

# Issues in Large Project Planning and Management

Lynne Siemens

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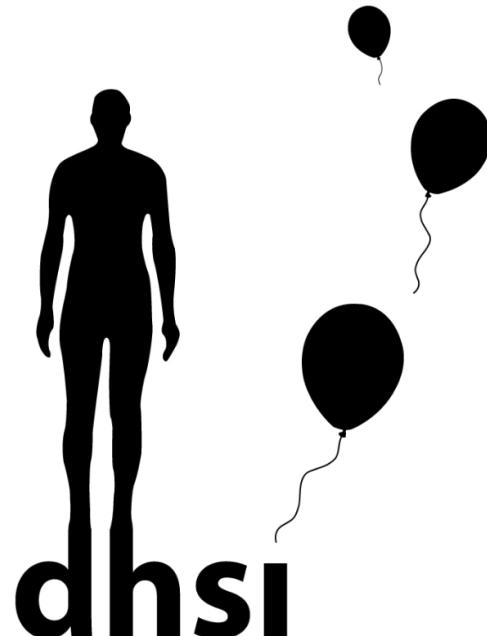
# Welcome to DHSI 2012!

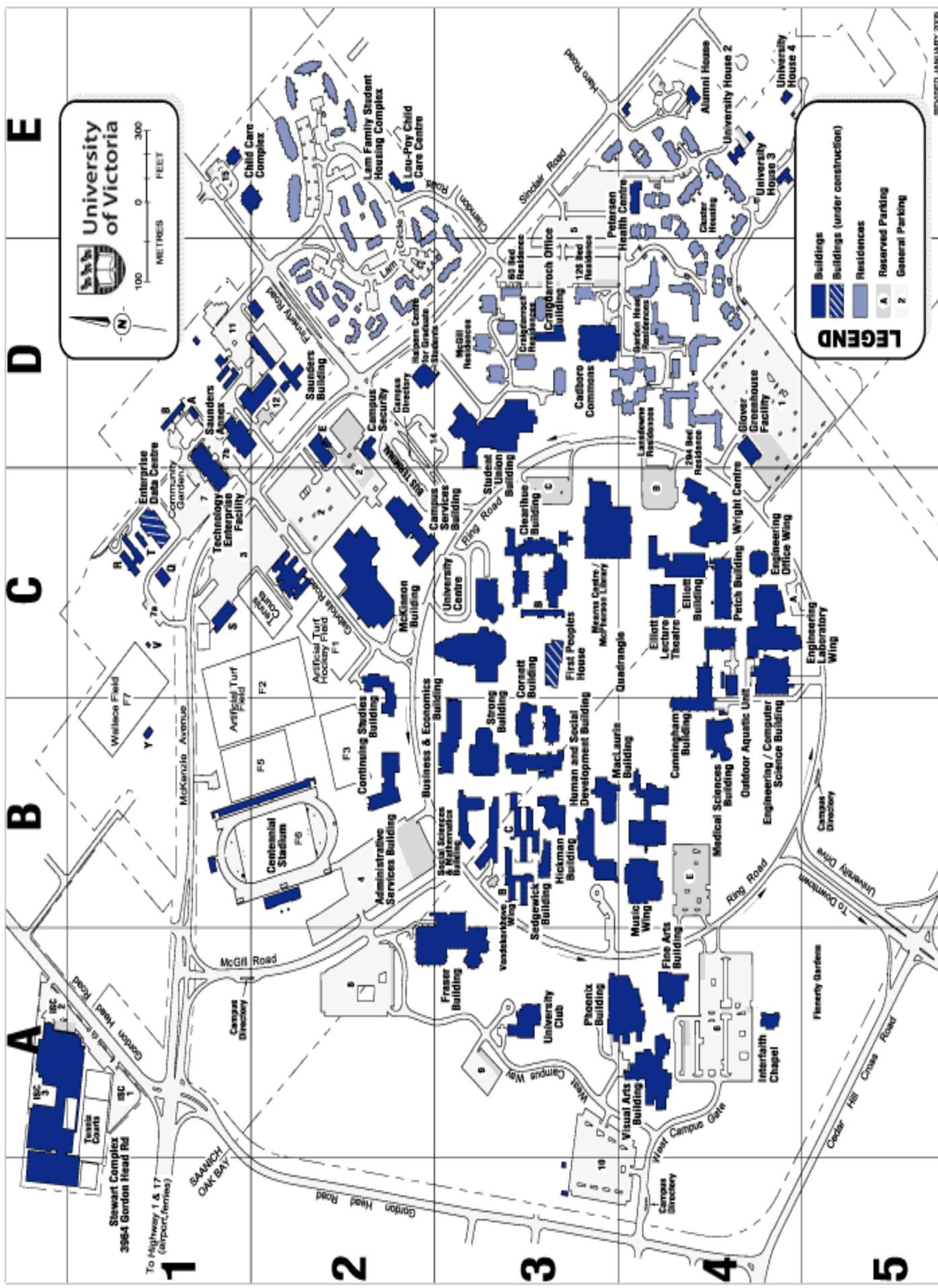
Thanks for joining the DHSI community this year – our 10<sup>th</sup> year, but our 11<sup>th</sup> offering!

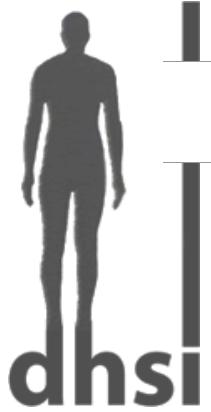
In this booklet, you will find essential course materials prefaced by some useful information about getting settled initially at UVic, finding your way around, getting logged in to our network (after you've registered on the Sunday afternoon, and received your login information), and so on.

Given our community's focus on things computational, it will be a surprise to no one that we might expect additional information online for some of the classes – your instructors will let you know – or that the most current version of all DHSI-related information may be found on our website at [dhsi.org](http://dhsi.org). Do check in there first if you need anything that's not in this coursepak.

And please don't hesitate to be in touch with us at [institut@uvic.ca](mailto:institut@uvic.ca) or via Twitter at [@AlyssaA\\_DHSI](https://twitter.com/AlyssaA_DHSI) or [@DHInstitute](https://twitter.com/DHInstitute) if we can be of any help ....







## Daily Schedule

### Sunday, 3 June 2012 [DHSI Registration]

DHSI Registration  
At UVic Housing / Residence Services Office ([Craigdarroch Building](#))  
See the [University of Victoria @ Google Maps](#)

After registration, many will wander to [Cadboro Bay](#) and the pub at [Smuggler's Cove](#).

### Monday, 4 June 2012

<p><b>8:00 to 8:30</b></p> <p>Last-minute Registration <a href="#">MacLaurin Building, Room A100</a> See the <a href="#">University of Victoria @ Google Maps</a></p>
<p><b>8:30 to 9:30</b></p> <p>Welcome <a href="#">MacLaurin A144</a></p>
<p>Classes in Session (Class locations for the week are as listed below)</p> <ul style="list-style-type: none"> <li>1. Text Encoding Fundamentals and their Application (<a href="#">Clearihue A102</a>)</li> <li>2. Digitisation Fundamentals and their Application (<a href="#">Clearihue A015</a>)</li> <li>3. Introduction to XSLT for Digital Humanists (<a href="#">Clearihue A103</a>)</li> <li>4. Multimedia: Design for Visual, Auditory, and Interactive Electronic Environments (<a href="#">Clearihue A108</a>)</li> <li>5. Geographical Information Systems in the Digital Humanities (<a href="#">Human and Social Development A170</a>)</li> <li>6. Physical Computing and Desktop Fabrication for Humanists (<a href="#">MacLaurin D016</a>)</li> <li>7. Digital Pedagogy in the Humanities (<a href="#">MacLaurin D110</a>)</li> <li>8. Creating Digital Humanities Projects for the Mobile Environment (<a href="#">Human and Social Development A270</a>)</li> <li>9. Designing RESTful APIs (Application Programming Interfaces) (<a href="#">MacLaurin D115</a>)</li> <li>10. Digital Humanities Databases (<a href="#">MacLaurin D114</a>)</li> <li>11. Augmented Reality: An Introduction (<a href="#">MacLaurin D109</a>)</li> <li>12. Issues in Large Project Planning and Management (<a href="#">Hickman 120</a>)</li> <li>13. Digital Editions (<a href="#">Clearihue A012</a>)</li> <li>14. Out-of-the-Box Text Analysis for the Digital Humanities (<a href="#">Clearihue A105</a>)</li> <li>15. Understanding the Pre-Digital Book (<a href="#">McPherson Library A003, A130</a>)</li> <li>16. Online Tools for Literary Analysis (<a href="#">MacLaurin D010 (M-W), D111 (Th-F)</a>)</li> <li>17. SEASR Analytics (<a href="#">MacLaurin D107</a>)</li> </ul>
<p><b>9:30 to Noon</b></p> <p>Lunch break / Unconference <a href="#">MacLaurin A144</a> (Unconference discussions through the week are coordinated by Deb Raftus; discussion topics, scheduling, and room assignments from among all DHSI rooms will be handled at this meeting)</p>
<p><b>1:15 to 3:50</b></p> <p>Classes in Session</p>
<p><b>4:00 to 5:00</b></p> <p>Institute Lecture: Laura Mandel (Texas A&amp;M) <a href="#">MacLaurin A144</a></p>
<p><b>5:00 to 6:00</b></p> <p>Light Reception <a href="#">University Club</a></p>

### Tuesday, 5 June 2012

<p><b>8:00 to 9:20</b></p> <p>DHSI Colloquium: Textual Analysis <a href="#">MacLaurin A144</a> Bill Enders, "Sorting Through Encoding Possibilities: TEI Guidelines and Conflicting Hierarchies in an 8th Century Illuminated Manuscript"; Paige Morgan, "Visible Prices: Digital Humanities at the Intersection of Literature and Economics"; James O'Sullivan, "Digitally Annotating the Bibliographic Code"; Charles Pence, "Software Demo: RLetters"; Rob Voigt, "Unmasking the Translator: The Example of Yu Hua's 'To Live'"</p>
<p><b>9:30 to Noon</b></p> <p>Classes in Session</p>

<b>Noon to 1:15</b>	Lunch break / Unconference, various locations
<b>1:15 to 3:50</b>	Classes in Session
	DHSI Colloquium: E-Publishing and Digital Editions <u>MacLaurin A144</u> Gord Barentsen, "Coding Digital Texts in TEI-Compliant XML, Case Study: The Folger Library Edition of <i>Troilus and Cressida</i> "; Carol Lea Clark, "The Future of the eBook: A Medium for Scholarly Innovation"; Constance Crompton, Daniel Powell and Ray Siemens, "The Devonshire Manuscript Defused: Modeling the Social Edition"; Jon Detombe, "Digitizing and Deciphering the Courten MS"; Elias Fahssi, "Working with <i>Patience</i> : Textual Editing, Digital Humanities, and Undergraduate Research"; Linnet Humble, "eBook Production at Canadian UPs: Problems and Possible Solutions"; Anna Gibbs and Maria Angel, "Digital Writing and the Literary Ethos"; Jeffrey Witt, "Rethinking the Critical Edition: The 'Editio Critica Electronica' of Petrus Plaoul"
<b>4:00 to 5:30/6:00</b>	

## Wednesday, 6 June 2012

	DHSI Colloquium: Digital Pedagogy <u>MacLaurin A144</u>
<b>8:00 to 9:20</b>	Almond Aguila, "The Pedagogy of Facebook"; Kathi Inman Berens, "Failure is Fruitive: Coding and Pedagogy"; Eugenie Duthoit, "Re-thinking the Use of Digital Tools to Assist the Pedagogical Translation from Latin"; Chris Friend, "Bringing Technology to Student Writing: How DH Practices Can Enhance Composition Pedagogy"; Peggy Jubien, "Reexamining Our Tools: Linking Educational Technology to the Socio-Political Dimensions"
<b>9:30 to Noon</b>	Classes in Session
	Lunch break / Unconference, various locations
<b>Noon to 1:15</b>	Lunch Discussion: James Cummings (Oxford), Elisabeth Burr (Leipzig), Jennifer Giuliano (Maryland), Rebecca Niles (Toronto), Sebastian Rahtz (Oxford), and Ray Siemens (Victoria), "Training Institutes in the Digital Humanities" <u>MacLaurin A144</u>
<b>1:15 to 3:50</b>	Classes in Session
	DHSI Colloquium: Archives and Databases <u>MacLaurin A144</u>
<b>4:00 to 5:30/6:00</b>	Orhan Elmaz, "How and Why to Create a Frequency Dictionary of Media Arabic"; Christopher Laxer, "Designing a Literary Labels Database"; Mike Nutt and Markus West, "Omeka and MicroTiles: Building Library Exhibits for Enormous Displays"; Anne Salsich, "The Archive and Digital Humanities: 'Shansi: Oberlin and Asia'"; Charles Shirley, "Can Putting <i>Troilus and Criseyde</i> into a Database Aid Critical Study?"; PANEL of Tara Thomson, J. Matthew Haculak, Katie Tanigawa and Stephen Ross, "The Modernist Versions Project"

## Thursday, 7 June 2012

	DHSI Colloquium: Gaming, Gamification, and Media Studies <u>MacLaurin A144</u>
<b>8:00 to 9:20</b>	Lauren Burr, "House of Leaves, House of Lexia"; Sara Humphreys, "Telling Open World Stories through Foundational Literary Genres"; Andy Keenan, "Gamification: Exploring the Debate within Game Design"; Amanda Visconti, "Choose Your Own Edition: Digital Pedagogy, Game Studies, and Editing Theory"
<b>9:30 to Noon</b>	Classes in Session
	Lunch break / Unconference, various locations
<b>Noon to 1:15</b>	Lunch Discussion: Andrew Stauffer (U Virginia) and Laura Mandell (Texas A&M), "Peer-Review, Publication, and the Academic Evaluation of Digital Scholarship: An Open Discussion" <u>MacLaurin A144</u>
<b>1:15 to 3:50</b>	Classes in Session
	DHSI Colloquium: Mapping and Visualization <u>MacLaurin A144</u>
<b>4:00 to 5:30/6:00</b>	Mary Borgo, "Voyeur-istically Viewing Middlemarch: Visualization Tools and Traditional Literary Scholarship"; Paul Faber, "A Thousand Tawnyling Instruments": Digital Humanities and the Study of Song"; Mary Galvin, "The Materiality of the Digital"; Gabriel Hankins, "Mapping the Modern Republic of Letters: Modeling Correspondence Networks with Omeka/Neatline"; Tim Hawkins, "Developing a Google Earth Finding Aid for Archival Materials About the Southern Colorado Coal Fields"; Alison Hedley, "Mobilizing the Maternal Body in Late Victorian England: Geo-Victorian Pedagogy"; Rob Imes, "Mapping Early Modern Travel Compilations: Merging Cartography, Travelogues, and GIS"; Sarah Koning, "Historical Gentrification?: The Example of 19th-Century Mexico City"; Ross Woods, "Mapping Madrid: Digital Humanities as Literary Criticism"

## Friday, 8 June 2012 [DHSI + Beyond Accessibility]

<b>8:00 to 9:20</b>	DHSI Colloquium: The Way Forward
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	<u>MacLaurin A144</u>	
		Christopher Church, Hannah Farber and Scott McGinnis: "Computing and the Practice of History: Creating an Institutional Framework for the Digital Humanities at UC Berkeley"; Kristin Cornelius, "Disseminating the Humanities"; Brooke Lestock and Sarah Storti, "The Praxis Program and Prism: Rethinking Graduate Training in a Digital Age"; Daniel Powell, Alyssa Arbuckle, Alyssa McLeod and Shaun MacPherson, "Digital Humanities and the Alt-Ac 'Track': Views from the Grad School Trenches"; Robin Wharton, "How to Make a Digital Humanist"
<b>9:30 to Noon</b>		Classes in Session
<b>Noon to 1:15</b>		Lunch break / Unconference, various locations Registration for conference, <u>Beyond Accessibility: Textual Studies in the 21st Century</u> (8-10 June) <u>MacLaurin Building, Room A100</u> See the <u>University of Victoria @ Google Maps</u>
<b>1:15 to 2:15</b>		Institute Lecture: Adriaan van der Weel (Leiden) Co-sponsored by <u>Beyond Accessibility</u> <u>MacLaurin A144</u>
<b>2:15-4:30 (or so)</b>		DHSI Wrap-up Session, Show and Tell <u>MacLaurin A144</u>

## Saturday, 9 June 2012 [**Beyond Accessibility**]

	<i>Beyond Accessibility: Textual Studies in the 21st Century</i> <u>Please visit the conference website</u>	
<b>8.30-5:00</b>		Room 1 ( <u>MacLaurin D101</u> ) Room 2 ( <u>MacLaurin D103</u> ) Plenary Session ( <u>Hickman 105</u> ) Breakout / Meeting Room ( <u>Hickman 120</u> )
<b>6.30-8:30</b>		TBA, Reception / Dinner

## Sunday, 10 June 2012 [**Beyond Accessibility**]

	<i>Beyond Accessibility: Textual Studies in the 21st Century</i> <u>Please visit the conference website</u>	
<b>9.00-12:45</b>		Room 1 ( <u>MacLaurin D101</u> ) Room 2 ( <u>MacLaurin D103</u> ) Plenary Session ( <u>Hickman 105</u> ) Breakout / Meeting Room ( <u>Hickman 120</u> )

**Contact info:**

[institut@uvic.ca](mailto:institut@uvic.ca) **P:** 250-472-5401 **F:** 250-472-5681

**RELATED LINKS:** [university of victoria](#) [humanities computing and media centre](#) [electronic textual cultures lab](#)

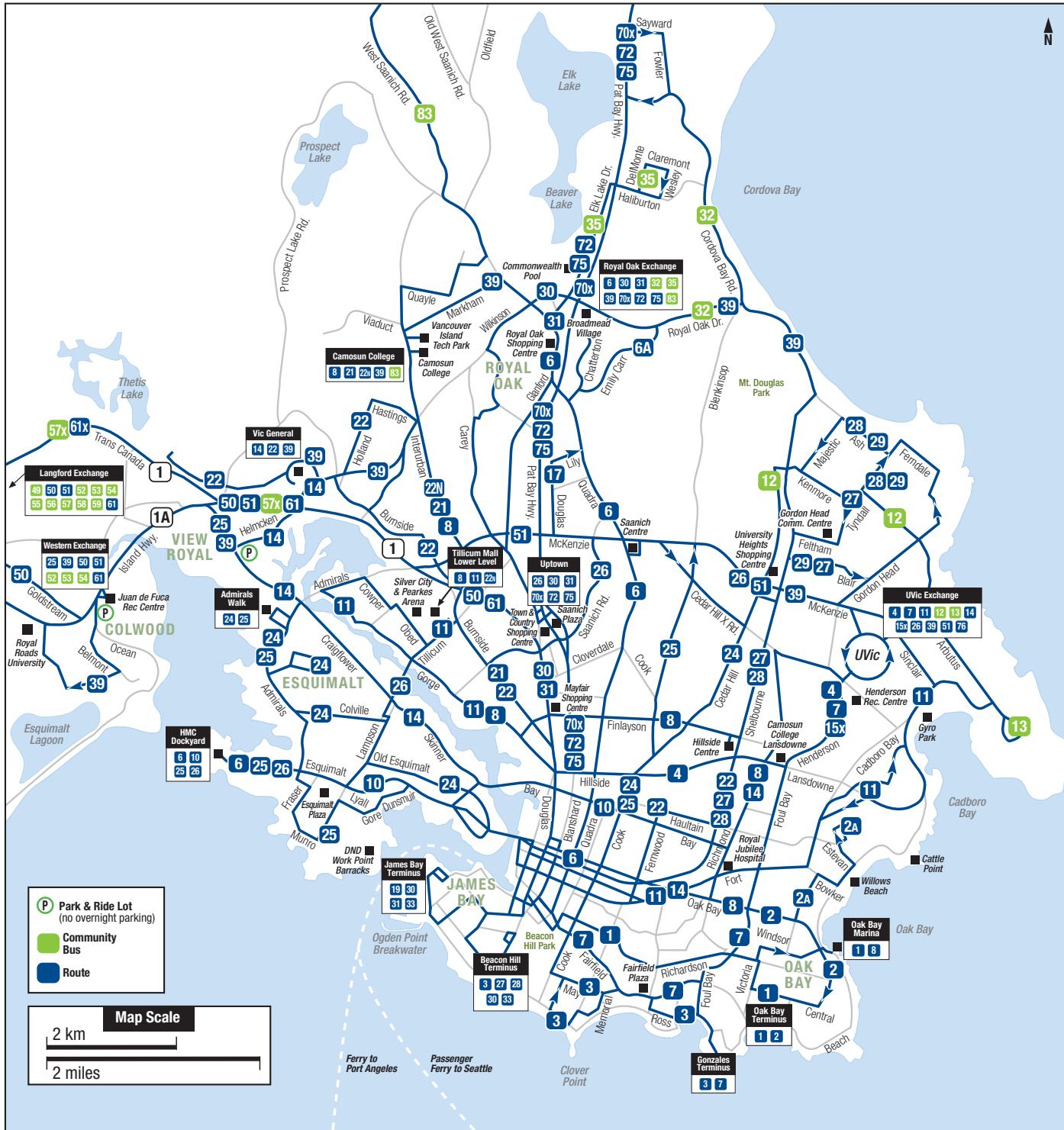


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## University Systems help centre



### [Internet and telephone](#)

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## Connect to UVic: Windows 7 and Vista

### **NEW UVic wireless configuration utility**

The UVic wireless configuration utility will automatically configure the "UVic" wireless network on your Windows XP SP3, Windows Vista, or Windows 7 computer.

[Download now](#)

**Note:** The UVic wireless configuration utility is still experimental; use this application at your own risk. UVic is not responsible for any damage caused by the use of the wireless configuration utility. Please report any problems to the [Computer Help Desk](#).

If the above doesn't work, please follow the manual instructions listed below. After the initial configuration, you should automatically connect to **UVic** (the secure wireless network) when you are on campus.

1. Before you start this procedure, ensure the following:

- Your **wireless card** and its drivers have been installed and you have rebooted your laptop since the installation.
- Your laptop is **powered on** and **booted up**.
- You are in an area with **wireless coverage**.
- You have a **NetLink ID** and **password**.
- You are using **Windows** to manage your wireless connections. If you are using a third-party application (sometimes network adaptors come with their own applications), you may experience problems during the configuration process.

2. Temporarily connect to the Internet using [UVic Open](#), an Ethernet port, or your home network. Download the security certificate by right clicking [thawte Primary Root CA](#) and saving the **thawte.cer** file to your computer. Once the file is saved to your computer, locate the file, double click on it, select **Install Certificate...**, and follow the **Certificate Import Wizard** instructions.

### Notices & bulletins

- [Student Computing Facilities website](#)  
Posted Apr 16, 2012
- [Microsoft Remote Desktop Protocol blocked](#)  
Posted Mar 16, 2012
- [Major system maintenance outages for February 24](#)  
Posted Feb 17, 2012
- [University Systems enhanced security and privacy services](#)  
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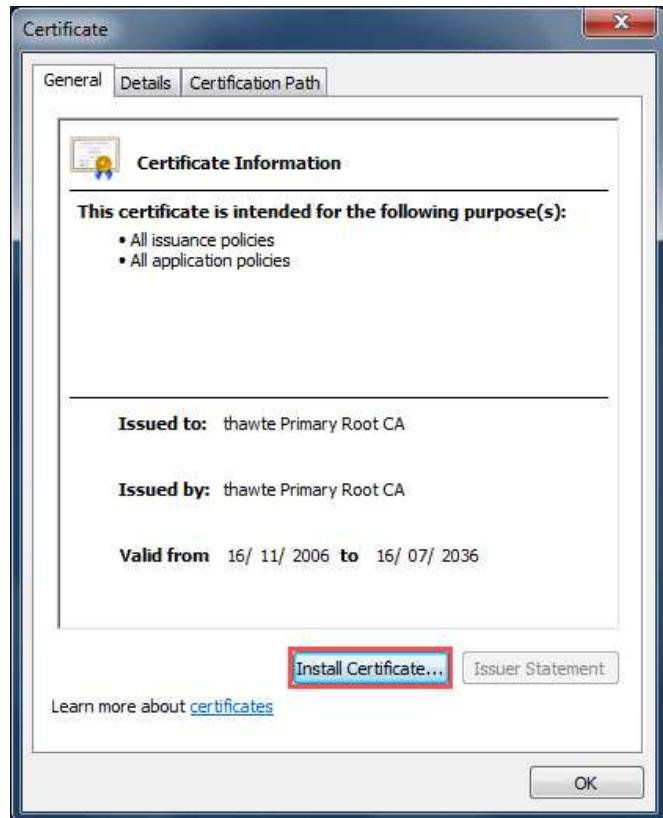
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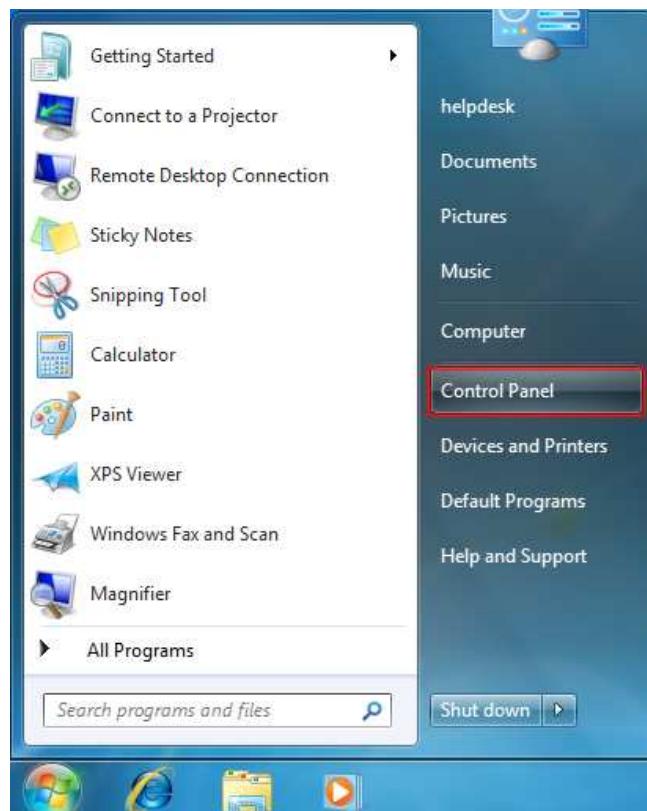
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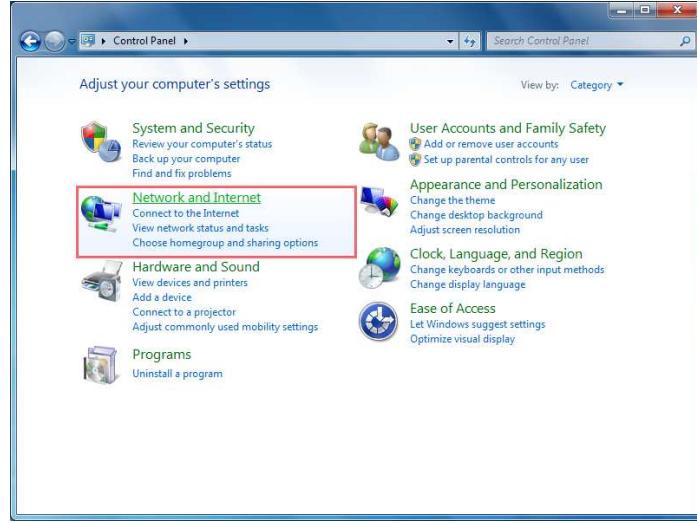
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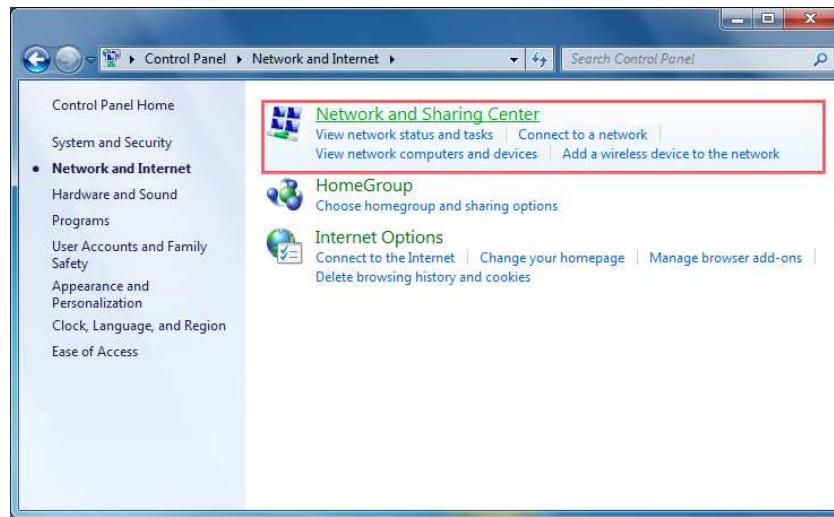
- Once you have successfully installed the certificate, open your **Start** menu and click on **Control Panel**.



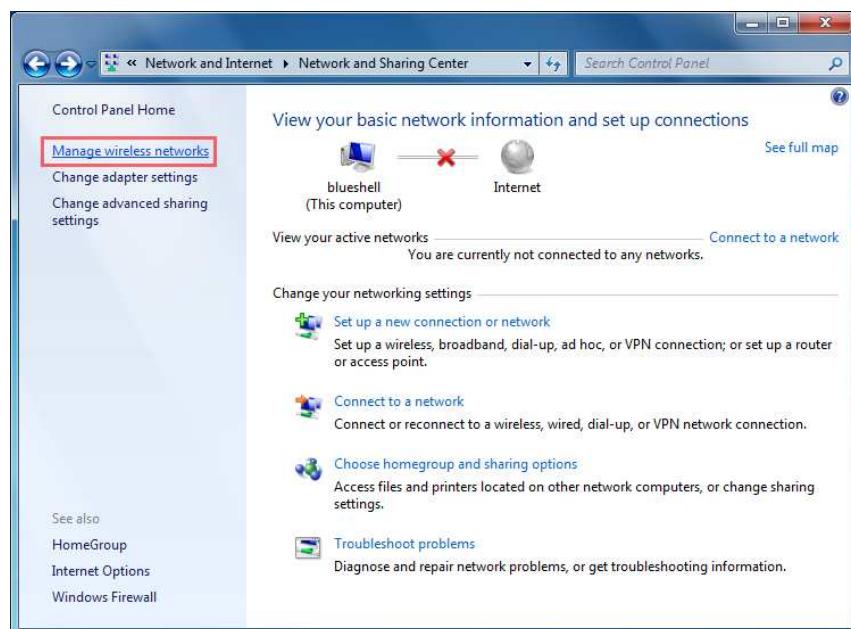
- Click on **Network and Internet** or **Network and Sharing Center**.



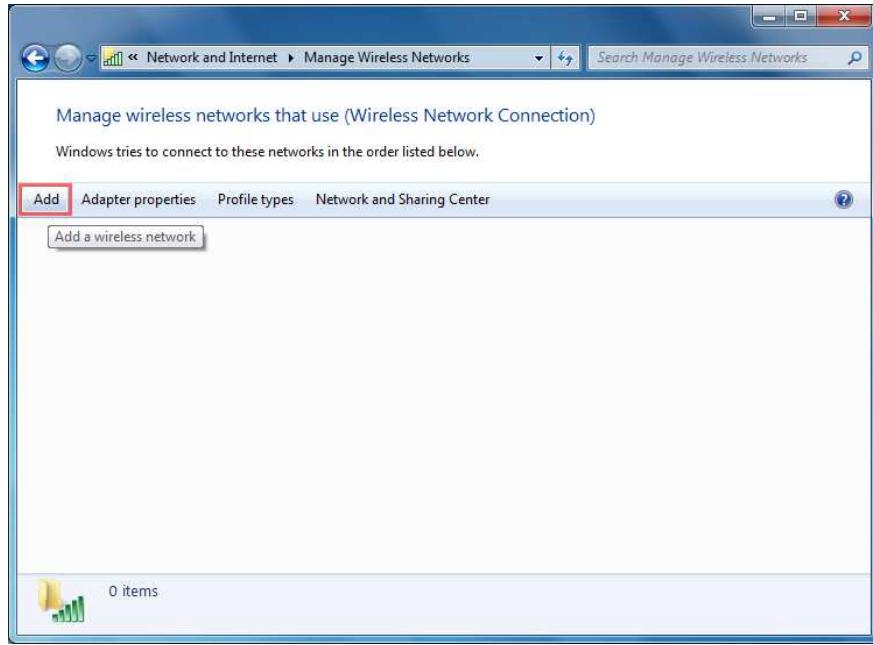
5. Click on **Network and Sharing Center**.



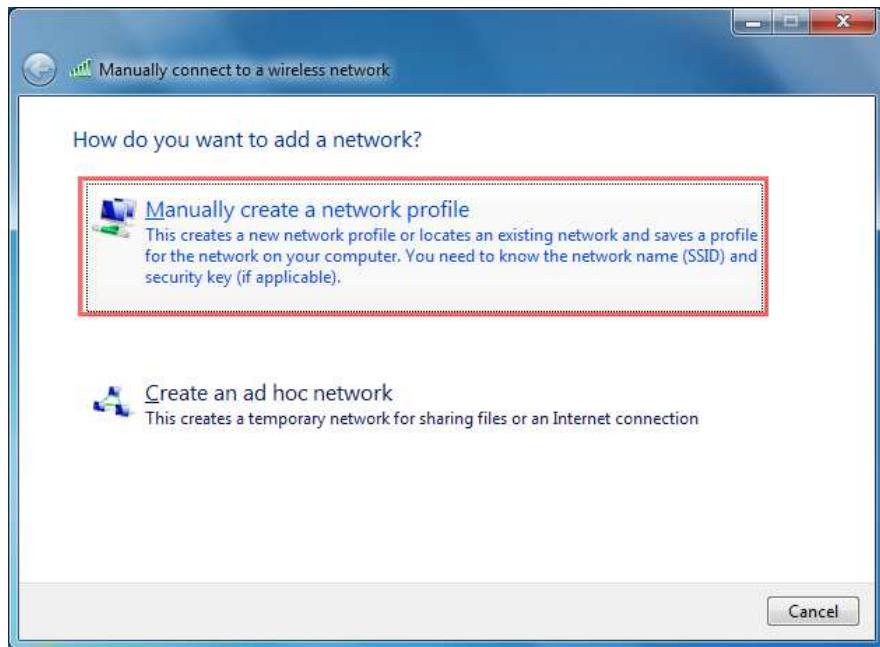
6. Click on **Manage wireless networks**, located on the left menu.



7. Click **Add**.

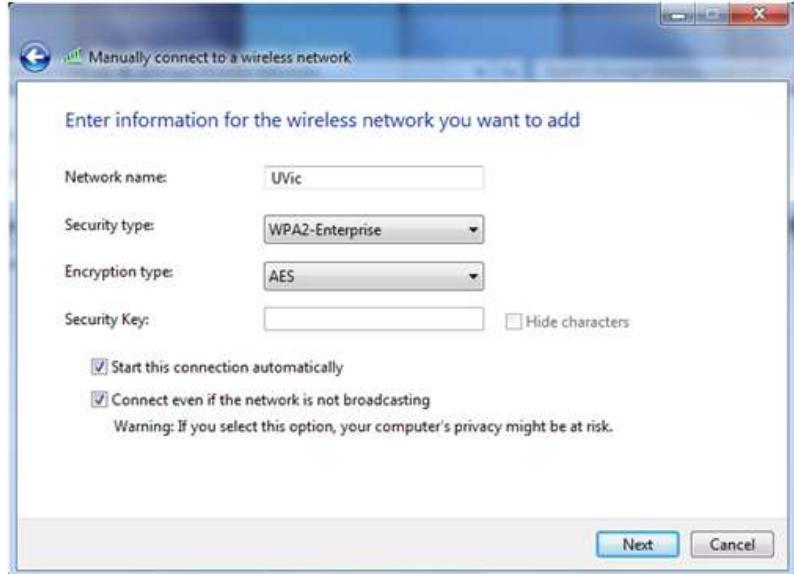


8. Click **Manually create a network profile**.



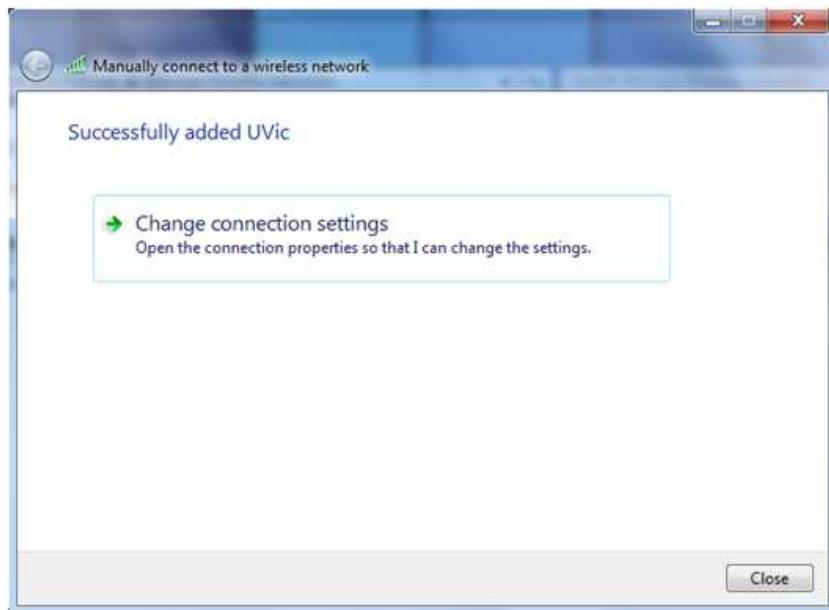
9. Enter the following information:

- Network name: **UVic** (case sensitive).
- Security type: select **WPA2-Enterprise**.
- Encryption type: automatically sets to **AES**.
- Security Key/Passphrase: (leave blank).



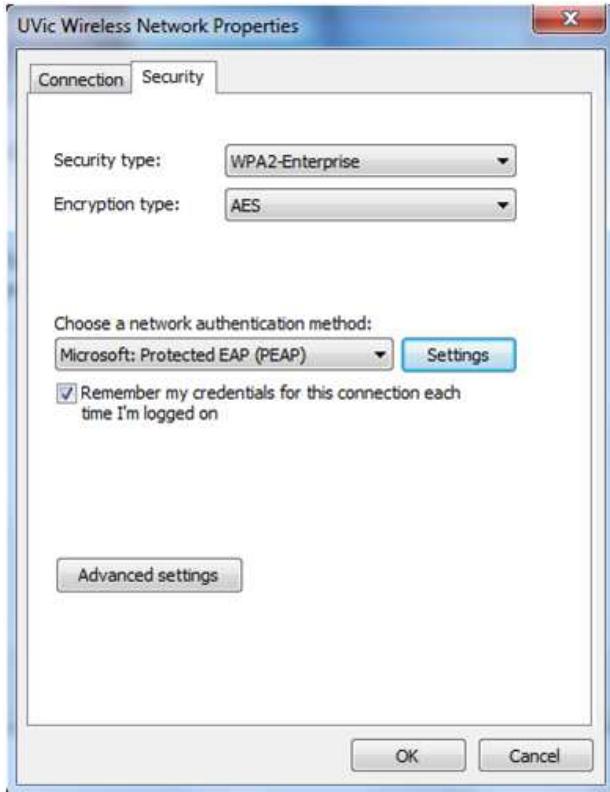
Ensure **both checkboxes are selected** (by default, the second box is not). Click **Next**.

10. Click **Change connection settings**. For now, ignore the pop-up window in the bottom-right corner.

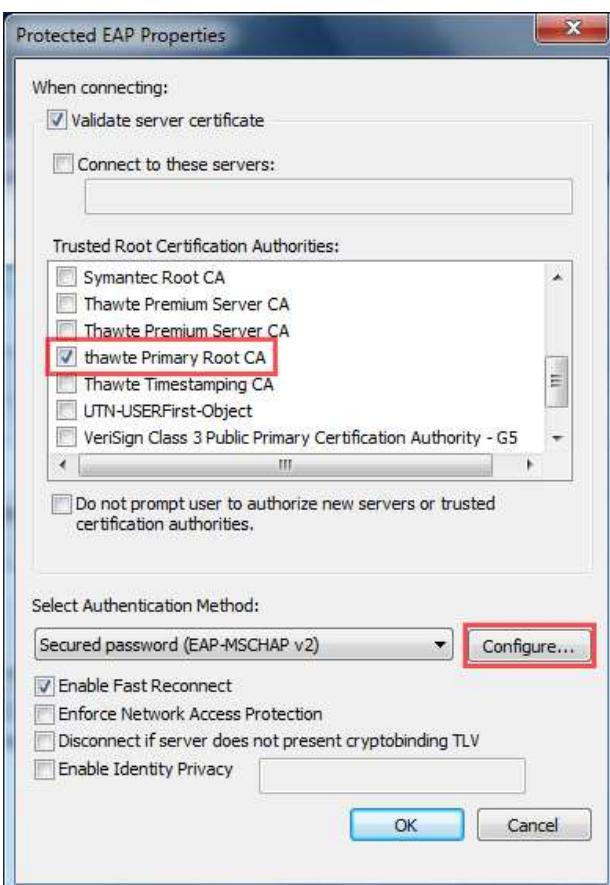


On the **Connection** tab, ensure the **Connect to a more preferred network if available** checkbox is not checked.

11. Click the **Security** tab. Ensure the authentication method is **PEAP**. Then click **Settings**.



12. Check the box beside **thawte Primary Root CA** in the list of **Trusted Root Certification Authorities**.



If you cannot find the correct certificate listed, please return to step 2 to download the certificate.

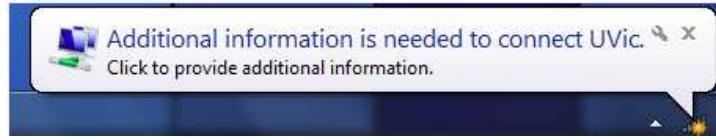
At the bottom of the dialogue, ensure that the **Authentication Method** is **Secured**

**password (EAP-MSCHAP v2).** Click **Configure**.

13. Deselect the checkbox for **Automatically use my Windows logon...** and click **OK**.



14. Close the remaining windows. In the bottom-right corner of your screen, you should see a small window pop-up informing you that **Additional information is required to connect to UVic**. Click on it to provide additional information.



15. Enter your personal **NetLink ID** followed by **@uvic.ca** in the **User name** field, and your **NetLink ID password** in the **Password** field. Click **OK**.



You should now be connected to the **UVic** secure wireless network.

The sidebar on the left contains the following links:

- [How-tos](#)
- [Setups](#)
- [AirNet wireless coverage](#)

The main content area features a heading **Internet & telephone** with a telephone icon. Below it is a list of links:

- Secure your data
- Domain names
- Mobile communications
- Public access network
- Remote access (VPN)
- Residence Internet (ResNet)
- Standard technology solutions
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- Voicemail and unified in-basket
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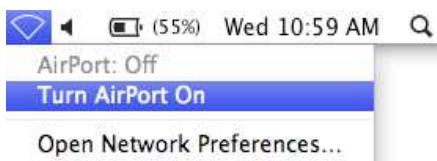
### Connect to UVic: Mac OS X 10.5 and newer

After the initial configuration, you should automatically connect to UVic (the secure wireless network) when you are using UVic's wireless network.

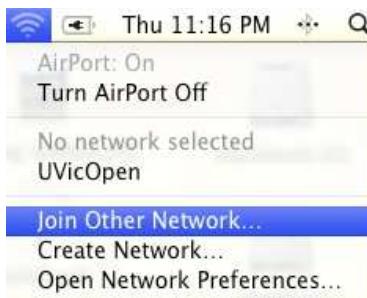
1. Before you start this procedure, ensure the following:

- Your **wireless card** and its drivers have been installed and you have rebooted your laptop since the installation.
- Your laptop is **powered on** and **booted up**.
- You are in an area with **wireless coverage**.
- You have a **NetLink ID** and **password**.

2. At the top-right corner of your screen there should be the **AirPort icon** (a semi-circle). If you do not see this icon, your AirPort card or AirPort software may not have been installed properly.
3. Click on the **AirPort icon** (it may be partially darkened) to reveal a menu. Ensure your **AirPort** is **On**.



4. Scroll down the **AirPort** menu and select **Join Other Network ....**



5. In the window that opens, enter the following information:

- Network Name: **UVic** (case sensitive)
- Security: **WPA2-Enterprise**
- User Name: **your NetLink ID**
- Password: **your NetLink ID password**
- 802.1X: **Automatic**

Click **Join**.

### Notices & bulletins

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Posted Apr 16, 2012
- [Microsoft Remote Desktop Protocol blocked](#)  
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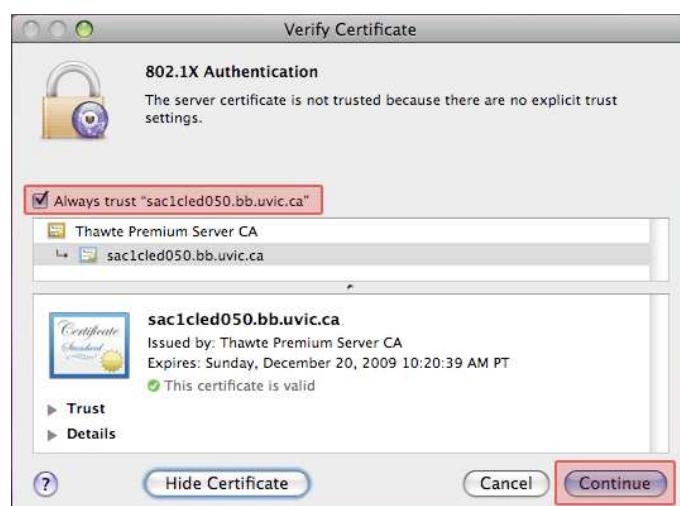
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6. If you see a message about Mac OS X wanting to access your Keychain, click **Always Allow**.
7. A **Verify Certificate** window will open saying that the certificate is not trusted.
  - Click **Show Certificate**.
  - Check the box that says **Always trust "sac1cled050..."** (the exact name may vary) and click **Continue**.
  - If you are prompted for your computer password, enter it and click **OK**.





You should now be connected to the **UVic** secure wireless network. To disconnect from the wireless network, click on the **AirPort icon** and click **Turn Airport Off**. Next time you connect to UVic, you should not need to enter any additional credentials.

■ [How-tos](#)  
■ [Setups](#)  
■ [AirNet wireless coverage](#)

**Internet & telephone**

- Secure your data
- Domain names
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### Connect to UVic: iPhone or iPod Touch

After the initial configuration, you should automatically connect to UVic (the secure wireless network) when you are using UVic's wireless network.

1. Before you start this procedure, ensure the following:
  - Your device is using **firmware version 4.0** or higher.
  - Your device is **powered on** and **booted up**.
  - You are in an area with **wireless coverage**.
  - You have a **NetLink ID** and **password**.
2. From the **Home** screen, press the **Settings** button.
3. Press the **Wi-Fi** option.



4. Under the **Choose a Network...** heading, select **UVic**.

**Notices & bulletins**

- [Student Computing Facilities website](#)  
Posted Apr 16, 2012
- [Microsoft Remote Desktop Protocol blocked](#)  
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Service	Status
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<a href="#">WebApps</a>	
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**Tell us what you need!**



5. Enter your personal **NetLink ID** followed by **@uvic.ca** in the **Username** field. Enter your **NetLink ID password** in the **Password** field. Press **Join**.



6. If prompted, press **Accept** to verify the **thawte Primary Root CA** certificate.



Your device should now be connected to the **UVic** secure wireless network.

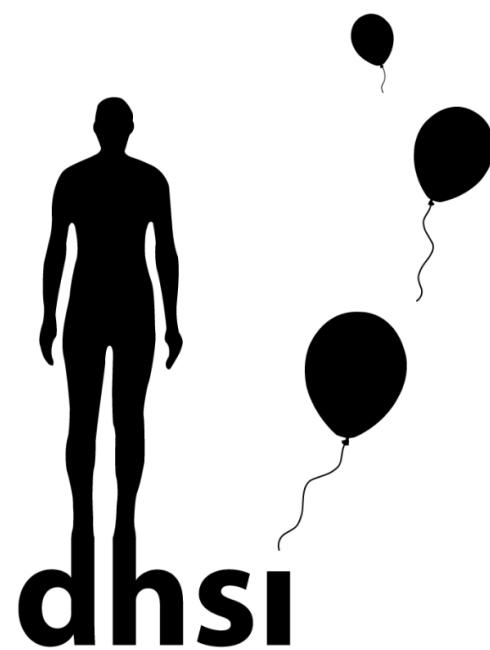


Known networks will be joined automatically. If no known networks are available, you will be asked before joining a new network.

■ How-tos  
■ Setups  
■ AirNet wireless coverage

**Internet & telephone**

- Secure your data
- Domain names
- Mobile communications
- Public access network
- Remote access (VPN)
- Residence Internet (ResNet)
- Standard technology solutions
- Telephones
- Voicemail and unified in-basket
- WebPhone
- Wired Internet
- Wireless Internet



## **Large Project Planning, Funding, and Management**

As the projects with Humanities Computing become larger and more complex, it becomes increasingly important for scholars/researchers to be able to manage these projects and resources effectively. One tool for scholars/researchers to meet these challenges and demands is project management. This course will cover the basics of project management from project definition to project review upon completion. Topics such as budget setting and controls, risk management, critical path scheduling, software tools, and related Internet resources will also be discussed. Material will be covered through lectures, discussions, case studies and presentations. By the end of the course, participants will be able to implement the concepts and tools in their projects.

### **Session 1 – Basics of Project Management**

- Course overview
- Definition of project management
- General model of project management
- Building the project plan

### **Session 2 – Project Teams and Groups/Project Start**

- Building a project team
- Project management model
  - Project initiation

### **Session 3/4 – Project Planning and Model**

- Project management model
  - Workbreak down structure
  - Project scheduling
  - Budget
  - Risk assessment
  - Project balancing

### **Session 5 – Project Change, Reporting and Managing Change**

- Managing project change
- Project control
- Project reporting
- Project review upon completion
- Software tools
- Internet resources



# Large Project Planning, Funding, and Management

## Session 1: Basics of Project Management

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Lynne Siemens

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Management, University of Victoria, 2012



## Eight Basic Principles of Project Management

- No major project is ever installed on time, within budget, with the same staff that started it. Yours will not be the first.
- Projects progress rapidly until they become 90 percent complete; they then remain 90 percent complete forever.
- One advantage of fuzzy project objectives is that they let you avoid the embarrassment of estimating the corresponding costs.
- When things are going well, something will go wrong.
  - When things just can't get any worse, they will.
  - When things appear to be going better, you have overlooked something.
- If project content is allowed to change freely, the rate of change will exceed the rate of progress.
- No system is ever completely debugged; attempts to debug a new system inevitably introduce new bugs that are even harder to find.
- A carelessly planned project will take three times longer to complete than you expected; a carefully planned project will only take twice as long.
- Project teams detest progress reports, because these reports vividly manifest their lack of progress.

<http://www.uclick.org/~de/humour/projects.html>

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Lynne Siemens

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## Introduction

- Introduction – participants and their projects
  - Yourselves
  - Your projects
  - Questions you would like answered

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## Agenda of Course

- **Session 1 – Basics of Project Management**
- **Session 2 – Project Teams and Groups/Project Start**
- **Session 3/4 – Project Planning and Model**
- **Session 5 – Project Change, Reporting and Managing Change**

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## Overview – Session 1

- Definition of project management
- General model of project management
- Building the project plan

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## Plan the Work –

## Now Work the Plan

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## Definition of Project Management

- Project Management is a set of principles, methods, tools and techniques for the effective management of objectives-oriented work in the context of a specific and unique organizational environment.

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## Successful Project Management Objectives

- Specified performance criteria
- Be within cost
- Be on schedule

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## Definition of a Project

- Key components
  - Not regular operations
  - Specific purpose or contract
  - Coordination of multiple tasks and resources
  - Specific cost, time and technical constraints
  - Not regularly repeated
  - Definite life cycle
  - Cross organizational boundaries and dissimilar skills
  - Relatively new or unknown undertakings
  - Uncertainty

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## Necessary Skills

- Negotiation
- Communication
- Team
- Analytical
- Evaluation

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## Examples

- New product or service
- Change in structure or staffing
- Building construction
- New business procedure

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## Model

- Problem identification
- Solution alternatives generation
- Solution selection
- Implementation planning
- Execution
- Progress analysis
- Project completion

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## Project Plan

- Tool for coordinating work
- Objectives
  - Determine and portray scope of work
  - Identify personnel and capital resources
  - Schedule work
  - Determine budget

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## Project Plan

- Essential questions to ask
  - What (technical objectives)
  - How (work breakdown structure)
  - Who (resource commitment and utilization plan)
  - When (schedule)
  - How much (budget)

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## Project Plan

- Benefits
  - Effective Communication
  - Final check
  - Baseline established
  - Reduces need for narrative reporting

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## Thought work

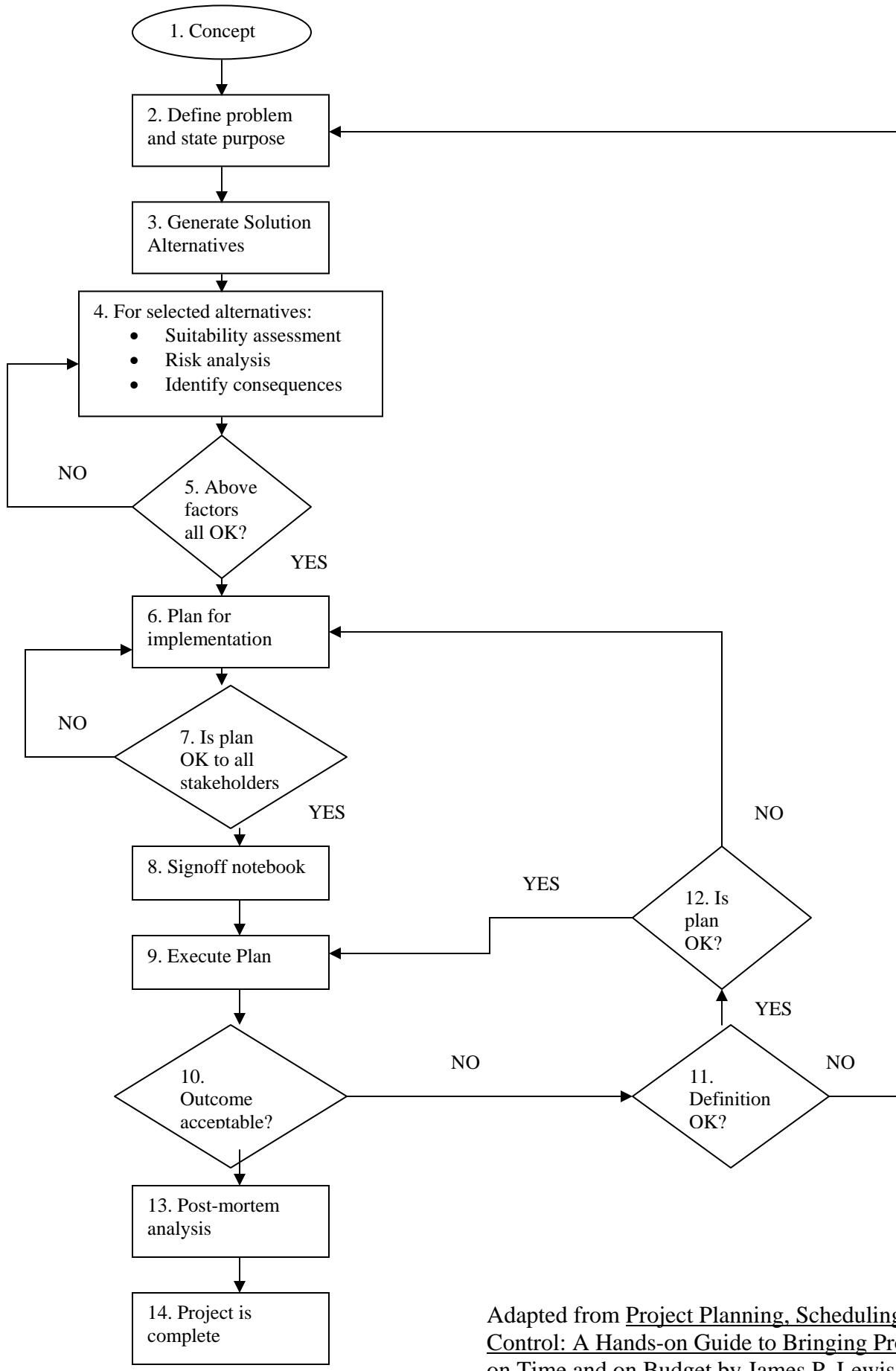
- Project Team – who/what skills
- Problem Definition

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# Project Management



Adapted from Project Planning, Scheduling and Control: A Hands-on Guide to Bringing Projects in on Time and on Budget by James P. Lewis, 1991

**Notes:**

**Notes:**

**Notes:**

# Large Project Planning, Funding and Management

## Session 2: Project Teams and Groups/Project Start

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## Overview – Session 2

- Team Formation and Development
- Project Start/documentation

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## Project Team

- Researcher/Primary Investigator
- Project Manager
- Project Members

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## Role of Project Manager

- Day to day management of project
- Establishment of project structure
- Negotiation of written agreements
- Monitoring work
- Reporting progress
- Training and developing staff
- Developing a sense of team

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## Project Team Formation

- Who should be a part of it?
- Questions to consider
  - Would I want this individual working for me
  - Would I want this individual as one of my peers
  - Would I want to work for this individual
  - Consideration of availability, personal style, goals

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## Components of an Effective Team

- Performance
- Member satisfaction
- Team learning
- Outsider satisfaction

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## Skills/Responsibilities

- What skills are needed?
  - Skills inventory matrix
- Who will be responsible for what?
  - Responsibility matrix
- Assessing competence
  - Balance between skills and “good guy”

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## Building an Effective Team

- Team definition
  - small set of individuals who work interdependently and are jointly accountable for performance goals
- Stages
  - Forming
  - Storming
  - Norming
  - Performing

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## Team Effectiveness Model

- Evaluation
- Components
  - Organization and team environment
    - Reward systems, communication systems, physical space, organizational environment and leadership
  - Team design
    - Task characteristics, size, composition
  - Team process
    - Development, norms, roles, cohesiveness

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## Team Charter

- Description of how the team will work together
- Components
  - Team purpose
  - Ground rules for behaviour
  - Assign roles and responsibilities

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## Starting Point for Team Development

- **Team formation**
  - Introduction
  - Team building exercises
  - Operating agreements
- **Team planning**
  - Review task/expectations
  - Set objectives
  - Assign roles/responsibilities
  - Create workplan

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## Important considerations for diverse, far flung teams

- Communication
- Trust/accountability

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## Project Start

- Identification of need/problem
  - What is the issue to be addressed
  - Questions
    - Why do you want the project done
    - Why now
    - What are the risks
    - What are the costs
    - By what standard, will you measure results

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## Project documentation

- Key components
  - Problem/opportunity statement
  - Scope definition
  - Completion criteria
  - Assumptions
  - Impact statement
  - Risks
  - Resource requirements

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## Thought work

- What is the work that needs to be done for the project?

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## Skills Inventory Matrix

	Required Skill	programmer	analyst	technical writer	training	quality assurance	user	project leader
individual			x	x				x
Joan								
Seth							x	
Guy	x					x		
Bob	x		x			x		
Jean	x							
Marie			x	x	x			

## Responsibility Matrix

P= Prime

S=Support

Task ID	Task	Joan R.	Bob S.	Guy R.	Marie S.	Jean M.	Seth K.
a	Assess requirements	p	s	s	s	s	s
b	design business system	s	p	s	s		s
c	modify purchased package			p		s	
d	modify in-house procedures	s	s		p		s
e	modify manual systems flow		p		s	s	
f	test purchased package	s		p		s	s
g	test in-house procedures	s			p		s
h	test manual systems flow	s	p	p			s
i	implement new software package	p	s	s	s	s	s
j	train staff				p		

## CHECKLIST 6.1. ASSESSING TEAM MEMBER COMPETENCE.

*Instructions:* Select the level in each area of competence that best characterizes the current skills and experience of the individual being assessed (your own skills and experience if this is a self-assessment).

<b>Area of Competence</b>	<b>Skills</b>	<b>Skill Level (1 = low, 2 = medium, 3 = high)</b>	<b>Experience</b>	<b>Experience Level (1 = low, 2 = medium, 3 = high)</b>
Project Management	<ul style="list-style-type: none"> <li>• Can develop personal, project, and task plans; schedules; and cost estimates</li> <li>• Can develop different strategies to get work back on schedule</li> <li>• Can derive and document learnings from a number of different situations</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has developed project or task plans, schedules, and cost estimates</li> <li>• Has shared learnings in formal and informal forums</li> </ul>	Score:
Networking	<ul style="list-style-type: none"> <li>• Can identify important local stakeholders for the team</li> <li>• Can plan and implement networking activities</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has worked in a number of different locations and functions within the organization</li> <li>• Has worked with external partners, such as vendors and suppliers</li> </ul>	Score:
Use of Technology	<ul style="list-style-type: none"> <li>• Can plan for the use of technology, given the backgrounds of team members and stakeholders and the demands of the team's task</li> <li>• Can access training and skill-building activities in this area</li> <li>• Can plan and facilitate remote meetings</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has experience in the use of a number of different communication and collaboration technologies</li> </ul>	Score:
Self-Management	<ul style="list-style-type: none"> <li>• Can plan and prioritize personal work</li> <li>• Can set limits and say no Has personal strategies for handling ambiguity</li> <li>• Can identify learning opportunities</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has worked in a number of different teams simultaneously</li> <li>• Has developed and executed personal-growth plans through formal education, on-the-job learning, and other strategies</li> <li>• Has performed tasks that required learning new skills or changes in work habits</li> </ul>	Score:
Spanning Boundaries	<ul style="list-style-type: none"> <li>• Can constructively discuss dimensions of cultural differences</li> <li>• Is able to create ways of working that not only accommodate but optimize differences</li> <li>• Is able to plan team activities, taking into account how these processes interact with functions and cultures of team members</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has worked in cross-functional teams</li> <li>• Has worked in teams with cross-organizational and/or cross-cultural representation</li> </ul>	Score:

## CHECKLIST 6.1. (CONTINUED).

<b>Area of Competence</b>	<b>Skills</b>	<b>Skill Level (1 = low, 2 = medium, 3 = high)</b>	<b>Experience</b>	<b>Experience Level (1 = low, 2 = medium, 3 = high)</b>
Interpersonal Awareness	<ul style="list-style-type: none"> <li>• Is able to collect and act on feedback from others about own interpersonal style</li> <li>• Is able to give appropriate feedback, when solicited, to others regarding their styles</li> <li>• Is able to foster interpersonal interaction about styles and their impact on others</li> </ul>	Score:	<ul style="list-style-type: none"> <li>• Has worked in different situations and has modified own behavior to meet the demands of the situations</li> <li>• Has participated in feedback sessions on personal behaviors</li> </ul>	Score:

Total number of 3s: \_\_\_\_\_

Total number of 3s: \_\_\_\_\_

Total number of 2s: \_\_\_\_\_

Total number of 2s: \_\_\_\_\_

Total number of 1s: \_\_\_\_\_

Total number of 1s: \_\_\_\_\_

Total: \_\_\_\_\_

Total: \_\_\_\_\_

### **Scoring**

*Instructions:* Total the numbers in the “skills” and “experience” boxes for each competence. (For example, selecting 3 in all skill areas would give you a total score of 18 for skills.) Interpret the numbers as follows:

#### *Skills*

6 or less: You are probably just getting started in a virtual-team setting. Your challenge is to gain skill in competence areas in which you scored 2 or below. This can be accomplished through training, reading, working with a mentor, and working in multiple virtual teams.

6 to 12: You have a solid understanding of the requirements of virtual-team membership. Your primary challenge is to refine your skills for application in a number of different situations. This can be accomplished best by working in multiple virtual teams under the mentorship of experienced managers.

12 or more: You have excellent virtual-team-member skills. You may want to work on skill areas in which you scored 2 or less. You also may want to plan to help others acquire knowledge in the areas in which you are most skilled. This can be accomplished by working as a mentor/coach in multiple virtual teams.

#### *Experience*

6 or less: You probably have not had the chance to practice team membership in a virtual setting. Your challenge is to gain experience. This can be accomplished by working with a mentor or beginning to work in virtual teams under the guidance of experienced managers.

6 to 12: You have solid experience in a virtual-team setting. Your primary challenge is to broaden your experience in a number of different situations. This can be accomplished by working with a mentor or in multiple virtual teams.

12 or more: You have exceptional experience in virtual teamwork. You may want to expand your experience in any areas in which you scored 2 or less. You also may want to help others to acquire skills and experience. This can be accomplished by working as a mentor or coach in multiple virtual teams

**TABLE 5.2. TEAM NORMS.**

*Instructions:* Use this worksheet to document your virtual team norms. Make certain that all team members agree to each norm and have all team members sign the document. You may choose to post this on a team Web site.

Team Name: \_\_\_\_\_

**Team Norms**

Category	Norms
Keeping in Touch with Other Team Members	
Meeting Management	
Decision Making and Problem Solving	
Conflict Management	
Working Together to Produce or Review Documents	
Other	
Team Member's Signature:	

**TABLE 5.1. SAMPLE TEAM NORMS.****Voice Mail**

- Check voice mail every day, and return calls within twenty-four hours.
- If you are unable to check voice mail, record a greeting that informs others of your limited access.
- When leaving messages for others
  - Speak slowly and clearly
  - Be clear and concise about what you need, when you need it, and how you want to receive it
  - Leave your complete phone number (including country code)
- State your name and phone number at the beginning and end of each message.

**E-Mail**

- Check e-mail every day, and return urgent e-mails within twenty-four hours.
- If you will not be checking your e-mail for any reason, use the "out of office" alert.
- Assume that if you are sent a copy of a message (that is, if your address is listed after "Cc:" rather than after "To:"), it is for your information only, and no reply is required.
- Remember that certain comments can come across as somewhat harsh in e-mail; be as diplomatic as possible in your choice of words.
- If you write a message in an emotional or agitated state, save it for a day and review and revise it as necessary before sending it.
- Do not use e-mail to resolve interpersonal issues, communicate sensitive information, or avoid personal interaction.
- Indicate in the subject line what you need and by when.
  - FYI means that the e-mail is not urgent but contains something of interest.
  - ACTION BY (DATE): (SUBJECT) means that a response or action is needed by the given date—notify the sender immediately if you cannot make the deadline.
  - URGENT FYI means that the information must be read immediately.
  - URGENT ACTION: (SUBJECT) means that the recipient must read and take action on the noted subject immediately.
- "Reply to All" should be used only when all parties need to have your information; attachments to such replies should be deleted.
- Review e-mail lists regularly to be sure they are up-to-date, and ask to be taken off old lists.
- If there are more than three e-mail threads, make a phone call to resolve issue.
- Always run spell-check before sending a message.
- Do not use ALL CAPITALS in the message body.
- Schedule meetings via a calendaring function and not by e-mail.
- When declining a meeting invitation, provide a reason and possibly an alternative time.

**Instant Messaging**

- Log on when you get into the office.
- Use the "I am away" and "Do not disturb" features of the application when you are away from your desk or already participating in an e-meeting.
- Turn IM off when you are in meetings or presenting.

(continued)

Mastering Virtual Teams by  
Deborah L. Duarte + Nancy Tennant Snyder

**TABLE 5.1. (CONTINUED).*****Cell Phones and Pagers***

- Switch to vibrate mode during meetings.
- Answer during meetings only when the call is urgent.
- Use only when the other party has agreed that he or she wants to use this as a method of communication.

***Audio- and Videoconferencing***

- All participants should announce their presence at the beginning of the conference or when they arrive—don't be a stealth participant!
- Identify yourself when speaking.
- Use mute buttons when people are not speaking.
- Do not engage in side conversations during a meeting; it is very frustrating for people not in the location of the actual discussion.
- If you have a problem hearing someone, notify the speaker.
- The leader of a videoconference should arrive early and establish the conference link prior to the meeting's start time.

***Meeting Management***

- Be on time for videoconferences, audioconferences, and other meetings, and attend the entire meeting.
- Rotate time zones for meetings.
- Link time and date to North American Eastern Standard Time (or whatever time zone is appropriate for the team).
- Take breaks every sixty to ninety minutes during audioconferences and videoconferences.
- Do not interrupt others in any meeting.
- Respect the facilitator's attempts to foster participation from all team members.
- The agenda should be sent out via e-mail no less than forty-eight hours in advance of every meeting, and minutes are sent out via e-mail no more than forty-eight hours after each meeting. Follow the agenda, and rotate taking minutes.
- If there are participants whose native language is different from the language in which the meeting is being conducted, give them time to think and time to speak. We provide "think breaks" so that people can gather their thoughts.
- At the end of each meeting, evaluate everyone's performance against the team norms.

***Decision Making and Problem Solving***

- Use a common approach to problem solving and decision making.
- Keep the interests and goals of the team in the forefront of all decisions.
- Balance the local interests of team members with those of the entire team.
- If advice is needed, turn first to the team member who is considered an expert before going outside the team.
- Strive for consensus but realize that consensus takes time and is not always necessary. If consensus cannot be reached, accept the expert team member's opinion.

(continued)

**TABLE 5.1. (CONTINUED).*****Conflict Management***

- Resolve differences in ways of doing business using the company code of conduct.
- Do not settle differences via e-mail. Call and speak directly to the person. Approach the person first, not the team leader or another team member.
- Use an established conflict management process.
- Realize that conflict is a normal part of the team's life cycle and that conflict focused on the task and not each other is healthy and productive.
- Recognize that unproductive conflict is more difficult to detect in a virtual setting, so take the pulse of the team frequently to ensure that conflict produces positive tension. Don't let tensions build.

***Working Together to Produce or Review Documents***

- Do not review details of long documents on group audioconferences; send them to the team leader or another person designated to integrate information and send out as notes.
- When working in an "assembly-line" fashion, move the document through the system in a timely manner. Give each other feedback when promised.
- Keep confidential documents within the team, and do not allow external team members to review them.
- Review the team's progress at the same time each week for a specific length of time via audioconference.
- Send agenda items and updates to the facilitator by the same deadline every week.
- The team leader is the only one with authority to release the documents to the client.

## **Project Agreement**

*This document represents a mutual commitment of time and resources between the XXX and the YYY funding for the fiscal period...*

\_\_\_\_\_  
Date

<b>Project Title</b>	<b>Project Number</b>
<b>Faculty Project Lead</b>	<b>Contact Information</b>
<b>Project Manager</b>	<b>Contact Information</b>
<b>Project Start Date</b>	<b>Project End Date</b>
<b>Implementation Date</b>	

### **Summary of Project Deliverables**

#### ***Project Detail***

The attached Project Schedule, A – G provides a detailed outline of the project rationale and description, deliverables, milestone dates, and specific roles and responsibilities of the project team.

#### ***Accountability***

- It is the responsibility of the School to ensure project faculty are provided sufficient release time to complete the project in a timely manner.
- It is the responsibility of the partners to ensure sufficient project support staffs (technical, administrative, and non-teaching faculty) are available to complete the project in a timely manner. A report on project progress will be submitted to the School and XXX Deans, on request.

#### ***Quality Assurance***

- Project faculty leads are responsible for ensuring that work performed conforms to standards within their professional area of practice, and within the requirements of the School's program area.
- Copyright clearance, where applicable, is the responsibility of the project lead and the School.
- The XXX is responsible for ensuring sound principles of curriculum and instructional design, and, is responsible for providing appropriate standards of editing, graphic and media design support, as applicable.
- ZZ is responsible for ensuring the work performed by the technical staff conforms to accepted professional standards.

#### ***Project Cancellation***

Either party may request suspension or cancellation of the project work with 30 days notice, in writing.

#### **A. Project Description/Rationale**

<b>Rationale</b>		
<b>Description</b>		
<b>B. Project Deliverables and Accountabilities</b>		
<b>Design</b>	Project Plan	
	Community of Practice	
<b>Development</b>	Needs analysis	
	Resources	
<b>Implementation</b>	Setting up initial contact with instructors	
	Monitoring and guiding discussions/chat	
<b>Showcase</b>	Article in various sources	
<b>Share</b>	Mentoring/Training other Department Heads on using Communities of Practice to encourage international ties with the institution	
	Sharing research ideas and results	
<b>C. Scope and Other Relevant Information</b>		
This project will encompass the following:		
<ul style="list-style-type: none"> <li>• Access to course outlines and curriculum materials</li> <li>• Forum for discussion</li> <li>• Resources</li> <li>• The sharing learning materials</li> <li>• The adaptation of materials to the needs of students</li> <li>• Development of teachers' own local, technology-specific teaching materials</li> <li>• Consultations with appropriate groups</li> <li>• Access to related internet links recommended by the Communication Department</li> </ul>		
This project will not involve any formal training of instructors.		
<b>D. Stakeholders</b>	<b>Level of Involvement</b> (Awareness, provides input, team member, etc.)	
School	Team member	

XXX	Team member, provides input
Other Projects (e.g. Faculty Resources)	Provides venue
Students	Provide input

#### E. Project Team Roles and Responsibilities

<b>Owner and Sponsor</b>	Advocate of project. Has ultimate responsibility for the project, including its priority, funding, achievement of the business objectives, and resolution of critical issues. Member of Core Team.	
<b>Project Lead</b>	Responsible for the overall content, design, development, implementation, showcasing, and sharing (including mentoring) of the project	
<b>Project Manager</b>	Overall project management, coordination, evaluation, teaching and learning practices, academic reviews.	
<b>Technical Advisor</b>	Technical training, advising on the technical capabilities and usability issues of the technology	
<b>Grassroots Coordinator</b>	Responsible for overall coordination of the Grassroots projects; manages the Grassroots Community of Practice; ensures the currency of the Grassroots component of the YYY Initiative Website; arranges orientation for Grassroots project leads	
<b>Academic Portfolio Manager</b>	Allocates adequate funding and resources for academic projects; guides technical aspect of the project	
<b>WCS Portfolio Manager</b>	Allocates adequate funding and resources for the technology component of the project	
<b>Users/Client</b>	Uses, tests learning approaches and the enabling technologies	

#### F. Milestones and Accountabilities

<b>Design</b>	Set up CoP (with appropriate rooms) and create Project Plan	Target Date	
<b>Development</b>	Communicate with teachers to determine needs, and gather resources from XXX instructors (course outlines, materials, links, etc.)	Target Date	

<b>Implementation</b>	Teachers enter and participate in CoP	Target Date	
<b>Showcase</b>	Writing an article	Target Date	
<b>Share</b>	Mentoring colleagues with similar international goals	Target Date Ongoing	

#### **G. Projected Resource Requirements (Days)**

<b>Position/Person</b>	<b>Year</b>	<b>Year</b>	<b>Total</b>
Project Lead			
Project Manager			
IDC			
Technical Advisor			
Project and Documentation Specialist			
Video Team			
<b>Total Days for Project</b>			

[Shade in the appropriate times]

F. Timeline		Sept	Oct	Nov	Dec	Jan-Mar	April
TASKS	Notes						
<b>Design (4 days)</b>							
▪ Decide on tool							
▪ Training: conceptual + hands-on							
▪ Ongoing consultation (outcomes, methodology, website integration)							
<b>Development (5 days)</b>							
▪ Populate (Launch)							
<b>Implementation (6 days)</b>							
▪ Training/support/facilitation for teachers							
▪ Manage the Process							
▪ Collect & tabulate user feedback							
▪ Archiving							
<b>Showcase (3 days)</b>							
▪ Organize and draft article							
▪ Publish Article							
▪ Archive							
<b>Share (2 days)</b>							
▪ Feedback/mentor							

PROJECT NAME  
Research Project Charter  
DATE

Charter Members: LIST of NAMES

Principle	Policy
We are interested in disseminating the results of this project as widely as possible, with credit to us for doing it.	<p>Project members may use any of it as examples in presentations, papers, interviews, and other media opportunities. They may post any of it to their web sites. Wherever possible, they should mention the names of the other project members.</p> <p>For presentations or papers where this work is the main topic, all team members should be co-authors. Any member can elect at any time not to be listed as a co-author, but may not veto publication.</p>
We intend this work to move forward at a steady pace, given due awareness of the vagaries of life.	<p>Project members will make every effort to attend meetings as arranged and to keep in regular contact by email or other electronic means. Frequent absence may result in being warned, then cautioned, then asked to leave the team.</p> <p>Project members will jointly establish and attempt to meet self-imposed deadlines; in the event the task is overdue by a considerable amount of time (for instance, double the original timeframe), other members may at their discretion notify the slowpoke that they are going to re-assign the task, without prejudice to the constitution of the team or the public credit of any member.</p>
We would prefer for this work to be funded.	Project members will watch for and notify each other of funding opportunities and participate wherever possible in the writing of appropriate grant proposals.

Signed this day at LOCATION

\_\_\_\_\_  
NAME 1

\_\_\_\_\_  
NAME 2

\_\_\_\_\_  
NAME 3

\_\_\_\_\_  
NAME 4

### **TABLE 5.5. DOCUMENTATION AND STORAGE GUIDELINES.**

---

1. Templates should be available to document the following:
  - The team's charter, technology plans, and communication plans
  - Schedules
  - Cost estimates
  - Requirements from customers
  - Changes in plans
  - Weekly status reviews
  - Monthly status reviews
  - Problems
  - Lessons learned and best practices
2. All team members should exchange documents using \_\_\_\_\_ (application).
3. All team members should store current deliverables in \_\_\_\_\_ (location). Use the following security protocol: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**TABLE 5.4. TEAM-BUILDING ACTIVITIES.**

Team-Building Activities That Can Be Used in Any Cultural Setting
1. Team-member dinner party for a face-to-face setting.
2. Ask each individual to describe his or her expertise and background as well as his or her best practices collected from other team experiences.
3. Ask each team member to tell the team something interesting about his or her culture or function and its way of doing business that the team may want to adopt.
4. Ask each team member to explain how he or she plans to facilitate boundary-management activities with his or her function, region, or organization.
5. Ask each team member to describe how the team can best use his or her particular expertise.
6. Use a whiteboard or other presentation software to share interesting information about previous projects or best practices.
7. Examine best-practice documents from other teams and apply them to the team. Subteams of people from different cultures can work together on this activity.
8. Use groupware functions, such as anonymity, to vote or poll in the early part of the team's activities so that team members from collective or high-power-distance cultures feel comfortable stating their opinions.
9. Share resumes, picture collages, and favorite music among team members for team building.

Mastering Virtual Teams by Deborah L.  
Duarte and Nancy Tennant Sayder  
Jossey-Bass, 2006.

## **CHECKLIST 5.5. NEW TEAM MEMBER ORIENTATION.**

---

Note that most of the orientation would be conducted over the phone following a face-to-face visit from the team leader.

1. First face-to-face or phone meeting with the team leader.  
  - Welcome to the team \_\_\_\_\_
  - Review of team mission, purpose, charter, and objectives \_\_\_\_\_
  - Review of deliverables and schedule \_\_\_\_\_
  - Review of roles and accountabilities \_\_\_\_\_
  - Development of new team member's role, accountabilities, and deliverables \_\_\_\_\_
  - Introduction of partner system \_\_\_\_\_
  - Review of status meeting schedule and access (phone, e-mail, and so on) \_\_\_\_\_
  - Determination that team member has adequate technical and other resources \_\_\_\_\_
  
2. Initial orientation from partner.  
  - Introductions \_\_\_\_\_
  - Review of face-to-face orientation and fielding of questions \_\_\_\_\_
  - Overview of each team member's background and role on the team \_\_\_\_\_
  - Overview of the customer's background \_\_\_\_\_
  - Overview of the team's norms and code of conduct, including remote team norms (phone etiquette and the like) \_\_\_\_\_
  - Review of software or other groupware and technology requirements, with tutoring, if appropriate \_\_\_\_\_
  - Review of how the new team member will be introduced during the next team session \_\_\_\_\_
  - Coaching through a first session with technology such as groupware, if necessary \_\_\_\_\_
  - Indication of where team notes from meetings are kept and fielding of any questions about them \_\_\_\_\_
  
3. Second orientation following the first team meeting  
  - Review of the session and fielding of questions \_\_\_\_\_
  - Feedback on the use of team norms and code of conduct \_\_\_\_\_
  - Responses to questions about the roles of other team members, customers, and stakeholders \_\_\_\_\_
  - Discussion of best practices and lessons learned from the team \_\_\_\_\_
  - Indication of team repository for best practices \_\_\_\_\_
  
4. Ongoing activities \_\_\_\_\_

- Review of best practices
  - Feedback on style, use of technology, and deliverables
- 
-

## CHECKLIST 5.6. OUTCOMES FOR FIRST TEAM MEETING.

### Outcomes

1. Team members understand the charter, mission, and scope of the team. \_\_\_\_\_
2. The team develops norms for team behavior and team processes.
  - How to schedule meetings; who has authority to schedule others; use of electronic scheduling or calendaring systems \_\_\_\_\_
  - How often voice mail and e-mail are to be answered \_\_\_\_\_
  - Etiquette for face-to-face meetings, audio conferences, and video conferences \_\_\_\_\_
  - How agendas for team meetings will be developed and distributed \_\_\_\_\_
  - How minutes will be taken and distributed (timing and method) \_\_\_\_\_
  - Who will facilitate meetings \_\_\_\_\_
3. Team members understand their accountabilities and those of other team members.
  - Accountabilities of all team members are reviewed and agreed on. \_\_\_\_\_
4. The team develops a plan for the use of technology, including
  - Agreement on major type of work (parallel, sequential, or pooled sequential) \_\_\_\_\_
  - Technology needed given the type of work \_\_\_\_\_
  - How to exchange information and documents \_\_\_\_\_
  - Hardware and software needs of team members (e-mail, fax, telephone, video, and so on) \_\_\_\_\_
  - How information and documents will be stored (team Web site, shared files, or other) \_\_\_\_\_
  - When to mark e-mail messages and other documents “urgent,” “important,” or the like \_\_\_\_\_
  - Acquisition of new technology (for example, groupware, electronic meeting systems) \_\_\_\_\_
  - Training and orientation for team members in technology \_\_\_\_\_
  - Review of compatibility issues (MAC or PC, word-processing applications, Internet providers) \_\_\_\_\_
5. The team develops an external communication plan:
  - Which stakeholders, partners, champions, and others will get what information and when? \_\_\_\_\_
  - Which team members will coordinate with those individuals and answer questions? \_\_\_\_\_
6. The team determines how it will review progress:
  - Frequency of team meetings \_\_\_\_\_
  - Preliminary agenda for review sessions \_\_\_\_\_
  - Who will be required to attend \_\_\_\_\_
  - How meetings will be held (audio conference, video conference, face to face, and so on) \_\_\_\_\_
7. Team-building activities are conducted, and team norms are reviewed. \_\_\_\_\_

## CHECKLIST 5.7. OUTCOMES FOR SECOND TEAM MEETING.

---

### Outcomes

---

1. The team reviews norms for team behavior and team processes and validates and updates them.  
\_\_\_\_\_
- Review of etiquette for audio conferences, video conferences, face-to-face meetings, and so on.  
\_\_\_\_\_
2. The progress of the team's work to date is reviewed.  
\_\_\_\_\_
3. Accountabilities are clarified, if necessary.  
\_\_\_\_\_
4. The team reviews technological issues and problems:
  - Exchange of information and documents, hardware and software needs of team members, information and document storage and access, e-mail and voice mail problems  
\_\_\_\_\_
  - Additional technology needs  
\_\_\_\_\_
  - Training and orientation  
\_\_\_\_\_
5. The team reviews progress regarding the external communication plan:
  - Is information getting to other team members, stakeholders, and champions?  
\_\_\_\_\_
6. The team assesses its work to date:
  - Progress of technical work, overlap or redundancy of roles and accountabilities  
\_\_\_\_\_
  - Availability of team members  
\_\_\_\_\_
  - Availability of information and documents  
\_\_\_\_\_
  - Access to technology  
\_\_\_\_\_
  - Access to stakeholders and other important team members  
\_\_\_\_\_
7. Additional team-building or trust-building activities are conducted, as appropriate.  
\_\_\_\_\_
8. The team reviews its current meeting effectiveness and plans for the next meeting.  
\_\_\_\_\_

## Project Name

Project Initiation Checklist			
Prepared By:		Date Prepared:	Revision Number:
Reference	Identify the source of the request and how it came.		
Project Objective	Expressed as <i>To, in a way that, so that</i> construct		
Background	Briefly describe how this project came about		
Project Scope	What business functions are in and out of scope? What locations are in and out of scope? (attach a Scoping Diagram for clarity) What are the project interfaces? What business procedures are required? What production operations procedures are required? Will an Acceptance Test Plan and testing be required? Will Systems Analysis be required, if so what's needed? What training is required? What documentation is required? What are the critical requirements?		
Constraints	What is the maximum cost of the project? What is the latest project completion date? What are the interproject dependencies?		
Current Issues	Briefly describe any issues that will need to be addressed prior to or during the project		

Organization	
Project Sponsor	Who agrees to this project setup? Who will signoff the requirements? Who will remove obstacles? Who will accept the finished product?
Project Lead	Who will execute the project initiation (e.g., Project Manager or Business Analyst)
Resources & Responsibilities	What additional resources will be required? What are they expected to do?

Schedule	
Start Date	When will the project start?
End Date	When will it end?
Estimate	How many effort hours? How many elapsed hours? What assumptions are you making?
Final Product	What is the end product?
Project Approach	What are the milestones?
Interim Products	What are the products of the milestones?

## *Project Initiation Checklist for Small Projects*

---

Business Case	
Project Justification	Why do this project? What happens if we don't do it? Why do it now? How critical will the impact of the project be?
Risks	What could go wrong? (both systems-related and user-related)
Countermeasures	How will you avoid this?
Costs	List all hardware, software, network, staff, facilities and other costs

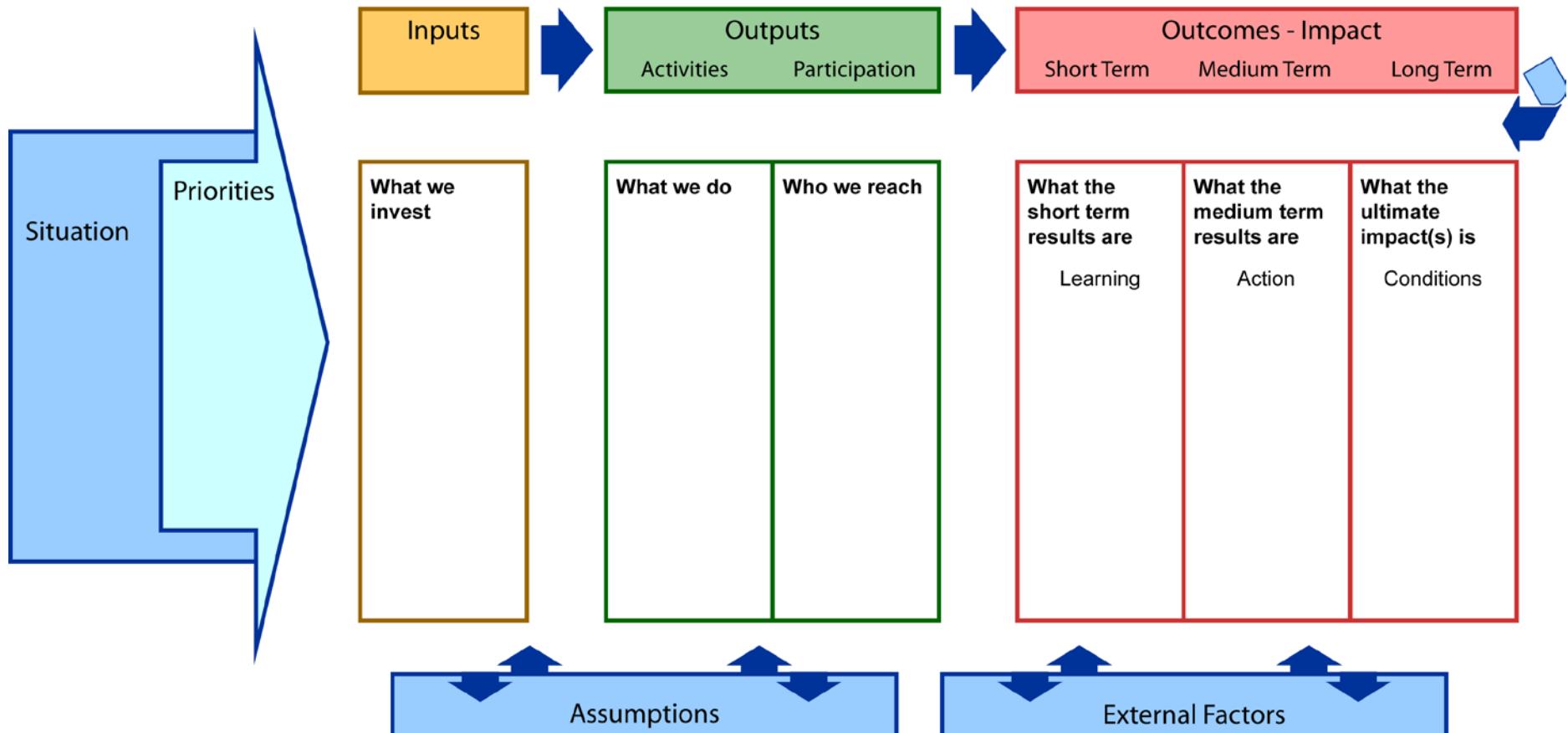
Project Initiation Approvals			
Requested Date:			
Client Requester:		Date:	
Department Manager:		Date:	
Project Manager:		Date:	
Manager:		Date:	

<http://dijest.com/tools/pmworkbench/pmtemplates/pitempl/PICCHK.DOC>

# PROGRAM DEVELOPMENT

Planning – Implementation – Evaluation

## Program Action - Logic Model



## Evaluation

Focus - Collect Data - Analyze and Interpret - Report

**Notes:**

**Notes:**

**Notes:**

# Large Project Planning, Funding and Management

## Session 3/4: Project Planning and Models

Session 3 Instructor – Lynne  
Siemens

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## Overview – Session 3/4

- Planning the Work
  - Tools

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## Model the Work

- Work breakdown structure
- Network
- Critical path analysis
- Schedule

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## Work Breakdown Structure

- Determines all work efforts
- Checklist of every activity
- Use to assign responsibility

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## Work Breakdown Structure

- Complete and accurate?
  - Is it broken down to a level of detail that guarantees control
  - Do the work efforts begin with an active verb
  - Does each activity result in a deliverable
  - Is someone accountable for completing the project on time, within budget and at an acceptable level of quality

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## Network

- Sequence of tasks
  - All tasks from the WBS must appear
- Show visually the relationships of work activities to each other
- Only one start and one end
- Communication tool

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## Critical Path Analysis

- Longest sequence of tasks from start to finish
- Any delay on this path will delay entire project

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## Schedule

- Place data from WBS, network, critical path analysis on a time scale
- Know as Gantt chart
- Basic chart
  - Time
  - Tasks
- Include other information

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## Other Areas To Include

- Resource utilization chart
- Budget
- Risk assessment and contingency planning

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## Balance The Plan

- Balance limited resources
  - Within project
  - Against other projects
  - Against nonproject efforts
- Can the project be achieved given the other deadlines that are present

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## Approve and Publish

- Document includes:
  - Target completion date
  - Target cost
  - Target resource utilization
  - Target asset utilization
  - Objectives

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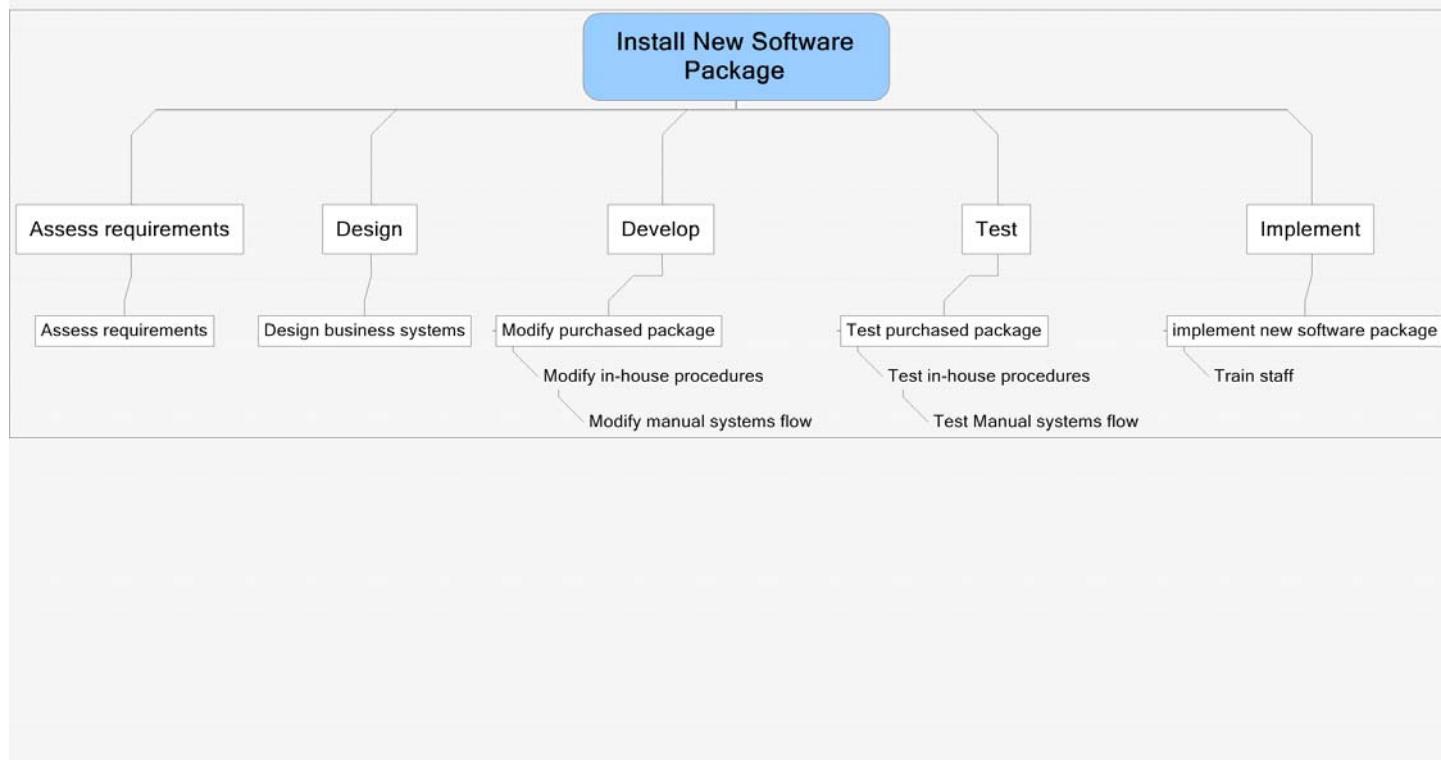
## Approve and Publish

- Serves as agreement among:
  - Project manager
  - Project client
  - Senior management
  - Functional managers
- Serves as basis for negotiating changes
- Signed and distributed

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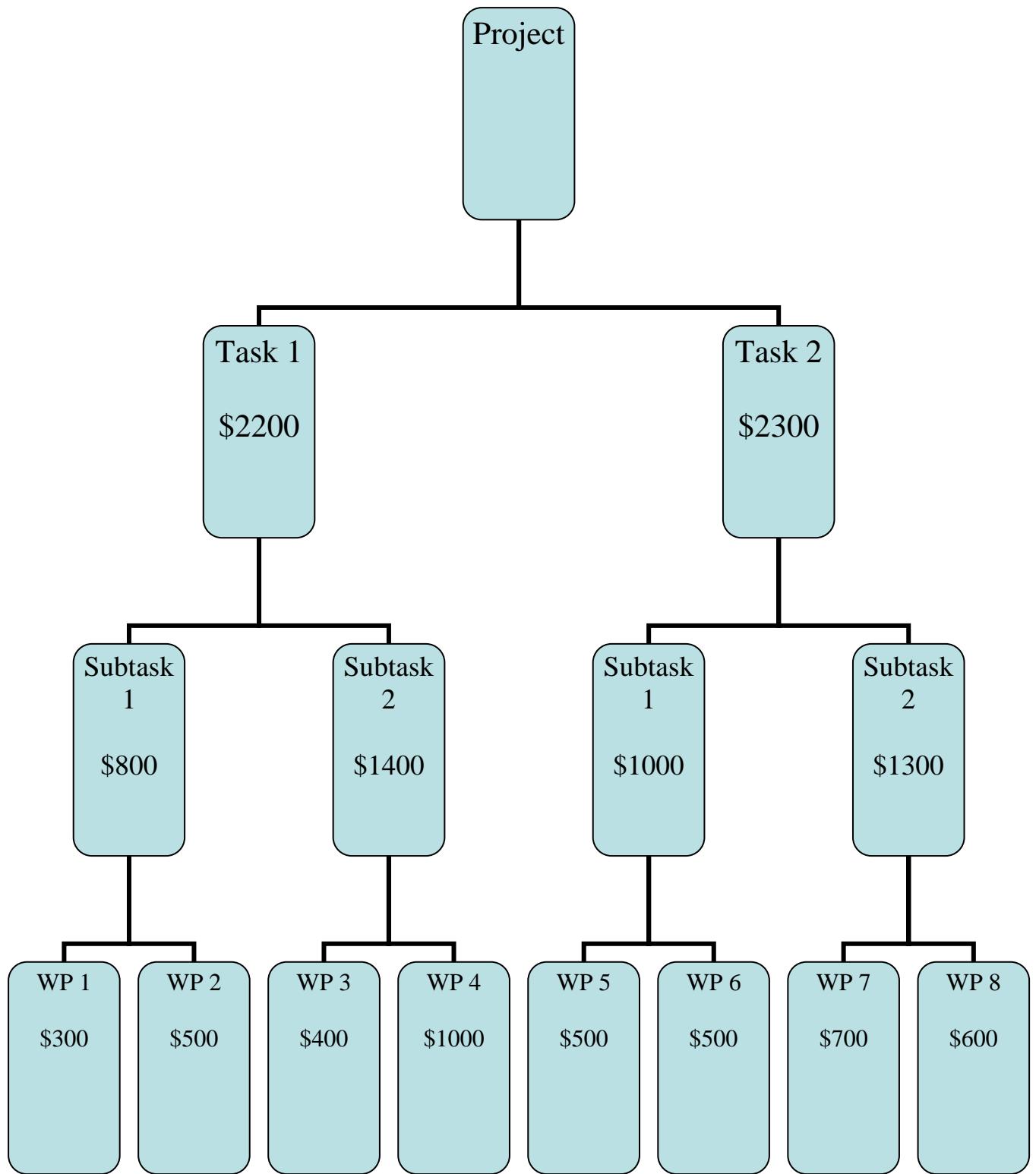




Work breakdown structure tree chart for a sample project

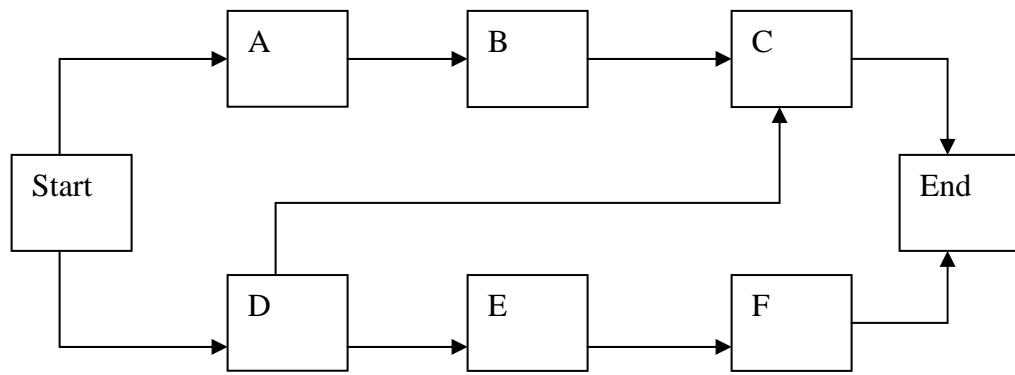
Knutson and Bitz (1991) [Project Management: How to Plan and Manage Successful Projects](#), Amacon/American Management Association.

## Work Breakdown Structure and Budget Development

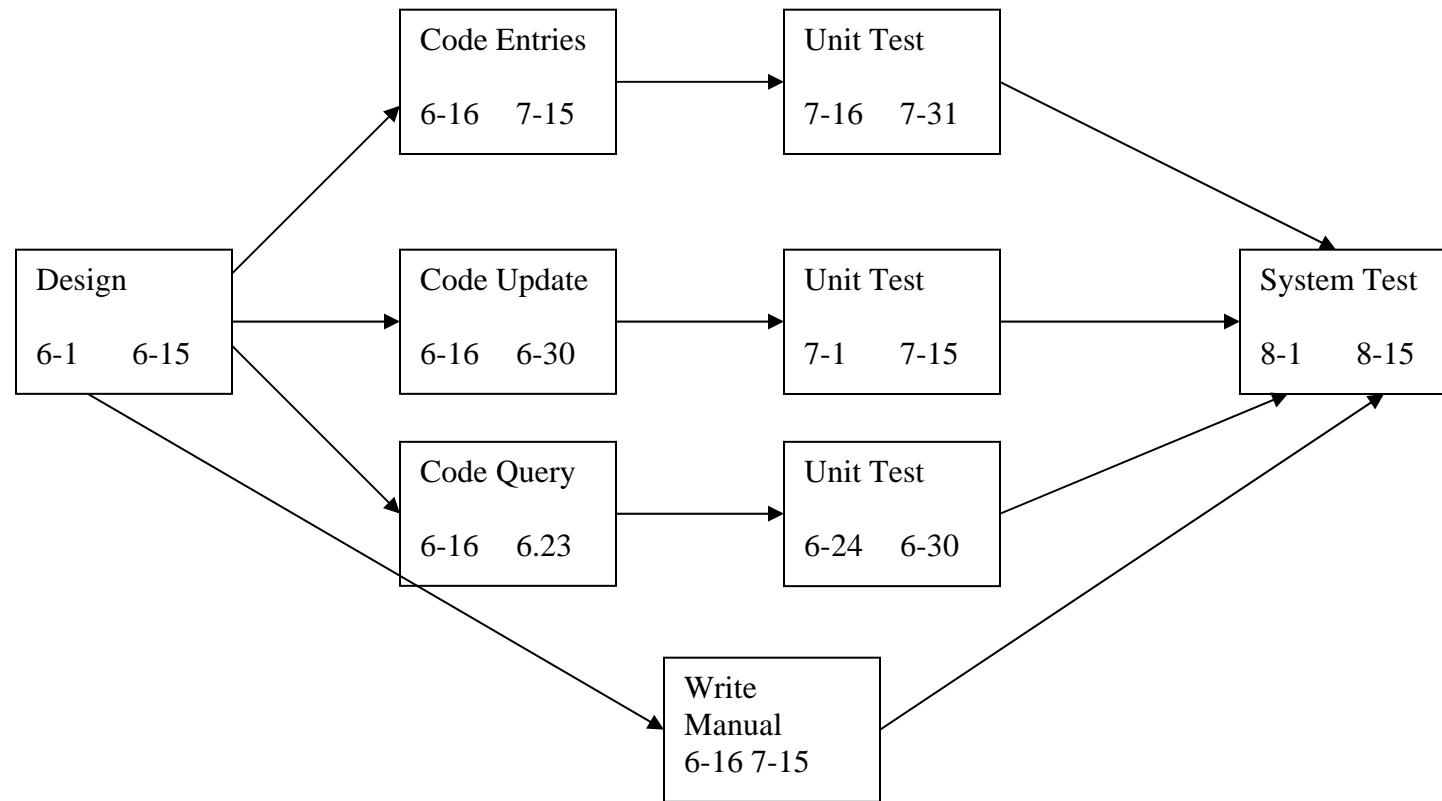


Lewis (1995) Project Planning, Scheduling and Control: A Hands-On Guide to Bringing In On Time and On Budget, Probus Publishing Company.

## Network Logic Diagram



Project Network Diagram with Scheduled Dates



Gantt Chart

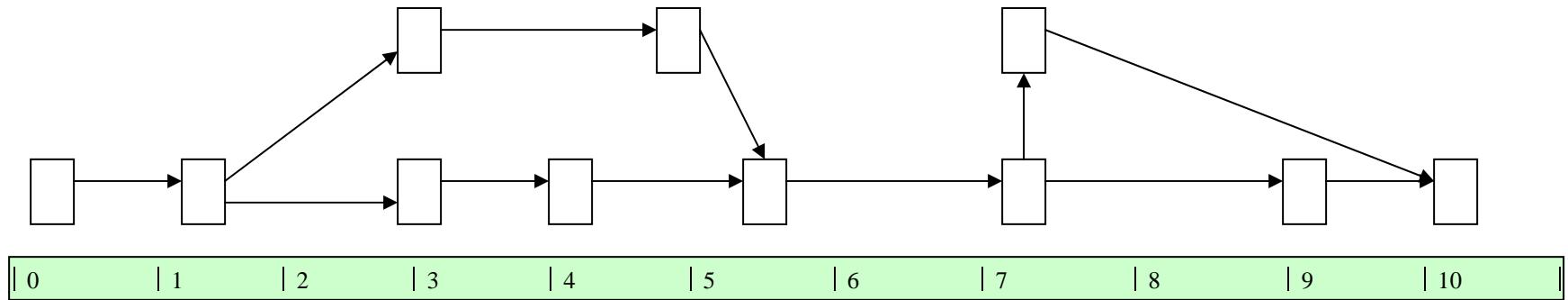
		Jan				Feb				March				April			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Task	Duration																
1	1 month																
2	2 month																
3	.5 month																
4	1 month																
5	.5 month																
6	1 month																

Gantt Chart with milestones

		Jan				Feb				March				April			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Task	Duration																
1	1 month									▲							
2	2 month											▲					
3	.5 month																
4	1 month																
5	.5 month																
6	1 month																▲

▲ Due Date

# Project Timeline



## Project Plan Approval

Project Plan Approval		
Project Description	Project Code	Date
From	Department	Return by:
Your signature below indicates that you agree with the plan submitted so far as your interests are concerned.		
Approving Individual	Signed	Date
Functional Managers		
Directors		
Project Manager		
Outside Stakeholders		
Comments		

Lewis (1995) Project Planning, Scheduling and Control: A Hands-On Guide to Bringing In On Time and On Budget, Probus Publishing Company.

**Notes:**

**Notes:**

**Notes:**

# Large Project Planning, Funding and Management

## Session 5: Project Control, Reporting and Managing Change

Session 4 Instructor –  
Lynne Siemens

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## Overview – Session 5

- Tracking Progress
- Managing Project Change
- Project Control/Reporting
- Project Review
- Software Tools/Internet Resources

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Lynne Siemens

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## Tracking Progress

- Planned versus actual
  - Gantt Chart
  - Budget
  - Etc.
- Do you make changes?

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## Managing Project Change/Project Control

- Key objectives
  - Determine what manager can/cannot control
  - Process for submitting change
  - Evaluating impact on project baseline
  - Documentation

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## Types of Changes

- Scope Changes
- Base Changes

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## Scope Changes

- Additions, modifications or deletions made to the end project or service
- Examples
  - Requirement changes
  - Design changes
  - Technological changes
  - Business changes
  - Personnel changes

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## Baseline Changes

- Baseline is the yardstick for measuring performance
- Examples
  - Project specifications
  - Applicable standards
  - Schedule target
  - Cost target
  - Resource and asset utilization

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## When is change needed?

- Tracked against actual performance
- Change may be required when not meeting plans
- Guidelines for change

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## Project Control

- Key questions to ask
  - Where are we
  - Where do we want to be
  - How do we get there
  - Are we getting there

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## Transition from Planning to Control

- Five step model
  - Update status
  - Analyze impact
  - Act on variances
  - Publish revisions
  - Inform management

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## 1. Update Status

- Sources of data
- Information for management in status reports
- Responsibilities for status reports
- Reporting techniques

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## 2. Analyze Impact

- Compare actual against planned
- Determine causes of differences
- Prepare analysis for future

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### 3. Act on Variances

- Choices
  - Do nothing
  - Make modifications
  - Negotiate trade offs

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### 4. Publish

- Format of status reports
  - Where are we today
  - Where will we be at the next report
  - What is our budget position
  - What items jeopardize project completion
  - Who deserves recognition

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## 5. Inform Management

- Information items
  - Major accomplishments since last review
  - Schedule status (actual vs plan)
  - Financial status (actual vs plan)
  - Major issues and action plans
  - Plans for next period
  - Special topics with sense of urgency
  - Review of action items and next meeting

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## 5. Inform Management

- Questions to answer
  - Foreseeable future problems
  - Adequate resources
  - Dissatisfaction among staff
  - Dealing with recurring problems
  - Lacking anything to do the job
  - Any changes to be addressed

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## Project Review Upon Completion

- Attainment of objectives
- Effectiveness of agreement
- Effectives of project plan, project organization and management systems
- Deficiencies and problems experiences
  - Any issues outstanding
- Lessons learned and suggested improvements

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## Other

- Software tools
  - Basecamp <http://basecamphq.com/>
  - [Demo](#)
- Internet resources

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## Back to the Beginning

- Have we answered/discussed your questions from the start of the workshop?
  - Any outstanding issues?

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Gantt Chart

Task	Duration	Jan				Feb				March				April			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	1 month	Y	Y	Y	Y	Y	Y	Y	Y								
	Actual	O	O	O	O	O	O	O	O								
2	2 month			Y	Y	Y	Y	Y	Y	Y							
	Actual		O	O	O	O	O	O	O	O							
3	.5 month				Y	Y											
	Actual			O	O	O											
4	1 month					Y	Y	Y	Y	Y							
	Actual				O	O	O	O	O	O							
5	.5 month									Y	Y						
	Actual						O	O	O	O							
6	1 month										Y	Y	Y	Y			
	Actual							O	O	O	O	O	O				

Gantt Chart with milestones

Gantt Chart

Task	Duration	Jan				Feb				March				April			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	1 month	Y	Y	Y	Y	Y	Y	Y	Y	▲							
	Actual	O	O	O	O	O	O	O	O								
2	2 month			Y	Y	Y	Y	Y	Y	Y							
	Actual		O	O	O	O	O	O	O	O							
3	.5 month				Y	Y											
	Actual			O	O	O											
4	1 month					Y	Y	Y	Y	▲	Y						
	Actual				O	O	O	O	O	O	O						
5	.5 month									Y	Y	▲					
	Actual						O	O	O	O	O	O					
6	1 month										Y	Y	Y	Y	▲		
	Actual							O	O	O	O	O	O	O			

▲ Due Date

## Budget Control

WBS Element	Budget	Actual Cost	Cost Variance	
	\$	%		
Pre Pilot Planning	63000	62500	500	0.79%
Draft Checklists	64000	46800	17200	26.88%
Curriculum design	23000	23500	-500	-2.17%
Mid-term evaluation	68000	72500	-4500	-6.62%
Implementation support	12000	10000	2000	16.67%
Manual of Practice	7000	6000	1000	14.29%
Roll Out Plan	20000	18100	1900	9.50%
Totals	257000	239400	17600	6.85%

Adapted from Figure 10-3, page 110

A Guide to the Project Management Body of Knowledge, PMI Institute, 1996

## **Change Control Log** (Adapted from Project Management: How to Plan and Manage Successful Projects by Joan Knutson and Ira Bitz, AMACOM, 1991.)

**Change Control Form** (Adapted from Project Management: How to Plan and Manage Successful Projects by Joan Knutson and Ira Bitz, AMACOM, 1991.)

<p>Part 1 – Requester</p> <p>Name:</p> <p>Date:</p> <p>Description of Change:</p> <p>Benefits:</p>
<p>Part 2 – Change Controller</p> <p>Change Number:</p> <p>Date Received:</p>
<p>Part 3 – Change Control Committee</p> <p>Disposition: (cancel or continue)</p> <p>Date:</p> <p>Signatures:</p> <p>Project Manager:</p>
<p>Part 4 – Investigation Team</p> <p>Assigned to:</p> <p>Date:</p> <p>Impact:</p>
<p>Part 5 – Approval Committee</p> <p>Disposition: (cancel or continue)</p> <p>Date:</p> <p>Priority:</p> <p>Signatures:</p> <p>Department Manager:</p> <p>Project Manager:</p> <p>Other:</p>

<http://dijest.com/tools/pmworkbench/pmtemplates/pctempl/CCFORM2.DOC>

## **Change Request Form**

Request No:

Request  
Date:

Request Title:

Status:

Originator's Name:

Phone/Emai  
l/Mailstop:

Sponsor's Name:

Priority:

Assigned To:

Response  
Date:

### **Request Description**

### **Justification**

### **Alternative Solutions**

1.

2.

3.

## **Impact Assessment**

<b>Impacts</b>	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
Functional Scope			
Schedule			
Effort			
Cost			

## **Recommendation**

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## **Authorization**

Action:

Authorized By:

Date:

# Prototype Project Board Progress Review Meeting

**MM/DD/YY  
1:30 PM to 3:00 PM  
Building 790, Monterey**

Meeting called by: Project Sponsor Facilitator: Project Manager  
Type of meeting: Progress Control

Attendees: Project Board Members and Project Manager

Please read:

Please bring:

## Agenda

1. Status & Achievements (Highlights of progress for schedule and major deliverables completed) Project Manager 1:30-1:40 PM
2. Upcoming Milestones & Adjustments (Focus on the scheduled milestones before the next meeting, and any planned schedule adjustments) Project Manager 1:40-1:50 PM
3. Cost & Staffing Review (Review of costs to date, compared to plan. Review staffing changes executed, planned, or shortages) Project Manager 1:50-2:00 PM
4. Change Requests (Review and decide on formal Change Requests) Project Board 2:00-2:20 PM
5. Major Issue Resolution (Review and decide on Project Board-level issues blocking the project) Project Board 2:20-2:40 PM
6. Business Case Review (Compare current plan for the project to client and business commitments and benefits) Project Sponsor 2:40-2:50 PM
7. Teaming & Meeting Management (Verify calendars for future Board meetings! Discuss and resolve teaming or process issues for the Project Board) Project Manager 2:50-3:00 PM

## Additional Information

Special notes:

# **Project Board Progress Review Meeting**

**MM/DD/YY  
1:30 PM to 3:00 PM  
Building 790, Monterey**

Meeting called by:

Facilitator:

Type of meeting:

Attendees:

Please read:

Please bring:

## **Agenda**

Status & Achievements

Project Manager

1:30-1:40 PM

Discussion:

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Conclusions:

Action items:	Person responsible:	Deadline:

Upcoming Milestones & Adjustments

Project Manager

1:40-1:50 PM

Discussion:

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Conclusions:

Action items:	Person responsible:	Deadline:

Cost & Staffing Review	Project Manager	1:50-2:00 PM
<u>Discussion:</u>		
<u>Conclusions:</u>		
Action items:	Person responsible:	Deadline:
Change Requests	Project Board	2:00-2:20 PM
<u>Discussion:</u>		
<u>Conclusions:</u>		
Action items:	Person responsible:	Deadline:
Major Issue Resolution	Project Board	2:20-2:40 PM
<u>Discussion:</u>		
<u>Conclusions:</u>		
Action items:	Person responsible:	Deadline:
Business Case Review	Project Sponsor	2:40-2:50 PM
<u>Discussion:</u>		
<u>Conclusions:</u>		
Action items:	Person responsible:	Deadline:

Teaming & Meeting Management

Project Manager

2:50-3:00 PM

Discussion:

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Conclusions:

Action items:	Person responsible:	Deadline:

### **Additional Information**

Special notes:

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# Monthly Project Status Report

General Information:	
Agency name:	Date:
Contact Name:	Phone:
Project ID:	For the period beginning: and ending:
Name of the project:	
Project Start Date:	Current Phase:

## Key Questions

- 1) Has the project scope of work changed? Yes/No
- 2) Will upcoming target dates be missed? Yes/No
- 3) Does the team have resource constraints? Yes/No
- 4) Are there issues that require management attention? Yes/No

If any of the above questions is answered "yes", please provide an explanation of the "yes" answer.

### Key Milestones for the Overall Project revised on <date>:

Milestone	Original Date	Revised Date	Actual Date

### Milestones Planned for this month and Accomplished this month:

Milestone	Original Date	Revised Date	Actual Date


**Accomplishments Planned for this month and not completed:**

Milestone/Item/Accomplishment	Original Date	Revised Date
1)		
2)		
3)		
4)		

For each item listed above, provide a corresponding explanation of the effect of this missed item on other target dates and provide the plan to recover from this missed item.

**Items Planned for Next Month:**

Milestone	Original Date	Revised Date

*(Use a chart like the following to show actual expenditures compared to planned levels. Break the costs into other categories as appropriate.)*

Year-to-Date Costs (000)				
Fiscal Year	Actual Costs to Date	Estimate to Complete	Total Estimated Costs	Total Planned Budget
20__				
Personnel Services				
Prof. & Outside Service				
Other Expenditures *				
Total Costs				

*(Use a chart like the following if this project spans more than one fiscal year.)*

**Year-to-Date Costs (000)**

<b>Grand Total</b>	<b>Actual Costs to Date</b>	<b>Estimate to Complete</b>	<b>Total Estimated Costs</b>	<b>Total Planned Budget</b>
<b>For Project</b>				

Personnel Services

Prof. &amp; Outside Service

Other Expenditures \*

Total Costs

**\* Other Expenditures include hardware, software, travel, training, support, etc.***Attach the current risk list.**Attach the current issues/action item list (for the significant items that need management attention)*<http://www.dir.state.tx.us/eod/qa/monitor/status.htm>

## **Checklist for Managing Projects**

- A clear, concise statement defining the project has been prepared and reviewed by knowledgeable parties for consensus.
- Performance criteria have been developed. These criteria are measurable and specific.
- A work breakdown structure has been developed to a level sufficient to prepare accurate estimates of costs, resources, and working times for all project activities.
- A statement of project scope that clearly defines the limits of what will and will not be done has been developed.
- Tangible deliverables have been identified for specific milestones to permit progress measurements.
- Where risks have been identified, contingency plans have been prepared to deal with them.
- The project plan has been prepared with participation and/or input from individuals who must implement it.
- The project notebook has been signed off by stakeholders and copies distributed to contributors.
- A control system has been established using variance analysis to assess progress.
- Individuals have been selected for assignment to the project.
- The project has been planned to a manageable level of detail.
- A post-mortem has been done at each milestone of the project as well as a final one for the overall project and placed in the project notebook.
- The controlling project notebook has been placed in a central file for use in future project planning.
- Limits have been established to determine when the project plan will be revised.
- Checklists have been prepared for major segments of the project so that nothing is overlooked.

Adapted from Project Planning, Scheduling & Control: A Hands-on Guide to Brining Projects in on time and on budget, James P. Lewis, Probus Publishing Company, Chicago, 1991

## **Project Management -- Internet Resources**

This is a small sampling of what is available on the Internet for Project Management. It is by no means complete.

Articles:

<http://www.4pm.com/>

[http://www.mindtools.com/pages/main/newMN\\_PPM.htm](http://www.mindtools.com/pages/main/newMN_PPM.htm)

Templates/Software:

<https://www.smartsheet.com/>

<http://www.method123.com/>

<http://gforge.org/> (Open Source software development tool)

<http://www.ittoolkit.com/>

<http://proj.chbs.dk/> (Open and free tools)

<http://www.same-page.com/> (Free demo)

<http://office.microsoft.com/home/office.aspx?assetid=FX01085795> (Microsoft Project – trial version is available)

<http://www.gantthead.com/tools/toolMain.cfm>

<http://www.projectmanagement.tas.gov.au/index.htm>

<http://www.smartdraw.com/specials/projectchart.asp?id=15458>

[http://www.mapnp.org/library/plan\\_dec/project/project.htm](http://www.mapnp.org/library/plan_dec/project/project.htm)

Other Resources:

<http://web.mit.edu/pm/>

Project Management Institute <http://www.pmi.org/info/default.asp>

Association for Project Management <http://www.apm.org.uk/>

NINCH Guide to Good Practice in the Digital Representation and Management of Cultural Heritage Materials <http://www.nyu.edu/its/humanities/ninchguide/>

Software Project Management <http://www.comp.glam.ac.uk/pages/staff/dwfarthi/projman.htm>

## **Project Management – Books**

- Digitizing Collections: strategic issues for the information manager, Lorna Hughes, Facet Publishing
- Managing Projects in Organizations: How to Make the Best Use of Time, Techniques, and People, J. Davidson Frame, Jossey-Bass
- Project Management for Dummies by Stanley E. Portny, John Wiley & Sons Canada
- Project Management for Business Professionals: A Comprehensive Guide by Joan Knulson, Joan Knutson, John Wiley & Sons Canada
- Absolute Beginner's Guide to Project Management by Greg Horine, Quebec
- Project Management Step-by-Step by Larry Richman, Amacom
- Project Management by Philip Baguley, NTC Publishing Group
- Achieving Project Management Success Using Virtual Teams, Dr. Parviz Rad and Ginger Levin, J. Ross Publishing
- Project Management Leadership by Rory Burke and Steve Barron, Burke Publishing
- Project Management: Planning and Control Techniques by Rory Burke, Burke Publishing
- Introduction to Project Management by Rory Burke, Burke Publishing
- International Project Management, Kathrin Koster, SAGE
- International Project Management, Owen Jay Murphy, Thomson

**Notes:**

**Notes:**

**Notes:**

# What Great Managers

by Marcus Buckingham

**"THE BEST BOSS I EVER HAD."** That's a phrase most of us have said or heard at some point, but what does it mean? What sets the great boss apart from the average boss? The literature is rife with provocative writing about the qualities of managers and leaders and whether the two differ, but little has been said about what happens in the thousands of daily interactions and decisions that allows managers to get the best out of their people and win their devotion. What do great managers actually *do*?

In my research, beginning with a survey of 80,000 managers conducted by the Gallup Organization and continuing during the past two years with in-depth studies of a few top performers, I've found that while there are as

Great leaders tap into the needs and fears we all share. Great managers, by contrast, perform their magic by discovering, developing, and celebrating what's different about each person who works for them. Here's how they do it.



many styles of management as there are managers, there is one quality that sets truly great managers apart from the rest: They discover what is unique about each person and then capitalize on it. Average managers play checkers, while great managers play chess. The difference? In checkers, all the pieces are uniform and move in the same way; they are interchangeable. You need to plan and coordinate their movements, certainly, but they all move at the same pace, on parallel paths. In chess, each type of piece moves in a different way, and you can't play if you don't know how each piece moves. More important, you won't win if you don't think carefully about how you move the pieces. Great managers know and value the unique abilities and even the eccentricities of their employees, and they learn how best to integrate them into a coordinated plan of attack.

This is the exact opposite of what great leaders do. Great leaders discover what is universal and capitalize on it. Their job is to rally people toward a better future. Leaders can succeed in this only when they can cut through differences of race, sex, age, nationality, and personality and, using stories and celebrating heroes, tap into those very few needs we all share. The job of a manager, meanwhile, is to turn one person's particular talent into performance. Managers will succeed only when they can identify and deploy the differences among people, challenging each employee to excel in his or her own way. This doesn't mean a leader can't be a manager or vice versa. But to excel at one or both, you must be aware of the very different skills each role requires.

## The Game of Chess

What does the chess game look like in action? When I visited Michelle Miller, the manager who opened Walgreens' 4,000th store, I found the wall of her back office papered with work schedules. Michelle's store in Redondo Beach, California, employs people with sharply different skills and potentially disruptive differences in personality. A critical part of her job, therefore, is to put people into roles and shifts that will allow them to shine—and to avoid putting clashing personalities together. At the same time, she needs to find ways for individuals to grow.

There's Jeffrey, for example, a "goth rocker" whose hair is shaved on one side and long enough on the other side to cover his face. Michelle almost didn't hire him because

he couldn't quite look her in the eye during his interview, but he wanted the hard-to-cover night shift, so she decided to give him a chance. After a couple of months, she noticed that when she gave Jeffrey a vague assignment, such as "Straighten up the merchandise in every aisle," what should have been a two-hour job would take him all night—and wouldn't be done very well. But if she gave him a more specific task, such as "Put up all the risers for Christmas," all the risers would be symmetrical, with the right merchandise on each one, perfectly priced, labeled, and "faced" (turned toward the customer). Give Jeffrey a generic task, and he would struggle. Give him one that forced him to be accurate and analytical, and he would excel. This, Michelle concluded, was Jeffrey's forte. So, as any good manager would do, she told him what she had deduced about him and praised him for his good work.

And a good manager would have left it at that. But Michelle knew she could get more out of Jeffrey. So she devised a scheme to reassign responsibilities across the entire store to capitalize on his unique strengths. In every Walgreens, there is a responsibility called "resets and revisions." A reset involves stocking an aisle with new merchandise, a task that usually coincides with a predictable change in customer buying patterns (at the end of summer, for example, the stores will replace sun creams and lip balms with allergy medicines). A revision is a less time-consuming but more frequent version of the same thing: Replace these cartons of toothpaste with this new and improved variety. Display this new line of detergent at this end of the row. Each aisle requires some form of revision at least once a week.

In most Walgreens stores, each employee "owns" one aisle, where she is responsible not only for serving customers but also for facing the merchandise, keeping the aisle clean and orderly, tagging items with a Telxon gun, and conducting all resets and revisions. This arrangement is simple and efficient, and it affords each employee a sense of personal responsibility. But Michelle decided that since Jeffrey was so good at resets and revisions—and didn't enjoy interacting with customers—this should be his full-time job, in every single aisle.

It was a challenge. One week's worth of revisions requires a binder three inches thick. But Michelle reasoned that not only would Jeffrey be excited by the challenge and get better and better with practice, but other employees would be freed from what they considered a chore and have more time to greet and serve customers. The store's performance proved her right. After the reorganization, Michelle saw not only increases in sales and profit but also in that most critical performance metric, customer satisfaction. In the subsequent four months, her store netted perfect scores in Walgreens' mystery shopper program.

So far, so very good. Sadly, it didn't last. This "perfect" arrangement depended on Jeffrey remaining content, and

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## The Elusive “One Thing”

It's bold to characterize anything as *the* explanation or solution, so it's a risky move to make such definitive assertions as "this is the one thing all great managers do." But with enough research and focus, it is possible to identify that elusive "one thing."

I like to think of the concept of "one thing" as a "controlling insight." Controlling insights don't explain all outcomes or events; they serve as the best explanation of the greatest number of events. Such insights help you know which of your actions will have the most far-reaching influence in virtually every situation.

For a concept to emerge as the single controlling insight, it must pass three tests. First, it must be applicable across a wide range of situations. Take leadership as an example. Lately, much has been made of the notion that there is no one best way to lead and that instead, the most effective leadership style depends on the circumstance. While there is no doubt that different situations require different actions from a leader, that doesn't mean the most insightful thing you can say about leadership is that it's situational. With enough focus, you can identify the one thing that underpins successful leadership across all situations and all styles.

Second, a controlling insight must serve as a multiplier. In any equation, some factors will have only an additive value: When you focus your actions on these factors, you see some incremental improvement. The controlling insight should be more powerful. It should show you how to get exponential improvement. For example, good managing is the result of a combination of many actions—selecting talented employees, setting clear expectations, catching people doing things right, and so on—but none of these factors qualifies as the "one thing" that great managers do, because even when done well, these actions merely prevent managers from chasing their best employees away.

Finally, the controlling insight must guide action. It must point to precise things that can be done to create better outcomes more consistently. Insights that managers can act on—rather than simply ruminate over—are the ones that can make all the difference.

he didn't. With his success at doing resets and revisions, his confidence grew, and six months into the job, he wanted to move into management. Michelle wasn't disappointed by this, however; she was intrigued. She had watched Jeffrey's progress closely and had already decided that he might do well as a manager, though he wouldn't be a particularly emotive one. Besides, like any good chess player, she had been thinking a couple of moves ahead.

Over in the cosmetics aisle worked an employee named Genoa. Michelle saw Genoa as something of a double threat. Not only was she adept at putting customers at ease—she remembered their names, asked good questions, was welcoming yet professional when answering the phone—but she was also a neatnik. The cosmetics de-

partment was always perfectly faced, every product remained aligned, and everything was arranged just so. Her aisle was sexy: It made you want to reach out and touch the merchandise.

To capitalize on these twin talents, and to accommodate Jeffrey's desire for promotion, Michelle shuffled the roles within the store once again. She split Jeffrey's reset and revision job in two and gave the "revision" part of it to Genoa so that the whole store could now benefit from her ability to arrange merchandise attractively. But Michelle didn't want the store to miss out on Genoa's gift for customer service, so Michelle asked her to focus on the revision role only between 8:30 AM and 11:30 AM, and after that, when the store began to fill with customers on their lunch breaks, Genoa should shift her focus over to them.

She kept the reset role with Jeffrey. Assistant managers don't usually have an ongoing responsibility in the store, but, Michelle reasoned, he was now so good and so fast at tearing an aisle apart and rebuilding it that he could easily finish a major reset during a five-hour stint, so he could handle resets along with his managerial responsibilities.

By the time you read this, the Jeffrey-Genoa configuration has probably outlived its usefulness, and Michelle has moved on to design other effective and inventive configurations. The ability to keep tweaking roles to capitalize on the uniqueness of each person is the essence of great management.

A manager's approach to capitalizing on differences can vary tremendously from place to place. Walk into the back office at another Walgreens, this one in San Jose, California, managed by Jim Kawashima, and you won't see a single work schedule. Instead, the walls are covered with sales figures and statistics,

the best of them circled with red felt-tip pen, and dozens of photographs of sales contest winners, most featuring a customer service representative named Manjit.

Manjit outperforms her peers consistently. When I first heard about her, she had just won a competition in Walgreens' suggestive selling program to sell the most units of Gillette deodorant in a month. The national average was 300; Manjit had sold 1,600. Disposable cameras, toothpaste, batteries—you name it, she could sell it. And Manjit won contest after contest despite working the graveyard shift, from 12:30 AM to 8:30 AM, during which she met significantly fewer customers than did her peers.

Manjit hadn't always been such an exceptional performer. She became stunningly successful only when Jim,

who has made a habit of resuscitating troubled stores, came on board. What did Jim do to initiate the change in Manjit? He quickly picked up on her idiosyncrasies and figured out how to translate them into outstanding performance. For example, back in India, Manjit was an athlete – a runner and a weight lifter – and had always thrived to the challenge of measured performance. When I interviewed her, one of the first things out of her mouth was, “On Saturday, I sold 343 low-carb candy bars. On Sunday, I sold 367. Yesterday, 110, and today, 105.” I asked if she always knows how well she’s doing. “Oh yes,” she replied. “Every day I check Mr. K’s charts. Even on my day off, I make a point to come in and check my numbers.”

Manjit loves to win and revels in public recognition. Hence, Jim’s walls are covered with charts and figures, Manjit’s scores are always highlighted in red, and there are photos documenting her success. Another manager might have asked Manjit to curb her enthusiasm for the limelight and give someone else a chance. Jim found a way to capitalize on it.

But what about Jim’s other staff members? Instead of being resentful of Manjit’s public recognition, the other employees came to understand that Jim took the time to see them as individuals and evaluate them based on their personal strengths. They also knew that Manjit’s success spoke well of the entire store, so her success galvanized the team. In fact, before long, the pictures of Manjit began to include other employees from the store, too. After a few months, the San Jose location was ranked number one out of 4,000 in Walgreens’ suggestive selling program.

## Great Managers Are Romantics

Think back to Michelle. Her creative choreography may sound like a last resort, an attempt to make the best of a bad hire. It’s not. Jeffrey and Genoa are not mediocre employees, and capitalizing on each person’s uniqueness is a tremendously powerful tool.

First, identifying and capitalizing on each person’s uniqueness saves time. No employee, however talented, is perfectly well-rounded. Michelle could have spent untold hours coaching Jeffrey and cajoling him into smiling at, making friends with, and remembering the names of customers, but she probably would have seen little result for her efforts. Her time was much better spent carving out a role that took advantage of Jeffrey’s natural abilities.

Second, capitalizing on uniqueness makes each person more accountable. Michelle didn’t just praise Jeffrey for his ability to execute specific assignments. She challenged him to make this ability the cornerstone of his contribution to the store, to take ownership for this ability, to practice it, and to refine it.

Third, capitalizing on what is unique about each person builds a stronger sense of team, because it creates inter-

dependency. It helps people appreciate one another’s particular skills and learn that their coworkers can fill in where they are lacking. In short, it makes people need one another. The old cliché is that there’s no “I” in “team.” But as Michael Jordan once said, “There may be no ‘I’ in ‘team,’ but there is in ‘win.’”

Finally, when you capitalize on what is unique about each person, you introduce a healthy degree of disruption into your world. You shuffle existing hierarchies: If Jeffrey is in charge of all resets and revisions in the store, should he now command more or less respect than an assistant manager? You also shuffle existing assumptions about who is allowed to do what: If Jeffrey devises new methods of resetting an aisle, does he have to ask permission to try these out, or can he experiment on his own? And you shuffle existing beliefs about where the true expertise lies: If Genoa comes up with a way of arranging new merchandise that she thinks is more appealing than the method suggested by the “planogram” sent down from Walgreens headquarters, does her expertise trump the planners back at corporate? These questions will challenge Walgreens’ orthodoxies and thus will help the company become more inquisitive, more intelligent, more vital, and, despite its size, more able to duck and weave into the future.

All that said, the reason great managers focus on uniqueness isn’t just because it makes good business sense. They do it because they can’t help it. Like Shelley and Keats, the nineteenth-century Romantic poets, great managers are fascinated with individuality for its own sake. Fine shadings of personality, though they may be invisible to some and frustrating to others, are crystal clear to and highly valued by great managers. They could no more ignore these subtleties than ignore their own needs and desires. Figuring out what makes people tick is simply in their nature.

## The Three Levers

Although the Romantics were mesmerized by differences, at some point, managers need to rein in their inquisitiveness, gather up what they know about a person, and put the employee’s idiosyncrasies to use. To that end, there are three things you must know about someone to manage her well: her strengths, the triggers that activate those strengths, and how she learns.

**Make the most of strengths.** It takes time and effort to gain a full appreciation of an employee’s strengths and weaknesses. The great manager spends a good deal of time outside the office walking around, watching each person’s reactions to events, listening, and taking mental notes about what each individual is drawn to and what each person struggles with. There’s no substitute for this kind of observation, but you can obtain a lot of information about a person by asking a few simple, open-ended

# Fine shadings of personality, though they may be invisible to some and frustrating to others, are crystal clear to and highly valued by great managers.

questions and listening carefully to the answers. Two queries in particular have proven most revealing when it comes to identifying strengths and weaknesses, and I recommend asking them of all new hires—and revisiting the questions periodically.

To identify a person's strengths, first ask, "What was the best day at work you've had in the past three months?" Find out what the person was doing and why he enjoyed it so much. Remember: A strength is not merely something you are good at. In fact, it might be something you aren't good at yet. It might be just a predilection, something you find so intrinsically satisfying that you look forward to doing it again and again and getting better at it over time. This question will prompt your employee to start thinking about his interests and abilities from this perspective.

To identify a person's weaknesses, just invert the question: "What was the worst day you've had at work in the past three months?" And then probe for details about what he was doing and why it grated on him so much. As with a strength, a weakness is not merely something you are bad at (in fact, you might be quite competent at it). It is something that drains you of energy, an activity that you never look forward to doing and that when you are doing it, all you can think about is stopping.

Although you're keeping an eye out for both the strengths and weaknesses of your employees, your focus should be on their strengths. Conventional wisdom holds that self-awareness is a good thing and that it's the job of the manager to identify weaknesses and create a plan for overcoming them. But research by Albert Bandura, the father of social learning theory, has shown that self-assurance (labeled "self-efficacy" by cognitive psychologists), not self-awareness, is the strongest predictor of a person's ability to set high goals, to persist in the face of obstacles, to bounce back when reversals occur, and, ultimately, to achieve the goals they set. By contrast, self-awareness has not been shown to be a predictor of any of these outcomes, and in some cases, it appears to retard them.

Great managers seem to understand this instinctively. They know that their job is not to arm each employee with a dispassionately accurate understanding of the limits of her strengths and the liabilities of her weak-

nesses but to reinforce her self-assurance. That's why great managers focus on strengths. When a person succeeds, the great manager doesn't praise her hard work. Even if there's some exaggeration in the statement, he tells her that she succeeded because she has become so good at deploying her specific strengths. This, the manager knows, will strengthen the employee's self-assurance and make her more optimistic and more resilient in the face of challenges to come.

The focus-on-strengths approach might create in the employee a modicum of overconfidence, but great managers mitigate this by emphasizing the size and the difficulty of the employee's goals. They know that their primary objective is to create in each employee a specific state of mind: one that includes a realistic assessment of the difficulty of the obstacle ahead but an unrealistically optimistic belief in her ability to overcome it.

And what if the employee fails? Assuming the failure is not attributable to factors beyond her control, always explain failure as a lack of effort, even if this is only partially accurate. This will obscure self-doubt and give her something to work on as she faces up to the next challenge.

Repeated failure, of course, may indicate weakness where a role requires strength. In such cases, there are four approaches for overcoming weaknesses. If the problem amounts to a lack of skill or knowledge, that's easy to solve: Simply offer the relevant training, allow some time for the employee to incorporate the new skills, and look for signs of improvement. If her performance doesn't get better, you'll know that the reason she's struggling is because she is missing certain talents, a deficit no amount of skill or knowledge training is likely to fix. You'll have to find a way to manage around this weakness and neutralize it.

Which brings us to the second strategy for overcoming an employee weakness. Can you find her a partner, someone whose talents are strong in precisely the areas where hers are weak? Here's how this strategy can look in action. As vice president of merchandising for the women's clothing retailer Ann Taylor, Judi Langley found that tensions were rising between her and one of her merchandising managers, Claudia (not her real name), whose analytical mind and intense nature created an overpowering "need

to know." If Claudia learned of something before Judi had a chance to review it with her, she would become deeply frustrated. Given the speed with which decisions were made, and given Judi's busy schedule, this happened frequently. Judi was concerned that Claudia's irritation was unsettling the whole product team, not to mention earning the employee a reputation as a malcontent.

An average manager might have identified this behavior as a weakness and lectured Claudia on how to control her need for information. Judi, however, realized that this "weakness" was an aspect of Claudia's greatest strength: her analytical mind. Claudia would never be able to rein it in, at least not for long. So Judi looked for a strategy that would honor and support Claudia's need to know, while channeling it more productively. Judi decided to act as Claudia's information partner, and she committed to leaving Claudia a voice mail at the end of each day with a brief update. To make sure nothing fell through the cracks, they set up two live "touch base" conversations per week. This solution managed Claudia's expectations and assured her that she would get the information she needed, if not exactly when she wanted it, then at least at frequent and predictable intervals. Giving Claudia a partner neutralized the negative manifestations of her strength, allowing her to focus her analytical mind on her work. (Of course, in most cases, the partner would need to be someone other than a manager.)

Should the perfect partner prove hard to find, try this third strategy: Insert into the employee's world a technique that helps accomplish through discipline what the person can't accomplish through instinct. I met one very successful screenwriter and director who had struggled with telling other professionals, such as composers and directors of photography, that their work was not up to snuff. So he devised a mental trick: He now imagines what the "god of art" would want and uses this imaginary entity as a source of strength. In his mind, he no longer imposes his own opinion on his colleagues but rather tells himself (and them) that an authoritative third party has weighed in.

If training produces no improvement, if complementary partnering proves impractical, and if no nifty discipline technique can be found, you are going to have to try the fourth and final strategy, which is to rearrange the employee's working world to render his weakness irrelevant, as Michelle Miller did with Jeffrey. This strategy will require of you, first, the creativity to envision a more effective arrangement and, second, the courage to make that arrangement work. But as Michelle's experience revealed, the payoff that may come in the form of increased employee productivity and engagement is well worth it.

**Trigger good performance.** A person's strengths aren't always on display. Sometimes they require precise trigger-

## The Research

To gather the raw material for my book *The One Thing You Need to Know: About Great Managing, Great Leading, and Sustained Individual Success*, from which this article has been adapted, I chose an approach that is rather different from the one I used for my previous books. For 17 years, I had the good fortune to work with the Gallup Organization, one of the most respected research firms in the world. During that time, I was given the opportunity to interview some of the world's best leaders, managers, teachers, salespeople, stockbrokers, lawyers, and public servants. These interviews were a part of large-scale studies that involved surveying groups of people in the hopes of finding broad patterns in the data. For my book, I used this foundation as the jumping-off point for deeper, more individualized research.

In each of the three areas targeted in the book—managing, leading, and sustained individual success—I first identified one or two people in various roles and fields who had measurably, consistently, and dramatically outperformed their peers. These individuals included Myrtle Potter, president of commercial operations for Genentech, who transformed a failing drug into the highest selling prescription drug in the world; Sir Terry Leahy, the president of the European retailing giant Tesco; Manjit, the customer service representative from Jim Kawashima's top-performing Walgreens store in San Jose, California, who sold more than 1,600 units of Gillette deodorant in one month; and David Koepp, the prolific screenwriter who penned such blockbusters as *Jurassic Park*, *Mission: Impossible*, and *Spider-Man*.

What interested me about these high achievers was the practical, seemingly banal details of their actions and their choices. Why did Myrtle Potter repeatedly turn down promotions before taking on the challenge of turning around that failing drug? Why did Terry Leahy rely more on the memories of his working-class upbringing to define his company's strategy than on the results of customer surveys or focus groups? Manjit works the night shift, and one of her hobbies is weight lifting. Are those factors relevant to her performance? What were these special people doing that made them so very good at their roles?

Once these many details were duly noted and recorded, they slowly came together to reveal the "one thing" at the core of great managing, great leading, and sustained individual success.

## What You Need to Know About Each of Your Direct Reports

- What are his or her strengths?
- What are the triggers that activate those strengths?
- What is his or her learning style?



ing to turn them on. Squeeze the right trigger, and a person will push himself harder and persevere in the face of resistance. Squeeze the wrong one, and the person may well shut down. This can be tricky because triggers come in myriad and mysterious forms. One employee's trigger might be tied to the time of day (he is a night owl, and his strengths only kick in after 3 PM). Another employee's trigger might be tied to time with you, the boss (even though he's worked with you for more than five years, he still needs you to check in with him every day, or he feels he's being ignored). Another worker's trigger might be just the opposite – independence (she's only worked for you for six months, but if you check in with her even once a week, she feels micromanaged).

The most powerful trigger by far is recognition, not money. If you're not convinced of this, start ignoring one of your highly paid stars, and watch what happens. Most managers are aware that employees respond well to recognition. Great managers refine and extend this insight. They realize that each employee plays to a slightly different audience. To excel as a manager, you must be able to match the employee to the audience he values most. One employee's audience might be his peers; the best way to praise him would be to stand him up in front of his coworkers and publicly celebrate his achievement. Another's favorite audience might be you; the most powerful recognition would be a one-on-one conversation where you tell him quietly but vividly why he is such a valuable member of the team. Still another employee might define himself by his expertise; his most prized form of recognition would be some type of professional or technical award. Yet another might value feedback only from customers, in which case a picture of the employee with her best customer or a letter to her from the customer would be the best form of recognition.

Given how much personal attention it requires, tailoring praise to fit the person is mostly a manager's responsibility. But organizations can take a cue from this, too. There's no reason why a large company can't take this individualized approach to recognition and apply it to every employee. Of all the companies I've encountered, the North American division of HSBC, a London-based bank, has done the best job of this. Each year it presents its top individual consumer-lending performers with its Dream Awards. Each winner receives a unique prize. During the year, managers ask employees to identify what they would like to receive should they win. The prize value is capped at \$10,000, and it cannot be redeemed as cash, but beyond those two restrictions, each employee is free to pick the prize he wants. At the end of the year, the company holds a Dream Awards gala, during which it shows a video about the winning employee and why he selected his particular prize.

You can imagine the impact these personalized prizes have on HSBC employees. It's one thing to be brought up on stage and given yet another plaque. It's another thing when, in addition to public recognition of your performance, you receive a college tuition fund for your child, or the Harley-Davidson motorcycle you've always dreamed of, or – the prize everyone at the company still talks about – the airline tickets to fly you and your family back to Mexico to visit the grandmother you haven't seen in ten years.

**Tailor to learning styles.** Although there are many learning styles, a careful review of adult learning theory reveals that three styles predominate. These three are not mutually exclusive; certain employees may rely on a combination of two or perhaps all three. Nonetheless, staying attuned to each employee's style or styles will help focus your coaching.

# Differences of trait and talent are like blood types: They cut across the superficial variations of race, sex, and age and capture each person's uniqueness.

First, there's analyzing. Claudia from Ann Taylor is an analyzer. She understands a task by taking it apart, examining its elements, and reconstructing it piece by piece. Because every single component of a task is important in her eyes, she craves information. She needs to absorb all there is to know about a subject before she can begin to feel comfortable with it. If she doesn't feel she has enough information, she will dig and push until she gets it. She will read the assigned reading. She will attend the required classes. She will take good notes. She will study. And she will still want more.

The best way to teach an analyzer is to give her ample time in the classroom. Role-play with her. Do postmortem exercises with her. Break her performance down into its component parts so she can carefully build it back up. Always allow her time to prepare. The analyzer hates mistakes. A commonly held view is that mistakes fuel learning, but for the analyzer, this just isn't true. In fact, the reason she prepares so diligently is to minimize the possibility of mistakes. So don't expect to teach her much by throwing her into a new situation and telling her to wing it.

The opposite is true for the second dominant learning style, doing. While the most powerful learning moments for the analyzer occur prior to the performance, the doer's most powerful moments occur *during* the performance. Trial and error are integral to this learning process. Jeffrey, from Michelle Miller's store, is a doer. He learns the most while he's in the act of figuring things out for himself. For him, preparation is a dry, uninspiring activity. So rather than role-play with someone like Jeffrey, pick a specific task within his role that is simple but real, give him a brief overview of the outcomes you want, and get out of his way. Then gradually increase the degree of each task's complexity until he has mastered every aspect of his role. He may make a few mistakes along the way, but for the doer, mistakes are the raw material for learning.

Finally, there's watching. Watchers won't learn much through role-playing. They won't learn by doing, either. Since most formal training programs incorporate both of these elements, watchers are often viewed as rather poor students. That may be true, but they aren't necessarily poor learners.

Watchers can learn a great deal when they are given the chance to see the total performance. Studying the individual parts of a task is about as meaningful for them as studying the individual pixels of a digital photograph. What's important for this type of learner is the content of each pixel, its position relative to all the others. Watchers are only able to see this when they view the complete picture.

As it happens, this is the way I learn. Years ago, when I first began interviewing, I struggled to learn the skill of creating a report on a person after I had interviewed him. I understood all the required steps, but I couldn't seem to put them together. Some of my colleagues could knock out a report in an hour; for me, it would take the better part of a day. Then one afternoon, as I was staring morosely into my Dictaphone, I overheard the voice of the analyst next door. He was talking so rapidly that I initially thought he was on the phone. Only after a few minutes did I realize that he was dictating a report. This was the first time I had heard someone "in the act." I'd seen the finished results countless times, since reading the reports of others was the way we were supposed to learn, but I'd never actually heard another analyst in the act of creation. It was a revelation. I finally saw how everything should come together into a coherent whole. I remember picking up my Dictaphone, mimicking the cadence and even the accent of my neighbor, and feeling the words begin to flow.

If you're trying to teach a watcher, by far the most effective technique is to get her out of the classroom. Take her away from the manuals, and make her ride shotgun with one of your most experienced performers.

•••

We've seen, in the stories of great managers like Michelle Miller and Judi Langley, that at the very heart of their success lies an appreciation for individuality. This is not to say that managers don't need other skills. They need to be able to hire well, to set expectations, and to interact productively with their own bosses, just to name a few. But what they do – instinctively – is play chess. Mediocre managers assume (or hope) that their employees will all be motivated by the same things and driven by the same goals, that they will desire the same kinds of relationships

and learn in roughly the same way. They define the behaviors they expect from people and tell them to work on behaviors that don't come naturally. They praise those who can overcome their natural styles to conform to preset ideas. In short, they believe the manager's job is to mold, or transform, each employee into the perfect version of the role.

Great managers don't try to change a person's style. They never try to push a knight to move in the same way as a bishop. They know that their employees will differ in how they think, how they build relationships, how altruistic they are, how patient they can be, how much of an expert they need to be, how prepared they need to feel, what drives them, what challenges them, and what their goals are. These differences of trait and talent are like blood types: They cut across the superficial variations of race, sex, and age and capture the essential uniqueness of each individual.

Like blood types, the majority of these differences are enduring and resistant to change. A manager's most precious resource is time, and great managers know that the most effective way to invest their time is to identify exactly how each employee is different and then to figure out how best to incorporate those enduring idiosyncrasies into the overall plan.

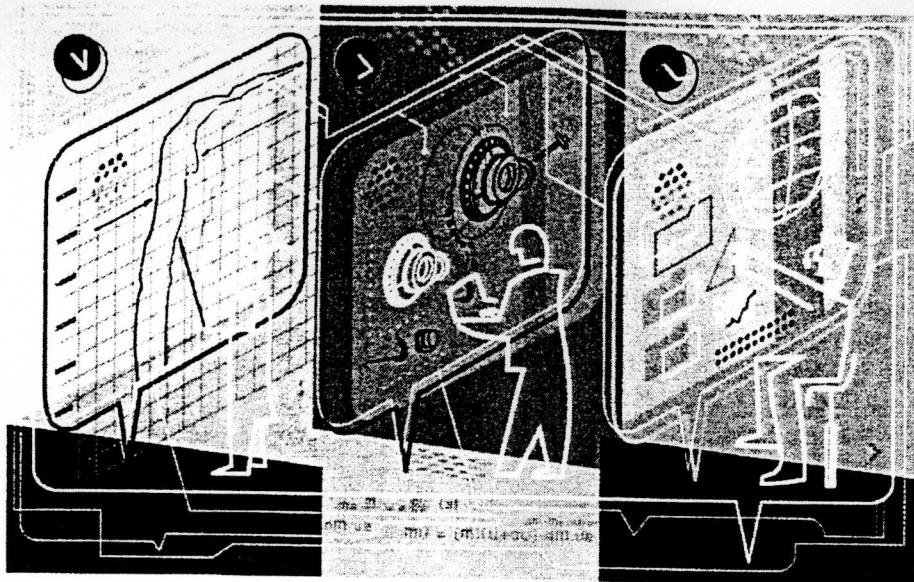
To excel at managing others, you must bring that insight to your actions and interactions. Always remember that great managing is about release, not transformation. It's about constantly tweaking your environment so that the unique contribution, the unique needs, and the unique style of each employee can be given free rein. Your success as a manager will depend almost entirely on your ability to do this. ☐

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To order, see page 151.



*"Of course I'm a team player, but why am I always stuck with the extra innings?"*



Far-flung teams can be remarkably productive, even outperforming groups whose members work side by side. But to make these teams succeed, you have to follow new rules about how to manage them.

# Can Absence Make a Team Grow Stronger?

by Ann Majchrzak, Arvind Malhotra, Jeffrey Stamps, and Jessica Lipnack

**T**HE COLD WAR had been good to Rocketdyne, Boeing's propulsion and power division. Starting in 1958, when the United States launched its first orbiting satellite, all the way through the 1980s, Rocketdyne was the dominant producer of liquid-fuel rocket engines. But after the breakup of the Soviet Union, makers of communications and weather satellites started favoring the cheaper engines coming out of a newly independent Russia.

In response, Bob Carman, a program manager at Rocketdyne, envisioned an engine that was radically simpler and cheaper than anything in its catalog. But to design it, Carman needed people with a depth of expertise that didn't exist within Rocketdyne's two offices in Canoga Park, California. He needed the best simulation-software stress analysts, who knew how to test alternative designs on the computer so the company

wouldn't have to build expensive prototypes, and he needed engineers who knew how to manufacture extremely precise parts in low volumes. The top simulation analysts worked at MSC Software, 100 miles away in Santa Ana, California, and the manufacturing engineers worked at Texas Instruments in Dallas. Remarkably, both groups had experience not only in modifying others' product designs for their own purposes but in originating them, a task more commonly the province of design engineers.

Going outside for expertise, specifically by forming partnerships with companies that had never produced a rocket engine, was viewed by Rocketdyne executives as "blasphemous," Carman recalls. Yet the eight-person group he assembled, about one-tenth the normal size, managed to design a reusable rocket engine, called SLICE, in only one-tenth the time span it took to develop its prede-

cessors—and 1% of the actual number of hours. Featuring a thrust chamber and turbopumps with only a few parts each instead of hundreds, it cost millions of dollars less to manufacture. The team was able to do all this even though the only physical meeting held included just five of its members, and the group as a whole spent only about 15% of each workweek over ten months on the project. The very first sample unit it produced passed what is known as cold-flow testing, a simulation stage in rocket development that few designs ever reach.

How did Carman pull off this amazing feat? By using modern communications technology to fashion a virtual, far-flung team of diverse talents that no face-to-face team could match, even if its members uprooted themselves to come work together, or commuted between their home offices and the team's site, for the project's entire length.

Carman then managed it so that the team's range of functions, disciplines, and temperaments didn't produce disarray.

In studying the Rocketdyne team, we noticed it had some unusual characteristics. Team members got to know one another well, though they spent absolutely no time together in person after the project began. They became remarkably attentive to one another's responses, though shifts in body language or facial expression were mostly invisible. They were working in areas outside their expertise but benefited greatly from being able to stay in familiar surroundings, continue working in their own organizations, and consult their local colleagues and extensive paper files.

We began to wonder whether other teams like SLICE existed. In 2002, we conducted a benchmarking study of successful virtual teams. (See the sidebar "Learning the Secrets of Far-Flung Teams.") Some were global, others regional. Half had members from more than one company. Half were long-term, and half had been set up just for a sin-

gle project. All of them convinced us that when a project requires a diversity of competencies and perspectives and the work can be done by means of electronic documents and tools, it's better to opt for a far-flung team than for one that works face-to-face. Such teams not only have a wider variety of communication channels at their command but also are free of many of the psychological and practical obstacles to full and effective participation that hobble their traditional counterparts.

For instance, several team members mentioned that they contributed much more during virtual meetings than they would have in face-to-face settings. They said they felt compelled to articulate their views more precisely than if they had depended on visual cues. Although many did affirm the value, in theory, of meeting together in the same room, few in practice found it essential. On the contrary, they asserted, holding such traditional meetings would have harmed the teams' work processes. Decisions in a complex project have to be made con-

tinually. Postponing them until everyone assembles slows everything down—way down. If such a meeting is in the offing, everyone expects it to be where the real work will take place and avoids doing anything of value until the meeting occurs. Our far-flung leaders dealt with that problem by never holding one. As one team leader said, "There's nothing we don't discuss virtually."

Indeed, much of the value of virtual teams derived from members' ability to be in two places at once. Remaining tightly linked to their local organizations allowed them to keep their teammates current on developments there. Long or frequent absences would have made that difficult, in addition to diminishing team members' value to their home units.

But, clearly, far-flung virtual teams establish a sense of connectedness and immediacy differently from the way local teams do. The virtual solution: Blur the distinction between time spent at meetings and time spent away from them through the use of always open, online team rooms—and ensure that the meetings that do occur really count.

The proof of the method was in the results. One team in our study went beyond its charge and designed a manufacturing process that saved its employer millions of dollars. Another team delivered virtual training to 80% of its company's employees at one-eighth the traditional cost. Yet another group was able to merge the IT infrastructures of two billion-dollar firms without suffering a single mishap on day one.

In this article, we set out three principles that guided most of our teams. The first deals with how these teams were composed; the second with how they used technology to coordinate their efforts; and the third with how team leaders induced a collection of strangers with little in common to function as a mutually supportive group.

### Rule 1: Exploit Diversity

With the assistance of his corporate partners, Bob Carman chose people for the SLICE team on the strength of their differences. They all may have spoken

## Learning the Secrets of Far-Flung Teams

To obtain data for our sample, we asked a handful of executives in companies known to conduct their work virtually whether they would give us access to both their successful and unsuccessful teams. They balked. No one wanted to talk about failures.

So we asked several hundred senior executives to nominate only teams they regarded as successful. This time, we got a good response. We asked about ones that did most of their work virtually yet interdependently, with few, if any, face-to-face meetings. We heard from 54 such teams in 26 companies representing a wide variety of industries—not only high-tech, telecom, financial services, and consulting firms but also heavy manufacturing, automotive, and consumer product companies. Among them were such brand names as EDS, IBM, Emery, Kraft, Motorola, and Shell Chemicals.

Fewer than 4% of the 293 participants in our survey reported ever meeting with all of their fellow team members face-to-face, and less than 17% reported ever meeting with any other member in person. Almost two-thirds of the teams included people from at least three time zones; slightly more than three-quarters had members from more than one country. The members of 57% of the teams performed different functions, and members of 48% of them came from more than one company.

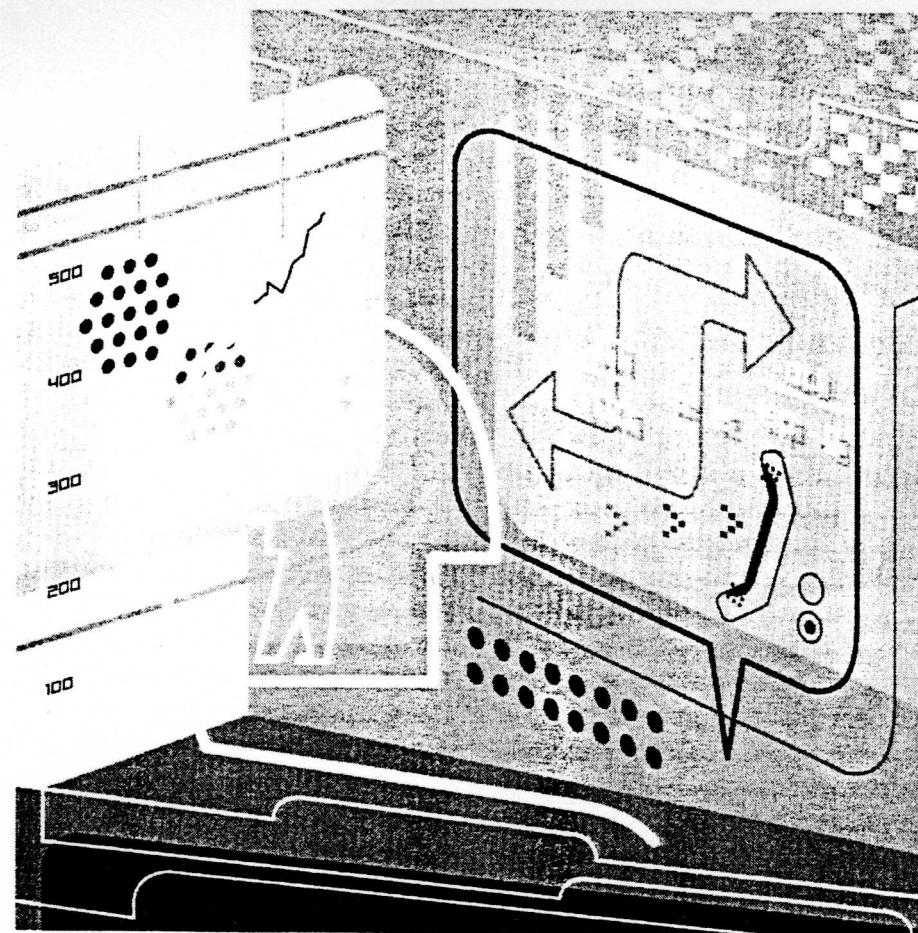
To participate, team members had to complete a 25-minute Web-based survey; the team leader had to agree to a half-hour telephone interview; and an executive familiar with the team had to rate it according to nine common dimensions of success, including quality of innovation, collective output, and adherence to budget.

English, but the languages of their various disciplines were so dissimilar that, for a while, the engineers, analysts, and rocket scientists couldn't understand one another. Each subgroup also had a different style of working and a different approach to solving problems. One of the engineers from Texas Instruments, for instance, didn't believe in going to the trouble of constructing elaborate models to test how an increase in material thickness might affect ease of manufacturing. In the early stages of the design process, he was comfortable relying on his own judgment and experience. Rocketdyne's more cautious propulsion experts felt otherwise. Each team member had areas of competence that were uniquely his or her own, and, inevitably,

## Much of the value of virtual teams derived from members' ability to be in two places at once.

disagreements arose over matters within one person's area of expertise that had repercussions for other team members. But the clash of perspectives produced solutions instead of acrimony. The propulsion engineers, for example, decided to thicken the edge of a casting part they had rounded to smooth the fuel's flow because the simulation engineers said the rounding diminished the part's ability to handle stress.

How were other teams able to take advantage of their diversity? Consider the example of a research and development team at Unilever Latin America that was asked to redesign a deodorant



for the Colombian and Venezuelan markets. The packaging for the roll-on, stick, and cream formats were to be manufactured in Brazil; the engineer who was to develop the cream packaging was situated in Argentina. The roll-on formula itself was going to be made in Mexico and Brazil, the stick in Chile, and the cream in Colombia. But because the packaging and formula for the Colombian and Venezuelan markets differed from those the factories were already making for the rest of Latin America, the company needed the existing suppliers and manufacturing engineers, who were spread across five countries, to par-

ticipate in the redesign of the new product. The kind of collaboration called for was best suited to a virtual team.

Much of the work of generating solutions happened in conference calls, which were carefully orchestrated by the team leader. "I didn't know the team members very well, didn't know how they thought and worked," the leader, who was based in Argentina, recalls, "so I couldn't always go directly to the point on an issue. Instead, I encouraged a lot of conversation, trying to reach a common view that included all of their points. We discussed different alternatives, always asking everyone, 'What do you think about this?'

"If we had ignored even one country," the leader continues, "we would have run the risk of creating a product that could not be rolled out according to schedule. But by surfacing our differences early, we didn't ignore anyone's needs, and we rolled out the product without problems on time."

This level of attention paid to soliciting and discussing everyone's opinions

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makes for a far more detailed conversation than the sort teams have when they meet in person, where they can be led astray by excessive politeness. After all, not every nod means assent. Most of the

## **It turned out that e-mail was a poor way for teams as a whole to collaborate.**

leaders we studied worked hard to move conversations beyond tacit agreement. Typically, the teams' charters from management were broad, not prescriptive, requiring searching discussions by the entire group, not half-baked suggestions "phoned in" to the leader by people working on their own.

Leaders planned their weekly or bi-weekly conference calls as orchestrated events that team members wouldn't want to miss. To ensure that everyone communicated in the same way, some of the leaders asked those working at the same location to call in from their own desks, rather than from a conference room. Wallflowers were drawn out in the meetings and mentored between them. If they still declined to participate, they were sometimes cut.

Leaders typically started their teleconferences with an unexpected query or bit of news, then introduced a topic they knew would generate some heat. Every person was given a minute or so to respond. The call closed with what one team member called "a self-propelling ending"—that is, one that set the agenda for the next meeting.

To help overcome differences in communication styles, at the outset of a project several teams administered an online version of the Myers-Briggs Type Indicator (MBTI), the widely accepted assessment tool that places people in one of four personality "dimensions." In early teleconferences, team members agreed to remind everyone of their own MBTI styles when they spoke. "As you know, I think out loud," said one with a high extroversion score. In another team, a particularly young member

often prefaced his comments with the reminder that he "hadn't been around the block yet."

These kinds of inclusive conversations proved to be indispensable for many of the teams. Although in the beginning their discussions took a lot of time, results more than made up for that. As the leader of the Unilever team says, "We got to a shared view much more quickly than any of us anticipated." Of course, teleconferencing was not the whole story.

## **Rule 2: Use Technology to Simulate Reality**

Today, a host of technologies exist for processing and communicating information. Which of them did the teams we studied use? Our more interesting discovery was the ones they didn't.

Many in our study found e-mail a poor way for teams as a whole to collaborate. They reported what others have noticed as well: Trying to do the main work of the team through one-to-one exchanges between members can cause those not included to feel left out, diminishing trust in the group and leading ultimately to dysfunction.

To avoid this expensive mistake, some teams initially adopted the practice of copying everyone else on every e-mail exchange. They soon were drowning in messages. To cope, members resorted to deleting e-mail without reading it. Over time, it became harder to maintain control over the circulation of documents. People regularly found themselves working from different versions of the same one. They also complained about e-mail's poor documentation and storage features, which made it hard to find information quickly.

They didn't think much of videoconferencing either. Only one-third of our sample used it. The majority offered such objections as the distracting time delay of most systems and the difficulty of returning to the videoconferencing facility after normal business hours, particularly if the team members were in different hemispheres. But participating in a teleconference from home at nine or ten o'clock at night was less problem-

atic. What's more, these teams felt that the visual cues most systems provided were too fuzzy to enhance the collaboration experience. In fact, those equipped with desktop videoconferencing found it almost impossible to watch their teammates and work collaboratively on their documents at the same time. Yet leaving the desktop and moving to a videoconferencing site was no answer either.

And while they made regular use of conference calls, team members did not report on the status of assignments during them. Instead, most (83%) relied on virtual work spaces. Here they posted their work in progress electronically and examined their colleagues' postings, well in advance of teleconferences. They tended to use the conference calls themselves to discuss disagreements, which they said were more effectively handled in conversation than in writing.

These work spaces were more than networked drives with shared files. Accessible to everyone at any time, the work space was where the group was reminded of its decisions, rationales, and commitments. A particularly good example of a team room is one that was set up at Shell Chemicals by assistant treasurer Tom Kunz, who led a project begun in February 2001 to develop a companywide, cash-focused approach to financial management. Essentially a Web site accessed on an intranet, it prominently displayed the project's mission statement on its home page, where no one could ignore it, as well as the photographs and names of team members, in a clocklike arrangement. During teleconferences, members adopted the practice of identifying themselves by their position on the clock: "This is Kate at ten o'clock," the member in Singapore would say. (See the exhibit, "Shell Chemicals' Virtual Work Space.")

The home page also had links to the other "walls," each of which was devoted to a particular aspect of the project. On the wall labeled "people," for instance, were kept not only individuals' contact information but also extensive profiles that included accomplishments, areas of expertise, and interests, as well as in-

formation about other stakeholders. On a wall labeled "purpose" was a hierarchical listing of the mission statement, the goals, and the tasks involved in meeting the goals, indicating how close each task was to completion. On the "meeting center" wall could be seen all the information needed to manage the teleconferences – notices of when they were being held, who was supposed to come, agendas, and minutes. Yet another wall displayed the team's responsibility chart, and one more contained the team's entire work product, organized into clearly numbered versions, so that people would not inadvertently work on the wrong one. Comprising seven walls in total, the team room kept information current, organized, and easily accessible.

Leaders used such online team rooms to hold virtual conversations, through threaded discussions. Here's how they worked in one of the teams we studied. During a conference call, the team took up the topic of quality assurance. Instead of devoting limited meeting time

to exchanging information, one member volunteered to start a thread in the online discussion area of the team room. A second person followed the opening comment by introducing research that summarized his related experience in another industry. A third team member responded to the first topic, while a fourth person responded to the second. In the meantime, someone began discussing scheduling conflicts, setting another series of remarks in motion. Organizing online conversations by topic made it easy for all those participating to follow each thread.

Team leaders tended to be the ones managing these threads, though that was not always the case. In a number of instances, a team member volunteered to serve as thread facilitator, taking responsibility for conducting the conversations the way teleconferences were run: a bit of news, a provocative question, and a self-propelling ending. To encourage participation in the online conversations, leaders posted links to documents relating to topics on the

agenda of upcoming meetings and then encouraged discussion before the meetings. They also encouraged those responsible for crafting draft documents (slides, drawings, analyses, and the like) to kick off new discussion threads with requests for comments.

Members were supposed to adhere to previously agreed-upon protocols, such as how quickly to respond – typically within a week. At the end of the designated time period, there were usually enough contributions to warrant summarizing what had been said. When a topic generated a great deal of discussion, summaries would appear more frequently. The person who initiated a thread would be responsible for the summary, which highlighted areas of both agreement and disagreement. The team then took up the areas of disagreement at the next teleconference. Between teleconferences, team members continued their online threaded discussions.

Everything of substance that the team generated was always available, neatly categorized and easily retrievable, in the virtual team room. The structure of the space itself encouraged good virtual-team hygiene, since it called for similar kinds of information to be stored in corresponding spaces.

Nearly half the teams used instant messaging (IM), even when their companies barred it, which surprised us somewhat. People said that they particularly liked being able to share their "Eureka!" and "Oh, no!" moments with others logged in at the same time. Since the majority of companies had no standards for its use, most of our teams adopted IM ad hoc. In some cases, a team found itself using more than one IM program, which created IM cliques isolated by the information they alone shared. Some teams found IM sessions difficult to store and retrieve for future use. Others resented IM's power to interrupt whatever they were doing at the moment. Aware of the burgeoning of IM use and its harmful side effects, some team leaders worked with their IT organizations to develop standards and improve security.

## Shell Chemicals' Virtual Work Space

How different are virtual work spaces from shared files? Here's the home page of the virtual work space for a project set up to create a new cash-based approach to financial management for the energy-company subsidiary.

### Rule 3: Hold the Team Together

The hazards that commonly threaten to splinter face-to-face teams – mistrust, cliques, uninformed managers, and the allure of other interesting but unrelated work – can be even more pronounced on a virtual team. Ours were notably adept at wielding techniques that instead drew them together.

Team leaders rarely let a day go by when members did not communicate with one another. Frequent phone conversations between the team leader and individual members – even with those who did communicate regularly in teleconferences, in the work space, and in e-mails – were not unusual. One team leader reported being on the phone with his team for ten to 15 hours a week. (See the sidebar “Whipping Up a Key Ingredient.”)

Early in the life of a team, the leader would push it to adopt a common language – usually English, but not always. The members of the Unilever team adopted what they called “Portuñol,” a hybrid of Spanish and Portuguese. Even on an unusually homogeneous team, where everyone shared a background in computer programming and spoke English, it was still necessary to compile a glossary, mostly of technical terms but also of figures of speech such as “home run” and “go for broke.” A team comprising mainly Americans along with some Japanese members hit upon the idea of hiring as translators local engineering interns fluent in both Japanese and English.

Leaders also needed to create coherence when they were trying to blend the work processes of the members’ home organizations. At one telecommunications company, some of the employees of a newly formed call center came from its northern operation, others from its southern. The southerners had been trained to solve customers’ problems no matter how long it took or how disruptive doing so might be to the linemen’s standing priorities. By contrast, the northerners were accustomed to spending a more or less standard amount of time with each cus-

### Whipping Up a Key Ingredient

A project in the life of a person we’ll call Paula Hans, a veteran technology manager at Carruthers Corporation, the pseudonym for a chemical processor, demonstrates how in one virtual team an especially coherent identity was forged. A few days into her vacation, Hans received an emergency call from her boss, who reported that the sole supplier of a key ingredient, one that met the company’s stringent environmental standards, was leaving the market in three months. He asked Hans to lead a team that would work with another supplier to develop the same ingredient.

“I needed chemists from research; people who knew supply chain; an expert in sourcing; someone who knew our manufacturing processes; someone who knew the product line; someone who knew the quality system, in case a change in formula required requalification [by OSHA, EPA, or other federal agencies]; and, finally, someone who knew marketing, in case we changed the product,” Hans says. “These people also needed to represent our plants here in Idaho and in Europe, as well as our research labs in the U.S., Europe, and Asia. I made a point of having people from all over the world. That way, we’d have people everywhere to represent, defend, and sell the project.”

But this degree of diversity generated forces that could have pulled the team apart. The chemists, for example, saw nothing in the team’s charter to prohibit the group from trying a new manufacturing process. The quality control person, however, didn’t want to change the existing process because the cost of requalifying any resulting product would be too high.

How did Hans build a coherent identity among the 40 people? She did it by communicating intensively. “We had a kickoff meeting on the phone using our online team room, which everyone visited daily. We followed up with weekly teleconferences. Between meetings, I talked to everyone individually, either on the phone or face-to-face. I also led meetings from two other locations. I was concerned that headquarters would be perceived as the in-group and the plants and the European and Japanese operations as the out-groups, so I talked to them a lot. I kept our virtual work space updated, and I moderated online discussion threads.

“In the beginning, I took minutes on a pad of paper and sent them out later, but no one ever commented on anything. So I switched to taking minutes during the meeting so that everyone could see them on their screens. People would comment and correct things as we went along, which meant the minutes that I posted in the team room immediately after the meeting were accurate reflections of what we’d decided. Then I put everything in the virtual work space and bugged people to keep up.”

The team met virtually, in different configurations, whenever it needed to. “We had lots of smaller brainstorming sessions. Since things never go as you like, we brainstormed about what might go wrong.” With the exception of one session in which the seven chemists met face-to-face, all the brainstorming was done virtually and outside the formal meeting schedule.

All this communication paid off. Early on, a research chemist developed a cheaper substitute ingredient that did not require the product’s manufacturing process to be requalified, netting the company more than \$2 million a year. “The rest of the team was able to integrate the new ingredient into the rest of the project, then show how we could apply it to other projects and products worldwide,” Hans attested.

At the end of the project, Hans put together a celebratory conference call. Every site was presented with a cake. The Europeans got alcohol served with theirs; the Americans, soft drinks.

tomer and documenting what they'd done. After much discussion, the two sides decided that neither approach was wrong and therefore each should adopt elements of the other.

Another technique used to glue teams together was having members work in ad hoc pairs for a week or two. These subteams allowed members to get to know one another better and discouraged the formation of cliques. At one chemical products company, for instance, the leader of a strategic accounts team named subteams to flesh out the details of the account plans. The subteam members then came together to edit one another's work.

To keep the team members' home offices from trying to pull them away, team leaders negotiated in advance the extent of the team's claim on a member's time, made clear how the home office and the individual member stood to gain, and kept the home office abreast of the team's and the member's progress. Some team leaders separately negotiated a financial reward for every team member with his or her respective HR person. Needless to say, these were time-consuming commitments. While team membership was always part-time, team leadership was often more than full-time.

Even though diversity was, in some sense, a virtual team's reason for being, leaders recognized that identifying commonalities would strengthen loyalties to the group. The leader of one team, a retired military officer, started his conference calls by asking each person to spend 30 seconds describing "where the member is at." During a conference call in 2002, when snipers were terrorizing the Washington, DC, area, a team member living there said she didn't feel so alone after she heard her fears echoed by another member in the Philippines, where insurgents were shooting people on their way to and from work.

## The Power of the Small Group

If far-flung teams can be so effective, why aren't they used more? Organizational inertia rather than direct opposition often stands in the way. For in-

stance, in today's military, commanders are not necessarily located with their troops; they may not even be on the same continent. But U.S. Army doctrine still holds that the "commander's intent" must be conveyed face-to-face whenever possible, even though commanding officers may be able to make more informed decisions when they are removed from the fray. Policies that keep managers, executives, or even commanders in perpetual motion hark back to the days when the jet plane, not the integration of telecommunications and computers, was the new technology.

There's another reason organizations have been slow to cotton to what our teams have discovered. The computer revolution missed a step. When companies went from enterprise computing to individual computing, they jumped over the small-group level, where the preponderance of work takes place. The first computers, typified by the IBM 360 behemoths of the 1960s, supported companywide operations. The genera-

tion of computers that followed supported department-level organizations, eventually morphing into today's servers. In the 1980s, personal computers boosted individuals' productivity. Then in the 1990s, the Internet and the Web connected these previously isolated individuals informally, boosting their productivity even more.

In this decade, the forgotten step, the small group, is suddenly the focus of advances in collaboration technology—shared online work spaces, on-demand teleconferencing, real-time application sharing, and instant messaging—which the massive investment in infrastructure of the late 1990s is now available to support. When small groups adopt the kinds of practices our teams have demonstrated, they can work faster, smarter, more creatively, and more flexibly than dispersed individuals or the enterprise as a whole. □

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To order, see page 153.



*"Frank, stop with the anxiety again. Let's just hire a consultant and move on."*

# Project Management in the Information Systems and Information Technologies Industries

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## Abstract

For many enterprises, sustainable success is closely linked to information systems (IS) and information technologies (IT). Despite significant efforts to improve software project success, many still fail. Current literature indicates that most of the software project problems are related to management, organizational, human, and cultural issues—not technical problems. This paper presents results of a survey of 36 software owners/sponsors, contractors/suppliers, and consultants on 12 projects. The empirical results address answers to questions related to success, performance metrics, and project business drivers. A lack of alignment on these critical issues emerge consistently by phase as well as across the entire project. The results of this study also are compared with others that span seven additional industry sectors. As a result, the authors have developed an approach that links project critical success factors (CSFs) to corporate strategy, and project metrics to the CSFs. An important finding of this study is the critical need to identify and manage realistic expectations of the stakeholders to achieve perceived project success.

**Keywords:** information systems; information technology; managing stakeholder expectations; critical success factors; software project management

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Information systems (IS) and information technologies (IT) are the fastest growing industries in developed countries. Huge amounts of money continue to be invested in these industries (Abdel-Hamid & Madnick, 1990). Due to pressure of time-to-market, there is a corresponding pressure to increase productivity. To maintain a competitive edge in today's fast-changing world, an organization's success depends on effectively developing and adopting IS. Literature has discussed concern for problems related to IT/IS development and implementation.

According to Zells (1994) and other studies, approximately 85% of software projects undertaken in Europe and North America are at level one of the Software Engineering Institute's capability maturity model (CMM). Level one is the lowest level of CMM. The challenges at level one are to have project planning, project management, configuration management, and software quality assurance in place—and have them working effectively. To improve project delivery performance, a number of organizations are adopting project management approaches and setting up project management offices (Barnes, 1991; Butterfield & Edwards, 1994; King, 1995; Munns & Bjeirmi, 1996; Raz, 1993; Redmond, 1991).

Current literature on software projects shows that most of the software problems are of a management, organizational or behavioral nature, not technical (Johnston, 1995; Martin, 1994; Whitten, 1995).

A survey of high-tech firms showed that if project management improved, time and cost could be reduced by more than 25% and profits would increase by more than 5% (Fisher, 1991). This has since been validated by use of Strategically Managed Aligned Regenerative Transitional (SMART) project management, based on internal benchmarking by the companies involved in the field trials.

## Objectives of the Study

In this paper, the authors report findings on current project management practices in the IT/IS industries. The purpose of the study was to find out what practices are important to IT/IS industries in successfully accomplishing their projects. Do they use proven project management practices? Whatever the IT/IS industries regard as important for the success of their projects, do they measure it? What are the project drivers? Are these three important elements aligned with each other? The authors investigated these questions not only for various phases of a project, but also from the perspective of three major stakeholders. These stakeholders include an owner or sponsor, a major contractor or supplier, and a consultant for the same project.

In the next section, the authors review the current literature, summarizing major problems of IT/IS projects. In the fourth section, the authors discuss their research methodology. This is followed by a discussion of the results of the study and a summary of the findings. Finally, the authors propose an approach for managing projects based on the SMART framework and implemented on a number of software and other projects with markedly improved results, followed by conclusions. The authors hope that this study will help project managers in understanding the state of the art of project management in the software industry and how it might be improved.

## Literature Survey

The horror stories about delay, cost overrun, and abandonment of software projects are widely reported in the literature (Bailey, 1996; Gibbs, 1994; Lucas, 1995; Martin, 1994; Ward, 1994). In other industries, causes of project failures are investigated and reports written, but in the computer industry their causes are covered up or ignored. As a result, the IT/IS industry keeps making the same mistakes over and over again (Johnston, 1995).

There are differences in the opinions of experts as to whether software project management is similar or different to project management in other industries. The authors believe that the principles are the same across industries, but the terminology and some applications are specific to each industry and sometimes to each company or physical location. But many believe that software management is very different (Otto, Dhillon, & Watkins, 1993; Raybould, 1996; Roetzheim, 1993; Samuels, 1996). However, in Duncan's (1991) view, software projects are not different from other projects. In the authors' opinion there are both differences and commonalities in all types of projects, let alone software projects. Any two projects from one industry sector can be unique, and we can benefit from other industries' experiences.

In summary, the most commonly reported causes of software project failure are as follows (based on a content analysis of the cited literature):

- Misunderstood requirements (business, technical, and social) (King, 1995; Lane, Palko, & Cronan, 1994; Lavence, 1996);
- Optimistic schedules and budgets (Martin, 1994);
- Inadequate risk assessment and management (Johnston, 1995);
- Inconsistent standards and lack of training in project management (Jones, 1994; O'Conner & Reinsborough, 1992; Phan, Vogel, & Nunamaker, 1995);
- Management of resources (people more than hardware and technology) (Johnston, 1995; Martin, 1994; Ward, 1994);
- Unclear charter for a project (Lavence, 1996);
- Lack of communication (Demery, 1995; Gioia, 1996; Hartman, 2000; Walsh & Kanter, 1988).

The authors of this paper believe that these are symptoms of the disease and not the root causes of the disease.

## Main Reasons for Failures of IT/IS Projects

Before looking into the main causes of project failures in the IT/IS industry, we must define critical success factors (CSFs)

and review the importance of metrics. The CSFs are the elements that make a project a success. These include trust, effective communication, top management support, etc. Key result areas (KRAs) are specific results that are needed to deliver a successful project. CSF methodology has been highly successful in identifying KRAs crucial for the success of a project (Atkinson, 1999; Baccarini, 1999; Belassi & Tukel, 1996; Byers & Blume, 1994; Clarke, 1999; Cooke-Davies, 2002; Fisher & L'Abbe, 1994; Forsberg & Mooz, 1996; Fowler & Walsh, 1999; Johnston, 1995; Levene, Bentley, & Jarvis, 1995; Lim & Mohamed, 1999; Martin, 1982; Pinto & Kharbanda, 1995; Raz, 1993; Shank, Boynton, & Zmud, 1985; Tan, 1996; Wateridge, 1999; Whitten, 1995; Zahedi, 1987; Zells, 1991).

With changing business conditions, half-century-old project performance metrics are no longer effective for the monitoring and control of today's projects. Proper measurement tools and metrics are necessary for effective control of projects (Hartman & Jearges, 1996; Kiernan, 1995; Simmons, 1992; Thamhain, 1994).

Based on both consulting and earlier research, the authors found that the main reasons for most of these problems are:

- Major stakeholders generally do not have a clear idea of project success or have differing views of what success constitutes. If a clear vision exists, it is not effectively communicated or the project team does not understand it. This leads to scope creep, inappropriate measurement, churn in developments, specification changes, delays, and other issues;
- Generally there is a problem in identifying KRAs and CSFs and linking them to the stakeholders' business strategy. This leads to lack of support by senior management;
- The project team and major stakeholders are not very clear on what the performance and control metrics should be. Normally the focus is on time, cost, performance, and quality. But this focus is not consistent between stakeholders or over time. Some have recognized the importance of customer and end-user satisfaction;
- Project control and performance metrics are not linked to KRAs and CSFs. This means we measure the wrong things and distract the team from what is important to success. It looks like inadequate or ineffective project control;
- Generally, there is very little or sometimes no alignment among major stakeholders on success criteria, KRAs, CSFs, performance metrics, project drivers, and on the dynamics of change for these elements over the project life cycle. This leads to inappropriate decision-making and inconsistency in management style and focus.

Current literature also supports these views, albeit piecemeal in many cases, as the focus of many papers is on specific aspects. A number of researchers have commented on the lack of project success criteria and on a lack of proper project metrics (Adams, Sarkis, & Liles, 1995; Demery, 1995; Ingram, 1994; Jiang, Klein, & Ballou, 1996; Johnston, 1995; Peters, 1996; Pinto & Slevin, 1988; Raybould, 1996; Stevens, 1991; Turner, McLaughlin,

Thomas, & Hastings, 1994; Wateridge, 1995). Hartman and Ashrafi (1996) reported an overview on CSFs, project drivers, and metrics of various industries. Some of the results of the current study were reported in Hartman and Ashrafi (1998).

As a first step to collecting empirical evidence to test the hypotheses, the authors decided to collect data on the current state of affairs for these aspects of project management. This included but was not limited to:

- Were the criteria for success clearly defined at the beginning of the project? Were KRAs and CSFs identified?
- Was there any alignment between major stakeholders on these CSFs?
- What project metrics were used for monitoring project performance during various phases of the project?
- Was there an alignment of major stakeholders on what these metrics should be?
- Were these metrics linked to KRAs and CSFs?
- Were the project priorities set at the beginning of the project? Did the priorities change during various phases of the project life cycle?
- Were the KRAs, CSFs, metrics, and project priorities consistent with each other?
- Were the CSFs, metrics, and project priorities changed during various phases of the project?
- Was there any alignment between major stakeholders on the dynamics of such change across the various phases of the project?

The first of these aspects is to identify what KRAs would be crucial to the successful accomplishment of the project. This allows the project team to keep a focus on them and not get led astray by the everyday fire fighting on project management problems. The second aspect is to link these KRAs and CSFs to corporate strategy and to get buy-in of all the major stakeholders. This linkage validates the project and helps senior management see its relevance and, thus, provide appropriate support to the project. The third aspect is to monitor, control, and measure those elements regarded as critical for project success. In other words, once we know what is important for success, project elements that contribute to this success are the ones we should be measuring to monitor performance during implementation. The fourth aspect is to identify project business drivers. This helps make project priorities very clear to everyone. The fifth aspect is to align all major stakeholders and the project team on KRAs, CSFs, project drivers, and metrics. Finally, it is important to have an understanding of the dynamics of these elements over various phases of the project.

The authors strongly believe that if project success criteria are defined at the beginning of a project, KRAs are identified and related to corporate strategy through a clear project mission, metrics are linked to these KRAs, project priorities are made clear, and buy-in is obtained by all major project stakeholders on all these aspects, most of the problems reported in the literature could be avoided. As a result, efficiency and success of projects could be significantly improved.

## Research Methodology

The authors developed a survey instrument to collect data on all the stated aspects of project management. The survey was divided into five sections. The first section collected project-related and demographic information such as industry sector, experience of project manager, project value, duration, location, completion date, purpose of the project, role of the respondent, etc. The second section provided a list of 33 items identified by the authors as potential CSFs. These CSFs were synthesized from the extensive literature on this subject. The respondents were asked to rate these factors in terms of their importance on a scale of 0 to 5 on each of the four project phases (5 = very important; 1 = not important; 0 = not applicable). These four phases were definition, planning, execution, and termination.

The third section of the survey dealt with project metrics. A list of 20 different project metrics were provided to the respondents and they were asked to rank the importance of these metrics on the scale of 0 to 5 over the four phases of a project. These metrics were drawn from standard project management texts and were guided by the Project Management Institute's *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (PMI Standards Committee, 2000). In the fourth section, a list of six project priorities was given and the respondents were asked to rank the importance of these project drivers at each of the four phases. Last, several open-ended questions were asked. Was this project successful? If so, on what basis? Other relevant information the respondent wanted to add was recorded here.

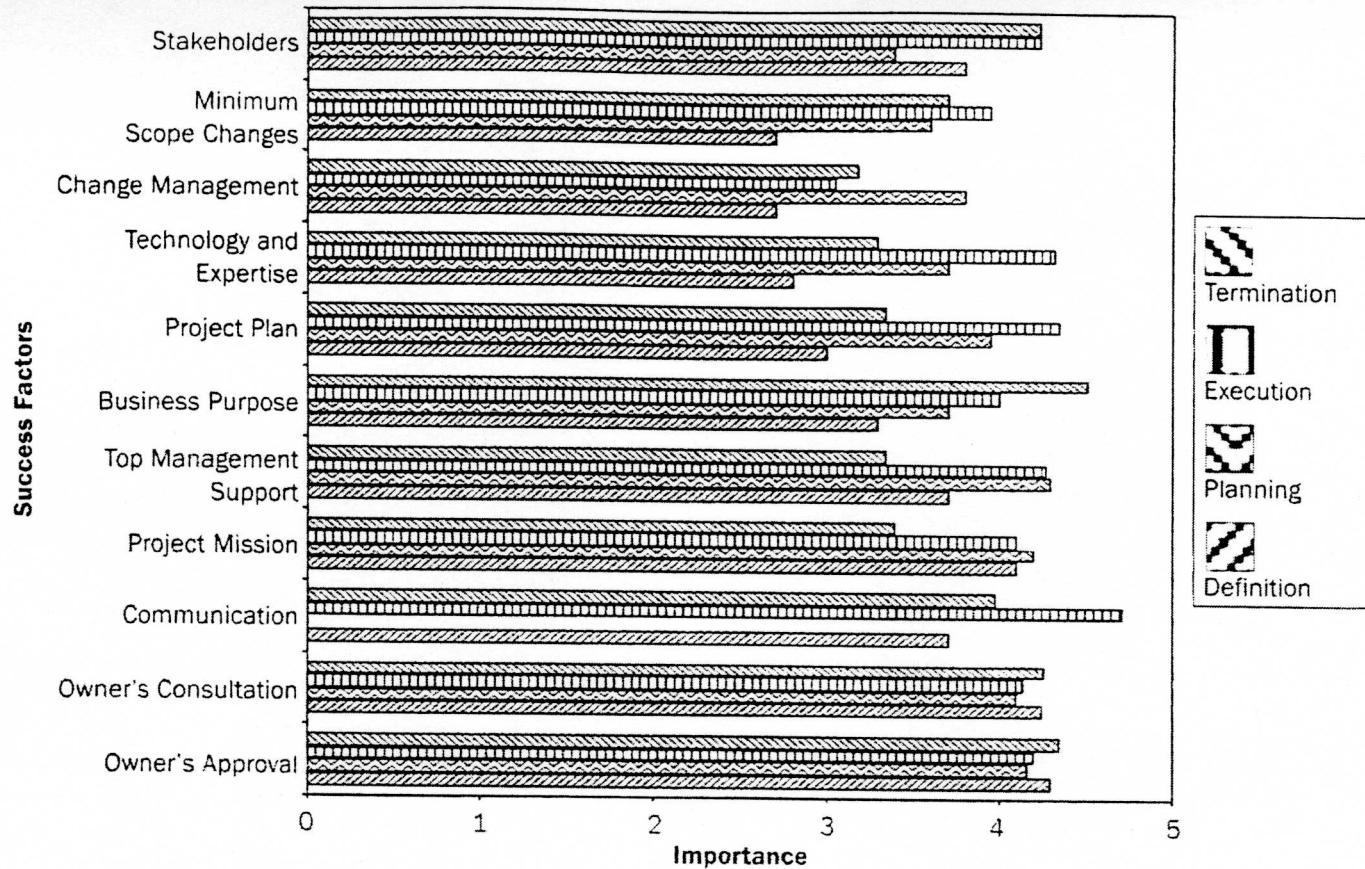
Data was collected on 12 projects in Canada through personal interviews of 36 project owners/sponsors, contractors/suppliers, and consultants—three people per project. This was part of a much larger study spanning eight industry sectors and more than 100 projects. A brief summary of projects is included in Appendix A.

First, an owner/sponsor of a suitable project was contacted and interviewed. With permission of the owner/sponsor, a major contractor or a supplier and a consultant to the same project were identified and interviewed. The respondents were asked to reply in the context of actual project management practices and not in terms of company policy or their personal opinions or preferences. The sample used in the study was small and based in Calgary, Alberta, Canada. However, based on correlation with other findings and observations from the literature, the authors believe these results have broad application.

## Results of Survey Analysis

One of the main goals of this study was to identify KRAs and CSFs and to find out if project metrics were linked to these KRAs and CSFs. The authors also wanted to establish project priorities during various phases of the project life cycle. In addition to these, the authors wanted to answer several questions including:

- Is there a change in the CSFs, metrics, and priorities over the life of the project?



**Figure 1.** Project Success Factors by Phases

- How consistent are the three major stakeholders (owner, contractor, and consultant) in their perceptions of CSFs, metrics, and project priorities?
- Are the perceived CSFs consistent with the metrics used and the project priorities identified by these stakeholders?

An average of all scores of the responses in the appropriate survey groups was calculated. The most important characteristics then were defined as those that had the highest average score:

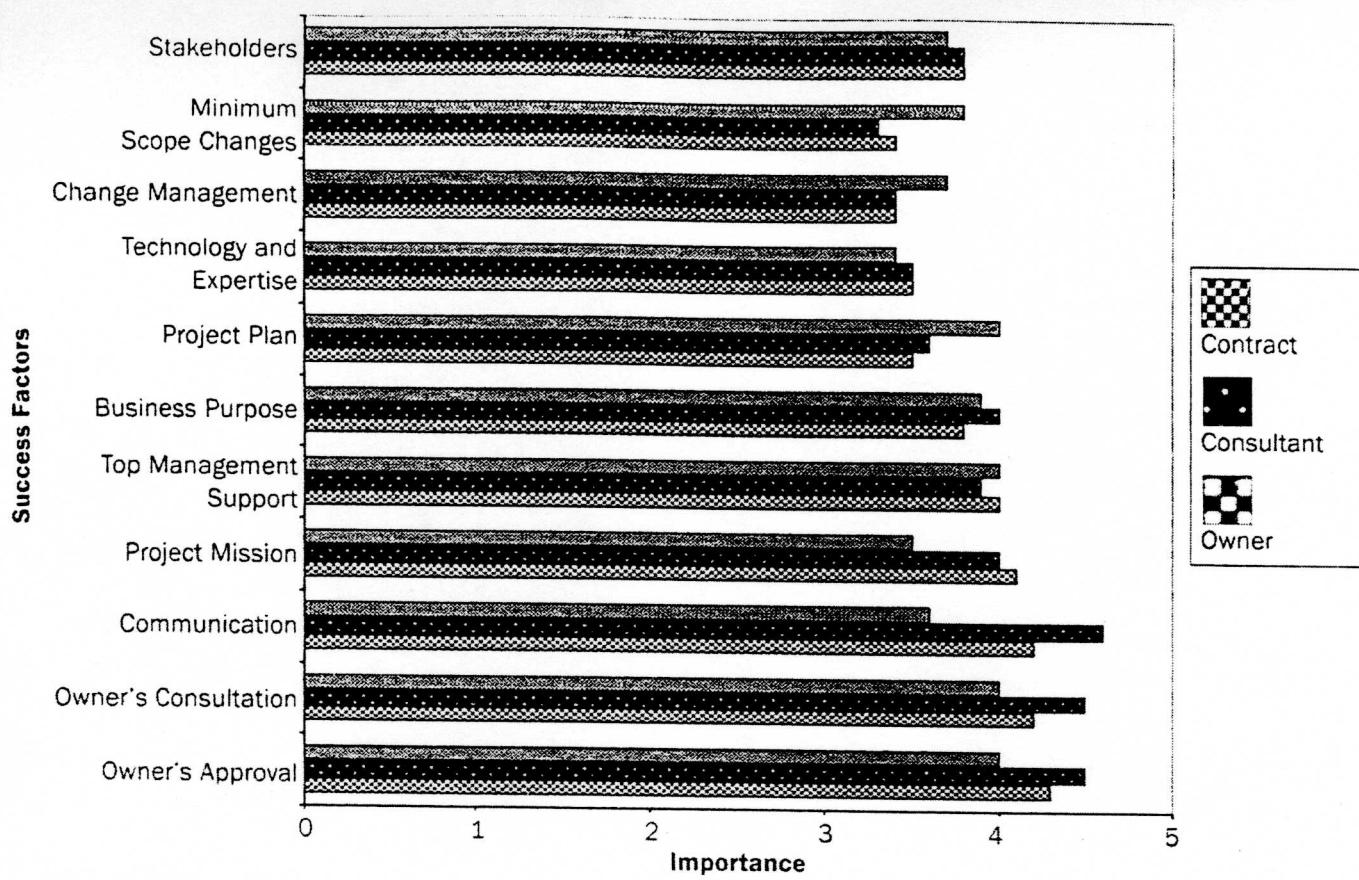
- **CSFs by Phases.** Figure 1 shows the 10 most important CSFs over the four phases of projects;
- **CSFs by Stakeholders.** The 10 most important CSFs by stakeholders group are shown in Figure 2;
- **Project Metrics by Phases.** Figure 3 shows the 10 most important project metrics for four phases of the projects investigated;
- **Project Metrics by Stakeholders.** The most important project metrics according to each of the stakeholders are shown in Figure 4;
- **Project Priority Ranking by Phase.** Figure 5 shows project priority ranking during four phases of the projects studied;
- **Project Priority Ranking by Stakeholders.** Figure 6 shows the most important project priority rankings by stakeholders.

From the results, it was concluded that the value of metrics as a predictive tool was not fully exploited by the project teams. It may have been possible to place more importance on key metrics earlier on in the project. This could have been done to ensure

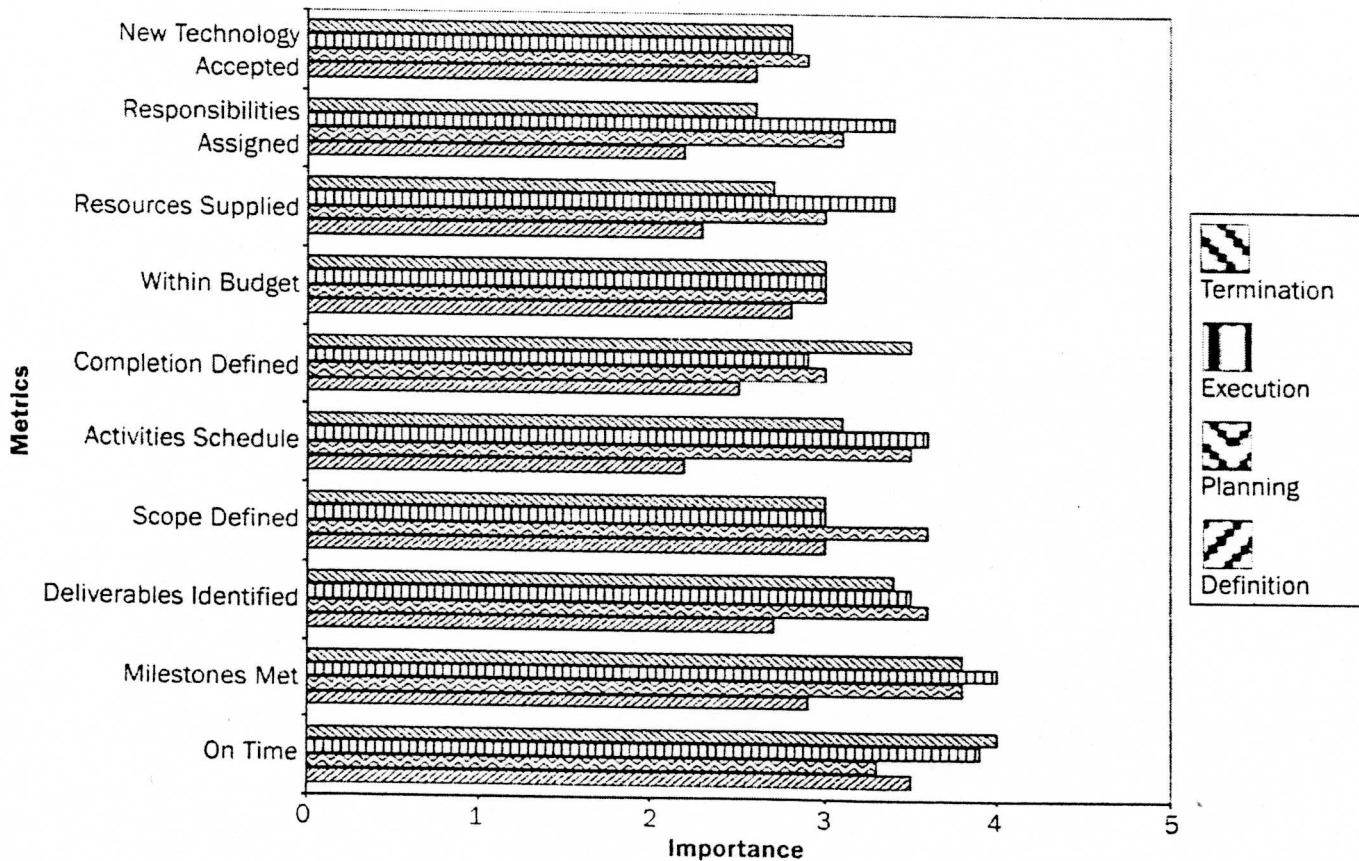
that things did not get out of hand by the time the execution stage rolled around because, at that point, the project has enough momentum that it becomes quite difficult to get it back on track.

Table 1 shows the most important overall CSFs and project metrics as identified by all the three stakeholder groups over four project phases. The respondents showed inconsistencies between what they identified as the project success factors and what were used as project metrics. It was observed that in some cases that respondents in the same project agreed on the importance of certain CSFs, but they did not agree on how the CSFs were measured. In other cases, respondents agreed on the importance of these factors, but they indicated that they did not have a metric established for measuring them.

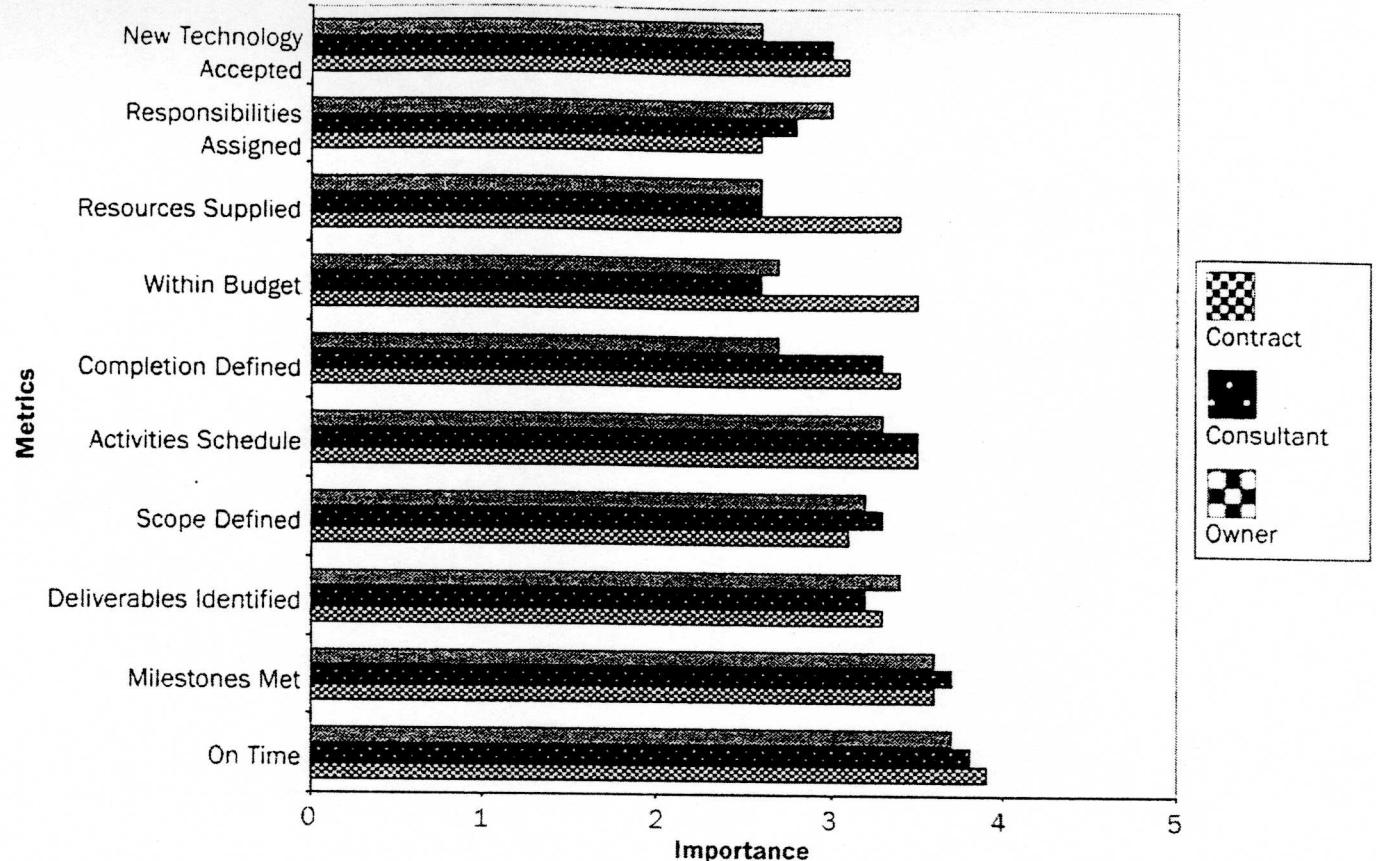
It also was observed that project owners, contractors, and consultants do not have a clear understanding of the methods that are used on their projects to measure how well project goals are met. Although there is some agreement as to which factors are important to the success of the project, there also should be agreement on how to measure success. If project metrics are not clearly understood, it is difficult to determine the level of success of the project. Each individual involved in the project may have a different opinion as to how successful the project is, depending on his or her own measurement. Another important point is that success factors considered to be important to a project should be measured in some way during execution to determine ahead of time whether



**Figure 2.** Success Factors by Stakeholders



**Figure 3.** Project Metrics by Phases



**Figure 4.** Project Metrics by Stakeholders

performance objectives will be met. If the project stakeholders and the team do not formally measure the factors that they deem to be most important, they cannot hope to predict its success and take corrective action as required. The project stakeholders and the team may be spending their time on measuring less important factors that will lead it to an incorrect ongoing measurement of whether or not the project is a success.

### Summary of Findings

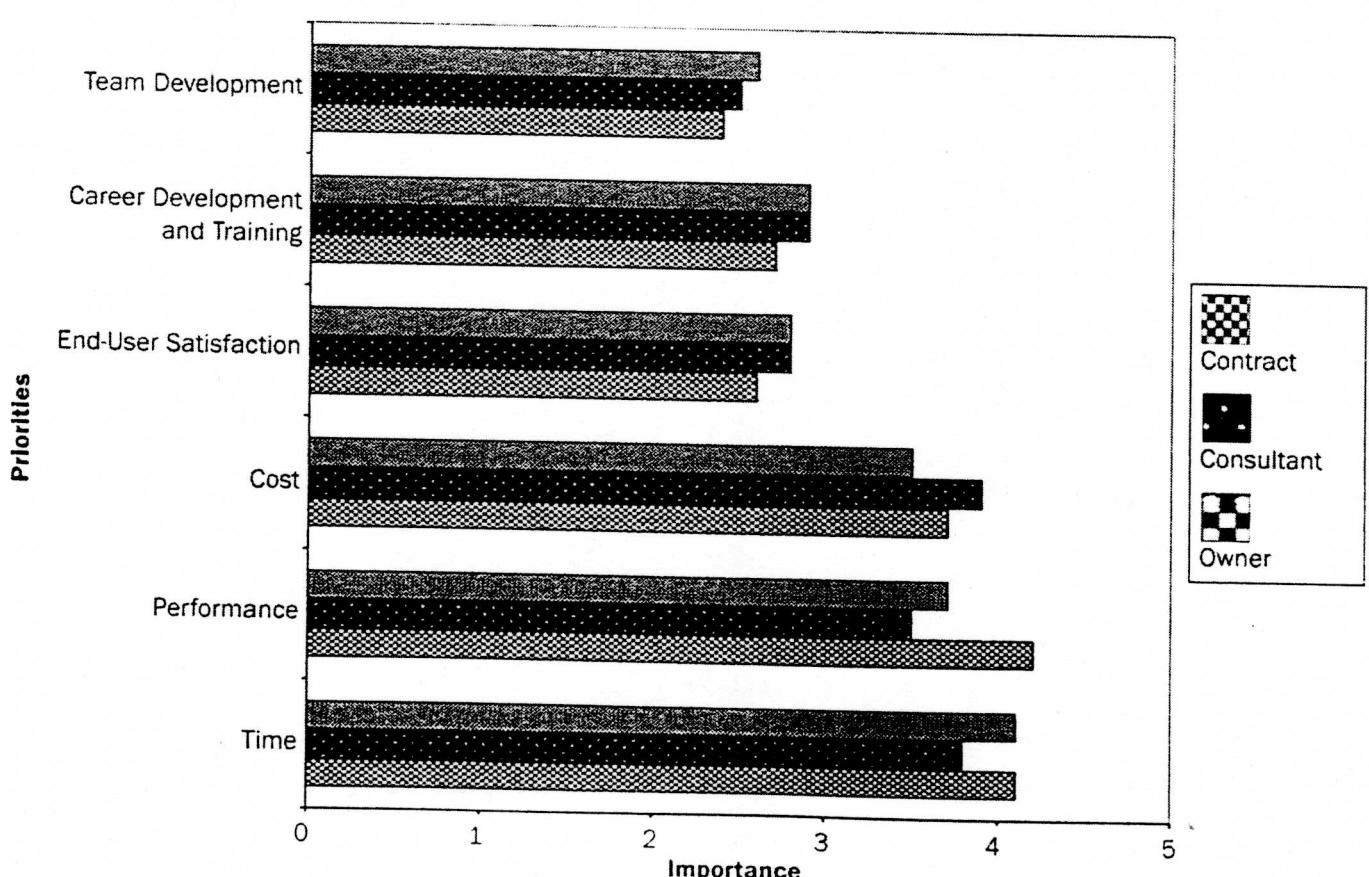
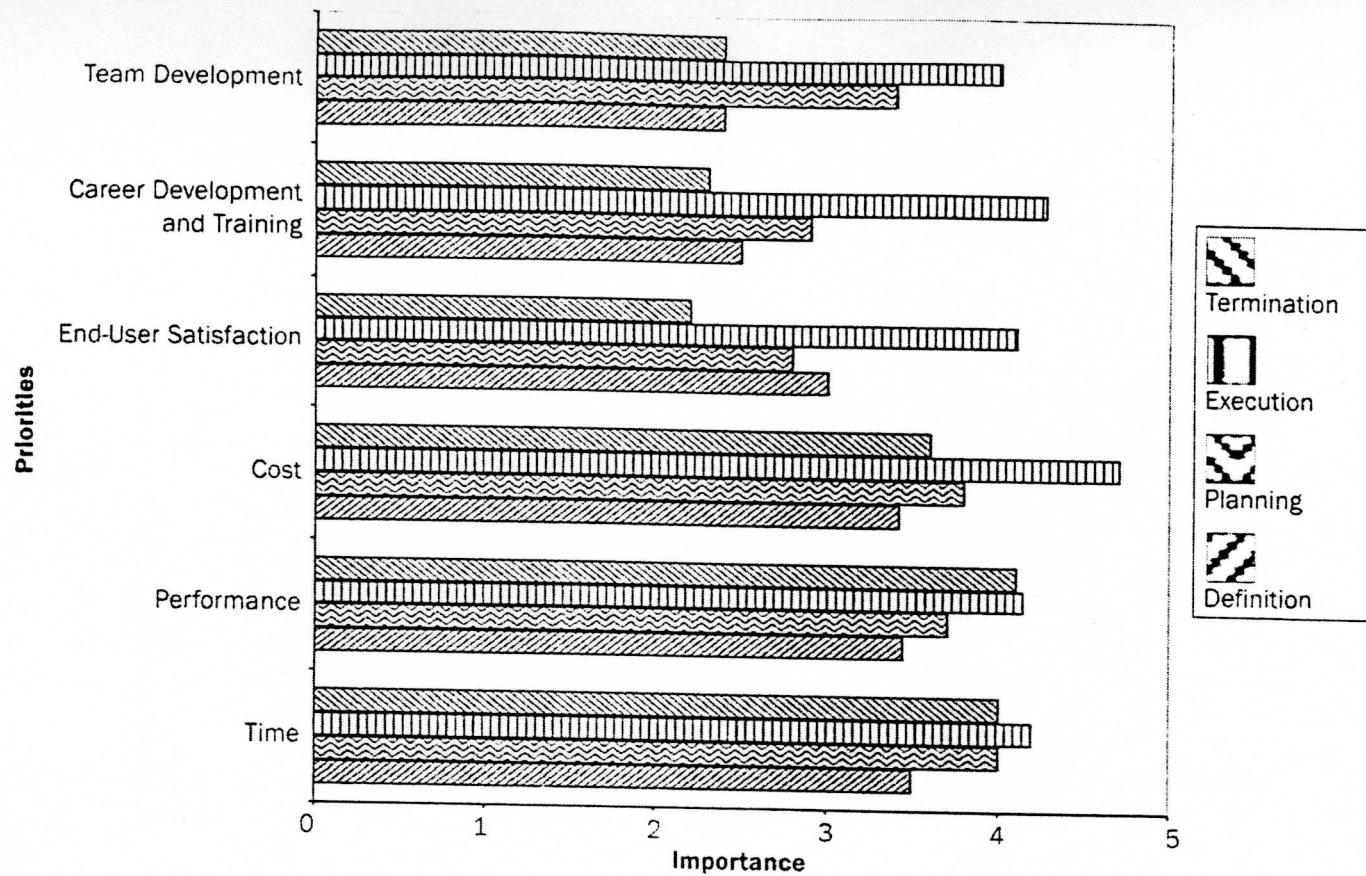
Based on the results, the authors found:

- The ratings for a particular project success factor did not change very significantly between different phases;
- Throughout all project phases, there was general agreement among survey participants that a project mission, consultation with the project owner, good communication, and the availability of resources are important factors for project success;
- Participants on each project agreed on certain project success factors, but they tended to either disagree on how the success factor should be measured, or they did not attempt to measure the success factor at all;
- Project metrics were not fully utilized as a predictive tool but rather as a measure of how well the project performed to that point in time. This often is too late to allow effective corrective action;
- The owners of the projects agreed unanimously that it is very important for the project to meet the needs of the end user;

- Responsibility breakdown structures, work breakdown structures, and CSFs were not well utilized;
- The owners did not have control, monitoring or feedback systems independent of those used by the contractors and/or consultants;
- Time taken to align stakeholders on what is important to the project probably would help improve communication, reduce rework, and enhance the possibility of success;
- The alignment of project metrics with project success factors and priorities appears to be an opportunity for improvement in the software industry.

### Recommendations

It is widely accepted that there is room for improvement in the delivery of software projects including new software development, upgrades, or implementation. Many of the specific studies in this area suggest either what the problems may be or what needs to be in place for success. While this is useful information, it does not help the practitioner with the question: "How do I achieve greater success?" This study set out to link the symptoms for success or failure with what constructive action may be needed to achieve such success. These recommendations, which have been tested on live projects to validate them, make that critical link. Based on internal benchmarks in the test companies, savings in time and cost of between 10% and 30% were matched by improved quality and end-user acceptance.



**Figure 6. Project Priorities by Stakeholders**

Rank order	Critical success factors	Project metrics
1	Owner is informed of the project status and his/her approval is obtained at each stage	Project completed on time or ahead of schedule
2	Owner is consulted at all stages of development and implementation	Milestones are identified and met
3	Proper communication channels are established at appropriate levels in the project team	Deliverables are identified
4	The project has a clearly defined mission	The scope of the project is clearly defined and quantified
5	Top management is willing to provide the necessary resources (money, expertise, equipment)	Activities and logical sequences are determined and scheduled (CPM)
6	The project achieves its stated business purpose	Project completion is precisely defined
7	A detailed project plan (including time schedules, and milestones) with a detailed budget in place	The project is completed within a predetermined budget
8	The appropriate technology and expertise are available	Resource requirements are identified and supplied as needed
9	Project changes are managed through a formal process	Responsibilities are assigned
10	The project is completed with minimal and mutually agreed scope changes	A specific new technology is adopted and accepted by end users

**Table 1.** Overall 10 Most Important Critical Success Factors and Metrics

The recommendations that follow represent the four most significant elements identified and tested in this study:

- Link your project to corporate business strategy;
- Align major stakeholders on key issues;
- Simplify project controls and metrics;
- Make sure effective communication and expectation management is maintained throughout the project life.

Greater detail on how these aspects are implemented can be found in Hartman (2000).

## Conclusions

Although the projects surveyed were rated as successes, some projects lacked defined goals or defined metrics to measure this success. If the owner, contractor, and consultant on a project all have different ideas of what success is and how success will be measured, it is unlikely that everyone (or possibly anyone) will be satisfied when the project is completed. There are many tools that can be utilized to ensure a successful project. For the

software industry, it may just be a matter of learning what tools are available and how to use them properly to raise the number of successful software projects to an acceptable level.

The authors hope that this study will help in:

- Considering a holistic approach for the project;
- Understanding what is important for success;
- Understanding the dynamics of project drivers and priorities and that these may shift over time;
- Getting and maintaining alignment of major stakeholders including the immediate project team on all important strategic and tactical issues;
- Realizing better planning and more effective control;
- Accomplishing a successful project with satisfied stakeholders, project teams, and customers.

Some general guidelines for how this may be achieved have been offered. The suggested approaches to achieving project success have been tested on live projects with consistently successful outcomes.

## Acknowledgments

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## Appendix 1. Project Details

Data on 12 software projects was collected. A brief description of the projects follows for the interest of the readers of this paper.

Project	Value	Duration
Facilities information and reporting management system	\$1 million	15 months
Data transmission security system	\$4 million	Two years
Network management software	\$4 million	One year
Financial systems	\$14 million	Two years
Software project for a major defense project	Not reported	Two years
Photo and driver's license information system	\$2 million	One year
Hip-Chip implementation	Not reported	Not reported
Business process control system	Not reported	Not reported
Implementation of a new corporate reserve database	\$6.5 million	One year
Development of a new version of software	\$1.5 million	One year
Accounting system implementation	\$0.5 million	Three months
Design and implementation of a software system to manage customer contract information	\$1.2 million	Two years



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# Project management in the live entertainment industry: what is different?

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The live entertainment industry consistently delivers projects on time. Their overall commercial success is better than some traditional project management oriented industries, for example construction, which has a higher bankruptcy and litigation rate! This paper examines the practices of the entertainment industry, an industry that rarely, if ever, uses classical project management tools and techniques. This paper first identifies the primary cause of project success in this industry, the alignment of participants. The part of this paper is an assessment of the learnings between traditional project management industries' practices and those of the live entertainment business. © 1998 Elsevier Science Ltd and IPMA. All rights reserved

Keywords: project management, entertainment industry, critical success factors, project metrics, priorities

## Introduction

In this paper we present select findings from a pilot study based on 42 interviews of project sponsors, contractors and consultants on 14 recent live entertainment projects in Alberta, Canada. The purpose of the study was to gain insight into how project management in the entertainment industry operated and how it differed from practices in other industries. Project management practices in the entertainment industry generally do not follow the Project Management Body of Knowledge (PMBOK) or text book approaches and processes. The authors' interest stemmed from the observation that entertainment projects are almost invariably on time. We wanted to learn how this was achieved where normal project management time controls were not present. Perhaps other industries would learn from this.

The research revealed that there was some consistency in the industry with respect to project management practices, factors that influence the industry and project priorities. However, there was an interesting degree of simplicity in the project management techniques observed. Effective planning tools, communication methods, market research and training of key personal in project management are four major aspects in the management of projects that are not thoroughly addressed by the sample of this industry surveyed.

It has been noticed by authors that there is a significant cultural difference between artistic and creative

projects and traditional engineering or technical projects. The management of artistic and creative projects tends to have a much stronger focus on people. These projects involve artists and entertainers, often rely heavily on volunteers and have a significant intangible component in the form of artistic creativity and merit. Projects' artistic quality is rated by the paying public, something that project management professionals in traditional areas have limited experience with.

The study revealed that four primary elements shaped the state of the industry's projects and, consequently, its project management practices. The four components were culture, communications, stakeholders' involvement and planning. We hope that the findings of this pilot study will encourage the live entertainment industry to consider some of the more conventional aspects of project management. Perhaps more important are the possible fruitful opportunities for other industries in their quest for more competitive project delivery, to learn from this old, but rapidly changing and exciting industry.

## Background

Despite the size of the live entertainment industry there is very little published work on its project management practices. Cummins<sup>1</sup> investigated the management practices of a community theatre and found that lack of purpose, frequent personality conflicts and recurring budget deficits were some of the main problems encountered. Cummins suggested a management by objective approach to resolve this theatre's pro-

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blems<sup>1</sup>. Wirth and DeVries<sup>2</sup>, and Wirth<sup>3</sup> identified a need for better planning, cost control and schedule control, and demonstrated the application of project management concepts, tools and techniques in theatrical productions for the benefit of all stakeholders. Farrell<sup>4</sup> provided practical guidelines for assessing risk in entertainment projects. In the authors' view, there appears to be significant opportunity for the entertainment industry to benefit from the discipline of project management to organize, plan and control their activities in a more efficient way. Equally, the converse may be true. As an illustration, consider the following:

Why is it that, at the opening event of the Olympics, the torch bearer is never asked to run around for another half-hour because the eternal flame has not been completed yet? Or at the theater, we never see the actors appear in cheap underwear because the costumes were not ready? We do not turn on the television for the six o'clock news to find it is running 15 minutes late.

The live entertainment industry must offer some skills that conventional project management does not encompass in order to achieve consistent, timely and sustainable delivery of quality projects without the use of conventional project management scheduling and time control tools.

#### *Live entertainment projects are unique*

The live entertainment industry differs from other industries in a number of ways. One of the major differences is that there is a strong focus on human, creative and aesthetic aspects of projects compared to what happens in traditional (i.e. capital) project-oriented industries.

The live entertainment industry has a number of unique aspects which influence project management practices. These aspects are not normally found in standard engineering projects. These include:

- a heavy reliance and utilization of volunteers throughout all project phases;
- artistic expression/creative process elements;
- divergent elements influencing public perceptions and expectations;
- some entertainment projects are fund raisers for other events.

*Table 1* highlights the major differences in project management practices of entertainment and traditional technical projects. This section presents background to the study conducted by the authors in which data was gathered through personal interviews using a questionnaire. The personal observations of the interviewees were also collected. Analysis of the data focused on three aspects: project success factors (PSFs); project metrics; and project priorities. These three aspects were studied at different phases of the projects in question, and with respect to perceptions of three major but different stakeholders, the sponsor; the contractor/major supplier; and the consultant. The method used for data analysis and major results are explained in terms of trends, similarities, differences and agreement between respondents. The section on recommendations lists the areas of project management in which the entertainment industry may improve and from which other industries may learn. The conclusion discusses the major learning that has been derived from the study. Appendix A contains a copy of the questionnaire.

#### *Research design*

At different phases of a project, different priorities for each project criterion exist. The questionnaire used in the current study was designed to measure these differences and their relative importance. There is also a culture shift throughout the life of any project, from creativity at the formation of the project, possibly extending to the planning and development phases and a focus on completion and the production of deliver-

**Table 1 Major differences in project management practices in entertainment and traditional technical projects**

Traditional technical projects	Entertainment projects
Follow well established project management practices	Generally do not follow traditional project management approaches and practices
Project managers may have formal training in project management or corporate procedures to follow	Project managers do not have a formal training in project management
Project complexity depends on the size and technical aspects	Project complexity depends on artistic style, human aspects and managing a large number of volunteers
Strong focus on technical and material aspects	Strong focus on people issues, creative and artistic aspects
More tangible components such as physical product	More intangible components such as artistic creativity, and merits
The quality of the project is measured by cost, time and user satisfaction	The quality is measured by audience. Divergent elements influence public perceptions and expectations
Timing is important but may be rescheduled	Timing of the event is fixed. The project must be delivered on time regardless of the state of preparation or cost
Profit is generally a key motivator	Quality (e.g. Public satisfaction, good reviews) and artistic creativity are key motivators
Job descriptions are generally defined, communicated and may be documented	Job descriptions are essentially implicit based on traditional functions
Roles are challenged	Roles are respected
Competency of project staff generally developed through education, training and experience in project management	Competencies are generally assumed not developed. Experience is gained on the job
Tend to linear solutions	Much work done in parallel
Technical solution, little own creativity present and recognized (weak ownership)	Some of self in end product (strong ownership)

**Table 2** Some of the characteristics of the projects studies

Name of project	Medium	Live?	Ownership	Frequency	Value: million \$	Duration (includes planning) (months)
Banff festival of mountain films	Film, Show, display	Yes	Non-profit	Annual	0.27	12
Mozart on the mountain	Music	Yes	Non-profit	Annual	0.25	12
Big Valley Jamboree	Music	Yes	Public	Annual	4.0	12
Theatre Calgary	Theatre	Yes	Non-profit	Annual	3.5	12
Calgary Winter Festival	Sports	Yes	Non-profit	Annual	0.25	10
Audio production	CD production	No	Private	One-off	0.03	3
Bobsleigh Canada World Championship	Sports	Yes	Non-profit	Annual	0.3	12
Alberta Theatre Projects	Theatre	Yes	Non-profit	Annual	2.6	8
University of Calgary Theatre	Theatre	Yes	Public	Annual	0.3	12
Spruce Meadows	Sports	Yes	Private	Annual	5.0	4
Stampede Grand Stand Show	Music	Yes	Non-profit	Annual	1.5	12
Educational Video Production	Video	No	Non-profit	One-off	0.03	3
Movie	Film	No	Private	One-off	32.0	7
Advertising campaign for a software package	Advertisement, displays	No	Private	One-off	0.06	6

ables at the implementation phase. There is no clear understanding of how these priorities shift or at which of the different phases of a project life cycle these changes occur. The project priorities for the project of the three major stakeholders were also captured in the interviews and were subsequently compared. The interviews were carried out by graduate students in the Project Management Specialization at The University of Calgary as part of a term assignment. The majority of the students were professionals with a mean of over 10 years of work experience. The study was designed both as a learning experience for the students to test what they learned in the class against practices in industry and as an instrument to collect data. Each student interviewed three persons (one stakeholder each) on each project. Only recently completed projects were used in the study. Interviewers explained the questionnaire layout and the overall purpose of the research. A questionnaire response form was used to capture priorities and the major project practices that were identified by the interviewee as they were communicated. In all interviews, respondents were asked to reply in the context of the particular project that was referenced in the study, not in terms of their respective organization policy or general practice. Also, respondents were asked to address actual project practices, not personal preferences or corporate practices.

## Objectives

The purpose of this study was to provide some insight into the practices and processes that project teams actually use to execute their projects. The study included an evaluation of how well they were organized, in what areas they could improve and what they are doing that was outstanding. In this paper, the analysis of 42 interviews on 14 different projects in the live entertainment industry is presented. The variety of projects ranged from sports to film. Of the 14 projects involved, ten were live. Three projects involved music, three theatre, three sports, two audio/video production, two film show, display and advertising, and one of film production (*Table 2*). Although the sample was small and restricted to Alberta, we believe these data provide interesting and useful insight into project management practices. Most of those interviewed had over twelve years of professional experience in this

industry. Also, most projects were of an international standard and the majority of the projects were held annually. Two events were repeated at other locations in North America and Europe.

## Analysis of survey results

Raw data from interviews, as well as interviewers' observations, discussions and comments were used to:

- determine success factors and how these changed over the project life cycle with respect to all three stakeholders;
- determine project metrics and priorities over the life cycle and from the perspective of all three stakeholders;
- develop a profile of the state of project management in this industry sample.

## Interview survey instrument

The questionnaire had four major sections. The first captured demographic information about the interviewee, the project and the industry in which the company operated. The second section covered 21 PSFs that were deemed important during the various phases of project life cycle. Criteria were extracted from previous studies, current literature, discussions with project managers and on-going research at The University of Calgary. The purpose of the third section was to identify project metrics used and how important these were at various project phases. The fourth part of the questionnaire targeted the importance of project priorities and how these varied over the life of a project.

## Results

### Project success factors

Success generally meant that the project was completed on time and the quality of the production met the expectations of the stakeholders. In other words, the show was opened as advertised and the paying audience was satisfied. These were well understood, traditional and consistent success criteria in the industry.

The 10 most important PSFs for each stakeholder group are listed in *Table 3*. Customer satisfaction was

**Table 3** Ten most important PSFs according to stakeholders

Owner	Consultant	Contractor
Consumers satisfaction (B22, 4.75)	On time (B15, 4.5)	On time (B15, 4.9)
On time (B15, 4.35)	Project mission (B1, 4.5)	Technology and expertise (B10, 4.85)
Within budget (B14, 4.35)	Communication (B4, 4.35)	Completed to specification (B13, 4.75)
Business purpose (B12, 4.35)	Owner's approval (B3, 4.25)	Stakeholder's satisfaction (B11, 4.7)
Project mission (B1, 4.3)	Completed to specification (B13, 5.15)	Business purpose (B12, 4.5)
Owner's consultation (B2, 4.2)	Stakeholder's satisfaction (B11, 3.85)	Project mission (B1, 4.2)
Stakeholder's satisfaction (B11, 4.15)	Contingency plan (B8, 3.85)	Communications (B4, 4.0)
Communications (B4, 4.15)	Technology and expertise (B10, 3.8)	Project plan (B5, 3.95)
Control and monitoring (B6, 4.1)	Business purpose (B12, 3.75)	Within budget (B14, 3.7)
Owner's approval (B3, 4.0)	Customer's satisfaction (B22, 3.75)	Owner's approval (B3, 3.65)

of prime importance to owner, followed by on time and within budget completion of the project. Consultant gave top importance to on time completion, followed by project mission and communications. Whereas, contractor considered on time completion, technology and expertise available, and project completed to specification as the most important success factors.

*Table 4* shows the ten most important PSFs over the various phases of projects. Project mission, owner's consultation, stakeholders satisfaction, on time, customer satisfaction and communications were the most important success factors during definition phase. Whereas in planning phase, project mission, customers' satisfaction, project plan, on time completion, completed to specification and job description were the most important success factors. Project completion on time, project achieves its business purpose, completed to specification, technology and expertise available, stakeholders satisfaction and communication were regarded as the most important success factors at the execution phase. Finally, during termination phase, maximum importance was given to on time completion, project completed to specification, stakeholders' satisfaction, project achieves its business purpose, owner's approval and within budget completion.

How the PSFs changed across various phases and with different stakeholders is evident from *Tables 3 and 4*. *Table 5* shows the top ten PSFs over project life, based on the average of importance assigned by all the three stakeholders over all four phases. On time completion was regarded as the most important success factor, followed by project has a clearly defined

mission, project completed to specification, project satisfies the needs of the sponsor, users and other stakeholders and achieves it's business purpose as the main success factors. An awareness and understanding of these differences and/or a need for some common PSFs across various phases and among the key stakeholders could improve efficiency and performance.

#### *On time completion*

On-time completion of the project was found to be the single most important factor that project executives believe contribute to success. Opening night is scheduled well in advance and date changes are very rare. Based on the above, one might expect that how a project is kept on time would also be a key success factor. However, we did not find this to be the case. As long as the show was on time, it was not important to the interviewees how it was achieved. Detailed project scheduling, monitoring systems and formal use of project management tools were not rated as essential. Nor were they in evidence.

The data revealed that project priorities are relatively balanced in the initial stages of projects, but as the projects progressed toward execution, the emphasis clearly shifted towards time as a top priority. We believe the lack of detailed planning and scheduling early in the project life contributes to this practice.

#### *Audience attendance and satisfaction*

The quality of an event, as measured by audience satisfaction and public reception, were clearly identified as critical success factors for the industry. Quality

**Table 4** Ten most important PSFs according to stakeholders

Definition	Planning	Execution	Termination
Project mission (B1, 4.73)	Project mission (B1, 4.73)	On time (B15, 5.0)	On time (B15, 4.4)
Owner's consultation (B2, 4.4)	Customer's satisfaction (B22, 4.67)	Business purpose (B12, 4.73)	Completed to specification (B13, 4.3)
Stakeholder's satisfaction (B11, 4.33)	Project plan (B5, 4.67)	Completed to specification (B13, 4.67)	Stakeholder's satisfaction (B11, 4.13)
On time (B15, 4.33)	On time (B15, 4.6)	Technology and expertise (B10, 4.53)	Business purpose (B12, 3.93)
Customer's satisfaction (B22, 4.22)	Completed to specification (B13, 4.47)	Stakeholder's satisfaction (B11, 4.47)	Owner's approval (B3, 3.87)
Communications (B4, 4.13)	Job description (B9, 4.47)	Communications (B4, 4.4)	Within budget (B14, 3.87)
Business purpose (B12, 3.93)	Technology and expertise (B10, 4.4)	Project plan (B5, 4.27)	Communications (B4, 3.8)
Technology and expertise (B10, 3.8)	Owner's approval (B3, 4.4)	Within budget (B14, 4.2)	Stakeholder's satisfaction (B11, 3.8)
Completed to specification (B13, 3.53)	Business purpose (B12, 4.2)	Control and monitoring (B6, 4.1)	Customer's satisfaction (B22, 3.78)
Within budget (B14, 3.47)	Within budget (B14, 4.2)	Project mission (B1, 4.1)	Control and monitoring (B6, 3.73)

**Table 5** Ten most important PSFs over the entire project life

Factor No.	Average score	Description
B15	4.58	The project completed on time
B1	4.33	The project has a clearly defined mission
B13	4.25	The project is completed to specification
B11	4.23	The project satisfies the needs of the sponsor, users and other stakeholders
B12	4.2	The project achieves its stated business purpose
B4	4.17	Proper communication channels are established
B22	4.09	Customer is satisfied
B10	4.05	The appropriate technology and expertise are available
B3	3.95	Owner is informed of the project status
B14	3.93	The project is completed within budget

measurements however, tend to be very subjective as there are very few, if any, specifications available against which to compare final products. Project sponsors tend to consider audience satisfaction, ticket sales, as well as critics' reviews when assessing a project's overall success. In particular the public's attendance (low or high) at an event has an immediate impact on the project's balance sheet and its continued viability.

In order to remain successful, the entertainment industry project managers face some challenges, including:

- remaining in tune with the interests, tastes and needs of the public;
- offering high value for the public's entertainment dollar;
- balancing being a critical success, versus being a popular success...struggle between artistic excellence and financial reality.

It is interesting to note that 10 of the 14 projects reviewed are annual events, implying that the project managers involved are successfully meeting these challenges.

#### Project metrics

*Table 6* shows the ten most important project metrics according to different project stakeholders. Owners gave top importance to customer's satisfaction, on time and within budget completion, PSFs identified, and project performance evaluated. Consultants regarded on time and within budget completion, project completion clearly defined, responsibilities assigned, work items estimated, and project scope defined as the most important project metrics. Whereas, contractors' most important project metrics were project completion clearly defined, resources supplied, deliverables identified, work breakdown structures, and milestones met. *Table 7* provides the ten most important project metrics at various phases of the project life cycle. Project completion precisely defined, project scope, within budget and on time and deliverables identified were identified as the most important project metrics during definition phase. During planning phase, on time completion, project completion precisely defined, work items estimated, responsibilities assigned and deliverables identified were the most important project metrics. During execution, most important project metrics were on time completion, completion clearly defined, work items estimated, responsibilities assigned and deliverables identified. At the termination phase, audience attendance, project performance evaluated, on time and within budget completion, and completion precisely defined were the most important project metrics.

The differences in importance of metrics during the life cycle of the project, as well as in perception of the three different stakeholders are evident from *Tables 6 and 7*. Here again, we would like to emphasize the importance of some common ground among the key stakeholders of what should be measured at various phases, will surely have a positive impact on project success. Finally, *Table 8* provides the ten most important project metrics over the entire project life by all the respondents over all phases of the project.

**Table 6** Ten most important project metrics according to different stakeholders

Owner	Consultant	Contractor
Customer's satisfaction (C20, 5.0)	On time (C5, 4.9)	Completion defined (C15, 3.5)
On time (C5, 4.75)	Within budget (C4, 4.55)	Resources supplied (C6, 3.5)
Within budget (C4, 4.6)	Completion defined (C15, 4.45)	Deliverables identified (C10, 3.4)
PSFs identified (C13, 4.4)	Responsibilities assigned (C11, 4.25)	Work breakdown structure (C12, 3.3)
Performance evaluated (C19, 4.1)	Work item estimated (C9, 4.2)	Milestones met (C7, 3.2)
Completion defined (C15, 4.45)	Project scope defined (C14, 4.15)	Work items estimated (C9, 3.1)
Responsibilities assigned (C11, 3.75)	Resources supplied (C6, 3.75)	Project scope defined (C14, 3.0)
Deliverables identified (C10, 3.65)	Rate of return (C1, 3.7)	Customer satisfaction (C20, 3.0)
Project scope defined (C14, 3.6)	Deliverables identified (C10, 3.55)	Audience attendance (C21, 3.0)
Rate of return (C1, 3.6)	Critical success factors identified (C13, 3.4)	Weather conditions (C22, 2.9)

**Table 7** Ten most important project metrics for all respondents over various phases in order of importance

Definition phase	Planning phase	Execution phase	Termination phase
Completion defined (C15, 3.8)	On time (C5, 4.33)	On time (C5, 4.33)	Audience attendance (C22, 4.67)
Project scope (C14, 3.8)	Project completion (C15, 4.33)	Completion defined (C15, 4.3)	Project performance (C19, 4.33)
Within budget (C4, 3.73)	Work items estimated (C9, 4.27)	Work items estimated (C9, 4.27)	On time (C5, 4.13)
On time (C5, 3.67)	Responsibilities assigned (C11, 4.2)	Resources provided (C6, 4.13)	Within budget (C4, 4.07)
Deliveries identified (C10, 3.6)	Deliveries identified (C10, 4.13)	Within budget (C4, 4.07)	Completion defined (C15, 3.4)
Critical success factors (C13, 3.4)	Resources provided (C6, 4.13)	Project scope (C14, 3.8)	Customer satisfaction (C20, 3.4)
Weather conditions (C22, 3.25)	Within budget (C4, 4.07)	Deliveries identified (C10, 3.8)	Responsibilities assigned (C11, 3.13)
Rate of return (C1, 2.93)	Project scope (C14, 4.0)	Responsibilities assigned (C11, 3.8)	Critical success factors (C13, 3.13)
Work items estimated (C9, 2.87)	Milestones identified (C7, 3.53)	Milestones identified (C7, 3.53)	Milestones identified (C7, 3.53)
Responsibilities assigned (C11, 2.73)	Critical success factors (C13, 3.4)	Critical success factors (C13, 3.4)	Work items estimated (C9, 3.0)

**Table 8** 'Top 10' most important project metrics over the entire project life

Factor No.	Average score	Description
C5	4.12	The project is completed on time or ahead of schedule
C4	3.98	The project is completed within a predetermined budget
C15	3.97	Project completion is precisely defined
C14	3.58	The scope of the project is clearly defined and quantified
C9	3.56	Each work item is estimated (cost and/or manpower)
C10	3.53	Deliverables are identified
C22	3.50	Audience attendance
C11	3.47	Responsibilities are assigned
C13	3.35	Critical success factors are identified
C6	3.27	Resource requirements are identified and supplied as needed

#### Alignment of project success factors and metrics

Table 9 shows the relevance of the top ten most important PSFs and associated project metrics used. From this table it is evident that the order of importance of project metrics is not the same as that of the PSFs. This suggests that whatever is considered important for project success is not given the same importance in terms of measuring it. Or in other words planning and execution is not consistent with the monitoring of project performance and progress evaluation.

#### Project priorities

Tables 10 and 11 provide data on project priorities according to importance by different stakeholders and at various phases of the project life cycle, respectively. Here we also notice a shift in priorities with respect to different stakeholders and over the various phases of the project.

End user satisfaction was identified as the most important priority through all project phases. The second most important priority was time. This was consistent with being time identified as the most important PSF and was also the most important project metrics. Perhaps this is main reason that entertainment projects are rarely late.

We also observed that the entertainment industry was highly people-oriented, compared to the generally technical orientation of traditional project management. However, career development and training of personnel and team development were the least im-

portant in our study's projects. Perhaps one of the reason for this is the industry's dependence on volunteers. This is another area for potential improvement in the industry.

#### Alignment of PSFs, metrics and priorities

In Table 12 we present a comparison of the top five PSFs, project metrics and priorities by all three stakeholders. Notice that there is very little consistency between PSFs, metrics and project priorities, and also across the perceptions of owners, contractors and consultants. On time is the only factor having top priority. In the authors' view this alignment of PSFs, metrics and priorities is the main reason entertainment projects are rarely late. On time is the strength of the entertainment industry. The alignment between PSFs, metrics and project priorities through various phases and among owners, contractors, and consultants provide a clear picture to all key stakeholders of what is important at which phase, what should be measured and the project priorities.

#### Project management profile

In addition to the information obtained via the questionnaire interviews, it was observed that some of the best information and insights was obtained from general conversations with interviewees. Some of these insights are combined below with the analyses from above to highlight other important aspects of the project management practices in the live entertainment industry. Topics are grouped under five headings: culture; communication; planning; stakeholders involvement; and priorities.

#### Project culture

Project culture is defined here as the behavior, attitudes and practices of people, organization and project managers. The comments below were derived from the responses to questions B16, B18, D5 (Appendix A) and information on project staff, project key players and stakeholders gained from the interviews. Suitable organization structure and setup and good team work/approach were based on questions B9, C6, C11, and D4 (Appendix A). Project manager's understanding of the project and level of project management techniques used were based on questions B6 and C16.

**Table 9** 'Top 10' critical success factors and associated project metrics

Critical success factors	Rank	Project metrics used	Rank
The project completed on time (B15)	1	The project is completed on time and ahead of schedule (C5)	1
The project has a clearly defined mission (B1)	2	The scope of the project is clearly defined and quantified (C14)	4
The project is completed to specification (B13)	3	Project completion is clearly defined (C15)	3
The project satisfies the needs of the sponsor, users and other stakeholders (B11)	4	Customer satisfaction is evaluation (C20)	7
The project achieves its stated business purpose (B12)	5	Project performance is evaluated (C19)	11
Proper communication channels are established at appropriate levels in the project team (B4)	6	Responsibilities are assigned (C11)	8
Audience attendance (B22)			
The appropriate technology and expertise are available (B10)	7	Customer satisfaction is evaluated (C20)	7
Owner is informed of the project status (B3)	8	Resource requirements are identified and supplied as needed (C6)	10
Owner is informed of the project status (B3)	9	Deliverables are identified (C10)	6
The project is completed within budget (B14)	9	Deliverables are identified (C10)	6
	10	The project is completed within a predetermined budget (C4)	2

**Table 10** Project priorities according to different stakeholders in order of importance

Owner	Contractor	Consultant	Overall project
End user satisfaction (D6, 4.7)	Time (D1, 4.45)	End user satisfaction (D6, 5.0)	End user satisfaction (D6, 4.55)
Cost (D2, 4.15)	Cost (D2, 4.25)	Time (D1, 4.45)	Time (D1, 4.2)
Performance (D3, 4.0)	Performance (D3, 4.0)	Performance (D3, 4.4)	Cost (D2, 4.2)
Time (D1, 3.95)	End user satisfaction (D6, 3.95)	Cost (D2, 4.2)	Performance (D3, 4.13)
Career development (D5, 3.5)	Career development (D5, 2.8)	Career development (D5, 2.95)	Career development (D5, 3.1)
Team development (D4, 3.05)	Team development (D4, 2.35)	Team development (D4, 2.75)	Team development (D4, 2.72)

Achieving a project spirit or culture is a strength of the live entertainment industry. The culture of project management on the entertainment industry appears to be based on the creative nature of the arts as opposed to technical issues. Many interviewees referred to human issues as vital to the success of projects. Since these are judged by attendees and other stakeholders rather than or rarely by technical aspects. It was suggested indirectly that human issues would be more appropriately dealt with by persons with appropriate backgrounds and training not engineering.

### Communication

Coordination, decision making and communication methods were considered for the following observations. Overall project coordination was understood with clear roles defined by questions B4, B9 and B17 (Appendix A). Decision making, clearly defined accountabilities and authority, the right person/team makes the decision and timely decisions were considered by questions B3, B9, C11 and C12 (Appendix A).

Communication methods appropriate for the project; targeted to the right people; timely; with clear channels established were assessed by questions B21 and B4 (Appendix A). The evaluation of these project parameters reveals that communications is generally strong but they seem to be weak in terms of project delivery methodology. Communication coordination and methods amongst the core team was strong. But, communication channels between the team, and sponsor/owner, volunteers and audience were weak. Methods were informal and at times key groups were outside the channels of communication. Without effective processes, key expectations may be missed. Identifying crucial lines of communication between participants will facilitate success and priority achievement.

### Planning

Planning process was defined as the planning methodology that was used, understood and was effective.

Were contingency plans developed? Were plans continuously updated and refined? Was the plan really used to manage the project? (i.e. progress measured against the plan); were all the stakeholders involved? Questions asked relating to these issues included: B5; B8; C6; C7; C8; C9; and C10 (Appendix A). Were any planning tools used? Were they appropriate? (simple or complex). Were they shared and common to all participants? Questions B5 and C8 (Appendix A) were used to test this.

Planning was generally strong, but suffered from weaknesses in two areas: the utilization of planning tools and contingency planning. Although plans were developed at the start of projects, progress was rarely checked. Only film production project used motion picture scheduling software, including CPM and checked progress daily and weekly. Detailed contingency plans and procedures were not produced for most projects. Incomplete or inadequate planning, coupled with the inflexibility of the opening night resulted in budgets being significantly extended. Projects that were not annual events appeared to have somewhat more defined planning processes, but nevertheless were loose informal methods in terms of planning. There was also little evidence that contingency plans were made at the start of projects. Most projects in the current study were annual events, yet all these projects experienced a time crisis in the final weeks before show time. The use of planning tools and contingency plans may help these projects avoid last minute panics, maintain or increase quality, and stay within budgets.

### Stakeholders

We consider customer/public, external issues and sponsor/owner involvement. Were customer expectations, needs, requirements met; considered and measured? Questions C20, D6 and B11 (Appendix A) address this issue. Question B20 refers to whether external issues were considered and managed effectively. Involvement of sponsor/owner in planning and throughout the project; expectations understood and shared by the project

**Table 11** Project priorities at different phases of life cycle in order of importance

Definition	Planning	Execution	Termination	Overall project
Performance (D3, 4.67)	End user satisfaction (D6, 4.47)	End user satisfaction (D6, 4.8)	End user satisfaction (D6, 4.47)	End user satisfaction (D6, 4.55)
End user satisfaction (D6, 4.47)	Cost (D2, 4.47)	Time (D1, 4.67)	Time (D1, 4.13)	Time (D1, 4.2)
Cost (D2, 4.2)	Time (D1, 4.4)	Performance (D3, 4.6)	Performance (D3, 4.13)	Cost (D2, 4.2)
Time (D1, 3.93)	Performance (D3, 3.73)	Cost (D2, 4.2)	Cost (D2, 3.93)	Performance (D3, 4.13)
Career development and training (D5, 3.0)	Team development (D4, 3.07)	Career development and training (D5, 3.53)	Career development and training (D5, 2.87)	Career development and training (D5, 3.1)
Team development (D4, 2.3)	Career development and training (D5, 2.93)	Team development (D4, 3.0)	Team development (D4, 2.47)	Team development (D4, 2.72)

**Table 12** Overall top five PSFs, metrics and priorities by each stakeholder

	<b>PSFs</b>	<b>Project metrics</b>	<b>Project priorities</b>
Owner	Audience attendance B22 Within budget B14 On time B15 Business purpose B12 Project mission B1	Customer's satisfaction C20 On time C5 Within budget C4 PSFs C13 Performance evaluated C19	End user satisfaction D6 Cost D2 Performance D3 Time D1 Career development D5
Contractor	On time B1 Project mission B1 Communication B4 Owner's consultation B2 Completed to specification B13	On time C5 Within budget C4 Completion defined C15 Responsibilities assigned C11 Work items estimated C9	Time D1 Cost D2 Performance D3 End user satisfaction D6 Career development D5
Consultant	On time B15 Technology and expertise B10 Completed to specification B13 Stakeholder's satisfaction B11 Business purpose B12	Completion defined C15 Deliverables identified C10 Work items estimated C9 Scope clearly defined C14 Within budget C4	End user satisfaction D6 Time D1 Performance D3 Cost D2 Career development D5

team (including consultants and contractors) were measured by questions B2, B3 and B11 (Appendix A). There appears to be a belief among interviewees that stakeholders' (sponsors, public, volunteers) expectations were considered and incorporated into project management. With the exception of one project, however, none appeared to utilize tools and methods to measure whether stakeholders' expectations were actually met. Although gleaning the expectations of each audience member is not feasible, being aware of the general perceptions and expectations of the audience may foster continuous improvement and continued support. Many entertainment projects have major sponsors. To ensure continued sponsorship and support, market research data should be collected on what these expectations are.

#### *Project priorities: time, cost and quality*

Are appropriate measures established to ensure milestones are held on schedule? Are schedules respected? Questions B15, C5, C7, C18, and D1 (Appendix A) were designed to capture the importance of time. Was project completed within budget? Was a specified rate of return on investment achieved and overall costs rated high? Were economic goals set, monitored and measured? Questions C4, B14 and D2 (Appendix A) refer to these issues. Was scope clearly defined?; Were Quality Management Programs in place?; Were project documentation and processes in place and followed?; Were qualified people available?; Were specifications established and understood? Questions B13, C18, D3 and D6 (Appendix A) were related to test Quality.

Priorities were strong, with an emphasis on time. This is a big strength of the live entertainment industry. All the projects studied were operated under the premise of the show must go on, at all costs. The budgets were set, and were often overrun (for privately owned projects). Profit was not a key motivator for most projects studied. One of the reasons may be as most of the projects were not done for profit, required sponsors and utilized volunteers (e.g. theatrical projects relies on corporate and government sponsors for 70% of revenue). In most cases promotion of arts, culture, music, sports, competition, nurture of artistic qualities and delivery of message were main objectives.

#### **Summary**

Although some traditional project management techniques and practices were understood and used by managers in the live entertainment industry, the emphases was clearly more strongly on human issues. Some improvements could be made by using the traditional project management tools, particularly in planning. Stronger integration of project participants, through improved communications, would also likely lead to improved project performance.

Equally, there is a significant opportunity for other industries to learn from the live entertainment industry. Strengths of the live entertainment industry included the following:

- completion was clearly defined;
- scheduled performance date(s) provided incentive for timely completion of projects;
- creativity was needed and actively encouraged;
- as 'esprit de corps' was inherent in the industry and developed on successful projects;
- comfort with risk and uncertainty.

#### **Recommendations**

Based on the evaluation of the projects studied, we recommend improvements in the following areas:

#### *Planning*

More rigorous use of planning techniques is recommended. Detailed project plans, contingency plans and job descriptions of all key team members should be in place. Scheduling techniques such as the critical path method could be utilized to help coordinate and manage the activities involved in the projects. Change order processes need to be formalized. Some of the interviewees gave the impression that in the live entertainment industry the best producers had a spontaneous style. They had to be people who could think on their feet. In the authors opinion this management style does not promote traditional principles of sound project management. Wirth<sup>3</sup> also found that "the current managerial practices rely upon producers' per-

sonal experiences, improvisation while production itself is in progress and a degree of spontaneity. This, quite obviously, stands in the way of production cost control and scheduling."

### *Communications*

Timely and accurate communication among project team members is an essential factor to the success of that project. Proper communication channels should be established in project teams. All parties have to be involved from the definition phase onward in order to assure proper communication in project teams during all phase of the project life cycle.

### *Market research*

Market research techniques, in some instances, need to be more formalized. The live entertainment industry changes rapidly and competition is high. Proper project selection techniques should be utilized in order to assess the feasibility of various projects. Moreover, customer opinion surveys have to be based on rigorous approaches in order to get the real perceptions of the public whose satisfaction is crucial to the success of any entertainment project.

### *Stakeholders involvement*

Improvement in the stakeholder involvement process is very necessary, particularly in the project definition and planning phases. This should help ensure a more complete plan, better understanding right across the organization, buy-in from all parties and alignment within teams.

### *Coordination, team development and training*

The project management structure in the live entertainment industry has a culture that regards human issues highly. This did not carry through to the care of personnel and contractors. The live entertainment industry could improve its processes by placing more emphasis on training, coordination, leadership and team development.

## **Conclusions**

Most of the respondents emphasized that the two major factors that affected the success of their projects were on-time completion and audience satisfaction. Project completion is a primary concern in the industry because scheduled dates cannot slip. Audience satisfaction was generally viewed as the main measure of quality and was believed to be critical to ensure ongoing support.

There was a significant cultural difference between artistic projects (as represented by the projects in this report) and the technical projects that constitute the background of both the interviewers and authors of this paper. Artistic projects tend to have more of a people perspective; they involve artists and entertainers, often rely heavily on volunteers and have a significant intangible component. The artistic project quality is rated by the paying public, something that

many engineering managers have little or no experience with.

One significant difference between most technical projects and live entertainment projects is in the role of the project manager. In technical projects, we typically combine director and producer roles in some haphazard fashion, whereas in live entertainment, the two distinct functions are quite clearly and universally established. The word 'haphazard' above may be unjust. Although not typically studied in this paper, the range of styles and scope of work of technical project managers is well documented in the literature. Arguably, we could improve both understanding of what project managers need to do and our performance in the role by studying why, over time these two distinct functions have emerged in the live entertainment industry.

### *Lessons: the live entertainment industry may learn from the discipline of project management*

It has been found that there is a certain lack of sophistication in project management techniques utilized in our sample of the entertainment industry. Effective planning tools, communication methods, market research, stakeholders involvement, team development and training of personnel are major project management aspects that are effectively not used by the industry sampled in this study. We believe that these attributes could contribute to be more effectively utilized if live entertainment projects are to not only continue to be successful but remain competitive. At the same time, these aspects (planning, communication, research, stakeholders involvement, team development and training) must be adapted to suit the unique elements of the industry. Rigid, inflexible techniques could lead to suppressing the creative processes and thereby adversely disrupt the industry's culture.

For the entertainment industry, project managers could benefit from the experience of technical project managers with respect to planning, communication, stakeholders involvement, integration and coordination, team development and training. The authors are aware of live entertainment where sophisticated project management tools and techniques were effectively used. The 1988 Winter Olympics, held in Calgary, for example used many, including CPM scheduling in 15-min intervals for the events.

### *Lessons: other industries may learn from the live entertainment industry*

The most interesting and possibly useful aspect of project management in this industry that could be applied to other industries are as follows:

- involving sponsors and contractors to develop common critical success factors is one way to ensure better cooperation and incentive to effectively complete the project;
- it may be worthwhile for the project manager to explore ways to make the project deadline feel like SHOW-TIME to the project team.

Overall we conclude that project management for the entertainment projects is well developed but represents a very different style and culture to classical capital

(technical) projects. The use of formal project management techniques does not appear to be advanced, but the techniques used seem overall to be effective for projects of such scope.

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## Appendix A

### Survey questionnaire

1. Industry you are presently employed in: Oil and Gas  Telecommunications  Utilities  Software systems  Marketing  Entertainment   
Infrastructure  New product development  Other (specify) \_\_\_\_\_

2. Position: Project manager  Project director  Other (specify) \_\_\_\_\_

3. Type of projects you are managing now: Construction  Software development  Product development  Manufacturing  R&D   
Other (specify) \_\_\_\_\_

4. Working experience in Project Management: \_\_\_\_\_ years

5. Number of similar projects worked on within the past 10 years: \_\_\_\_\_

6. Answer the following with respect to a most recent project (or part of the project) you are reporting in this study:

(a) Project Value: (millions \$); \_\_\_\_\_ (b) Project duration: months \_\_\_\_\_

(c) Completion Date: Month \_\_\_\_\_ Year \_\_\_\_\_

(d) Purpose: \_\_\_\_\_

(e) What was delivered: \_\_\_\_\_

(f) Where was project located: \_\_\_\_\_

7. (a) Your role in this project: Owner \_\_\_\_\_ Contractor \_\_\_\_\_ Consultant \_\_\_\_\_

(b) Your name: \_\_\_\_\_ Company: \_\_\_\_\_

(c) Address: \_\_\_\_\_

(d) Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ (e) E-mail: \_\_\_\_\_

8. If you are an owner, please provide us names and addresses of two other persons to be contacted (a contractor, and a consultant to the same project).

1. Name: \_\_\_\_\_ Company: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

Role: Contractor \_\_\_\_\_ Consultant \_\_\_\_\_

2. Name: \_\_\_\_\_ Company: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

Role: Contractor \_\_\_\_\_ Consultant \_\_\_\_\_

Note: Please fill in the next sections of the questionnaire with respect to this particular project

## Appendix B

### Overall Project Success Factors

**Instructions:** Rate the importance of each item on the list for each phase separately on a scale of 1–5.

**Rating:** 5 = Very important; 4 = Important; 3 = Preferred; 2 = Less important; 1 = Not important, 0 = Not applicable.

**Key:** D, Definition phase; P, Planning phase; E, Execution phase; T, Termination phase.

Overall Project Success Factors (How important are these factors at identified project phase)	Project phase			
	D	P	E	T
1. The project has a clearly defined mission 2. Owner is consulted at all stages of project development and implementation 3. Owner is informed of the project status and his/her approval is obtained at each stage 4. Proper communication channels are established at appropriate levels in the project team 5. A detailed project plan (including time schedules, and milestones) with a detailed budget is in place 6. Effective and comprehensive control, monitoring, and feedback mechanisms are established 7. Top management is willing the necessary resources (money, expertise, equipment etc.) 8. A contingency plan is in place to handle unexpected crises and deviations on the project 9. Job descriptions of all key team members are written and communicated 10. The appropriate technology and expertise are available 11. The project satisfies the needs of the sponsor/owner, users and other stakeholders 12. The project achieves its stated business purpose 13. The project is completed to specification 14. The project is completed within budget 15. The project is completed on time  16. The project satisfies the needs of individual member of the project team and its supporters 17. The project is completed with minimal and mutually agreed upon scope changes 18. The project is completed without changing the corporate culture 19. The project does not disturb the main work flow of the sponsoring organization 20. Environmental and external issues are properly addressed 21. Project changes are managed through a formal process 22. Customer is satisfied 23. Other (specify) 24. Other (specify)				

## Appendix C

### The Project Metrics

**Instructions:** Check yes or no in column (a) for each item in the list. Write the units for used for each item in column (b), if your answer is yes in column (a).

Rate each of the items for each project phase separately on a scale of 1–5. Rating: 5 = Very important; 4 = Important; 3 = Preferred; 2 = Less important; 1, Not important; 0 = Not applicable.

**Key:** D: Definition; P: Planning; E: Execution; T: Termination.

The Project Metrics: (How important are these measures at identified project phase)	(a) Used		Project phase			
	Yes	No	(b) How measured? D	P	E	T
<b>Note:</b> Examples of how these metrics are measured are shown in parentheses						
1. A specified rate of return on the investment is achieved (\$, IRR*, NPV*) 2. Market share is increased by a predetermined amount (\$, %) 3. A specific new technology is adopted and accepted by the end users (survey, usage) 4. The project is completed within a predetermined budget (\$, effort or work-hours) 5. The project is completed on time or ahead of schedule (deadline, schedules, CPM*) 6. Resource requirements are identified and supplied as needed (work-hours, materials, lost time) 7. Milestones are identified and met (deadlines, hurt rate) 8. Activities and logical sequences are determined and scheduled (CPM*, days, weeks) 9. Each work item is estimated (cost and/or manpower) 10. Deliverables are identified (sign-off, payment, customer acceptance) 11. Responsibilities are assigned (RBS*, RACI*) 12. A work breakdown structure is developed (WBS*, coding structure) 13. Critical success factors are identified (opinion, survey) 14. The scope of the project is clearly defined and quantified (deliverables, project plan) 15. Project completion is precisely defined (deliverables, sign-off) 16. A quality management program is implemented (test results, ISO 9000) 17. Safety performance is measured (L.T.A's*) 18. Progress is measured using Earned Value techniques (dollars, time, effort) 19. Project performance is evaluated (preset measures, budget, schedule) 20. Customer satisfaction is evaluated (survey, opinion) 21. Other (specify) 22. Other (specify)						

IRR, Internal rate of return; NPV, net present worth; CPM, critical path method; RBS, responsibility breakdown structure; RACI, responsibility action coordination inform; WBS, work break down structure; L.T.A., lost time accidents.

## Appendix D

### Project Priorities

Instructions: Rate each of the items in terms of its importance for each phase separately on a scale of 1-5.  
Rating: 5 = Very important; 4 = Important; 3 = Preferred; 2 = Less important; 1 = Not important; 0 = Not applicable.

Project Priorities for the following at identified project phases	Project phase			
	Definition	Planning	Execution	Termination
1. Time				
2. Cost				
3. Performance (scope and quality)				
4. Project team development				
5. Career development and training for individuals on the project team				
6. End user satisfaction				
7. Other (specify)				
8. Other (specify)				

## Appendix E

### Open-ended questions

(a) Was this project successful? Yes  No  If yes, on what basis do you make this assessment.

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(b) Additional comments regarding any item or section or project specific:

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(c) Would you like to receive survey results: Yes  No

(d) Release for individual data: Yes  No

## II. Project Planning

### Introduction

Planning is the first and arguably the most important step in any digitization project. Lest this sound like a platitude, it is worth noting that far too many projects are undertaken without adequate thought to the activities involved, the staff required, or the technical exigencies of the work. The need for good planning may be self-evident, but in practice it is often difficult to anticipate all the areas in which forethought is essential. Good planning for any project—even for managers who have successfully completed previous projects—requires a large number of decisions on questions such as the following:

- What work needs to be done;
- How it will be done (according to which standards, specifications, best practices);
- Who should do the work (and where);
- How long the work will take;
- How much it will cost, both to "resource" the infrastructure and to do the content conversion;
- Where, after having answered all of these questions, one might obtain funding.

This kind of planning is one of the most intellectually challenging of the project tasks, and may well be time-consuming. There may also be pressure to hurry this step, from a desire to show visible progress or in response to institutional pressure. But an investment in this kind of planning will be amply repaid over the life of the project: in the quality of the products, in smooth workflow, in staff morale, and not least in the total project cost. The goal of this section is to sketch out the parts of the planning process and indicate the important decisions—assessing the resources needed to complete the project, the staffing and equipment required, the choice and role of metadata, and the overall project management—and how to go about making them effectively. The checklist below gives a brief inventory of the resources required to undertake a digitization project. Not all projects will require all the resources listed, but this list will show the range of needs you should anticipate.

Technology develops and changes so quickly that decisions like those listed above may seem almost impossible to make with any confidence. Information on the array of standards, specifications, equipment, skills, and techniques not only presents a daunting learning curve, but also a welter of detail that can be very difficult to track. For the project planner, however, it is not these details that really inform good decision-making. It is much less important to know what sampling rate a particular piece of equipment offers than to understand how sampling works and how it can affect the quality of digital conversion. These underlying principles apply more broadly and change more slowly. Most importantly, though, they represent the level at which good planning takes place; with this knowledge, the planner has the tools to bring together an expert group of staff and consultants and create an effective framework within which they can work. This *Guide* contains detailed, up-to-date information on best practices in a number of technical areas, but the *Guide's* greatest and most enduring value for the project planner is its presentation of the more fundamental issues and how they interrelate.

The *Guide's* introductory section has already addressed the first question on the list above: What work needs to be done? By emphasizing the identification of audience and of your own institutional location and goals, the introduction contextualizes this decision and reminds us to ask "Who needs this work? Who will benefit?" The further ramifications of this question are explored in Section III on selecting materials, which discusses how to assess your collections and set priorities for digitization, and in Section XII on user evaluation, which provides guidance on how to assess the needs of your audience and how this information can shape your digitization strategy. This is also the stage at which you should get the facts and make your decisions concerning rights management, without which you cannot proceed with digitization: you need to establish the intellectual property status of the materials you wish to digitize, and you also need to decide on your own strategy for managing the intellectual property you are about to create. Both of these issues are explored in depth in Section IV. And although the project's final product may seem impossibly remote at this stage, you need to consider how the results will be distributed: not only what technologies you will use, but also how you will control access and ensure that you reach your intended audience. Section X covers these issues in detail.

The question of how the work will be done—the specifications, standards, and procedures you need to

establish—has many facets which are addressed at various points in the *Guide*. Foremost among these is the question of standards: by using standards-based approaches wherever possible, you increase the longevity, portability, and interoperability of your data. You need to be aware of the standards that apply to the kinds of digitization you are undertaking, and these are described in detail in the sections on digitizing text, images, and audio-visual materials. Given the complexity and breadth of most standards, though, you also need to be aware of the best practices that apply to your community. For instance, both documentary historians and linguistic researchers use the XML-based Text Encoding Initiative Guidelines to encode textual data, but each group uses the standard in different ways that serve their particular needs. While you are considering the specifications for your data, you should also think carefully about how to capture and represent the metadata you will need to administer your digital materials and enable them to be used effectively. The *Guide* includes an appendix on metadata which describes the various types and their uses. The relevant sections of the *Guide* also provide pointers to specific information on best practices for particular digitization communities.

The question of "how" also involves decisions about equipment. For the project planner, these questions are most usefully addressed not at the level of specific brands and models, but by thinking about the functionality you require and the tradeoffs you are willing to make (for instance, whether keeping costs low is more important to the project's overall success than achieving the highest possible capture standard). The sections on images and audio-visual materials discuss how to approach these decisions; more specific information on particular kinds of equipment can be found in the appendix on equipment. Finally, you need to establish an effective workflow for your project. At the highest level, this includes project management strategies, which are discussed later in this section, and quality assurance methods (discussed in Section VIII). But in addition you need to consider how you will store, manage, and track your digital objects, which is addressed in detail in Section XIII on digital asset management.

Staffing issues—who should do the work—are closely related to the points just mentioned, since your decisions about methods and procedures may be difficult to separate from the staff resources you actually have available. Few projects have the luxury of hiring all new staff to an arbitrary standard of skill and experience. Further on in this section we discuss human resources: how to construct job descriptions and identify skilled staff, and how to set up a management and advisory framework that allows your staff the autonomy to do their jobs effectively. In Section IX, Working With Others, we consider a range of collaborative and cooperative relationships that may expand your staffing options, including project consultants, vendor outsourcing, collaboration with other institutions, and internal cooperation.

Once you have worked through the issues sketched above, you will be in a position to assess the practical scope of the project: how long the work will take, and how much it will cost. Of all the questions addressed here, these may be the most vulnerable to change over time, as techniques and equipment improve and grow cheaper, and as quality expectations rise. Some guidance on cost estimation is offered later in this section, and also in the sections on specific digitization areas (Sections V, VI, and VII). You should make sure in researching costs to take into account all of the startup and infrastructural costs the project will incur—costs for initial planning, choosing data specifications, building or choosing tracking and documentation systems, training staff, and so forth—as well as the incremental cost of digitizing the materials themselves. This is also an opportunity to consider the scope of your investment and whether this infrastructure can be reused or adapted for further digitization projects once this project is completed.

Finding the funds to undertake the project is the final step, at least logically; a successful funding request will almost always require a thorough consideration of the issues just described. Even if you are fortunate enough to have funding already committed, going through this process will ensure that you spend your resources prudently and receive value for your investment. Funding sources and strategies are discussed later in this section, and also in Section XI on sustainability.

The checklist box below gives a condensed list of the resources you may need to undertake a digitization project. Although not all projects will need all of the resources listed, it gives a sense of the range and options.

#### Checklist Box:

##### ***Resources that you will need for a digitization project:***

Personnel:	advisors project management staff rights specialists researchers editors authors	<input type="checkbox"/>
------------	---	--------------------------

	digitizers catalogers technical support/development legal advisors	
Software:	operating systems applications: --> image manipulation --> metadata authoring --> database --> indexing and search engine --> web server utilities server systems network clients specialist applications/developments	<input type="checkbox"/>
Storage devices:	local hard drives network storage servers optical devices (e.g. CD writers) magnetic devices (e.g. tape drives) controlled storage environment	<input type="checkbox"/>
Network infrastructure:	cables routers switches network cards ports	<input type="checkbox"/>
Consumables:	stationery utilities printer cartridges lamps (for capture devices/special lighting) storage and backup media	<input type="checkbox"/>
Project management:	preparing bids recruitment publicity and dissemination creation of deliverable product specifications design of workflow supervision of staff quality assurance	<input type="checkbox"/>

## Resources within your institution

If you are working within an institution that has other digitization projects under way, an examination of the resources already available within your institution is a good starting point. Staff will know if their department or unit has capture devices available or workers with experience of digitization or cataloging. This is an easy first step towards building a resource inventory, although knowing that you have one flatbed scanner, a digital camera and suitable equipment for digitizing audio, as well as people who know how to use that equipment, is not on its own sufficient. A thorough identification of internal resources involves checking that:

- equipment and software are of a sufficient specification to meet your requirements;
- workers who can operate the equipment are available and appropriately trained;
- technical support and maintenance are in place;
- capture devices are (or can be) directly connected to your storage area; and,
- access to equipment and staff suits your workflow requirements.

Clearly assessing the adequacy of these resources is predicated on other decisions, such as your workflow requirements; indeed, many of the planning areas discussed in this section are closely interdependent. It should also be apparent why the *Guide's* introductory section stressed early on that you need to define what you want to do and the audience or audiences you intend to reach (see Section I). A clear statement of

objectives (preferably in a formal document that can be shared with staff), combined with the resource inventory, will enable you to assess the suitability of your local resources.

You will make this document an even more effective planning tool by adding information about equipment specification (e.g. computer processor speed, RAM, hard disk capacity) and the results of tests for suitability. Before you can conclude that you have suitable resources you must test them to make certain that they will meet the requirements of the project. The Example Box below, "Resource Inventory and Test", shows what a resource inventory and test for scanners might look like.

**Example Box:**

**Resource Inventory and Test:**

PCs and Scanners	Functional Requirements	Suitability Test Result
1 Pentium 3, 600 Mhz, 128 MB Ram	Must handle processing and manipulation of image files up to 50 MB	Needs more RAM
1 Pentium 4, 1 Ghz, 384 MB Ram		Okay
1 Agfa Arcus		Okay
1 Agfa DuoScan 1200		Transparency tray inadequate

Overall Conclusion: Upgrade one PC and replace one scanner

Most large institutions in the cultural heritage sector will have resources that may be useful to the project but would not necessarily need to be borrowed for the entire life of the project. There may be physical equipment, such as devices for digital capture, analog capture equipment (e.g. record, tape, CD and video players that can be used when converting from analog to digital), network storage devices, or handling equipment and controlled storage for analog material.

Human resources may be even more useful—expertise in digitization, text encoding, networks or web delivery can often be found in-house. Even those institutions yet to carry out any significant digitization will have cognate areas of expertise. These skilled individuals can be difficult to find, so tell your colleagues that you are planning a digitization project and have them consider which skills might be of value to you. For example, the skills, techniques and processes required by digital photography are identical in many areas to analog photography, and the same applies to image processing. Similarly, the standards and methods for creating metadata have their roots in the creation of bibliographic records, library catalogs or finding aids and museum collection management systems. In addition to this, it is important to consider the project team and project management process here. Projects should establish a set of procedures for project management from the very start of any project, identifying goals and time scales as well as tasks and outcomes tied to the availability of specific staff and equipment.

It is much easier to identify potential facilities and expertise within the framework of an institutional digitization policy or corporate technology plan—follow the more detailed questions for your own resources as described above. If such a policy has not already been adopted, it will probably be beyond the scope of an individual project to initiate one. Nevertheless, informal inquiries can still be made relatively easily. Remember that apparently unrelated departments or projects may be useful. For example, a great deal of high-end digital imaging takes place in dental, medical, biological and life science departments. The Internal Resource Identification Question Box illustrates some of the common areas of expertise to be found within an institution.

- Is there an institutional digitization policy to adhere to?
- Who else in the institution has digitization projects underway?
- What experience can you use (e.g., photographic, equipment analysis, etc.)?

**Question Box:*****Internal Resource Identification:***

Institution Type			
Resource	Academic	Library	Museum/Gallery
Imaging	Medical Imaging / Media Services / Photographic Services / Library	Special Collections / Photographic Dept	Imaging / Publications Dept
Metadata	Library	Cataloging Finding Aids	Collection Management Finding Aids
Text Encoding	Literature / Language / Computing Science Depts. / Information Management / Library	Cataloging / Information Management Finding Aids Electronic Texts	Finding Aids / Information Management

**External Resources**

Identifying resources outside your immediate department, unit or institution can be a more difficult process. Success depends upon what type of institution you are, your strengths and limitations, the accessibility of the resources you are seeking, and whether there is scope for collaboration. Guidance from and access to the experience of others are likely to be readily available. The Link Box points you to national organizations that provide information to support digitization projects. Outsourcing can be another way to fill gaps in the resources available locally, by contracting with a vendor, hiring a consultant, or establishing a cooperative relationship with another institution. These options are discussed in greater detail in Section IX, Working with Others.

**Link Box:*****Links to National Organizations Offering Guidance***

CLIR: Council on Library and Information Resources: "The projects and activities of CLIR are aimed at ensuring that information resources needed by scholars, students, and the general public are available for future generations." <http://www.clir.org/>

DLIB Forum: "The D-Lib Forum supports the community of researchers and developers working to create and apply the technologies leading to the global digital library." <http://www.dlib.org/>

LOC: Library of Congress: "The Library's mission is to make its resources available and useful to the Congress and the American people and to sustain and preserve a universal collection of knowledge and creativity for future generations." <http://www.loc.gov/>

NINCH: National Initiative for a Network Cultural Heritage: "A coalition of arts, humanities and social science organizations created to assure leadership from the cultural community in the evolution of the digital environment." <http://www.ninch.org/>

RLG: Research Libraries Group: "The Research Libraries Group, Inc., is a not-for-profit membership corporation of universities, archives, historical societies, museums, and other institutions devoted to improving access to information that supports research and learning." <http://www.rlg.org/rlg.html>

PADI: "The National Library of Australia's Preserving Access to Digital Information initiative aims to provide mechanisms that will help to ensure that information in digital form is managed with appropriate consideration for preservation and future access." <http://www.nla.gov.au/padi/>

AHDS: Arts and Humanities Data Service: "Create and preserve digital collections in all areas of the arts and humanities." <http://ahds.ac.uk/>

HEDS: Higher Education Digitization Service: "The Service provides advice, consultancy and a complete production service for digitization and digital library development." <http://heds.herts.ac.uk/>

TASI: Technical Advisory Service for Images: "Advise and support the academic community on the digital creation, storage and delivery of image-related information." <http://www.tasi.ac.uk/>

## Resource challenges

There are a number of challenges both in assessing and securing the resources required for the project. Projects that take place in large institutions frequently benefit from a significant amount of non-project-related investment. Such hidden benefits include local area networks, high bandwidth Internet connections, large capacity network-based storage devices, web servers, and technical expertise associated with maintaining and developing these facilities. This infrastructure provides the framework for the specific resources and skills a project needs, and without it many projects simply would never get off the ground. Although institutions are now trying to quantify this input, its actual value is difficult to establish, with the result that projects in well-resourced institutions are able to scale up more quickly but often under-represent the real costs that lie behind their activities.

Equally, less well-resourced institutions and initiatives face an increasing challenge in matching the developments in presentation and delivery of digital resources that larger projects can provide. Frequently, the solution is for small and medium size institutions to develop collaborative projects. The Colorado Digitization Project (<http://coloradodigital.coalliance.org/>) provides a flagship example of how equipment, staff and expertise can be shared between large and small projects alike, enabling the digitization and delivery of resources that would not otherwise be possible.

Another challenge for digitization projects, large and small, lies in the area of human resources. Content creation is a burgeoning field and although many Internet businesses have failed, those companies such as Getty Images, Corbis, The Wall Street Journal and Reed Elsevier, which have adopted prudent content creation and marketing strategies, are showing steady growth. The finance, commerce, media and entertainment industries all recognize the value and benefits of digital assets, and this places a premium on skilled personnel. Furthermore, the development of staff with digitization skills related specifically to the humanities and cultural field has not kept pace with the growth in the number of digitization projects. Many projects report difficulties in recruiting and retaining staff. Few public sector projects can match the remuneration levels offered by the private sector, but there are strategies you can adopt that enhance your chances of meeting the human resources challenge. These are outlined in the Human Resources Question Box.

### Question Box:

#### *Human Resources:*

- Are there non-monetary factors that can be emphasized or enhanced? For example, will the project offer advantageous working conditions, training opportunities, or the possibility of gaining

- qualification or accreditations?
- Are there aspects of the job that are more attractive than private sector equivalents (e.g. greater creativity, responsibility, freedom)?
- Can posts be combined or split to make most effective use of existing skills?
- Can you consider applicants from a non-humanities/cultural background, particularly for technical posts?
- Can any staff be re-deployed, temporarily transferred or re-trained from elsewhere in your institution?
- Can posts be shared or joint funded with other projects?
- Are you able to outsource any jobs?

## Funding

Some project staff will be preoccupied with securing adequate financial resources to start, develop and sustain a project throughout its lifecycle. An accurate picture of the financial costs will help you to identify the financial pressure points and to estimate more accurately the overall costs of running the project. The sections below on skills, equipment, and project management will provide points to help you develop accurate project budgets. An accurate profile of project costs helps to minimize the financial unpredictability of the project and improves the probability that it will attract funding. Funding agencies remain attracted by the opportunities for funding initiatives in the heritage sector. The Link Box provides pointers to some major US funders.

### Link Box:

#### **Potential Funders of Digitization Projects:**

- Andrew Mellon Foundation: The purpose of the Foundation is to "aid and promote such religious, charitable, scientific, literary, and educational purposes as may be in the furtherance of the public welfare or tend to promote the well-doing or well-being of mankind." <http://www.mellon.org/awmf.html>
- NEH: National Endowment for the Humanities, "an independent grant-making agency of the United States government dedicated to supporting research, education, and public programs in the humanities." <http://www.neh.gov/>
- The Getty: "The Getty Grant Program provides support to institutions and individuals throughout the world for projects that promote the understanding of art and its history and the conservation of cultural heritage." <http://www.getty.edu/grants/>
- IMLS: Institute of Museum and Library Services, "an independent federal agency that fosters leadership, innovation, and a lifetime of learning." <http://www.imls.gov/grants/index.htm>
- NHPRC: National Historical Publications and Records Commission, "supports a wide range of activities to preserve, publish, and encourage the use of documentary sources relating to the history of the United States." <http://www.nara.gov/nhprc/>

From the projects surveyed it is evident that most potential funders, particularly in the public sector, require applicants to provide a robust and auditable cost model. How this should be presented may vary from one funder to another, but it can be extremely useful to break down equipment and salary costs on a per unit or work package basis. Not only does it help the potential funders to make comparisons of unit costs between projects within and across heritage sectors, but it also forces you to look at the process and scheduling of work in detail. The accuracy of these figures will be greatly improved by conducting a pilot study or by adopting a cost model from a previous project, even if it needs to be revised in light of the experience of the earlier project.

All the projects surveyed obtained their financial backing from a combination of institutional budgets, public grants, private donation or corporate sponsorship. None of the projects reported serious under-funding, although some found that the distribution of funds created an uneven cash flow, resulting in medium term planning problems. Similarly, none of the projects reported serious concerns about sustainability, even where the source of future funds was unclear. The general absence of plans for self-generating funds or of exit strategies supports this confident view that income would continue to materialize in the future. A number of projects have recognized that failing to adopt long-term financial planning is less than prudent. We recommend that time and support for securing further external funds are crucial as well as exploring the potential for self-generating income. Projects should develop an exit strategy that will secure the maintenance and accessibility

of the digital material. These issues are discussed in more detail in Section XI on Sustainability.

## Cost models

Determining the cost of digital content creation on a per unit basis is extremely problematic. Not only are there no comprehensive cost models available that cover all resource types but trying to apply such a model to the variety of institution types, financial arrangements, prevailing market conditions, nature and volume of material and the resolutions required would be problematic. Furthermore, the cost basis for creating, storing and delivering digital resources can be quite different and trying to establish a single cost per unit can disguise these differences or ignore them altogether. In spite of these problems it is possible to establish some bases for per unit cost.

At the simplest level a project can take the total funding required and divide it by the total number of units that they intend to digitize. For example total project funding of \$300,000 divided by 40,000 units equals \$7.5 per unit. However, such a figure can be extremely misleading. Firstly, there will be variation in per unit cost according to the type of material digitized. The creation of OCR text pages will differ from reflective color still images, which will be different again from 16mm moving images or 78 rpm records. Even within material of the same broad type there will be variation. Black-and-white negatives are likely to be more expensive to scan than black-and-white prints, since tone reproduction needs to be set image-by-image in the former case, while the same settings can be applied to a group of photographic prints. Even if a project is dealing with material of a uniform medium and size, variations can occur that impact on unit costs. A collection of bound, legal-size books may have volumes that cannot be opened beyond a certain degree for conservation reasons. This may require a different capture technique, for example capturing pages from above rather than inverted. Some volumes may have details that demand a higher capture resolution than the rest of the collection, while others may require curatorial intervention to prepare them for digitization. The extent to which projects need to take account of such details will vary but at the very least different material types should be distinguished as well as same-type materials that require different capture techniques.

The cost items that go to make up a per unit calculation also require consideration. Should pre-digitization conservation work, handling time, programmers and management staff be included in addition to capture equipment and staff? In practice, projects need to do both. This is best achieved by calculating the costs directly related to capture on a per unit basis, which facilitates comparison and cost effectiveness for different techniques. Non-capture-related items could then be added to provide a total project cost and a second per unit calculation could be carried out if required. The list box below provides an indication of how these different factors can be differentiated. It is common practice to calculate costs for audio-visual material on a per minute basis.

### List Box:

#### **Capture Cost Factors:**

(per unit for a single media type with uniform capture techniques and settings). It is important to note that the digitization capture costs are actually the least costly of the whole process.

- Handling time (from the shelf to point of capture and return) as a percentage of total salary costs on a daily basis
- Pre-digitization conservation work (this should only be applied for those items that have required it)
- Capture time (from set-up to naming and saving) provided as a percentage of the capture operators total salary costs on a daily basis
- Cataloguing/Metadata (required for digitization and/or created at capture stage) as a percentage of total salary costs
- Hardware cost per item
- Quality Assurance time as a percentage of salary cost
- Software cost per item (both hardware and software costs should be on the basis of the depreciation of equipment or projected replacement cost, rather than the total cost of hardware and software)
- Hardware maintenance
- Technical support time (proportion of total salary or contract cost related to capture)
- Project Management time (proportion of total salary related to capture)
- Training (directly related to capture)

#### **Non-Capture Cost Factors:**

- Additional Project Management salary
- Web Programmer's salary
- Educational Officer's salary (or other additional project staff)
- Cataloguing/Metadata (post capture creation) % of total salary costs
- Additional technical support salary
- Additional hardware and software costs
- Consumables (including any storage media such as CDs or DATs)
- Travel and per diem
- Training (non-capture related)
- Storage costs (based on total maintained cost for the gigabytes required)

Some sites with detailed information on costing are listed below.

***Key Sites with resources on costings:***

- Research Libraries Group: <http://www.rlg.org>
- Library of Congress: <http://www.loc.gov>
- Online Computer Library Center: <http://www.oclc.org/home/>

## Human Resources

A project's long-term success depends on the accurate assessment of the required human resources, and producing a map of available and unavailable skills is a valuable starting point. Institutions vary in their areas of expertise and different types of project require different skills. Nevertheless, from the projects that we surveyed it has proved possible to develop a basic template of the people and skills required in realizing a digitization project. The requirements can be scaled according to the size of the project envisaged.

***Job descriptions, performance indicators, training***

Comprehensive job descriptions are indispensable, regardless of the project or institution. While job descriptions are not always required by the host institution, employment law often demands them. Funders are increasingly expressing an interest in viewing job descriptions as part of the application process as this provides them with a richer overview of the project. It is worthwhile developing an outline of job descriptions before the project reaches the recruitment stage. This is useful to determine the delegation of work, how jobs interrelate, which posts can be tailored to existing skills and which can be identified for external recruitment or outsourcing. A useful process for developing accurate job descriptions is to set out a list of all the tasks required for a post and then rank them from highest to lowest priority or into essential, desirable and non-essential categories. Next, compile a corresponding list linking these tasks to the skills required, including any particular knowledge or qualification. Alongside this, compose a description of the experience or background required for these skills. Finally, review the original tasks and their priority to ensure that a realistic and coherent job description is produced. A resource which has been developed by the Association for Computers and the Humanities is a database of jobs in this field—it may be consulted by projects for guidance in drafting job descriptions, and can also be used to publicize new jobs to a focused audience of candidates. See <http://www.ach.org/jobs/> for more information.

**Example Box:**

Sample Job Description

**Job title: Digital Library Research Assistant**

The Digital Library Research Assistant will play an integral role in the university's digital library projects, the goal of which is to bring a wide range of source materials to as large an audience as possible. The DLRA has responsibility for overseeing initial scanning and data capture, creating and reviewing metadata, and performing quality assurance checks. With other project members, collaborates on project publications and research.

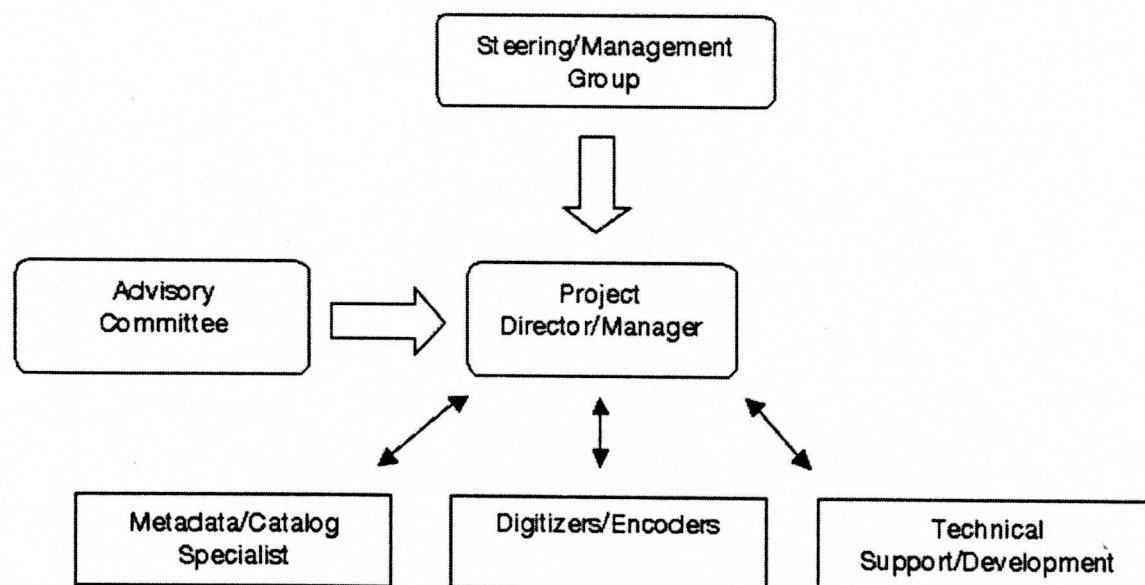
**Job requirements:** Bachelor's degree and one to three years' experience; basic computational skills, and expertise in at least one area of the humanities. Advanced degree and three to five years experience preferred. Familiarity with relevant encoding and metadata standards, including SGML/XML, METS and Dublin Core, is highly desirable. Must be a self-directed team worker with strong motivation and the ability to take initiative. Needs good communications skills (oral and written) and willingness to work collaboratively.

The use of performance indicators appears to be on the increase. They can have a positive impact, not least by providing a way of formally identifying training requirements. While most projects assess training needs on the job as an informal exercise, formal methods encourage appropriate training solutions to be planned and resourced in advance.

There is a close interplay between performance indicators, job descriptions and training assessments. The job description is very useful in developing meaningful performance indicators. Indeed, a useful starting point for performance review is to evaluate current tasks against those set out in the job description, highlighting whether the original job description was unrealistic, whether workloads need to be re-evaluated in the light of practical experience, or whether a skills shortfall needs to be addressed. The aim of addressing training requirements is to ensure that future tasks can be achieved and that the project will not encounter a skill shortage.

***Managing the skills base***

It is vital to ensure that a project be able draw on the right balance of skills. The challenge is to determine the skills of individuals and how they can most effectively contribute to the project. The key to successful delivery of projects is management. The diagram below incorporates elements from all of the projects surveyed, from the smallest to the largest, and illustrates the general structure that may be used to manage the project's skills base.



The steering group functions as an executive board and includes all constituents who are directly involved in the project, even if not employed by it, such as curators, archivists, subject specialists and education officers. In practice it is common for the steering group to be an existing committee within an institution.

The advisory committee is a broader-based group, providing general advice on the project's focus and direction. Members usually include the steering group with additional appointments from external organizations bringing particular areas of expertise, such as evaluation, to the initiative. There may be more than one advisory committee, or the advisory committee may be broken down into sub-committees each of which supplies more focused technical, academic or editorial decision-making support. This is the case with the Perseus Project at Tufts University, which has separate Technical and Academic Advisory Boards as well as a Steering Group to provide general project management. ([Read Interview 28.2](#) for details on this arrangement)

It is essential to have a single project manager who is employed by the project, with responsibility for its daily management. In most cases the project manager provides the necessary project management experience, supplemented by internal or external advice. An institution needs to assign both accountability and authority to the project manager position, so that the process is not bogged down by myriad interactions with the advisory group or groups to deal with daily operations. In content creation projects it is unusual to employ external consultants to handle project management.

### ***What skills are required?***

There are four main areas, which will require staff with identifiable skills. These skill areas may be provided within a single project, dispersed across a collaborative project, or outsourced.

- Conservation: A crucial aspect of any digitization initiative will be a conservation assessment of the analog materials. Under some conditions this may show that before some material can be digitized it will require conservation intervention.
- Digitization/Encoding: This can involve digital imaging, keyboarding, OCR, character or full-text encoding, or a combination of these. In some projects it may also include conservation intervention in the analog material.
- Metadata/Cataloging: The creation of metadata records for the digital material. This work may also involve cataloging the analog material or searching for information to enhance the metadata record where it is absent from the analog version.
- Technical Development/Support: This falls into two distinct areas: the creation or implementation of specific IT solutions for creating, managing or delivering the digital material, and the provision of IT support for project hardware and software. This latter area includes desktop applications, network services, and capture devices.

In smaller projects staff may carry out tasks in more than one area: for example, the digitizer may also undertake technical development, or the project manager may take on metadata creation. In larger projects, such as [SHOAH](#) or the [Genealogical Society of Utah](#), the duties of staff are so extensive that this is not feasible.

Project managers will have to decide whether to hire new staff with the required skills or to re-deploy existing staff from other areas of the institution. We found that many projects prefer the former, with two notable exceptions. First, there is a discernable trend for photographers to be employed for high-end digitization work. Projects have found that better-quality images are produced through training a photographer in digitization rather than trying to equip a digitizer with photographic skills. The second exception is the tendency to re-deploy or train existing cataloging staff in metadata creation. This is a logical progression for staff who will already have considerable experience in creating bibliographic records, collection management records, finding aids or catalogs, frequently in an electronic form such as MARC.

Another decision concerns background skills. With the exception of some technical posts, we noted a clear preference for staff with arts, humanities, library, museum or gallery backgrounds, or at least some experience or interest in the subject area of the collection. There may sometimes be advantages in not having such a specialization. For keyed-in text transcription, staff without subject knowledge are more likely to enter exactly what is on the page rather than interpret the contents and enter what they think is in text. On the other hand, subject knowledge can be exceptionally useful in gauging what areas of the content should be focused upon, deciphering difficult materials, or recognizing how areas of the content should be marked up.

When you are trying to find staff with appropriate skills, remember that some projects have benefited from using student labor and volunteers. The ability to draw on student labor represents a significant benefit for university-based projects. Projects such as those based at the University of Virginia Library have been able to build large and diverse digital collections because they are able to draw upon a pool of skilled, motivated and affordable labor. Projects that recruit student labor have invested considerably in training, adopted flexible

working practices and tailored the work around the students' educational commitments. This approach has the added benefit of equipping students with the skill set required for future work, adding to the pool of available staff.

Volunteers often provide a similar pool of skills and projects such as the Genealogical Society of Utah have made effective use of this resource. They have found it both necessary and beneficial to invest in appropriate training for the volunteers. Such training should be factored into the project resource plans. In large-scale initiatives, volunteer management and training may become a significant part of the project itself.

The Link Box below provides links to sites that support skills development in digital representation.

#### Link Box:

***An increasing number of organizations are offering training in digitization, which generally proves cheaper and far more useful than commercial training courses:***

- Archive Builders: Document Imaging and Document Management. <http://www.ArchiveBuilders.com>
- Cornell University Library, Department of Preservation and Conservation: Moving Theory into Practice: Digital Imaging for Libraries and Archives. "This workshop is intended for librarians, archivists, curators, administrators, technologists, and others who are contemplating or implementing digital imaging programs." <http://www.library.cornell.edu/preservation/workshop/>
- HATII: Humanities Advanced Technology and Information Institute. Digitization Summer School: "The course will examine the advantages of developing digital collections of heritage materials, as well as investigate issues involved in creating, curating, and managing access to such collections." <http://www.hatii.arts.gla.ac.uk/>
- Humanities Computing Unit in Oxford: Summer Seminars covering a range of topics: <http://www.hcu.ox.ac.uk/>
- School for Scanning - North East Document Conservation Center: Creating, Managing and Preserving Digital Assets. <http://www.nedcc.org>
- Harvard Extension School, Museum Studies Certification Program. Muse E130: Information Technology for Museums. <http://www.extension.harvard.edu/2001-02/courses/muse.shtml>
- TASI: Technical Advisory Service on Images. Training courses "aimed at those involved in digitization projects, those who wish to capture images and those who wish to use digital images in teaching and research." <http://www.tasi.ac.uk/training/training1.html>
- UCLA/Getty course: Museum, Libraries and Archives: Summer Institute for Knowledge Sharing. <http://skipper.gseis.ucla.edu/orgs/gettysi/html/summer.html>
- University of Virginia Library: Digital Media Lab Services tutorials and short courses on digital image, video, and audio capture and editing. <http://www.lib.virginia.edu/clemons/RMC/digilab-services.html>

#### Equipment

Because our digitization capabilities are so strongly tied to—and limited by—the developing equipment technology, it is tempting to feel that the available technology should motivate our digitization strategies. However, on the contrary, it is vital to base equipment requirements on the characteristics of the collection/s to be digitized and on project needs, and not the other way around.

Although there are significant cost savings associated with outsourcing work to "offshore" production bureaus in Asia, the Far East, Mexico, etc, in cases where unique materials or special collections materials are to be digitized it is important that digitization should take place as close to the original as possible. Hence many projects will need to confront the complex questions of equipment specification and selection. A detailed discussion of matching material properties to hardware and capture settings can be found in Section VII on audio-visual materials. There is also further information on equipment choices in the appendix on equipment. At the moment we will focus on the basic differences in equipment and the technologies employed in order that the correct type of equipment resource can be procured for a project. Selecting the most appropriate equipment can be time consuming, but projects should not be deterred by the plethora of manufacturers and their competing claims. For example, the SCAN project (Scottish Archive Network) was initially unable to find a commercially available digital camera that exactly matched their requirements. Instead, they sourced a camera custom-made to their exact specification. This level of exactitude may be out of reach—and unnecessary—for most projects, but it is worth remembering that one need not be entirely constrained by what is commercially available.

### ***Principles of digital data capture***

Although there is a variety of capture devices for different applications, whether you are digitizing images, text, audio, video or 3D objects, the operating principles are the same. All digital capture devices take a sample of the analog source material to create a digital surrogate. This sample is made up of two elements: the sample rate and the sample depth. The sample rate describes how frequently readings are taken of the analog material. For example, in a digital image this would be the resolution, or the frequency per unit of area: the number of pixels per inch, expressed as pixels per inch (ppi) or dots per inch (dpi). An image captured at 600 ppi would have had 360,000 samples recorded per square inch. Similarly, for audio-visual materials the sample rate is the frequency per unit of time at which the source material is sampled. The sample depth is the amount of information recorded at each sampling point. For example, a sample depth of 24-bits would capture 8 bits for each of the three color channels (red, green and blue) at every sample point. For a more detailed explanation of sampling, see the appendix on digital data capture and Section VII on Audio-Visual Materials.

### ***Selecting equipment***

The medium, format, size, and fragility of the original material are among the primary factors affecting equipment choice. For text documents, flatbed scanners are suitable for single leaf, regular sized documents, provided the material does not go beyond the scanner's maximum imaging area (usually up to approximately US Letter size), or is put at risk by "sandwiching" it in the scanner. Large format flatbed scanners and sheet-feed scanners can handle single leaf, oversized documents. However, sheet-feed scanners put material at greater risk than flatbed scanners as the originals are pulled through a set of rollers. Drum scanners, whose imaging area is usually from 8" x 10" to 20" x 25", and digital cameras can also be used for oversize material, but they are an expensive option compared to flatbed scanners.

Bound pages that cannot be disbound, and pages in bindings that cannot open fully to 180 degrees require flatbed scanners with a right angle, prism, or overhead capture array. Digital cameras, with appropriate easels, book rests and weights are a versatile option for bound material. Camera beds or mounts, lighting, lenses, and filters all add to the cost and complication but make digital cameras more versatile tools for capturing manuscripts, bound volumes, original works of art, prints, out-size material and artifacts.

To achieve the highest quality scans of transparent media (e.g. 35mm slides and negatives, 6x4 and large format transparencies and microfilm) specialist equipment such as slide and film scanners, microfilm scanners or drum scanners should be used. Some flatbed scanners, with a dual light source, can handle transparent media though they often lack the dynamic range comparable to that supported by transparency scanners. However, you will not achieve as high a quality image as you would with a dedicated film or slide scanner. These have an inherently higher resolution, appropriate for the small size of the original, hold the transparencies more closely and securely, and frequently have negative color compensation to correct color casts for different types of film.

Audio and moving image materials present their own problems for digital capture. Not only is there a variety of source formats, including wax cylinders, 33, 45 and 78 rpm records, 8-track and cassette tapes, two-inch and VHS video in PAL and NTSC formats, but it is often very difficult to obtain access to analog devices for playback and linkage is difficult.

#### **Definition Box:**

##### ***Audio-Visual Facilities:***

- Audio capture card required for sound material or video capture card required for moving images
- Source devices, such as 78 rpm record players and tape players.
- Mechanism for connecting these devices digitization equipment
- Intermediary device, such as a DAT (capable of handling ASEBU and SPDIF digital audio) machine

**Link Box:**

***There are a number of audio and video digitization projects that are just getting started:***

RAI: <http://www.rai.it/portale>

BRAVA: Broadcast Restoration of Archives through Video Analysis  
<http://www.ina.fr/recherche/projets/encours/brava/>

COLLATE: Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material  
<http://www.collate.de/index.htm>

PRESTO: Preservation Technology for European Broadcast Archives <http://presto.joanneum.ac.at/index.asp>

AMICITIA: Asset Management Integration of Cultural Heritage In The Interchange between Archives  
[http://www.amicitia-project.de/ami\\_home.html](http://www.amicitia-project.de/ami_home.html)

The 3D representation of objects, from coins to buildings, is at the forefront of current digitization developments. At present the technology can be divided into two broad categories. The first, and simplest, is to create a moving image of an object. This is achieved by moving a digital camera around the object, or rotating the object in front of a fixed camera, while taking a series of still images. These images are then compiled to create a moving image of the object. The most common format for this is QuickTime VR. This is a reliable technology that requires a digital camera and mount or turntable. However, it does not provide a true 3D representation of the object because while only two planes are captured and displayed, it still represents 3D objects using two spatial planes. The viewer cannot manipulate the object, and the views provided are fixed and pre-determined.

Creating a true 3D representation of an object requires that the dimensions and features of the object be modeled. That is, the three dimensions of the object are represented in the computer as a set of coordinates. Attached to this "frame" are the textures of the object to provide the surface details. At present most 3D imaging technology remains in the sphere of industry. The technologies used to capture coordinates, render the model, and interact with the 3D representation (such as haptic feedback systems that allow one to "touch" the object, or 3D printing to create facsimiles) are often quite costly and require a relatively enormous amount of computing processor power compared to the average desktop computer (in 2002). As such, 3D modeling devices remain application-specific, for example body imaging, prototyping or CAD/CAM applications. However, it was not long ago that digital imaging was the sole preserve of medical applications. During the next ten years we should see increasingly cost-effective and user-friendly devices that will bring 3D modeling into the mainstream.

**Definition Box:*****Virtual Reality:***

Virtual reality can be described as an interactive, self directed, multi-sensory, computer generated experience which gives the user an illusion of participating in a three dimensional environment, even if a synthetic one. For cultural and heritage institutions, this may mean using virtual reality to create virtual representations of three dimensional objects in their collections or to create representations of environments, such as an Egyptian tomb, an ancient Persian palace, a historic Greek theatre or an ancient landscape. These three-dimensional objects could range from coins, vases, and sculptures to representations of whole rooms of collections.

**Metadata**

Metadata is an indispensable part of any responsible digitization program, and considerable attention has been paid to the definition of high-quality metadata standards for various purposes. (The [appendix on metadata](#) provides more detail on different types of metadata, and on specific metadata schemes and their uses.) The availability of accurate metadata is as important as the digital surrogates themselves for accessibility, usability and effective asset management. In many instances institutions will already have substantial metadata about the analog object (for instance, catalog records) much of which can be applied to the digital object. The project will be able to reduce its metadata creation costs by building on existing metadata. When selecting material for digitization you may wish to give priority to material for which partial metadata already exists.

It is crucial to remember to determine the status of the existing metadata, when you are assessing resource requirements. In an ideal world the existing catalog or finding aid would be complete and up to date. However, many libraries, archives and museums have a backlog of cataloging work, and part of a collection selected for digitization could fall into this category. Therefore, it may be necessary to devote time to locating missing information for your metadata records. You must then decide whether to seek information just for those fields required for the metadata, or to update the original catalog record in its entirety. Digitization provides an economical opportunity for institutions to expand their metadata, so consider the possibility of seeking extra funds or devoting more resources to this activity. Some of the new elements required for the metadata record of the digital object can be generated automatically: for instance, automatic metadata creation is a feature of much high-end digital camera software and of some OCR systems. Alternatively, a project may need to develop its own system, and can greatly improve the efficiency and accuracy of technical metadata. There is a general dearth of metadata tools, which poses a problem for the efficient creation and management of metadata for many projects. There is therefore likely to be a significant element of manual work, whether this lies in adding digital objects to existing electronic catalogs, creating records for web-based delivery such as Dublin Core, or implementing encoded metadata schemes such as EAD. Creating a metadata record will usually take as long as creating the digital surrogate and if detailed encoding schemes such as Encoded Archival Description or Text Encoding Initiative are used, this process can be considerably longer.

## METADATA RESOURCES:

### GENERAL METADATA RESOURCES

1. Canadian Heritage Information Network Standards Page: [http://www.chin.gc.ca/English/Standards/metadata\\_intro.html](http://www.chin.gc.ca/English/Standards/metadata_intro.html)
2. J. Paul Getty Trust, Introduction to Metadata: <http://www.getty.edu/research/institute/standards/intrometadata/>
3. Extensible Markup Language: <http://www.w3.org/XML/>
4. International Federation of Library Associations and institutions. Digital Libraries: Metadata Resources: <http://www.ifla.org/ll/metadata.htm>
5. Text Encoding Initiative: <http://www.tei-c.org>
6. Metadata Encoding and Transmission Standard (METS): <http://www.loc.gov/standards/mets/>

### METADATA MENTIONED ELSEWHERE IN THE GUIDE

1. Section III: Selecting Materials: Metadata & Interoperability. The Dublin Core metadata initiative <http://dublincore.org/>
2. Section IV: Rights Management: Technologies for Copyright Management and Protection.
  - o The Open Digital Rights Language Initiative (ODRL): <http://odrl.net/>
  - o Digital Object Identifier (DOI): <http://www.doi.org>
3. Section V: Digitization and Encoding of Text - Text markup schema. Text Encoding Initiative (TEI): <http://www.tei-c.org>
4. Section VI: Images
  - o Descriptive:
    - Library of Congress Subject Headings (LCSH): <http://lcweb.loc.gov/cds/lcsh.html#lcsh20>
    - Categories for the Description of Works of Art (CDWA): <http://www.getty.edu/research/institute/standards/cdwa/>
    - Art and Architecture Thesaurus (AAT) <http://www.getty.edu/research/tools/vocabulary/aat/about.html>
    - VRA Core Categories: <http://www.vraweb.org/vrarecore3.htm>
    - Dublin Core Metadata Element Set: <http://dublincore.org/documents/dces/>
  - o Structural:
    - Synchronized Multimedia Integration Language (SMIL) <http://www.w3.org/AudioVideo/>
    - Metadata Encoding and Transmission (METS) Standard: <http://www.loc.gov/mets>

- o Administrative:
  - A Web Hub for Developing Administrative Metadata for Electronic Resource Management <http://www.library.cornell.edu/cts/elicensestudy/>
  - Digital Library Federation, "Structural, technical, and administrative metadata standards. A discussion document." <http://www.diglib.org/standards/stamframe.htm>
- 5. Section VII: Audio and Video Capture and Management
  - o Dublin Core Metadata Implementers: <http://www.fiu.edu/~diglib/DC/impPurpose.html>
  - o Synchronized Multimedia Integration Language (SMIL) [http://www.w3.org/\(AudioVideo/](http://www.w3.org/(AudioVideo/)
  - o Metadata Encoding and Transmission (METS) Standard: <http://www.loc.gov/mets>
  - o MPEG-7: <http://mpeg.telecomitalialab.com/standards/mpeg-7/mpeg-7.htm>
  - o Authority Tools for Audio-Visual Catalogers: <http://ublib.buffalo.edu/libraries/units/cts/olac/capc/authtools.html#g>
  - o Authority Resources for Cataloging Popular Music: [http://www.music.indiana.edu/tech\\_s/mla/wgpms/wgpms.htm](http://www.music.indiana.edu/tech_s/mla/wgpms/wgpms.htm)
  - o Library of Congress's Digital Audio-Visual Preservation Prototyping Project: <http://lcweb.loc.gov/rr/mopic/avprot/avlcdocs.html#md>
  - o Library of Congress's Digital Audio-Visual Extensions to METS Standard <http://www.loc.gov/rr/mopic/avprot/metsmenu2.html>
  - o Cinemedia's SWIFT project for on-demand delivery of film and video: <http://www.cinemedia.net/SWIFT/project.html>
- 6. Section VIII: Quality Control and Assurance: Importance of Quality Control and Assurance of Metadata
- 7. Section X: Distribution:  
Metadata Harvesting
  - o Clifford Lynch, "Metadata Harvesting and the Open Archives Initiative," *ARL Bimonthly Report* 217 (August 2001): <http://www.arl.org/newsltr/217/mhp.html>
  - o Donald Waters, "The Metadata Harvesting Initiative of the Mellon Foundation," *ARL Bimonthly Report* 217 (August 2001): <http://www.arl.org/newsltr/217/waters.html>
  - o The OAI MHP protocol: [http://www.openarchives.org/OAI\\_protocol/openarchivesprotocol.html](http://www.openarchives.org/OAI_protocol/openarchivesprotocol.html)
  - o MHP tutorial: <http://library.cern.ch/HEPLW/4/papers/3/>
  - o CIMI Working Group: <http://www.cimi.org/wg/metadata/>
  - o CLIR Metadata harvesting project: <http://www.clir.org/activities/details/metadata-docs.html>
  - o DLF and Metadata Harvesting: <http://www.diglib.org/architectures/mdharvest.htm>
  - o University of Illinois at Urbana-Champaign Metadata Harvesting services: <http://oai.grainger.uiuc.edu/>
- 8. Section XIII: Digital Asset Management: "Metadata definition and management"
- 9. Section XIV: Preservation:  
Institutional Approaches
  - o METS (Metadata Encoding and Transmission Standard) <http://www.loc.gov/standards/mets/>
  - o UK Cedars project: structure for preservation metadata: <http://www.leeds.ac.uk/cedars/metadata.html>
  - o Australian Preserving Access to Digital Information (PADI): Research Overview and Updates on Preservation Metadata: <http://www.nla.gov.au/padi/topics/32.html>
  - o NISO: Technical Metadata for Digital Still Images: [http://www.niso.org/standards/resources/Z39\\_87\\_trial\\_use.pdf](http://www.niso.org/standards/resources/Z39_87_trial_use.pdf)
  - o OCLC/RLG Preservation Metadata Working Group: <http://www.oclc.org/research/pmwg/>
  - o Reference Model for an Open Archival Information System (OAIS): <http://www.ccsds.org/documents/pdf/CCSDS-650.0-R-2.pdf>

## Project Management

Many different approaches to managing projects are possible. While we found little evidence of the conscious adoption of a project management model, such as PRINCE 2 (<http://www.kay-uk.com/prince/princepm.htm>), most projects implemented many of the key features of successful project management. As understanding of digitization becomes more commonplace it may not be necessary to "hot house" prototype projects in the manner that many early projects experienced. However, it should also be recognized that integrating existing projects into host institutions often adds a layer of bureaucracy.

The Genealogical Society of Utah provides a good example of a comprehensive project management model. Each imaging project undertaken follows six stages:

1. Negotiation and project administration
2. Capture Convert Acquire
3. Image and metadata processing
4. Storage and preservation
5. Indexing and cataloging

## 6. Access and distribution

All projects will need to consider these six areas in setting up their own project management systems.

You do not necessarily need to adopt all the activities of a project management methodology; rather you need to scale the method to the needs of your project. The whole process should be determined by the project's objectives and rationale for creating the digital deliverable. Each process should be defined, together with the specific objectives to be achieved and activities to be carried out. The various roles and responsibilities should be detailed (defining job descriptions and breaking finances down aid in this — see above) and adapted to the size and complexity of the project. This should enable the efficient control of resources and facilitate regular progress monitoring. Regular reviews should be used to ensure that the project's objectives, which may change during the project lifecycle, are being met. Whatever project management method is adopted, it should provide a common framework and delineate milestones for all elements of the project.

In summary, your project management methodology should make possible:

- The use of pilot projects and feasibility studies to shape the overall scheme of activity
- Controlled and organized stages
- The establishment of a project plan with milestones
- Regular reviews of progress against plan and against objectives
- Control of any deviations from the plan
- The involvement of all constituents at the right time and place during the project
- Good communication channels between all constituents in the project and the sponsoring institution/s

Other key features are the need for one project manager to have ultimate responsibility and for the project advisory group to provide management quality control and assurance. In distributed projects, site managers are recommended in addition to an overall project manager. Most projects have relied on internal project management expertise, supplemented by external advice. Although many projects started as relatively autonomous there is a clear trend for project management structures and the project organization to be integrated into the host institution's structure. This may be a natural progression for projects as they mature, but new projects may consider whether they should adopt it immediately.

## Work flow and costings

While few of the projects interviewed carried out benchmarking tests most had conducted pilot studies. These were undertaken for a variety of reasons:

- Technical feasibility
- Technical forecasting
- Workflow analysis
- Training needs

When considering technical forecasting or prototyping, particularly in relation to costs, remember that there may be no corresponding benefit, and if there is a benefit it will vary for different types of content. Few projects in the humanities and cultural sector charge users for the digital deliverables. As such the cost/benefit may simply be realized by the ability of the project to amortize the depreciation on the equipment. A new high-resolution camera may pay dividends for fine textual or line art material, but not so for color images. Similarly, a device that enables the digitization of material that previously could not be captured, such as a 3D modeler, may not make financial sense if a project has to build in a profit or depreciation margin. However, if the device makes an important collection more widely available, the public access benefit may outweigh the financial costs.

Where any form of pilot study is undertaken it is important to build this into the project design and development cycle. For example, the University of Virginia Library's Special Collections department delineates its project work as intricately as possible before extrapolating its workflow and costings. This has given the project reliable data to forecast costs, but there are some areas where measurement has proved inaccurate, such as network transfer rates. The UVA Special Collections department also has a scheduling calendar tied to a tracking database to generate quality control and assurance checks and back-ups. In this respect it is typical of the projects surveyed which all use flowcharts, spreadsheets or Gantt charts to plan and monitor their workflow and costs.

If you are considering using a cost model (see above), it is important to include all the relevant costs, not just the obvious items such as equipment and staff time. You will also need to decide on what basis to evaluate — for example, costs per unit to be digitized or costs per hour. The table below provides a checklist of the factors that should be built into a cost model.

Finally, one further area to be aware of as you develop your cost estimates is digital asset management. In

digitizing an image collection, for instance, you may well be generating a number of different kinds of digital objects—archival masters, delivery masters, thumbnails and other deliverables—which in turn will require storage, tracking, documentation, and upkeep. This process may require a significant commitment of resources and will need to be planned carefully. Section XIII covers digital asset management in detail.

<b><i>Cost Model Factors</i></b>	
Equipment	Purchase Maintenance Repair
Software	Purchase Upgrades
Staff	Salary (including benefits and insurance,) Training Recruitment Travel & subsistence
Utilities	Heat Light Water Phone Postage
Building	Rates Maintenance Upgrading/expansion

#### **Analysis Box:**

##### ***Costs of Digitization Programs***

There is little information available about costs and this is an area where future work is necessary. In a rare exception, Steven Puglia analyzed the costs of digitization programs, in particular from the Library of Congress Ameritech competition and the National Archives and Records Administration's Electronic Access Report. The costs discussed are mostly *projected* and *estimated* costs, a problem discussed in the conclusion, which suggests that further studies are necessary. After an initial discussion on general costs of projects—it appears that on average, a third of the costs incurred by projects is the digital conversion, slightly less than a third is metadata creation, and slightly more than a third is made up of administrative and quality assurance tasks—the emphasis turns towards long term maintenance costs. The author suggests that these are not often taken account of with the project costs.

Three types of maintenance of digital objects are considered, each with mounting costs in relation to the initial costs per image:

- The first projection is an example taken from the maintenance of NARA objects. This involves only keeping one copy of master files and offering thumbnails and access online. The cost of this basic maintenance is in the region of 14-38% of the initial imaging cost.
- The second projection comes from Cornell report on computer output microfilm. Applying this to NARA, the cost would be 55-60% of the initial cost per image.
- The third projection looks at outsourcing to a commercial firm. This would cost 275-796% of initial cost. But it must be remembered that the other two costs do not include major IT infrastructure costs and thus are false figures, whereas the private firm costing will include this.

In conclusion, it is suggested that digital imaging may not be the best approach for long-term retention of

information. Institutions can only justify retention if the images are used. Analog retention is the best way of holding materials in the long-term. In addition, it would be instructive to use figures from final project costs and also examine costs per person and production per person.

For the full report see: Steven Puglia, 'The Costs of Digital Imaging Projects', *RLG DigiNews*, October 15 1999, Vol. 3 No. 5. <http://www.rlg.org/preserv/diginews/diginews3-5.html>

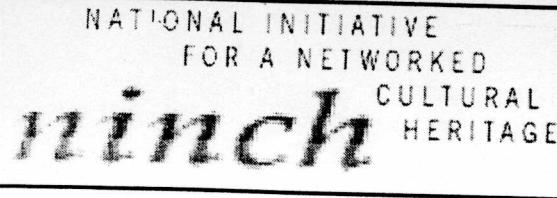
## Conclusion

At the start of any project, project planning feels like a way to exert control, eliminate risk, and guarantee a successful outcome. Certainly without good planning, the likelihood of failure and inefficiency is much greater. But you can be a better project planner by recognizing that the goal is not to eliminate risk but to prepare for it—not to control every variable but to create a project framework within which your team's response to the unforeseen will be resourceful and effective. In the technology domain, change and unpredictability are facts of life, and often represent opportunities rather than disasters for a well-planned project. Your planning goal should be to create a flexible, adaptable system whose staff and procedures can accommodate change. Your aim as a project leader should be to distinguish between what is essential—the central project objectives, the strategic components that will ensure long-term viability—and what is merely instrumental detail.

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## The NINCH Guide to Good Practice in the Digital Representation and Management of Cultural Heritage Materials

***By the Humanities Advanced Technology and Information Institute (HATII), University of Glasgow, and the National Initiative for a Networked Cultural Heritage (NINCH)***

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## **Relationships and Tasks in Scientific Research Collaboration**

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### **ABSTRACT**

What are the requirements on computer- and telecommunications-based tools to aid groups in producing intellectual products? In this article we examine research collaborations as a particularly informative example of group work and propose a framework for describing research collaboration that should provide guidance to those developing technology to support collaborative work. The framework is based on 50 semistructured interviews with researchers in psychology, management science, and computer science. It focuses on the problems in forming and maintaining personal relationships and completing tasks that researchers must solve to have a successful collaboration. These problems occur when collaborators are initiating projects, executing them, and documenting results.

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## 1. INTRODUCTION

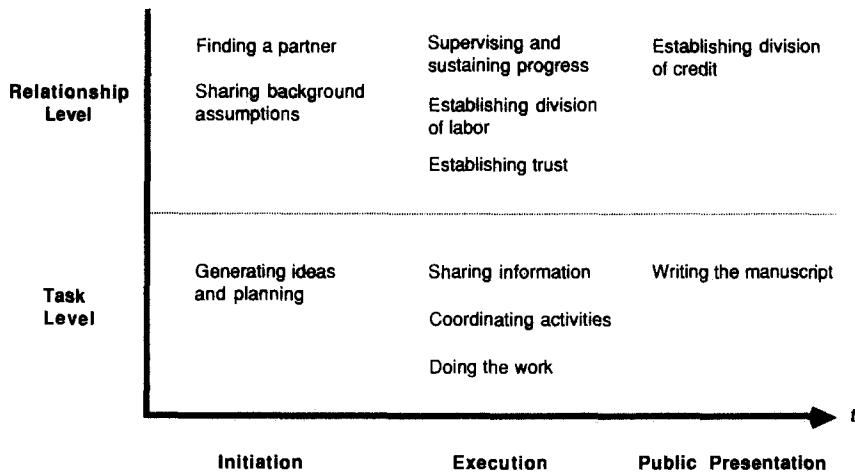
Most computer-based aids for researchers and other workers have had individuals, rather than groups or teams, as their beneficiaries. This is unfortunate because much work in business and academia is performed by groups of people (Bair, 1985). It is especially unfortunate for researchers in the sciences and social science. Examinations of patterns of authorship reveal that collaborative research is increasing in many disciplines. In psychology, for example, the mean number of authors per published article rose from 1.5 in 1949 to 2.2 in 1979 (Over, 1982), and, in 1981, over 65% of articles in a sample of six social psychology journals were jointly authored (Mendenhall, Oddou, & Franck, 1984). A variety of factors including increases in the professionalization of science and in research funding can partially explain these trends, but, so far, improvements in technology do not seem to have caused or even facilitated this increase (Beaver & Rosen, 1978, 1979; Heffner, 1981; Over, 1982). With the important exception of improvements in the quality and cost of telecommunications transmission, information technology has not evolved to meet the needs of collaborating research scientists. The trends noted here, however, suggest that opportunities to test and implement technologies that support collaborative research are proliferating and seem

likely to grow in the years ahead. The premise of this article is that understanding the nature of collaborative work relationships can help to make those efforts a success.

In this article we propose a framework for describing research collaboration that we hope will provide guidance to those developing technology to aid collaborative work. Our general approach has been to specify the hurdles or dilemmas that researchers must overcome in order to collaborate successfully. These are real problems, although most research-scientists do not see them as major or particularly difficult to handle. Institutional arrangements resolve many before they occur, and others are solved naturally in the course of doing research. They are resolved through the behaviors and techniques for doing work that are built into the structure of the scientific community, learned through observation of the experiences of others, absorbed from the organizational culture, or worked out in explicit discussions between research partners. In dealing with these potential dilemmas, researchers illustrate the current technologies for collaborative work. We use the term *technologies* here in its broadest sense, to include not only hardware and software, but also institutional arrangements and work techniques that the institution of science itself, the organizations that employ researchers, and individual researchers have adopted to get the work of science done. As such, these technologies provide a baseline that computer scientists and engineers must understand in order to not disrupt ongoing adaptations and to offer better solutions to partially solved problems.

Our framework was derived from semistructured interviews with one member from each of 50 pairs of researchers in social psychology, management science, and computer science, as well as on our experience with long-distance collaboration in producing this and other research products. We selected our interviewees from among those who had published a jointly authored article in a small number of prestigious refereed journals in 1986. Hour-long telephone interviews were conducted with one member of each collaborative pair. In 36 of the interviews we asked collaborators to describe the production of the published article, whereas in 14 we asked them to describe projects they defined as problematic. During the interview, respondents provided a narrative history of their collaboration, from first meeting to the time of the interview. Through follow-up questions and probes, respondents were encouraged to discuss the following topics: the decision to work together, the evolution of the project, the division of labor between the collaborators, the apportioning of recognition and reward for the project, coordination of the work in progress, problems that arose during the collaboration, and the advantages and disadvantages of collaborative work.

Figure 1 shows the path that collaborative research typically follows. We propose that research collaborations progress through three stages—initiation, execution, and public presentation—and that at each stage, activity takes

**Figure 1.** Model of research collaboration.

place on two levels—a relationship level and a task level. Remarkably different problems confront the collaborators at each of these stages. In the initiation stage, potential collaborators establish a personal relationship, commit themselves to working together, and plan a project. Their primary goal is to establish an interpersonal relationship based on shared interests. To do so they must identify commonalities or, at least, compatibilities in research interests, in professional goals, and in individual work styles. In addition, they must come to an agreement about the broad outline of their research objectives and the approach they will take to reach them. These goals are very general across disciplines.

The central goal of the execution stage of the collaboration is to move from the specification of a research objective through the many and varied tasks that must be carried out to complete the project. In this stage, plans become more detailed and specific; they are often revised and occasionally abandoned without the research collaboration disintegrating. Ultimately, for successful collaborations, the work itself is executed. The nature of activities during the execution stage, of course, depends on the research being carried out. But regardless of these topic-specific activities, most collaborators are confronted with the complexities of developing an equitable division of labor, of subtly supervising a peer, of sharing private and ill-formed information, and of coordinating activity that is continually evolving.

In the public presentation stage, researchers document and disseminate their research. This activity is, again, similar across disciplinary lines. The physical task of writing most often involves a division of labor, but, in the course of developing a final product, the collaborators must come to a common understanding of what they want to say and how to say it. In

addition, they must make decisions about order of authorship and responsibility for public talks. The necessity to allocate credit and the opportunity to be in the spotlight force collaborators to evaluate each other's contribution to the joint project.

It typically takes 18 months to 2 years for a pair of researchers to move through these stages (Garvey, Lin, & Nelson, 1970). At a minimum, this time span suggests that technologies focusing on collaborative tasks, with time spans ranging from minutes (e.g., making plans and arrangements, exchanging information via conference calls) to days (e.g., writing and editing using word processing) or even to months (e.g., idea generation and evaluation via computer conferences), will only nibble at the large problem of supporting research collaborations. In this article we describe individual and social factors that facilitate or hinder accomplishment of the goals we described and discuss technological needs and difficulties that arise at each stage.

## 2. INITIATION STAGE

Researchers became involved in collaborative relationships for a variety of reasons. As one might expect, combining resources to accomplish a project was a major reason. These resources included material ones (e.g., grant money, research assistants, labor, computer time) and intellectual ones (e.g., substantive knowledge and methodological skills). Second, people collaborated because collaboration changed the process of research for them in desirable ways. In particular, for many of our respondents, working with another person was simply more fun than working alone. Similarly, they also believed that working with another improved the quality of the research product, because of the synthesis of ideas it allowed, the feedback they received from each other, and the new skills they learned. Third, a number of our respondents collaborated primarily to maintain a preestablished personal relationship, especially one that was threatened by physical separation. The collaboration provided a *raison d'être* for contact. Fourth, researchers collaborated for self-presentational or political reasons, because they believed that working with a particular person or that being in a collaborative relationship *per se* was valuable for their careers. As Crane (1965) demonstrated, multiple publications in an area are crucial to becoming a recognized leader in a field, and having multiple authors does not hinder this process (Innes, 1980). Of course, these motives are not mutually exclusive, and in most cases respondents cited a combination of them to explain why they collaborated with their partners. These motivations represent a mix of task and relationship factors, and the development of a satisfactory and productive collaborative relationship requires activity on both of these levels.

To start a research collaboration, potential collaborators must become

acquainted with each other, identify their common interests and the mutual benefit that might come from working together, become committed to working together, and establish a preliminary agenda and division of labor. In the following sections we discuss each of these aspects of the initiation of a collaborative relationship.

## 2.1. Relationship Level

The essential relationship-level activity during the initiation stage is determining whether potential collaborators are suitable work partners. This means determining whether they are smart enough to help think through problems and responsible enough to do their share of the work, as well as whether they are sympathetic enough with one's research perspective and compatible enough in work style and personality to make working together pleasant. Ideally, potential collaborators would like to make these judgments before they are committed to the execution of a long and difficult project with a less than compatible partner. The organizational arrangements of their workplaces enable most researchers to make these assessments unobtrusively, perhaps without even being aware of the process.

### Getting Connected

The most fundamental requirement for the development of a collaborative relationship is that potential collaborators have the opportunity to make contact with each other. Then, in order for the relationship to grow beyond acquaintance, the individuals must come to see each other as intellectually and interpersonally suitable collaborators. The opportunity to make contact can be provided by geographical proximity or institutional norms or can be created by special events such as professional conferences or the collaborators' own actions. Each of these mechanisms has different implications for how potential collaborators manage the problem of establishing suitability.

***Proximity Effects.*** The frequent, low-cost contact that is made possible by physical proximity creates many opportunities for potential collaborators to become acquainted, to identify common interests and to assess interpersonal compatibility. People with interests in common are often geographically clustered. But even if potential collaborators were evenly distributed across the social environment, pairs of them are more likely to get acquainted and identify shared interests and world views the more opportunities they have to communicate and the easier these opportunities are. As we found in our interviews, the identification of shared interests was likely to occur with a potential collaborator who sat across the lunch table, who was down the corridor, or who was in the same academic department. The effects of simple proximity and frequency of interaction seem to be as powerful in facilitating

research collaborations as they are in social relations more generally (e.g., Festinger, Schachter, & Back, 1950; Kerckhoff, 1974).

One reason for the powerful effect of proximity is that it enables people to solve the primary relationship-level concern of this stage—establishing compatibility—easily and at low personal cost. They can exchange ideas, comments, news of their own activities and interests casually over lunch or a cup of coffee. If both individuals find the conversations and each other stimulating and enjoyable, they may discuss the possibilities for joint research more seriously and directly. But the casual conversation implies no commitment, and if a research collaboration does not develop, neither participant has lost face.

Well-documented tendencies in human judgment may help to explain why proximity plays such a dominant role in determining who collaborates with whom. Years of research on person-perception processes have shown that individuals overestimate their ability to make complex judgments about other people. They feel that they can make better judgments about another when presented with the complex array of data that face-to-face interaction makes available than when presented with only a few relevant facts about the stimulus person or than when they interact with a partner over a limited channel like the telephone, even though the extra information rarely improves their judgments (Dawes, 1971, 1979; Sawyer, 1966; Zuckerman, DePaulo, & Rosenthal, 1981). In the development of collaborations, therefore, people are more likely to feel confident about making commitments to work together when they have had the opportunity to size up each other face to face than if they learn about each other in an indirect way such as by reading each other's prior publications. These tendencies to prefer face-to-face contact and to attribute to ourselves complex powers of judgment combine to make proximity a frequent solution to the relationship-level problem of establishing compatibility with a potential collaborator.

Thus, we see that proximity not only enables potential collaborators to make contact with each other, but also makes it possible for them to make unobtrusive and psychologically satisfying assessments of the likelihood that they would be able to work together productively and amicably. Reaching agreement to work with another individual on a specific project requires both interpersonal compatibility and mutual substantive interests. That both of these elements seem to be present in collaborations that are described by the participants as successful may establish boundary conditions on technologies supporting cooperative work. Such technologies are geared toward allowing individuals to learn about each other's ideas and interests or to accomplish tasks, but do not provide a sustained opportunity to learn about each other as people. Technologies such as computer conferencing or readily available video links between organizational locations (Goodman & Abel, 1987) combine the opportunity for chance meetings and low-cost contacts with the

opportunity to seek out a particular other on the basis of mutual interests. They could be used more extensively to promote the initiation of research collaborations at a distance. We wonder, however, whether potential collaborators will be able to or willing to use them to discover personal compatibilities.

***Institutional Norms.*** In addition to proximity, institutional norms create opportunities to make contact with potential collaborators and strongly influence who collaborates with whom. Many respondents mentioned the existence of an environment that encourages or, at least, does not actively discourage collaboration as a factor shaping their research activities. The most typical of collaborations—between professor and student or between principal investigator and paid research assistant—are defined almost totally by reference to social norms. Depending on the local supply and demand, faculty will work with almost any student who walks in the door and students with any faculty who will take them. Only in the context of these role obligations do individual tastes in research topic or personal style come into play. In these situations, then, the relationship-level problem of making contact is obviated by a social system that requires particular people to make contact with particular others.

***Extrainstitutional Contact Mechanisms.*** Collaborations between investigators within the same institution (or who were within the same institution when the collaboration started) were, by far, the most common in our research. But we did find instances of collaborative relationships that were initiated outside an institutional framework. In a number of cases, including our own, people began to work together after an initial conversation at a professional meeting.

We observed two different patterns in the development of relationships after an initial meeting at a conference. In some cases, individuals with only remotely overlapping research interests met and liked each other at a conference and then later found a way to work together. In one of these instances, a now very close and productive collaborative relationship turned into a work relationship only after meetings at three successive annual conferences. In other cases, one party sought out the other because a conference presentation or published work was of particular interest. In these situations, the issue of intellectual compatibility was already resolved—at least at a superficial level—and, in our interviews, people seemed to assume that interpersonal compatibility would follow. It is worth noting, however, that even in these cases where seeming strangers came together, contact at meetings was preceded by contact with the potential collaborator's reputation. Research communities are small and provide many opportunities for individuals to know about each other without ever having met. The existence of a

research community is a surrogate for physical proximity, and professional meetings provide the intellectual and social benefits of proximity to colleagues, if only on a short-term basis. Thus, even when researchers do not share an institutional home, social structures—in this case, professional organizations—play an important role in bringing them together.

### Moving Toward Commitment

The initial contact between potential collaborators sets the stage for conversations or long-distance interactions that lead to a commitment to work together on a specific project. We identified two dominant routes through which potential collaborators moved from mere acquaintance to commitment. In some collaborations, informal contact evolved into commitment, similar to the way in which informal contact often evolves into friendship. Here collaborators could not identify a precise time when informal discussion turned into collaboration. For other collaborators, however, the process was more analogous to courtship and marriage, in which one partner proposed collaboration to the other. The proposal was accepted or rejected on the basis of explicit evaluations of mutual interests and feasibility. In addition, we found a few cases of “arranged marriages,” in which a high-status person ordained that two people he or she was responsible for should work together.

As might be expected, the nature of the commitment process varied with distance. The gradual, informal contact-to-commitment evolution was by far the more frequent and occurred in situations in which individuals had the opportunity for frequent interaction, and the more explicit, formal proposal-acceptance process occurred in situations in which both proposing and executing the collaborative work required structured, intentional communication.

### 2.2. Task Level

In the initiation stage, as elsewhere, relationships and tasks often blend, but the distinction between the two is useful to illuminate the complexity of the process through which researchers come together and begin to formulate a research project or program. The major goal at this point is to merge differing perspectives and interests into a framework that will provide the basis for a joint project.

The initial task-level activity in a collaborative relationship usually consists of multiple face-to-face discussions, occurring over the course of days, or, more typically, weeks or even months. These discussions are the most intensely interactive aspect of a collaborative project. The investigators we interviewed reported that they are also the most intellectually exciting and rewarding aspect of collaborative work. It is here that ideas are really joined.

In these talks, the collaborators moved from the general ideas that brought them together to a specific research question and the outline of a plan for executing the project.

The mechanics of these meetings are simple; they take place in faculty offices or conference rooms and, typically, the only technologies involved are paper, pencils, and blackboard. The participants, except for graduate students, do not prepare for these meetings in any formal sense. There is little reliance on prewritten documents or diagrams as a basis for the discussion; instead, the collaborators seem to value the opportunity for spontaneous, informal, and unstructured exchange of ideas. The participants talk, argue, interrupt, write equations, draw sketches, and modify both their own and their partners' work. Participants may take notes in order to have a record of important observations or issues that arise in the conversation or to remind themselves of things to do—articles to read, people to contact, purchases to make—but there is usually no explicit effort to make a formal record of the proceedings. Even though many researchers would have valued such a record, the onslaught of ideas and conversation in these meetings often prevented them from taking complete and accurate notes. Among peer collaborators, only one pair in our sample wrote a formal proposal or memorandum of understanding to each other to document and clarify the work they intended to do together. Such formal documents were more typical of graduate student research proposals to faculty. In listening to reports of these conversations, one has the sense of high energy levels and a high level of concentration on the serious, substantive intellectual questions involved.

Our analysis of these discussions revealed two methods for project development and planning. In the first, the research question and project plan grew directly out of the joint conversations. In these cases, individuals did not seem to be able to identify idea ownership. In the other, one partner presented his or her ideas for a project and the other partner served as a sounding board, presenting critiques, alternative approaches, and refinements, until they had come to an agreement about the questions they wanted to pursue and outlined an approach for their empirical work. This second pattern was more common for both peer and faculty-student collaborations. However, despite the fact that collaborators could frequently identify ownership of the initial idea, they also acknowledged that initial ideas usually underwent major transformations before work was done. Indeed, many interviewees seemed to feel the opportunity to do this kind of intellectual work with another person was the primary benefit of collaboration.

By this point, then, the collaborators have developed a specific research plan and some general ideas as to how to carry it out. All of this has been accomplished with little reliance on sophisticated technology of any sort, including the telephone. In order to preserve the value that researchers currently find in these intense face-to-face interactions, technology builders

must concentrate on supporting the highly interactive, real-time, spoken, non-text-oriented, multimedia work style we described earlier. Although visual nonverbal behavior (e.g., quizzical expressions or nodding to indicate agreement) no doubt plays a role in helping researchers understand each other at this point, these behaviors are probably not crucial and are redundant with parallel auditory nonverbal behavior (Krauss, Garlock, Bricker, & McMahon, 1977). Technology that allows researchers to talk and to pass and quickly modify brief handwritten documents would be more useful. Especially if individuals are already acquainted, it is less important to be able to see each other than to be able to work with and have records of sketches, equations, and other notes.

Although our research indicates that the initiation and planning of research occurs most frequently when individuals are physically close, we found a few cases in which collaborators maintained research activity after one member moved and face-to-face meetings became rare. In these instances, individuals had developed both a shared world view and a shorthand way of communicating that diminished the impact of distance on their ability to do the awkward, ill-defined idea generation and specification work that seems to be particularly difficult to do at a distance.

However, we should not conclude that a well-developed research relationship can be easily maintained at a distance. Indeed, one of our colleagues, a veteran of many collaborative projects, commented that after his research partner moved to a new institution they had not initiated any new projects despite their intentions to do so—intentions that were reaffirmed over drinks when they saw each other at annual conferences. His explanation for the gap between their intentions and their behavior was that “we never got to have the second conversation.” Thus, despite a long history of successful collaboration and intentions to continue to work together, these individuals seemed to be hampered by distance in their ability to formulate new plans and projects.

### 3. EXECUTION STAGE

Assuming that a pair of individuals has arrived at an agreement to work together and a general plan about work topic and agenda, they must then plan in detail and execute the actual tasks required to carry out and document their research. Some problems confronting collaborators were universal—achieving an equitable division of labor; dealing with intellectual and other disagreements; coordinating work; monitoring progress; and overcoming the derailing effects of personal problems, conflicting commitments, and procrastination—whereas other problems in collaborations were more domain-specific. Social psychologists rarely had to solve the algorithm problems that plagued computer scientists; computer scientists did not have to negotiate access to organizations as management scientists do. We do not discuss these

domain-specific problems in this article. Rather, we attempt to portray the issues involved in the execution of collaborative work at a more general level.

In carrying out their research plan, collaborators have two primary missions. First, they must accomplish the work they have set for themselves, overcoming both practical barriers and sloth as they proceed. Second, they must maintain an interpersonal relationship that is at least minimally cordial, often in the face of stressful circumstances. These goals are potentially in conflict, but collaborators are helped in trying to achieve them by the commitments developed earlier in the relationship. Our respondents reported that although their initial research plan might have foundered or required substantial reshaping, the idea of working together remained intact; the commitment to work on a particular project with a particular other made it possible for their collaboration to withstand disruptions, conflicts, and hurdles that would have been fatal in the earlier stage.

### **3.1. Task Level**

Here we reverse the order of the discussion of relationship and task-level issues. This is a reflection of a switch in what might be called the motive force for execution stage activity. In the initiation stage, tasks typically flowed from a personal relationship; in the execution stage, relationship-level issues seemed to arise from the task-level concerns that govern this production-oriented phase.

#### **Coordinating Activity and Sharing Information**

Whenever two or more people work together, they must share information and coordinate activities in ways that solo researchers need not do (cf. Galbraith, 1973). For collaborators, information-sharing means that some information that would have remained implicit throughout a solo research project must become explicit so that it can be communicated to a research partner. The requirement to make implicit knowledge explicit surfaces throughout the collaboration process. For example, collaborators must explicitly delineate their research direction and methodological approach, translate idiosyncratic shorthands, and summarize meetings with external contacts. This can be particularly difficult when people are involved in complex technical tasks such as programming and data analysis in which knowledge of what has been done, what has been learned, and what remains to be done exists at a preverbal level in the mind of one member of the collaborative pair.

In addition to sharing information, people who work together need to coordinate their activities. In general, this means they must mesh their work so that all of it gets done, that it is not done redundantly, and that components of the work are handed off in a timely manner without impeding another's progress on a different part of the project.

We had hypothesized that both information sharing and activity coordination would be among the major unresolved problems of collaborative research, but collaborators did not experience them as such. They identified some difficulties in cramming meetings and research activities into overloaded schedules, but in general they did not experience problems in the mechanics of sharing information or meshing activities. By drawing conclusions from a sample of small and relatively successful collaborations, however, we may have underestimated the importance of this set of problems.

***Reducing the Need for Information Sharing.*** The reason for this difference between our expectations and our findings was that collaborators developed work strategies that reduced the need for information sharing and activity coordination. We identified three mechanisms that collaborators used to minimize coordination problems: division of labor, encapsulation, and sequential processing.

By dividing tasks among themselves, collaborators turned many potentially joint tasks into individual ones. For example, in the modal collaboration in our sample—an empirical, social science research project—data collection, data analysis, and writing the first draft were each typically the responsibility of one member of the collaboration. In other collaborations, the division was at finer levels, for example, developing questionnaires, drawing figures, or handling contacts with administrative committees. Whatever the level of granularity, the division of labor had the consequence of allowing a single individual to handle all of the details of one phase in the research process so that information sharing and activity coordination needs were reduced. Although division of labor has many functions, simplification of the communication task among collaborators was an important one in our sample.

Collaborators used encapsulation in conjunction with division of labor to reduce needs for activity coordination and information sharing. Encapsulation means that the researcher who had primary responsibility for a piece of a project often presented his or her partner with a completed subunit, but generally did not communicate in detail the processes by which these subunits were produced. By keeping intervening processes private, collaborators reduced the need to turn inchoate material into a form that was comprehensible to another. For example, after planning an experiment, the collaborators generally did not meet to discuss it in detail until the responsible partner had collected some pretest data and then not again until all of the data had been collected and made ready for analysis. Encapsulation was a technique practiced more among peer collaborators than among unequal collaborators: Faculty often did not trust the competence of their student collaborators and demanded more active supervision.

Finally, during the execution and especially during the writing stages of research, collaborators used sequential processing to minimize the need for coordinating activity and sharing information. Sequential processing means

that a passive partner becomes activated only when he or she received a completed subunit from the then active partner. For example, one partner started data entry after the active partner handed off a set of completed questionnaires, and another started writing the first draft of a manuscript after the active partner handed off the results of the data analysis.

As a result of these three techniques—division of labor, encapsulation, and sequential processing—many collaborations can be characterized as threaded collections of jointly planned but individually executed products. The highly interactive and integrative aspects of the collaboration come primarily in the planning stages for both the project as a whole and for the documentation; the execution of these plans, however, tends to be done as the exclusive responsibility of one party or another.

**Annotation.** One way in which collaborators did share information was to annotate the products they passed to their collaborators, thus making explicit some information that they would have kept implicit if they had been working by themselves. In data analysis, for example, they would pencil in label definitions to annotate the brief variable labels common in some statistical software. But this static annotation was the exception rather than the rule. Instead, collaborators typically handed off products, passed information, and briefed their partners in person. Providing such information during face-to-face meetings takes much less forethought and effort than providing clear asynchronous textual annotations. In addition, feedback from the partner being briefed allowed the briefer to tailor the communication to the partner's concerns and confusions (Kraut, Lewis, & Swezey, 1982). In speech, communicators indicate mutual understanding through the use of back-channel responses—nods, eye movements, and “uh-hums.” They allow research collaborators to develop rich and meaningful, partner-specific abbreviations and shorthands, which would be incomprehensible to an outsider (Krauss & Weinheimer, 1966). The back-channel responses are peppered throughout ordinary speech many times a minute, but they seem to have no analog in current asynchronous electronic communication systems. Kiesler, Siegel, and McGuire (1984) reported that the absence of such feedback has a detrimental effect on electronically transmitted messages.

**Joint Supervision of the Project.** In peer collaborations one member occasionally adopted the role of project manager. More frequently, though, this leadership and project monitoring role was shared, if only to minimize status differentiations between the supposed peers. Their need to jointly supervise the progress of their research demonstrates an interesting conjunction of information sharing and activity coordination that deserves special attention.

Collaborators typically monitored the progress of a project by passing brief messages about project status during meetings with other primary purposes.

These meetings were of two sorts. First were scheduled meetings in which decisions were made and substantive work on the project was done. These meetings could either be event driven (e.g., when the first test results of a computer program came in or when stimulus materials for an experiment had to be selected) or they could be periodically scheduled (e.g., weekly group meetings). The second type of meeting was a brief hallway, mailroom, or lunchroom encounter. Both types of meeting provided collaborators an opportunity to alert their partners to deviations from normal progress about which the partner should be aware. The ritual dialogue

"How's it going?"

"Fine."

which seems to carry little information is a sign from one partner to another that the agreed upon division of labor is working satisfactorily and does not require active intervention on the part of the passive partner. The failure to provide status information in the face of easy opportunities to do so is often taken as evidence that all is proceeding smoothly.

More generally, low-cost communication and the opportunity for quick and easy access to a partner are crucial for collaborators' joint supervision of the project and each other's work. As a result, proximity plays an important role in project management. Many of the sticking points in conducting research are minor. They consist of questions like: Should I change the wording of a question in a questionnaire? At what points should we break the program into modules? While working alone, one would simply make a decision. When working with a collaborator, researchers often want to share the decision, if only to preserve the balance of control they and their partner share in the project. Distance raises the personal costs of communication, so that short messages become uneconomical. As a result, distance cuts down on nags and feedback, both so crucial to accomplishing collaborative activities. One collaborator told us that her relationship with her partner deteriorated in part because personal commitments prevented them from having lunch together; as a result, they had difficulty solving the minor problems of their ongoing research, which were considered unworthy of a meeting or even a telephone call.

Computer mail can certainly supplement the face-to-face message passing now used by collaborators, although it runs the danger of appearing to be unwarranted nagging if it is frequently used for the sole purpose of requesting status reports. In computers with shared workspaces for the collaboration, each collaborator should be able to directly view the other's files to check on progress; how this procedure will affect issues of privacy and trust remains to be seen.

In our study, we found that collaborators rarely used even shades of formal project management techniques. Only one respondent reported estimating how long tasks should take and then intervening when the actual time to accomplish the work took substantially longer than the scheduled time. This

reluctance suggests that collaborators are unlikely to use formal project management techniques, including software, even though avoidable or unexplainable delays were a major problem in a minority of collaborative projects and researchers frequently complained that collaborative research took longer than solo research. Furthermore, in peer collaborations, the use of such techniques runs the risk of generating unequal leadership roles and a sense of distrust among partners that may damage the collaborative relationship.

### **Sustaining Progress**

In executing their work, collaborators are confronted with many of the same problems that confront solo researchers. Both collaborators and solo researchers have similar impediments to progress from competing commitments, recalcitrant research topics, and logistical difficulties and use many of the same mechanisms for solving these problems. However, collaborators have additional mechanisms for sustaining progress that are unavailable to solo researchers.

For example, like solo researchers, collaborators motivate themselves by setting deadlines with external consequences (e.g., by promising to give talks at conferences before the work is actually completed). But in addition, collaborators set internal deadlines as well, in the form of promises to their partners or of preparations for a regularly scheduled meeting. This is one of the many ways that collaborators act as external consciences for each other: The guilt and embarrassment from disappointing a partner's expectations drives the work. Frequent hallway meetings between collaborators give the conscience its sting.

In addition to being an external conscience, collaborators also served the roles of cheerleader and social support agent. Collaborators reported that when things were not going well, they used each other as "shoulders to cry on" and, in general, helped convince each other that the project was worthwhile and would turn out well. A supportive partner who believed in the value of the project was especially important in the face of rejections from journal reviewers and other peers (see Festinger, Schachter, & Reicken, 1956, and Sherif, 1935, for more general demonstrations of the power of social support in sustaining a view of reality in the face of opposing evidence).

### **3.2. Relationship Level**

#### **Equitable Division of Labor**

The major potential strain on a collaborative relationship during the execution of the work was an imbalance between collaborators in both the amount of work they are doing and the credit they claimed. Among peers, at least, collaborators go to great lengths to ensure that they and their partners

do comparable amounts of work. In one collaboration, for example, when one partner supervised data collection, the second felt compelled to supervise the data entry, merely to even the score. Sometimes, recognition of the need to divide labor (and credit) leads the collaborators to initiate more than one project simultaneously, in order to ensure that both bear an equal share of the burden of routine work and both will have an equal opportunity to be recognized as project leader. Because many collaborations extend over multiple projects, the time span for achieving equity in contributions can be similarly extended. Peer research collaborations, however, disintegrate, if over the long term one member feels that another is not doing his or her part or is getting more than his or her share of the rewards. One of our interviewees told us he now takes pains to avoid having his former collaborator find out about his current activities because, in the past, the collaborator frequently "weaseled" his way into a research project, made only minor contributions, and then insisted on sharing authorship.

Achieving an equitable division of labor generally does not appear to be a goal for faculty-student collaborations. When faculty members collaborate with their students, both individuals typically assume that the student will be responsible for carrying out the work of the project under the supervision of the faculty member. However, students are often resentful of the credit faculty members receive for their minimal contributions.

Individuals use a variety of principles to divide responsibility for carrying out specific tasks. For instance, relative status, the possession of a necessary skill or available time, access to resources such as research facilities or participants, and simple preferences for particular tasks were all used as criteria for deciding who would do what. Division of labor between faculty and students was strongly governed by institutional norms. Students were invariably responsible for data collection and analysis and writing code. In collaborations involving advanced graduate students, faculty often acted as advisors; with less experienced graduate students they were more actively involved in planning and writing.

In addition to variations in the principles used to divide work, our respondents also varied in the extent to which they held explicit discussions of dividing their labor. In established relationships and those that evolved out of an extended series of informal contacts, the division of labor seemed to just happen, perhaps because of some implicit, shared knowledge about preferences or talents. With new and with the relatively formal collaborations that were initiated at a distance, the collaborators were careful to discuss both who will do what and the rationale for particular task assignments.

### **Establishing Trust**

Throughout a collaboration, partners act individually in ways that have the potential to influence the outcome of their joint work and each other's good

name. Consequently, they must rely on the good sense and noble motives of their partners. This reliance requires affirmative answers to questions such as: Will my partner give this project as much attention as I have? Should I trust the data analysis or the writing of a difficult section to my partner? Will he or she acknowledge my contribution when talking about our work? Our sense is that being able to trust a collaborator in these and other ways is a crucial determinant of both the productivity and longevity of the relationship, but we have very little specific information as to how collaborators assess or monitor trustworthiness.

We suspect that, like so many aspects of a collaborative relationship, research partners are helped in this respect by proximity and that proximity is especially important early in the relationship. Being close at hand provides the opportunity to observe how one's partner spends time and whether he or she does, in fact, acknowledge one's contributions in informal discussions. As in any relationship, trust between collaborators grows out of experience. Over time, collaborators who observe that their partners carry out their work promptly and accurately and do not trample on each other's interests or reputation will come to trust each other, and the need for continued monitoring will decline.

#### **4. PUBLIC PRESENTATION**

As we have seen, collaboration has the potential for improving both the quality of a research product and the process by which it is made. In addition, collaboration on average increases the extrinsic rewards of research. In the most straightforward way, joint projects increase the visibility of the collaborators, associating each of them with more projects than they could accomplish independently and often increasing audiences for each project. Increases in audience are particularly likely if the collaborators are affiliated with different institutions or if they identify themselves with different fields and professional communities.

Successful research collaboration culminates in the documentation and publication of the work effort, but publication is only one of many avenues for public presentation of work. Throughout the entire course of a research project many occasions arise for both formal and informal public discussion of the work. The occasional hallway encounter with one's department head, the casual lunchtime conversation with colleagues, and the semiformal presentations at seminars and progress review meetings all provide opportunities to publicize one's professional activities.

Much of what goes on during this phase recapitulates the earlier stages of the collaborative process. Collaborators must plan their work, divide the labor, and do the work. Although the problems are similar, some solutions are

different during this stage and we concentrate on these differences. In addition, because the written record leaves little room for the ambiguity that can help gloss over differences during working discussions, during the public presentation stage final disagreements must be resolved and individual ideas and perceptions must converge to a common perspective. Finally, the public presentation stage is the time when researchers must allocate rewards and credit for their joint product to individual researchers.

#### **4.1. Relationship Level**

##### **Equitable Division of Credit**

When a research project goes public, collaborators must decide how to divide credit for the work between themselves, and they must also figure out how to control outsiders' perceptions of each collaborator's relative contributions. These dilemmas are starkly highlighted in the collaborators' decision about the ordering of authorship, but also show up in decisions about who should give formal and informal presentations of the work, and how casual discussion about the work should be handled. Outsiders' views about each collaborator's contributions to a project are shaped by the nature of these public presentations. First authorship or public presentation of jointly executed work often leads the audience to view the highlighted member as the principal contributor. Thus, the desire to publicize work as widely as possible in one's own professional circles must be carefully balanced with the distribution of credit to one's collaborator. Particularly where there is significant overlap between collaborators' professional communities, managing this balance is an important requirement for sustaining a long-term collaborative research relationship.

In computer science, professional norms make authorship strictly alphabetical. In psychology and management science, professional norms make ordering of authorship reflect ordering of contributions. Within this general framework, collaborators that we interviewed used a variety of rules to determine order of authorship. Ownership of the original ideas seemed to be the strongest determinant, as long as the initial ideas had not been modified too extensively by the second member of the team. No other kind of work is valued as highly as the intellectual work involved in the initial formulation of the research plan. The ability to formulate interesting research questions and translate them into research plans is the sine qua non of being a scientist; those who contribute to the execution of a project in this way are generally seen as project leaders, the most important members of the team, despite the fact that they may be totally reliant on others to carry out the plan. Thus, even in cases in which the second member had played a major role in actually carrying out the research plan, the generator of the original ideas became the first author.

One important exception to this rule is in cases of faculty-student collaborations surrounding dissertation topics, in which institutional norms dictated that the student should get first authorship.

Many of our interviewees stated that first authorship belonged to the writer of the first draft, but in cases in which ownership of the seed ideas was clear, this writing task was taken on by the original owner. Thus, idea ownership often determined who would write the first draft and, in turn, who would be first author.

In cases in which initial ownership is less clear, credit is allotted according to the perceived amount of work done by each member of the collaboration. Interestingly, however, the relative amounts of work are not measured using a straightforward metric such as time spent executing it. Almost invariably, intellectual work was judged as more valuable than work the collaborators thought was menial (e.g., running experiment participants), clerical (e.g., keypunching data), or routine (e.g., coding software), regardless of the time and effort needed to do these tasks. Need occasionally played a role in authorship decisions. A collaborator on the job market or up for tenure was more likely to get first authorship. Very senior faculty were sometimes magnanimous in assigning authorship.

In formal and informal oral presentation, it was common for collaborators to use an alternation rule in deciding who should give the presentations. Less commonly, collaborators divided presentations by topic or section, although this made the logistics of the presentation difficult.

Although a shared view of who principally owns or leads the project must at least begin to be achieved in the handling of formal and informal oral presentations, many collaborators do not explicitly discuss order of authorship for the written document until they are ready to begin the actual task of writing. In many cases both collaborators have independently arrived at the same conclusion about deserved order, but they often still feel a need to discuss the issue openly at some point. In one case in which explicit discussion had never taken place, one of our respondents felt insulted to see her name appear second on the first draft written by her colleague, even though in fact she had always assumed second authorship for herself.

Although authorship and credit allocation are highlighted at the stage of public presentation, they are latent issues throughout the collaborative process and inform decisions throughout, from the initial decision of whom to collaborate with to decisions about how to divide the labor. For example, some junior faculty members noted that, although some of their research is collaborative, they felt pressure to produce articles on their own in order to demonstrate their competence as independent researchers to tenure committees. For much the same kind of public relations reason, they also expressed reluctance to become involved with senior faculty unless they could clearly demonstrate their independent contribution and leadership role in the project.

## 4.2. Task Level

### Planning

Like the collaboration process as a whole, writing is typically planned over highly interactive, face-to-face meetings during which the collaborative pair makes extensive use of multiple media such as blackboards, data printouts, graphs, and sketches to supplement their discussion. Document planning meetings accomplish at least two goals. First, the collaborators begin to achieve a common understanding of what should be said and how. A few of our interviewees in fact reported having to resolve divergences of views that had developed during the low-communication project execution stage. Second, they come to an agreement as to how the writing tasks are to be divided between the two of them. As in the early meetings, the outcome is a jointly developed plan for tasks that will be executed individually.

This jointly developed plan is frequently made explicit in the form of a written outline for the document, which, unlike other written records produced during earlier meetings, can constitute a binding agreement between the two members of the collaborative team. Surprisingly, though, given their importance, these outlines were very sketchy, rarely longer than a handwritten page.

### Writing

The division of the writing tasks minimized the need to share and coordinate information, much the same way that division of tasks did in earlier stages. In the modal case, one member of the collaboration assumed responsibility for writing a first draft, and the second collaborator took on the role of editor and reviewer. Subdividing the writing task by document section was not common in our sample, particularly among collaborators of equal status. Working together in the same place to produce an article was extremely rare.

As we noted earlier, physical proximity between collaborators plays important though distinct roles in the initiation and execution stages. In contrast, proximity is not as important a factor during the document writing period. Distance can add considerable delay in exchanging document drafts. However, by this time, distance is much less of an impediment at the relationship level because the need for direct, frequent communication during the documentation stage is limited. Documentation tasks are, for the most part, very compartmentalized, with each collaborator having very specific individual responsibilities. Thus, although researchers find it difficult to initiate and execute collaborative projects at a distance, they usually succeed in writing an article at a distance. Only in cases in which geographic separation had occurred prior to planning the document did collaborators fail to produce a final document.

Before conducting our interviews we hypothesized that the difficulty of accepting criticism from collaborators would emerge most strongly in the documentation stage, in which changes to one's work are unambiguous. To our surprise, few of our respondents considered this a problem. In general, collaborators felt free to make changes to each other's work without needing to justify or explain them, and, in turn, they accepted most changes to their work without question. In fact, more than one research pair adopted a "Don't tell me about it; change it" rule. Similarly, in cases in which equipment incompatibilities made it difficult for collaborators to rework the writing themselves, they often fell naturally into editor-clerk roles, in which the "editor" rewrote and the "clerk" simply entered the changes into the word processor.

For many researchers a major attraction of working with another is that the collaborator will be involved enough to read the work carefully and help to improve the writing. Although one can sometimes get feedback from a colleague prior to submitting a manuscript, the critical scrutiny and effort necessary to point out subtle flaws in arguments or clearer ways of stating an argument is not likely to come from a casual reader. We encountered agreement among our interviewees about this point in many different ways. One researcher to whom we spoke thought highly enough about this function that he routinely granted second authorship on his papers to anyone who offered him significant comments, regardless of whether they had any other connection with the research. In another case, a collaboration is thriving between two scientists whose primary language is not English largely because they carefully corrected each other's grammar and style.

### **Technology for Multiauthor Documents**

Almost all of the articles produced by the collaborators in our sample were written using computers or word processors, which made revision easy and encouraged collaborators to pass work back and forth and to make changes or additions. The combination of interlocation computer networks, electronic mail, and word processing could make the process of long-distance editing and revising much more efficient and less expensive than shipping paper manuscripts back and forth, and for some could even be an improvement over face-to-face meetings. However, in 1984 and 1985, when many of the manuscripts in this sample were written, collaborators rarely passed manuscripts back and forth in electronic form; instead, they passed paper copies. This reliance on paper occurred in part because collaborators rarely had compatible hardware or software. But even when transferring electronic files was technologically feasible (i.e., compatible hardware and software or interlocation networks), researchers still often passed paper. The use of paper copies minimized the need for collaborators to keep track of multiple versions of a manuscript and made it very easy to detect changes, as they were usually

in the margins or the backs of the pages. Few word-processing systems provide mechanisms to track or compare versions or to allow annotations analogous to penciling in the margins. Some collaborators overcame this limitation by writing notes to each other within the manuscript they were working on. They expressed uncertainties about what they had written, asked for evaluations of particular points, and explained changes that they had made from previous versions. These comments and questions were a useful means of drawing attention to problematic parts of a manuscript or of discussing the rationale for specific decisions, but they often created discontinuities in the flow of the text. Furthermore, they interfered with some of the housekeeping aspects of document writing, such as monitoring length or previewing its final appearance.

## 5. CONCLUSIONS

The dominant conclusion that emerges from our research is that the establishment and maintenance of a personal relationship is the glue that holds together the pieces of a collaborative research effort. Often, it is at least as important as the content of the work itself. When collaborators describe collaborations as problematic, they inevitably point to problems in the personal relationships: untrustworthy or irresponsible colleagues who do not do their part, who assume too much control, or who seize too much credit for the work they have done. They sometimes point to difficulties in the intellectual tasks (e.g., improving on an algorithm or describing a theoretical approach in a way that satisfies reviewers). But rarely do they point to difficulties in the process by which the collaborative work gets done. Instead, they generally have institutional arrangements and work techniques—technologies in the broadest sense—that solve potential problems in the work process before they arise.

The challenge we see for information technology developers is to create tools that not only facilitate task completion but also support productive personal relationships. By contrast, the main technologies that have been developed so far to support group work focus primarily on task completion, and we believe have been largely unsuccessful precisely because of this.

To take but one example, consider the use of teleconferencing to support group work. Marketing strategies for teleconferencing systems and services typically have focused on the electronic replacement of face-to-face meetings to reduce travel time and cost. But this replacement is sold without regard to the consequences of reducing opportunities for personal contact. For research collaboration in particular, in which frequent personal contact is a major facilitator of the process, care must be taken to prevent the damage to personal relationships that may result from reducing opportunities for communication and spontaneity. A wiser approach may be to provide communication

technologies that will supplement or enhance, rather than replace, existing communication modes.

A second major conclusion of our research is that no single technology for supporting collaboration will adequately satisfy researchers' needs throughout the collaborative process. Although we started our research with the aim of investigating how particular intellectual products (i.e., publications in scholarly journals) were created, we were immediately pushed into investigating the collaborative relationship, which often had a life of multiple products and many years. The extended time course of research collaboration and the diversity of goals and tasks that characterize each phase of the process call for a varied collection of collaborative work tools to choose from. For example, the techniques and technologies one might use to introduce potential collaborators to each other are certainly not what would be useful to coordinate the writing and revision by collaborators who have worked with each other in previous projects.

A related point is that a single technique currently used during various stages of the collaborative process may serve different functions at each stage. As a result, these techniques may have multiple technological translations. Consider, for example, the role that proximity plays in research collaborations and the ways one might devise technological solutions to allow collaborations to occur at a distance. During the initiation stage, proximity provides low-cost communication that allows potential collaborators to form impressions of each other and feel each other out before committing to work together. Computer conferencing with facilities for private side conversations might be a possible technological substitute. So, too, might be a continuous video link between the lunchrooms of two compatible research institutions. But during the planning stages of execution and of documentation, proximity supports intense, unstructured, multimedia meetings for completing highly interactive intellectual work. The slow speed of computer conferences and electronic mail and the relative formality of writing would not serve these ends. Instead, audio or video conferences that allowed participants to pass documents and scribbled notes and figures back and forth, to modify these materials interactively, and to retain paper copies of their work would be a useful tool. Next, during the rest of the execution stage, proximity is used to supervise and sustain progress by providing the low-cost communications to chronicle what has been done, to alert partners to minor problems, and to enforce guilt. Some of this work could be done automatically by the electronic monitoring of shared files and other parts can be done using a regimen of computer-assisted project management techniques. But more generally and throughout the collaborative process, proximity supports the maintenance of a warm personal friendship among the collaborators that aids them through the travails of working together, and it is possible that no electronic aids will substitute for its role in this domain.

When considering technologies that could support collaborations, one must consider at least three classes of tools: (a) those that collaborators use to accomplish the many individually performed activities in the collaboration, (b) technologies and protocols that would allow them to integrate these individually accomplished products, and (c) communication technologies that allow them to be in touch and work jointly as easily as if their offices were next door to each other.

We can illustrate this point by describing ways to improve the documentation phase of a research collaboration. As we reported, most researchers use computers or word processors for their writing. Many of the irritating problems with these programs remain, in part, because word-processing systems are designed to produce polished final copy, but not to support the process of writing itself, much less collaborative writing. For instance, few word-processing systems provide mechanisms to track or compare versions or to allow side annotations analogous to penciling in the margins of a manuscript. Word processors with built-in version control and annotation would aid many writers, among them collaborative writers for whom the difficulties of annotating and comparing versions are great. Although most collaborators in our study found word processors easier to use than typewriters for making revisions and incorporating another's comments, many of them had difficulties with the incompatibilities among programs and computing environments. Along with the reasons of control discussed earlier, this incompatibility was one reason why a single partner in the collaboration typically controlled the manuscript and incorporated the other's handwritten annotations and changes into an electronic version of the text. Common protocols for word-processing programs or translation programs that would convert text between them without losing structure and formatting information would be a highly valuable addition to the tools for collaborative work. Finally, we discussed the need for an array of communications facilities that would allow collaborators to intensively discuss material during the planning section; to view, talk about, and modify sections of a manuscript; and to monitor and help sustain each other's progress on a manuscript.

The conclusions we have presented here, although based on careful examination of a moderate number of research collaborations, should be considered tentative and possibly of restricted generality for a number of reasons. First, they are based on a sample of voluntary two-person scholarly research collaborations, with all of the limitations that this implies. These collaborations were typical of traditional science as described by Hagstrom (1964). The scientists had relative freedom to choose their research partners and topics, had long and flexible deadlines for their work, and were rewarded intangibly through reputation and esteem. Whether our conclusions about the dominance of relationship issues would hold for collaborations with shorter deadlines among people assigned to their topics and partners is an open

question. In addition, we suspect that the task of coordinating activity would become substantially more difficult if more than two parties were involved. Second, our sample is biased toward successful collaborations and collaborators. The primary sample discussed published research articles, although a supplementary sample was asked to describe problematic collaborations. Third, we examined the relationships between the principal research scientists in these collaborations. We did not, however, extend our focus to the numerous supporting roles, ranging from secretaries and research assistants to department heads and grant officers, whose work contributes to the successful completion of a research project. Finally, the methodology we used—retrospective interviewing—is not the optimal way to learn about how people perform tasks that seem to them routine. Interviewees often cannot describe how they made decisions, how they assigned responsibilities, how they knew what a partner was doing, or how often they met because these issues were forgotten, out of their awareness, or uninteresting to them. Systematic observation or experimental methodology may be a more appropriate methodology for capturing this type of detail, although these techniques place different constraints on the unit of work that can be analyzed.

Despite these caveats, our research has sketched a framework for describing collaborations that can provide some guidance to those developing technology to support collaborative work. We have stressed the importance of the communication and the social-psychological component of research collaboration and have suggested some shortcomings of current technology designed to support collaborations. Our most important advice to those who develop technology for collaborative work is that the technology needs to support people and their relationships as well as the tasks that they perform.

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# **THE PROVISION OF EFFORT IN SELF-DESIGNING WORK GROUPS**

## **The Case of Collaborative Research**

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*Teams of academic coauthors can be conceptualized as self-designing work groups, an infrequently studied but increasingly prevalent group structure. This research note considers issues surrounding how management scholars form collaborative teams, provide effort toward completion of research projects, evaluate colleagues' efforts, and decide whether to pursue further collaborative opportunities with them. The findings indicate that withholding effort occurs in self-designing groups, such as research collaborations, and that the emotional bonds that group members form with colleagues play a key role in whether they decide to work together again, as well as in how they react to perceptions that a coauthor withheld effort.*

**A review of the literature** on work groups in organizations reveals a paucity of research focused on what Hackman (1987) termed *self-designing work groups*. Such groups cooperatively determine their membership, manage their own activities, perform their own tasks, and develop their own norms to guide decision making. Examples of such groups provided by Hackman include top management

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*AUTHORS' NOTE: Author order is alphabetical. Both authors contributed equally to the completion of the article. An earlier version of this article was presented at the 1998 meeting of the Eastern Academy of Management.*

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groups, boards of directors, and mature autonomous work teams. It is particularly important to conduct research on various types of self-designing work groups because team structures are used in almost half of all organizations and the use of ongoing project teams is becoming more frequent (Devine, Clayton, Philips, Dunford, & Melner, 1999). To this point, research on self-designing work groups has generally focused on top management teams and has explored issues such as conflict (e.g., Amason, 1996) and heterogeneity (e.g., Hambrick, Cho, & Chen, 1996).

Clearly, many important questions about self-designing work groups have yet to be addressed. One notable issue concerns factors that influence group members' decisions about their provision of effort toward accomplishment of group goals. Although this question has been the focus of research in other types of groups (e.g., George, 1995; Miles & Greenberg, 1993; Wagner, 1995), unique characteristics of self-designing groups suggest that extant research may not generalize. The purpose of this article is to explicitly focus on those factors associated with the provision of effort in self-designing work groups. We do so by examining groups of management scholars whose interdependent task is the production of an academic manuscript. Readers familiar with such groups will see that they cooperatively determine membership and manage their own activities.

Among academicians, it is understood that publishing in high-caliber, peer-reviewed journals is critically important. Academic departments benefit from enhanced reputations when their faculty members publish in respected outlets (Stahl, Leap, & Wei, 1988), and publishing has personal importance because it is the basis for many personal and professional rewards (Cole & Cole, 1967; Gomez-Mejia & Balkin, 1992; Park & Gordon, 1996). To accomplish publishing goals, scholars often design and participate in cooperative groups. The long-observed and well-documented trend toward collaborative publication (Broad, 1981; Floyd, Schroeder, & Finn, 1994; Over, 1982; "Really big science," 1995), as well as the central role that publication records play in personnel decision making within the university (e.g., Gomez-Mejia & Balkin, 1992), suggests that this performance context is worthy of

attention. Through enhancing our understanding of the process, we gain knowledge of how those who participate in such groups form them, work toward achieving their goals, and evaluate the contributions of fellow team members.

### **PROVIDING EFFORT IN INTERDEPENDENT TASKS**

Kidwell and Bennett (1993) presented a model, based on Knoke (1990), which suggests that individuals working in groups may or may not provide full effort for three general reasons: as a rational choice, in conformance to group norms, or to express affective bonding with coworkers. These three reasons are detailed below and then applied to this study.

#### **RATIONAL CHOICE**

The rational choice perspective holds that individuals in work groups decide whether to provide effort based on cost-benefit calculations. The economics literature argues that employees have an increased tendency to supply less effort (i.e., shirk) (Leibowitz & Tollison, 1980) when they can opportunistically take advantage of monitoring difficulties (Alchian & Demsetz, 1972). For example, as group size increases, the contribution of individual members tends to decrease because they believe they can hide in the crowd (e.g., Latanè, Williams, & Harkins, 1979). In addition, in unstructured or ambiguous tasks that require greater interdependence to complete, there may be a tendency for effort to be withheld by individuals in work groups because monitoring of effort becomes more difficult as task performance becomes less discrete (Jones, 1984).

When rational choice is considered in the context of a jointly authored academic article, coauthors may attempt to calculate maximum personal utility, providing the minimum effort that would get the paper published. Or, coauthors may determine that they should provide as much effort as possible because the benefits (promotion and tenure, enhanced reputation) outweigh such costs

as compensatory activity for a colleague's perceived lack of effort (cf. Williams & Karau, 1991). Selection of coauthors during design might be part of a cost-benefit analysis for those who consciously attempt to withhold effort or shift responsibilities to others. Nontenured faculty who need publications to be promoted might seek a self-designing group that includes other faculty as coauthor experts who will carry more of the load as well as assist them in networking activities. Senior faculty may team with junior faculty who can be relied on to provide high effort to solidify their positions in the field through publications, or to otherwise ingratiate themselves. Faculty of all ranks might identify promising Ph.D. students who would provide large amounts of effort on a project. Coauthors may seek to increase the number of collaborators, which would lessen visibility of their own efforts; this strategy contains risks in that too many free riders could sink the entire project. Whereas there are clearly a number of factors that likely influence rational choice motives in regard to self-designing work groups, a starting point for our consideration lies in the following prediction:

*Hypothesis 1:* As size of the self-designing group increases, withholding effort by individual members tends to increase.

#### NORMATIVE CONFORMITY

The normative conformity perspective suggests that individuals make choices about withholding effort based on conforming to principles of acceptable behavior. For example, Akerlof (1982, 1984) proposed that norms defining a fair day's work play a major role in the effort workers are willing to provide. The self-interest of the rational choice perspective is tempered by the idea of a 'norm of fair dealing' (Stroebe & Frey, 1982, p. 127) to which individuals comply as a matter of reciprocity toward others. Compliance norms (Heckathorn, 1990) develop within the work group, and these important values take on significance as a "social contract" that may rival rational calculation of costs and benefits. Another normative effect on withholding effort may occur when individuals believe that coworkers will withhold effort and allow them to

shoulder most of the work (Jackson & Harkins, 1985; Schnake, 1991). Instead of compensating for the lower effort levels of coworkers, these individuals reduce their own efforts to avoid being played for suckers.

There are a variety of ways that normative conformity could play a role in a collaborator's decision to withhold effort on a joint publication. For example, it is a norm within many disciplines that the order of authorship reflects contribution to the manuscript. Thus, we would expect that lower positioned authors provide less effort, relative to higher positioned authors (Floyd et al., 1994). In addition, norms of reciprocity might indicate that on a previous collaboration, Author A did the bulk of the work and Author B withheld effort; on a current collaboration, Author B is expected to shoulder a greater burden of work. In all, the normative conformity perspective suggests the following:

*Hypothesis 2:* Members of self-designing research groups are expected to conform to prevailing norms by contributing greater effort levels based on author order.

#### AFFECTIVE BONDING

Finally, the affective bonding perspective suggests that individuals provide or withhold effort based on their emotional attachments to others. These attachments occur as part of the individual's identification with other members and with the group. "The resulting sense of 'oneness' between person and group strengthens the member's motives for contributing personal resources to the organization" (Knoke, 1990, p. 42). How much cooperation occurs within a group may be determined by whether the group members plan to work together in the future or already know they will work together again (Axelrod, 1984; Spicer, 1985).

Tying affective bonding to academic collaboration and withholding effort would involve considering personal relationships among coauthors (Floyd et al., 1994). How well coauthors regard each other, whether they identify with coauthors due to demographic similarity, whether personal relationships are important

among them, and whether they believe they will work together again might be expected to affect how much effort is provided or withheld within the conceptual framework of affective bonding. The affective bonding perspective suggests the following hypothesis:

*Hypothesis 3:* The greater degree that members of the self-designing group like each other, the less likely the members are to withhold effort.

## METHOD

### SAMPLE

We mailed questionnaires to authors who had published a paper with at least one and as many as four other individuals during 1993, 1994, or 1995 in the *Academy of Management Journal* or the *Academy of Management Review*. We did not include any paper with six or more authors because there were so few such articles in the time span considered. This raised concerns that it might not be possible to guarantee anonymity to these respondents. Each questionnaire was coded so that coauthors' responses could be matched with one another; no key was kept to tie any code number to an article. Further, we were blind to this coding process; there was no way for us to link any author or article to a returned questionnaire. The focus of the questionnaire was on the collaborative effort involved in producing the article; individuals who published more than one article in those journals during that time period received a questionnaire for each article.

Questionnaires were mailed to 418 coauthors of 197 articles. Of the 418 questionnaires mailed out, we received 241 useable individual responses, an overall response rate of 57.7%. Although we received at least one response for 76.7% of the published articles, our analysis considered only those articles where at least two coauthors responded. The final sample size was 165. Within that group, 40% of the respondents were women. At the outset of the focal col-

laboration, 22% were Ph.D. students, 33% assistant professors, 22% associate professors, and 23% full professors. Forty-three percent of the respondents were first author on the collaboration, 38% second author, 17% third author, and 2% fourth author.

#### MEASURES

A number of measures were included that allowed coauthors to evaluate one another on various aspects of the collaboration. First, to tap the social contract that existed among the coauthors, respondents were asked to imagine that 100 points represented the amount of effort necessary to bring the project to fruition. Then, respondents allocated the 100 points across the coauthors to reflect the contribution each was expected to make at the outset of the collaboration. Respondents then were asked to recall the actual contribution of each coauthor to the project. We computed an effort variable where actual contribution was subtracted from the intended contribution: A positive value indicates the author provided less than intended, a negative score indicates the author provided more than intended. Deviations from a score of 0 (zero) reflect a deviation from the social contract. The score on this variable assigned to each author is the average of their coauthor's responses. For example, on a paper with three authors, A, B, and C, author A received the mean of the perceptions of B and C with regard to his or her effort, and so on.

Second, respondents answered a series of questions concerning each coauthor. These questions were answered using a Likert-type scale and are coded such that a low score represents a high amount of the focal construct. Respondents completed a four-item measure of *coauthor liking* (adapted from Wayne & Ferris, 1990;  $\alpha = .91$ ). Sample items include "I would like to spend more time with this person" and "I regard this person as a good friend." In addition, two original measures were included. A five-item scale ( $\alpha = .93$ ) asked each respondent to make a *coauthor evaluation* of the quality of each coauthor's contribution to the paper. Items gauged the degree to which each author's contributions to the manuscript "were of high quality," "were completed in a timely fashion," and "met my

expectations in regard to quality." A seven-item scale ( $\alpha = .90$ ) assessed *coauthor satisfaction*. Sample items include "Working with this individual was a positive experience," "This person took advantage by withholding effort on this project" (reverse coded), and "I would not accept an opportunity to work with this person in the future" (reverse coded). Again, individuals were assigned values on these measures that were the mean of their coauthors' responses.

A number of variables were used to describe the context in which the collaboration occurred. Respondents were asked to indicate their *rank* at the outset of the collaboration. This measure is coded using five categories, where 1 indicates the respondent was a Ph.D. student and 5 indicates the respondent was a full professor. *Gender* is coded so that 1 represents women and 2 represents men. A three-category variable was used to indicate when the coauthors determined *author order* on the publication. A score of 1 indicates that the decision was made at the outset of the collaboration, 2 indicates the decision was made during the development of the manuscript, and 3 indicates the decision was made right before the submission of the manuscript, based on contribution. A three-category measure was used to tap *liking at outset* of the collaboration. Here, a low score indicates greater liking. Respondents were asked (a) whether or not they felt the focal paper was one of their *better publications*, (b) if they had a *previous collaboration* experience with any of these coauthors, and (c) if, at the outset of this project, they anticipated *future collaboration* with any of these coauthors. Each of these variables is coded (1, 2) such that 1 indicates an affirmative response.

Finally, respondents answered a series of items that were developed based on previously conducted interviews with management faculty that assessed (a) the degree to which each coauthor should be credited for various sorts of contributions to the manuscript (e.g., methodological competence, expertise in the topic area), and (b) how influential various factors were in deciding authorship order (e.g., alphabetical, writing of the first draft). Responses to these items were made using 5-point Likert-type scales. In the case

of the former measure, respondents were assigned the mean of the evaluations by their coauthors.

## RESULTS

At the outset, we posed three hypotheses to guide this study. Hypothesis 1, which predicted decreased effort levels as size of the group increased, was not supported, perhaps in part because members' effort levels in their self-designing groups were identifiable and specific. Hypothesis 2, which predicted greater effort levels on the part of the first author due to established norms, was supported. Hypothesis 3, which predicted that the degree of liking would lessen the likelihood of effort decrement, was not supported.

Despite modest support for the hypotheses, a number of other findings provide important insight into the operation of self-designing work groups. Respondents were asked to indicate on a 5-point scale how influential eight possible decision rules for determining authorship order had been in their collaboration. The two criteria receiving the strongest responses were "writing the first draft" ( $M = 1.82$ ,  $SD = 1.27$ ) and "effort given to the project" ( $M = 1.93$ ,  $SD = 1.18$ ). Factors such as "contributing a data set" ( $M = 2.97$ ,  $SD = 1.63$ ) and "methodological competence" ( $M = 3.39$ ,  $SD = 1.45$ ) were of moderate importance, and others such as alphabetical order ( $M = 4.34$ ,  $SD = 1.12$ ) were evaluated as unimportant. It is somewhat interesting to note that effort given to the project was so highly regarded as a means for determining authorship when 50% of the respondents also indicated that author order was decided *before* the collaboration began; only 14% of the respondents indicated that author order was determined after the manuscript was completed.

Respondents were also asked to report the degree to which each author should receive credit for contributing (a) writing expertise, (b) topic expertise, and where relevant, (c) data collection, (d) a data set, (e) methodological expertise, and (f) statistical expertise. The results suggest that contributions of authors two, three, and

four do not differ significantly from one another. There were no remarkable differences for these authors across the various forms of contribution, but there were some differences noted in the contributions of the first author as compared to the others. Specifically, first authors were more often credited for data collection ( $t = 2.53$ ,  $p < .05$ ) and for being a "topic expert" ( $t = 2.07$ ,  $p < .05$ ) than were subsequent authors.

Table 1 contains the correlation matrix and descriptive statistics for the variables used in our multivariate analyses. A number of interesting relationships can be noted. First, the four coauthor evaluations that serve as dependent variables in subsequent analyses are moderately intercorrelated, with the exception of the relationship between the effort measure and the liking measure. Among the other variables, the correlations indicate that as the number of authors goes up, author evaluations of the paper's quality go down. There is a significant correlation between position in authorship and coauthor evaluations of effort; first authors received higher effort scores than subsequent authors. We followed this up with an ANOVA that indicates second authors were rated the lowest on this effort measure—they had, on average, the greatest shortfall between effort expected and effort actually provided ( $F_{2,154} = 10.17$ ,  $p < .001$ ). There are also moderate intercorrelations between previous collaborations with coauthors, liking of coauthors, and plans for future collaboration at the outset of the project.

In these data, gender was consistently correlated with lower evaluations by coauthors with women receiving lower evaluations than men, no matter the gender of the rater. More positive evaluations, even in the case of author liking, were made of authors who were more highly placed in terms of author order. Previous collaboration with some or all of the coauthors was associated with better liking of each coauthor at the conclusion of the project. Respondents who generally liked their coauthors at the outset of the project reported greater satisfaction with each coauthor at the conclusion of the project as well.

To further consider these intercorrelations, a series of multiple regression analyses were conducted. Based on the exploratory nature of this article, we selected variables for this analysis based

**TABLE 1: Descriptive Statistics for Variables Included in Multivariate Analyses**

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Coauthor liking	1.81	.81												
2. Coauthor evaluation	1.57	.80	.59											
3. Coauthor satisfaction	1.72	.78	.56	.71										
4. Effort	.26	7.71	.15	.37	.40									
5. Number of authors	2.63	.66	.32	.06	.03	.02								
6. Gender	1.60	.49	-.22	-.16	-.14	-.17	-.05							
7. Rank	.35	.48	.07	.06	-.07	.05	.11	-.09						
8. Author order	1.78	.79	.23	.18	.30	.26	.30	.05	-.12					
9. Better publication	1.11	.32	.15	.00	.05	-.02	.20	-.13	-.14	.11				
10. Previous collaboration	1.38	.49	.22	.07	.05	-.01	.04	-.08	.11	-.05	-.15			
11. Liking at outset	1.03	.18	.11	.07	.20	.08	.00	-.16	.09	.10	.06	.23		
12. Future collaboration	1.08	.27	.14	.03	.08	-.03	.12	-.01	-.01	.05	.06	.32	.23	

NOTE:  $N = 152$ . A correlation of .16 is significant with  $p < .05$ , of .21 with  $p < .01$ , and of .26 with  $p < .001$ .

**TABLE 2: Results of Multiple Regression Analyses**

	<i>Coauthor Liking</i> β	<i>Coauthor Evaluation</i> β	<i>Coauthor Satisfaction</i> β	<i>Effort</i> β
Number of authors	.25**			
Rank				
Position in authorship	.17*	.19*	.31***	.27***
Previous collaboration	.20**			
Liking at outset				
Better publication				
Gender	-.20**	-.17*	-.16*	-.19*
<i>R</i> <sup>2</sup>	.21	.06	.11	.10
<i>F</i>	9.51***	4.79***	9.50***	8.76***

NOTE: *N* = 150.\* *p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

on our expectations and the correlational results. Results of these analyses are reported in Table 2. The results are fairly consistent across the four dependent variables. Specifically, women and individuals who were lower in terms of author order received poorer evaluations from their coauthors. In addition, individuals who had not previously worked with a particular coauthor and authors on projects with greater numbers of authors were less well-liked by their group members. Because we were particularly surprised by the finding concerning women and their evaluations by coauthors, we repeated these analyses in two separate ways. First, we included as a control variable a measure of the proportion of authors who were women. Second, we conducted the analysis for only those instances where women were the evaluators. In each case, results of the regression analyses were the same. We then conducted a MANOVA to determine if the regression results would hold when intercorrelations between dependent measures were considered. The results suggest they do (Wilks'  $\Lambda = .89$ ,  $F_{4,138} = 3.97$ ,  $p < .01$ ).

Finally, we examined the correlations between respondent evaluations of each of their coauthors and their reports of whether or not they have worked with them since this collaboration. The only evaluation associated with whether or not the two collaborated again was liking; the correlations between liking and a consequent col-

laboration ranged from .28 to .59 across the up to four authors considered. There was no relationship between evaluations of the coauthors' contribution to the collaboration and having subsequently worked with them on a project.

## DISCUSSION

The results of this study provided only modest support for the hypotheses, but there were several interesting findings with regard to self-designing work groups in the context of academic collaboration that could provide guidance for future research into these types of groups. In particular, the results indicated that the norms and emotional bonds that form among members of these self-designing groups—in particular whether the members like each other—sufficiently mitigated adverse actions toward group members who withheld effort.

An important issue in this study was whether withholding effort can be attributed to rational choice, normative conformity, and affective bonding factors. Here, our goal was to apply a theoretical framework (Kidwell & Bennett, 1993; Knoke, 1990) to the process of self-designing groups. At the outset, we believed individuals might be motivated to withhold effort for rational reasons, in conformance to norms, and because they have strong bonds with others in the work group. In this study, the importance of affective bonding and the liking that coauthors had for each other emerged as paramount, particularly in how withholding effort is received when it occurs in a collaborative project, just not as we had predicted.

The results also underscored the importance of equity and reciprocity norms in joint academic efforts. About half of the respondents reported that they had negotiated an informal contract deciding authorship order before the project began. This result in combination with the finding that "effort given to the project" is an important determinant of authorship order indicates that contributions to the project were to be governed by normative expectations (i.e., first authors do more, as predicted in Hypothesis 2). Most individuals then were perceived to have provided strong effort toward

completion of the project. In addition, discrepancies occurred between expected effort negotiated when the group was formed and the evaluation of effort actually provided during the project. Generally, first authors contributed more effort than expected, whereas second—and to a lesser extent, third—authors provided less than expected effort.

When effort given was less than expected, it did not seem as critical in these cases from a post hoc perspective. Perhaps this is due to the fact that the results of the self-designing group were so successful. Those who were perceived to have given less than full effort on a publication that resulted in an *Academy of Management Journal* or *Academy of Management Review* article were not punished for their disregard of the normative expectations. In these data, there was no relationship between a coauthor's evaluation of a colleague's efforts and whether they worked together again. The only relevant consideration in whether or not coauthors worked together again appeared to be whether they liked each other.

It is important to reiterate that the study focused respondents on collaborative efforts that were a "success," in that a high-quality product (i.e., publication in a well-regarded, peer-reviewed journal) resulted. Even in these successful collaborations, some discrepancies between what others expected of one another and what actually was forthcoming were noted. Future research should consider the way dysfunctional group member behavior, including withholding effort, might operate in projects that fail to develop to their potential.

Affective bonds played a crucial role in deciding whom to work with: an expectation that high effort would be provided on the current project based on past experiences or interpersonal relationships. Whether coauthors liked each other was often of greater significance than the performance of individuals on a given project. However, the results contradict the prediction made in Hypothesis 3 that the degree of liking would keep effort levels up within the group.

In retrospect, elements of a motivation model proposed for traditional work groups (e.g., Kidwell & Bennett, 1993) do not appear appropriate in this case. Self-designing groups differ from work

groups in that they form voluntarily. In this study, individuals contributed effort based on rational and normative considerations, as the model would predict, but they also evaluated others' shortcomings less severely. The unforced nature of the self-designing team underscores the importance of affective bonds among the team members: if potential group members do not like each other, they may not form a team, or they are in a better position to exit than a work group member who may not get along with coworkers.

Clues to the importance of liking in the evaluation of coauthors could be gleaned from an examination of the theoretical roles of interpersonal attraction and leader-member exchange quality on performance appraisals and working relationships. A long stream of research stemming from Byrne (1971) indicates that perceptual similarity is positively related to a manager's evaluation of subordinates and vice versa (e.g., Pulakos & Wexley, 1983), and from Graen (1976) that a high-quality exchange relationship can be related to high-quality performance. For example, research has offered empirical support for a linkage between liking and performance ratings (Wayne & Ferris, 1990). Whereas these relationships deal with manager/subordinate relationships, future research on collaborative authorship might consider interpersonal attraction or exchange quality among coauthors as theoretical frameworks.

The findings concerning the relationship between gender and evaluations were interesting. Controlling for a number of factors, women received lower evaluations from their colleagues—whether those colleagues were men or women. First, it should be noted that the evaluations were generally favorable; that is, a lower evaluation is still, in most cases, a positive evaluation. At the same time, the consistency of this finding across four dependent measures, and in the presence of a number of control variables, suggests that something may be operating that is worthy of further consideration. There are a number of explanations that might account for the finding that men evaluate women less favorably (e.g., Pulakos & Wexley, 1983). In this study, women also rated women coauthors less favorably than their male coauthors did. This finding merits additional research in the context of self-designing work groups.

There are several other avenues for future research that emerged from this study. First, it would be interesting to expand the examination of coauthors as self-designing groups in a number of ways. For example, research that investigates coauthor behavior in failed collaborative efforts would provide a useful companion to our results concerning successes. Second, research that further explores the dynamics involved in the negotiation of the social contract used to structure a self-designing group would be useful. Such research could consider status differentials among collaborators and how the power held by each party influences the distribution of effort specified in the social contract. Third, in semi-structured interviews conducted prior to data collection, we repeatedly heard accounts of individuals who withheld effort in other areas of professional importance (e.g., team teaching, committee work, service work, professional activities). This leads us to suggest that investigations of withholding effort in other types of academic self-designing groups would be viable.

This study suggests that collective action models provide a level of insight into the functioning of self-designing work groups. That is, members come together for rational reasons, engaging in cost-benefit analyses by deciding which projects they wish to participate in and with whom. Members develop normative expectations of equity in effort and reciprocity by informally negotiating who does what in the collaborative process and agreeing on a first author who is to carry the brunt of the load. Most important, the members' emotional bonds with other individuals play a strong role in their decision as to whom to work with on a repeating basis. The personal regard they have for fellow group members is integral to how they evaluate their collaborators' contribution toward the project's completion.

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# Competent **Jerks,** Lovable **Fools,** and the Formation of Social Networks

by Tiziana Casciaro and Miguel Sousa Lobo

ONE OF MANAGEMENT'S GREATEST CHALLENGES ARISES from a natural tension inherent in every organization. People are brought together because they have the variety of skills that, in concert, are needed to carry out a complex activity. But this variety inevitably leads to fragmentation of the organization into silos of specialized knowledge and activity.

It's an understatement to say that resolving this tension is crucial to success in today's knowledge-based and collaborative business environment. How do you ensure that relevant information gets transferred between two parts of an organization that have different cultures? How do you encourage people from units competing for scarce corporate resources to work together? How do you see to it that the value of a cross-functional team is more, not less, than the sum of its parts?

The answers to such questions lie not in an examination of organization charts but largely in an understanding of

New research shows that when people need help getting a job done, they'll choose a congenial colleague over a more capable one. That has big implications for every organization—and not all of them are negative.

COMPETENT JERK

LOVABLE FOOL

informal social networks and how they emerge. Certainly, organizations are designed to ensure that people interact in ways necessary to get their jobs done. But all kinds of work-related encounters and relationships exist that only partly reflect these purposefully designed structures. Even in the context of formal structures like cross-functional teams, informal relationships play a major role.

In this article, we offer somewhat surprising insights into how informal networks take shape in companies—that is, how people choose those they work with. We then discuss some of the benefits and drawbacks of this phenomenon and offer ways for managers to mitigate its negative effects and leverage the positive ones.

## How We Choose Work Partners

When given the choice of whom to work with, people will pick one person over another for any number of reasons: the prestige of being associated with a star performer, for example, or the hope that spending time with a strategically placed superior will further their careers. But in most cases, people choose their work partners according to two criteria. One is competence at the job (Does Joe know what he's doing?). The other is likability (Is Joe enjoyable to work with?). Obviously, both things

a lot but is unpleasant to deal with; the lovable fool, who doesn't know much but is a delight to have around; the lovable star, who's both smart and likable; and the incompetent jerk, who...well, that's self-explanatory. These archetypes are caricatures, of course: Organizations usually—well, much of the time—weed out both the hopelessly incompetent and the socially clueless. Still, people in an organization can be roughly classified using a simple matrix. (Indeed, with relative ease you can probably populate the four boxes depicted in the exhibit "Whom Would You Choose?" with the names of people in your own company.)

Our research showed (not surprisingly) that, no matter what kind of organization we studied, everybody wanted to work with the lovable star, and nobody wanted to work with the incompetent jerk. Things got a lot more interesting, though, when people faced the choice between competent jerks and lovable fools.

Ask managers about this choice—and we've asked many of them, both as part of our research and in executive education programs we teach—and you'll often hear them say that when it comes to getting a job done, *of course* competence trumps likability. "I can defuse my antipathy toward the jerk if he's competent, but I can't train someone who's incompetent," says the CIO at a large engineering

## If someone is liked, his colleagues will seek out every little bit of competence he has to offer.

matter. Less obvious is how much they matter—and exactly how they matter.

To gain some insight into these questions, we studied four organizations selected to reflect a wide range of attributes – for-profit and nonprofit, large and small, North American and European. We asked people to indicate how often they had work-related interactions with every other person in the organization. We then asked them to rate all the other people in the company in terms of how much they personally liked each one and how well each did his or her job. (For a more-detailed description of the studies, see the sidebar "Who Is Good? Who Is Liked?")

These two criteria—competence and likability—combine to produce four archetypes: the competent jerk, who knows

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company. Or, in the words of a knowledge management executive in the IT department of a professional services firm: "I really care about the skills and expertise you bring to the table. If you're a nice person on top of that, that's simply a bonus."

But despite what such people might say about their preferences, the reverse turned out to be true in practice in the organizations we analyzed. Personal feelings played a more important role in forming work relationships—not friendships at work but job-oriented relationships—than is commonly acknowledged. They were even more important than evaluations of competence. In fact, feelings worked as a gating factor: We found that if someone is strongly disliked, it's almost irrelevant whether or not she is competent; people won't want to work with her anyway. By contrast, if someone is liked, his colleagues will seek out every little bit of competence he has to offer. And this tendency didn't exist only in extreme cases; it was true across the board. Generally speaking, a little extra likability goes a longer way than a little extra competence in making someone desirable to work with.

Of course, competence is more important than likability in some people's choice of work partners. But why do so many others *claim* that to be the case? "Choosing the lovable fool over the competent jerk looks unprofessional," suggests a marketing manager at a personal products company. "So people don't like to admit it – maybe not even to themselves."

Yet is such a choice unprofessional? Is it a mistake to steer clear of the competent jerk when we have a job to do? Sometimes, yes. We may forgo the opportunity to tap a competent jerk's knowledge and skills because we don't want to deal with his patronizing, brusque, or otherwise unpleasant attitude – which is arguably a modest price to pay for the valuable assistance he can provide. We may even shun the jerk simply to deny him the satisfaction of lording his knowledge over us.

But there are justifiable reasons to avoid the jerk. Sometimes it can be difficult to pry the needed information from him simply because he is a jerk. And knowledge often requires explanation to be useful – you might, for instance, want to brainstorm with someone or ask follow-up questions – and this kind of interaction may be difficult with a competent jerk. Furthermore, in order to learn, you often have to reveal your vulnerabilities, which also may be difficult with the competent jerk – especially if you are afraid of how this might affect your reputation in his eyes or in the eyes of others to whom he may reveal your limitations. By contrast, the lovable fool may be more likely to freely share whatever (albeit modest) information or skills he has and, without any intention of gaining an advantage, help others put them to use.

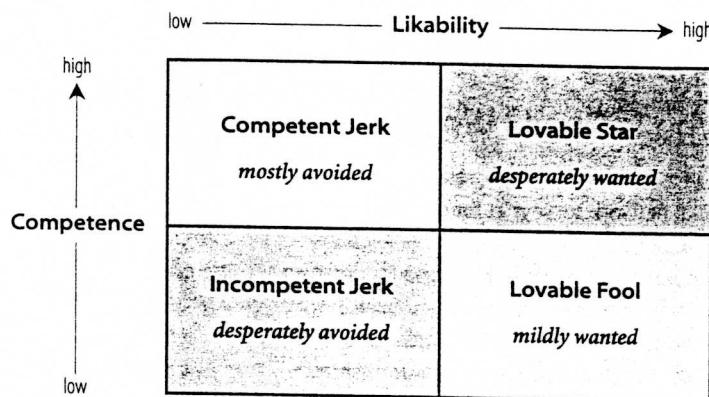
## The Likability Bias: Pros and Cons

Some people are liked pretty much universally. In other cases, likability is relative: One person's friend may be another one's jerk. This is because our positive feelings can result from people's inherent attributes or from the situations we find ourselves in with them. This distinction is important to keep in mind as we try to manage this tendency of people to favor likability over competence in their choice of work partners.

Social psychologists have long known that we like people who are *similar* to us; people we are *familiar* with; people who have *reciprocal* positive feelings about us;

## Whom Would You Choose?

If you were faced with the need to accomplish a task at work, what sort of person would you pick to help you – someone able to get the job done or someone enjoyable to be around? Studies done in four very different organizations consistently showed that most people would choose a "lovable fool" (someone who, to varying degrees, is more likable than competent) over a "competent jerk."



and people who are inherently *attractive*, either in their appearance or their personality – that is, they are considerate, cheerful, generous, and so on. Each of these sources of personal likability can contribute, for better or worse, to the formation of an informal network.

**For Better.** That we like people who are similar to us – for example, in their background, their beliefs, their interests, their personal style – is one of the most solidly documented findings in the social sciences. After all, these people make us feel good because they reaffirm the validity of our own characteristics and attitudes. But there's a business, as well as a psychological, benefit when similar people choose to work together: Their similar values, ways of thinking, and communication styles help projects flow smoothly and quickly.

Benefits also result when we work with people who aren't necessarily similar, but are familiar, to us. When you launch into a task with those you already know, you don't waste a lot of time figuring out what to expect from them or explaining what you mean every time you say something. In addition, because you are usually relatively comfortable with individuals you know, you're likely to be more accepting of their differences.

We also like to work with people who seem to like us. This can produce a virtuous circle in which everyone is more open to new ideas, more willing to help, and more trusting than would typically be the case. A similarly positive

environment can be created if you work with someone who has an attractive personality – someone who is empathetic, for example, or generous. You know that you'll have liberal access to her intellectual resources, however abundant or modest they may be, and are likely to reciprocate by freely sharing your own knowledge.

And a person who is physically attractive? Well, in such a case, the job you do together can be, in some indefinable way, simply a bit more enjoyable than usual.

**For Worse.** One of the greatest drawbacks of choosing to work with similar people is the limited range of perspectives that a homogeneous group often brings to bear on a problem. A diverse collection of colleagues – whatever

the tensions and misunderstandings that arise because of their differences – provides an array of perspectives that can lead to truly innovative approaches to accomplishing a task.

Even groups composed not of similar souls but merely of people who are very familiar with one another miss the chance to integrate the fresh perspective that new players bring to a project. Working with the same old colleagues can also dampen debate: People may hesitate to challenge or reject a bad idea put forward by someone they know and like.

There is also an obvious downside when we gravitate toward people because they like us or because they are pleasant to work with. These individuals, however terrific they may be, aren't necessarily the ones most suited to tackling the task at hand. The required expertise or knowledge may lie elsewhere, in someone who in fact doesn't like us that much or isn't attractive.

One other danger of people working primarily with those they like: They may simply have a good time and get nothing done. An experienced venture capitalist recalls the case of a very capable manager who hired individuals based on his personal affinity with them. "His team had a great time going out for a beer, but the quality of their work was seriously compromised," says the dismayed investor. "If you keep hiring only people you like, you can kill a company."

The objective, therefore, is to leverage the power of liking while avoiding the negative consequences of people's "affect-based choice" – to use the psychological term – of work partners. Keep in mind that we're not talking here about formal work relationships: You work with your boss and your direct counterparts in other divisions whether you like them or not. We're talking only about people's choices of informal, though work-related, interactions. Even so, that doesn't preclude executives from doing some things that will positively affect those interactions and the often task-crucial informal networks that grow out of them.

We offer three basic approaches. First, where possible, manufacture liking in critical relationships. Second, carefully position universally likable people so they can bridge organizational divides. Third, to put it bluntly, work on the jerks. The first tactic acknowledges that whether you like some-

## Who Is Good? Who Is Liked?

To test our theory of work relationships, we conducted a series of social network surveys at four organizations: an entrepreneurial technology company in Silicon Valley, a unit of a multinational IT corporation, a U.S. university, and the Spanish country office of a global luxury goods corporation. We also surveyed a large group of MBA students at a U.S. business school. In all, we collected data about more than 10,000 work relationships.

We conducted multiple studies for two reasons. First, we wanted to see if the findings would remain consistent across different industries, types of organizations, and national cultures. Second, we wanted to see if the findings would remain consistent if we used different measures of likability, competence, and work-related interaction. For example, the definition of work interaction in the survey questions ranged from the very general ("We interact at work"—in which any kind of work-related interaction counted, whether formal or informal, but not other unrelated socializing) to the more specific ("When I have a question or issue about my job, I go to this person for advice or help" or "When I need to engage in creative problem solving regarding my job, I go to that person to help me think out of the box and consider different aspects of the problem innovatively"). Although our results clearly were limited to the five groups we studied, the consistency of the findings on both counts was striking.

Our analysis of the responses took into account biases often present when someone is asked to rate other people. We corrected, for instance, for the fact that some people are generally very generous with their ratings and others are very stingy. We took into account the fact that people working in the same department or in the same part of the building would naturally interact more frequently, regardless of liking or competence. And we adjusted for the fact that evaluations of competence and likability tend to go together: If I like you, I'm more likely to rate you as competent, and, conversely, if we've worked together in the past, I'll tend to like you better. We were able to disentangle this overlap in our analysis, as well. For details of our statistical approach, see our working paper at [www.people.hbs.edu/tcasclaro/AffectInstrumentalTies.pdf](http://www.people.hbs.edu/tcasclaro/AffectInstrumentalTies.pdf).

one or not may depend on the situation. The second and third tactics acknowledge that being a jerk or being likable can be an intrinsic characteristic of a person, almost regardless of the situation.

## Manufacture Liking

Given the central role that our feelings about people play in our work relationships, is there anything a manager can do to foster positive feelings toward one another? The answer, perhaps surprisingly, is yes.

**Promote familiarity.** In a well-known psychological experiment, a person shown a photograph of himself and a reversed image of the same picture consistently preferred the reversed photograph—simply because it was the image he was used to seeing in the mirror! And just as people like the images they're used to seeing, so they tend to like other people they're used to seeing around—they, too, are known and predictable. Familiarity is, in turn, one of the

They offer an opportunity for people from different functions and units to become familiar with one another, thus making it easier for them to share knowledge in the future.

**Redefine similarity.** Similarities can be created where they might not naturally arise. It's no secret, for example, that marketers and researchers tend to be wary of one another. Their personalities, as well as their departmental allegiances, are generally very different. But if you create a product management team that includes both marketers and researchers, there is a chance their similar identities as "Product X people" may begin to feel stronger than their dissimilar identities as "marketing people" and "R&D people." Superimposition of the shared identity, by overriding natural differences, may lead to increased cross-functional cooperation, both formal and informal.

**Foster bonding.** Often, however, cooperation fails to emerge despite a redefinition of similarities. Where there exists powerful forces of distrust or animosity, either

## Sometimes it can be difficult to pry the needed information from the jerk simply because he is a jerk.

reasons why physical proximity strongly affects the degree to which people like each other: Research has shown that regular exposure to someone generally increases the comfort and pleasure of interaction.

The power of familiarity to generate positive interpersonal feelings argues for some careful thinking about the design of office space. This could involve anything from mixing up people's work spaces ("I generally don't care for people in Finance, but I've actually grown to like Sarah since she moved into the next office") to creating areas in an office that foster informal, watercooler-style chats.

You can also design processes that give people an opportunity simply to become acquainted and thus make them more comfortable with each other. The "peer assist," a knowledge management process in which team members aim to capture the expertise of other colleagues before starting a project, generally involves some initial interaction—say, a cocktail party—the evening before work begins and any work-specific goals are addressed. This allows people to get to know one another a bit, independently from the work at hand, while relationships are still emotionally neutral and haven't yet been subjected to any task-related interference, such as the potentially competing interests of the assisting and assisted parties. Less formally, all-office get-togethers on Friday afternoons can be more than culture- and morale-building exercises.

because of strong dissimilarities (for instance, loyalty to different premerger companies) or because of a troubled history (years of competition between functional areas over budget allocations, for example), you won't be able to get people to like each other simply by inviting them to some TGIF gatherings or by sticking them on a cross-functional team. Promoting positive feelings in those circumstances requires stronger methods.

One involves putting people through an intense cooperative experience. In a famous experiment conducted more than 40 years ago by social psychologist Muzafer Sherif, groups of 11- and 12-year-old boys were brought together in a camp setting. Initially, they were randomly assigned to two groups. These were kept separate to foster ties within each group, and competitive activities were designed to produce animosity between the two groups. Then, to see if exposure to one another in a fun environment could reduce the hostility that had been generated, the competitive activities were suspended, and the boys got together for such benign activities as watching movies. In fact, though, hostility increased, with fights erupting at every turn. Sherif figured that something else was needed: a situation that would force the boys to cooperate with one another. So he created several. For instance, a truck taking the two groups on a camping trip broke down, and all of the boys had to push it up a steep hill to get it going



again. Over time, episodes like this decreased hostility and, by the end of the camp experience, the number of boys who said that they had a best friend in the other group quadrupled.

The Outward Bound-style off-site experiences used by many companies are based on this venerable psychological principle. Such tactics can be problematic, however, because novelty and authenticity are critical to their success. The moment they become trite or feel manufactured, they lose their effectiveness. The challenge for managers, therefore, is to constantly find new ways to take advantage of this old concept.

## Leverage the Likable

What should managers do to make effective use of people—fools or otherwise—who are likable almost regardless of the situation? Perhaps the best way to capitalize on their personal qualities is to have them play the role of “affective hubs”—people who, because they are liked by a disproportionate number of people, can bridge gaps between diverse groups that might not otherwise interact.

We don’t necessarily like such people because they are similar or familiar to us. More likely, we are drawn to their attractive personality traits, sophisticated social skills, and old-fashioned “chemistry”—a chemistry that may arise from our sense that these people genuinely like us. Such individuals aren’t necessarily the best performers (although they can be—that’s the lovable star). More commonly, because of the time they devote to interacting with people, they may actually lag slightly behind their peers in terms of measurable performance. But their ability to establish

positive working relationships between groups that would otherwise tend to be disconnected can be crucial to an organization’s success. Managers can do several things to get the most out of such people.

**Identify them.** Attentive managers know if they have someone who could play—or is already playing—the role of an affective hub. But most managers aren’t closely enough attuned to the emotional dimension of work to recognize such an individual. Take the case of an employee in one company’s IT department. She was the person who dealt with breakdowns in the technical infrastructure of the company. Although less technically proficient than many of her colleagues, she acted, in the words of one, “as a coral reef barrier when the user community in the company had problems. Because she was liked by everyone, she could deflate users’ frustration and anger, insulating us geeks from complaints and allowing us to solve the problem.” After she was laid off in a cost-cutting move, her job was divided among more technically competent people. The result? “It was a disaster,” according to her former colleague.

Granted, it’s often difficult for a manager several steps up in the firm to identify and assess the value of such a person. One aid is the increasingly common 360-degree evaluation, which typically includes questions about how pleasant someone is to deal with. A more systematic approach is to perform a social network analysis with surveys whose questions are specifically designed to collect information on relationships between workers and on the structure of the network formed by those relationships.

**Protect them.** Even when affective hubs are identified and their value to the company is acknowledged, such soft contributions may be deemed less important than more quantifiable ones. When told about the concept of affective hubs, members of a management team at a large technology company exclaimed almost in unison: “Damn, we just fired him!” They went on to describe someone who was beloved within and outside the organization, a person other people would turn to when they wanted to make contact with someone in another part of the business or at an alliance partner. “It’s not just that he knew everybody,” according to one member of the team. “It’s that everybody really liked him, and they were happy to do him a favor.” Even though people were aware of his critical informal role, it wasn’t enough to save him from being one of the first to go in a round of downsizing.

**Position them strategically.** Clearly, you don’t want to waste the talents of an affective hub by letting the person languish in a job that is only loosely connected with other

functions. Such individuals should be put in a position to link people from different parts of the organization who might otherwise resist – or never think of – collaborating with one another. Affective hubs also are useful in positions central to the diffusion of new ideas. Think, for example, of a program designed to communicate new practices or principles throughout an organization. How do you select participants? Do you chose managers? Star performers? Or do you chose the people who, because others will listen to them, are going to be good evangelists for the new ideas?

## Work on the Jerk

Competent jerks represent a missed opportunity for the organization because so much of their expertise goes untapped. Dealing with jerks is so unpleasant that colleagues simply can't be bothered with them. What can you do with such people?

**Reassess their contribution.** The individual performance of the competent jerk is great. But how does he contribute to the performance of the organization as a whole? Does he help the people who work with him or actually hinder them? Take the case of an investment bank that hired an extraordinary rainmaker in a difficult and highly profitable market the bank wanted to enter.<sup>1</sup> Unfortunately, the qualities that made the new hire a phenomenal producer in this rough-and-tumble market also

he did not. His boss adopted an aggressive coaching stance, scolding for bad behavior immediately after the fact, rather than waiting for a year-end performance review. The boss was effective in explaining in detail how the behavior was self-defeating – information that a self-interested and ambitious individual is likely to take to heart. After coaching from his boss, the rainmaker's behavior improved, and he was promoted the following year. (Sadly, there are people who are disliked because they are socially incompetent and probably never will be truly charming. For them, interpersonal-skills training, rather than incentive-based coaching, may be preferable.)

**Reposition.** If likable people can improve an organization when they operate in highly interdependent roles, competent jerks will probably do best when they work independently. There is often a place for people who don't need to be liked so long as they get their jobs done – even if you must sacrifice widespread access to their expertise.

...

Obviously, simply being liked doesn't mean a person is valuable to an organization. We all know the fellow that people adore whose performance is continually disappointing – to the point that his colleagues end up disliking him because he repeatedly lets them down. We all know the woman who builds relationship after relationship that ultimately go nowhere, at least as far as the organization is concerned.

## Jerks who can be charming when they wish – but choose to do so only when convenient – may respond to incentives.

alienated lots of his colleagues. Over time, it became clear that the newcomer's manner was violating the culture of respect and polite behavior that helped define the company. What, then, to do about it?

**Reward good behavior; punish bad behavior.** If the contributions of the competent jerk are significant, it's probably worth trying to turn him into a tolerated, even if not actively liked, star performer. Changing the behavior of adults is never a straightforward proposition, of course, but some things can be done. Jerks who can be charming when they wish – but choose to do so only when convenient – may respond to incentives. The rainmaker was one of those. He could be very charming to potential clients but was not to his coworkers. So when it came time for him to be considered for a managing director position, the bank denied him the promotion.

**Socialize and coach.** Although the rainmaker could have quit, taking his revenue-generating skills with him,

Still, it's easy to be mistakenly dazzled by a high performer, even if his expertise is never tapped or shared because people don't want to work with him. And too many managers fail to appreciate the benefits that a likable person can offer an organization, particularly if those benefits come at the expense of some measure of performance. Building an environment in which people like one another – whether by creating situations that make liking people easy, by fostering those likable people who can play the role of an affective hub, or by improving the behavior of competent jerks – can help all employees work more happily and productively and encourage the formation of strong and smoothly functioning social networks. □

1. "Rob Parson at Morgan Stanley (A), (B), (C) (Abridged), (D)," HBS case nos. 9-498-054, 9-498-055, 9-498-057, and 9-498-058.

It won't surprise anyone to find an article on teams by Jon Katzenbach and Douglas Smith figuring into an issue devoted to high performance. While Peter Drucker may have been the first to point out that a team-based organization can be highly effective, Katzenbach and Smith's work made it possible for companies to implement the idea.

In this groundbreaking 1993 article, the authors say that if managers want to make better decisions about teams, they must be clear about what a team is. They define a team as "a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable." That definition lays down the discipline that teams must share to be effective.

Katzenbach and Smith discuss the four elements – common commitment and purpose, performance goals, complementary skills, and mutual accountability – that make teams function. They also classify teams into three varieties – teams that recommend things, teams that make or do things, and teams that run things – and describe how each type faces different challenges.

# The Discipline of Teams

by Jon R. Katzenbach and Douglas K. Smith

What makes the difference between a team that performs and one that doesn't?

**E**arly in the 1980s, Bill Greenwood and a small band of rebel railroaders on most of the top management of Burlington Northern and created a multibillion-dollar business in "piggy-backing" rail services despite widespread resistance, even resentment, within the company. The Medical Products Group at Hewlett-Packard owes most of its leading performance to the remarkable efforts of Dean Morton, Lew Platt, Ben Holmes, Dick Alberding, and a handful of their colleagues who revitalized a health care business that most others had written off. At Knight Ridder, Jim Batten's "customer obsession" vision took root at the *Tallahassee Democrat* when 14 frontline enthusiasts turned a charter to eliminate errors into a mission

of major change and took the entire paper along with them.

Such are the stories and the work of teams – real teams that perform, not amorphous groups that we call teams because we think that the label is motivating and energizing. The difference between teams that perform and other groups that don't is a subject to which most of us pay far too little attention. Part of the problem is that "team" is a word and concept so familiar to everyone. (See the exhibit "Not All Groups Are Teams: How to Tell the Difference.")

Or at least that's what we thought when we set out to do research for our book *The Wisdom of Teams* (HarperBusiness, 1993). We wanted to discover what differentiates various levels of

## >> THE HIGH-PERFORMANCE ORGANIZATION

team performance, where and how teams work best, and what top management can do to enhance their effectiveness. We talked with hundreds of people on more than 50 different teams in 30 companies and beyond, from Motorola and Hewlett-Packard to Operation Desert Storm and the Girl Scouts.

We found that there is a basic discipline that makes teams work. We also found that teams and good performance are inseparable: You cannot have one without the other. But people use the word "team" so loosely that it gets in the way of learning and applying the discipline that leads to good performance. For managers to make better decisions about whether, when, or how to encourage and use teams, it is important to be more precise about what a team is and what it isn't.

Most executives advocate teamwork. And they should. Teamwork represents a set of values that encourage listening and responding constructively to views

expressed by others, giving others the benefit of the doubt, providing support, and recognizing the interests and achievements of others. Such values help teams perform, and they also promote individual performance as well as the performance of an entire organization. But teamwork values by themselves are not exclusive to teams, nor are they enough to ensure team performance. (See the sidebar "Building Team Performance.")

Nor is a team just any group working together. Committees, councils, and task forces are not necessarily teams. Groups do not become teams simply because that is what someone calls them. The entire workforce of any large and complex organization is *never* a team, but think about how often that platitude is offered up.

To understand how teams deliver extra performance, we must distinguish between teams and other forms of working groups. That distinction turns on per-

formance results. A working group's performance is a function of what its members do as individuals. A team's performance includes both individual results and what we call "collective work products." A collective work product is what two or more members must work on together, such as interviews, surveys, or experiments. Whatever it is, a collective work product reflects the joint, real contribution of team members.

Working groups are both prevalent and effective in large organizations where individual accountability is most important. The best working groups come together to share information, perspectives, and insights; to make decisions that help each person do his or her job better; and to reinforce individual performance standards. But the focus is always on individual goals and accountabilities. Working-group members don't take responsibility for results other than their own. Nor do they try to develop incremental performance contributions requiring the combined work of two or more members.

Teams differ fundamentally from working groups because they require both individual and mutual accountability. Teams rely on more than group discussion, debate, and decision, on more than sharing information and best-practice performance standards. Teams produce discrete work products through the joint contributions of their members. This is what makes possible performance levels greater than the sum of all the individual bests of team members. Simply stated, a team is more than the sum of its parts.

The first step in developing a disciplined approach to team management is to think about teams as discrete units of performance and not just as positive sets of values. Having observed and worked with scores of teams in action, both successes and failures, we offer the following. Think of it as a working defi-

### Not All Groups Are Teams: How to Tell the Difference

#### **Working Group**

- Strong, clearly focused leader
- Individual accountability
- The group's purpose is the same as the broader organizational mission
- Individual work products
- Runs efficient meetings
- Measures its effectiveness indirectly by its influence on others (such as financial performance of the business)
- Discusses, decides, and delegates

#### **Team**

- Shared leadership roles
- Individual and mutual accountability
- Specific team purpose that the team itself delivers
- Collective work products
- Encourages open-ended discussion and active problem-solving meetings
- Measures performance directly by assessing collective work products
- Discusses, decides, and does real work together

**Jon R. Katzenbach** is a founder and senior partner of Katzenbach Partners, a strategic and organizational consulting firm, and a former director of McKinsey & Company. His most recent book is *Why Pride Matters More Than Money: The Power of the World's Greatest Motivational Force* (Crown Business, 2003). **Douglas K. Smith** is an organizational consultant and a former partner at McKinsey & Company. His most recent book is *On Value and Values: Thinking Differently About We in an Age of Me* (Financial Times Prentice Hall, 2004).

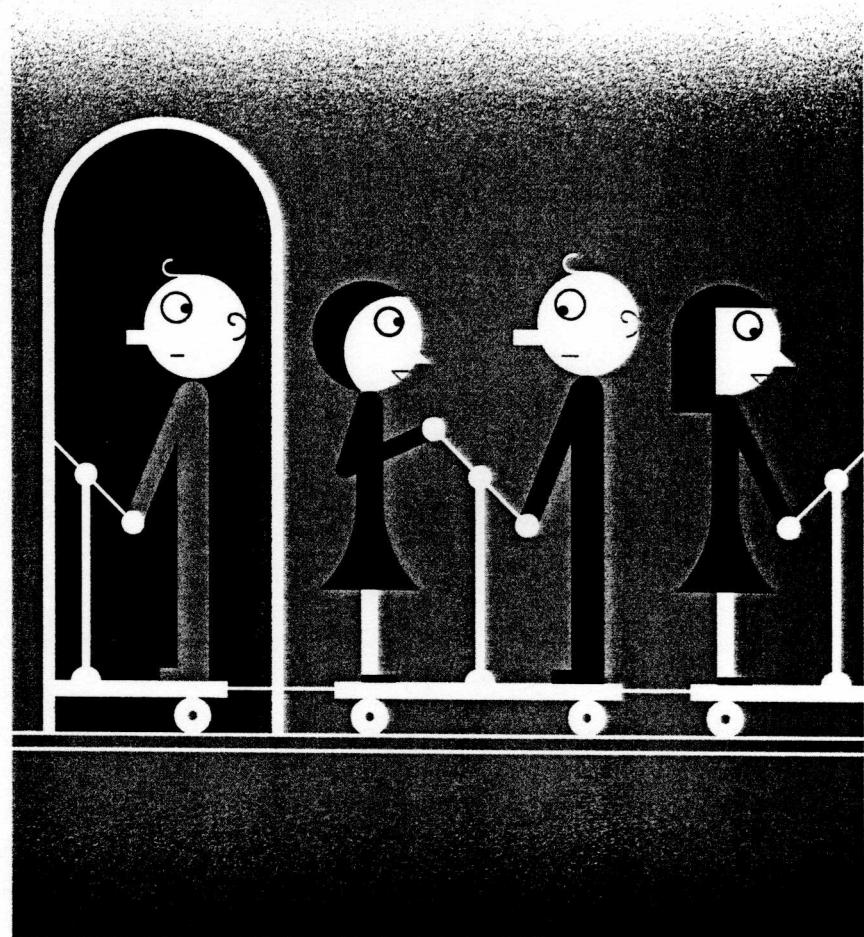
nition or, better still, an essential discipline that real teams share: *A team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable.*

The essence of a team is common commitment. Without it, groups perform as individuals; with it, they become a powerful unit of collective performance. This kind of commitment requires a purpose in which team members can believe. Whether the purpose is to "transform the contributions of suppliers into the satisfaction of customers," to "make our company one we can be proud of again," or to "prove that all children can learn," credible team purposes have an element related to winning, being first, revolutionizing, or being on the cutting edge.

Teams develop direction, momentum, and commitment by working to shape a meaningful purpose. Building ownership and commitment to team purpose, however, is not incompatible with taking initial direction from outside the team. The often-asserted assumption that a team cannot "own" its purpose unless management leaves it alone actually confuses more potential teams than it helps. In fact, it is the exceptional case – for example, entrepreneurial situations – when a team creates a purpose entirely on its own.

Most successful teams shape their purposes in response to a demand or opportunity put in their path, usually by higher management. This helps teams get started by broadly framing the company's performance expectation. Management is responsible for clarifying the charter, rationale, and performance challenge for the team, but management must also leave enough flexibility for the team to develop commitment around its own spin on that purpose, set of specific goals, timing, and approach.

The best teams invest a tremendous amount of time and effort exploring, shaping, and agreeing on a purpose that belongs to them both collectively and individually. This "purposing" activity continues throughout the life of the



## People use the word "team" so loosely that it gets in the way of learning and applying the discipline that leads to good performance.

team. By contrast, failed teams rarely develop a common purpose. For whatever reason – an insufficient focus on performance, lack of effort, poor leadership – they do not coalesce around a challenging aspiration.

The best teams also translate their common purpose into specific performance goals, such as reducing the reject rate from suppliers by 50% or increasing the math scores of graduates from 40% to 95%. Indeed, if a team fails to establish specific performance goals or if those goals do not relate directly to the team's overall purpose, team members become confused, pull apart, and revert to mediocre performance. By contrast, when purposes and goals build on one

another and are combined with team commitment, they become a powerful engine of performance.

Transforming broad directives into specific and measurable performance goals is the surest first step for a team trying to shape a purpose meaningful to its members. Specific goals, such as getting a new product to market in less than half the normal time, responding to all customers within 24 hours, or achieving a zero-defect rate while simultaneously cutting costs by 40%, all provide firm footholds for teams. There are several reasons:

- Specific team-performance goals help define a set of work products that are different both from an organization-wide

## Building Team Performance

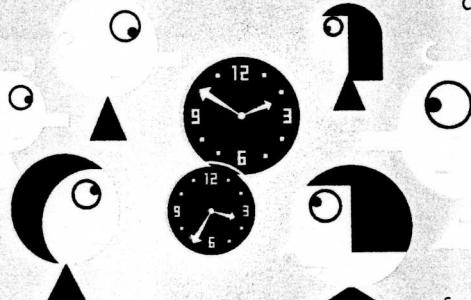
**A**lthough there is no guaranteed how-to recipe for building team performance, we observed a number of approaches shared by many successful teams.

**Establish urgency, demanding performance standards, and direction.** All team members need to believe the team has urgent and worthwhile purposes, and they want to know what the expectations are. Indeed, the more urgent and meaningful the rationale, the more likely it is that the team will live up to its performance potential, as was the case for a customer-service team that was told that further growth for the entire company would be impossible without major improvements in that area. Teams work best in a compelling context. That is why companies with strong performance ethics usually form teams readily.

**Select members for skill and skill potential, not personality.** No team succeeds without all the skills needed to meet its purpose and performance goals. Yet most teams figure out the skills they will need after they are formed. The wise manager will choose people for their existing skills and their potential to improve existing skills and learn new ones.

**Pay particular attention to first meetings and actions. Initial impressions always mean a great deal.** When potential teams first gather, everyone monitors the signals given by others to confirm, suspend, or dispel assumptions and concerns. They pay particular attention to those in authority: the team leader and any executives who set up, oversee, or otherwise influence the team. And, as always, what such leaders do is more important than what they say. If a senior executive leaves the team kickoff to take a phone call ten minutes after the session has begun and he never returns, people get the message.

**Set some clear rules of behavior.** All effective teams develop rules of conduct at the outset to help them achieve their purpose and performance goals. The most critical initial rules pertain to attendance (for example, "no interruptions to take phone calls"), discussion ("no sacred cows"), confidentiality ("the only things to leave this room are what we agree on"), analytic approach ("facts are friendly"), end-product orientation ("everyone gets assignments and does them"), constructive confrontation ("no finger pointing"), and, often the most important, contributions ("everyone does real work").



**Set and seize upon a few immediate performance-oriented tasks and goals.** Most effective teams trace their advancement to key performance-oriented events. Such events can be set in motion by immediately establishing a few challenging goals that can be reached early on. There is no such thing as a real team without performance results, so the sooner such results occur, the sooner the team congeals.

**Challenge the group regularly with fresh facts and information.** New information causes a team to redefine and enrich its understanding of the performance challenge, thereby helping the team shape a common purpose, set clearer goals, and improve its common approach. A plant quality improvement team knew the cost of poor quality was high, but it wasn't until they researched the different types of defects and put a price tag on each one that they knew where to go next. Conversely, teams err when they assume that all the information needed exists in the collective experience and knowledge of their members.

**Spend lots of time together.** Common sense tells us that team members must spend a lot of time together, scheduled and unscheduled, especially in the beginning. Indeed, creative insights as well as personal bonding require impromptu and casual interactions just as much as analyzing spreadsheets and interviewing customers. Busy executives and managers too often intentionally minimize the time they spend together. The successful teams we've observed all gave themselves the time to learn to be a team. This time need not always be spent together physically; electronic, fax, and phone time can also count as time spent together.

**Exploit the power of positive feedback, recognition, and reward.** Positive reinforcement works as well in a team context as elsewhere. Giving out "gold stars" helps shape new behaviors critical to team performance. If people in the group, for example, are alert to a shy person's initial efforts to speak up and contribute, they can give the honest positive reinforcement that encourages continued contributions. There are many ways to recognize and reward team performance beyond direct compensation, from having a senior executive speak directly to the team about the urgency of its mission to using awards to recognize contributions. Ultimately, however, the satisfaction shared by a team in its own performance becomes the most cherished reward.

mission and from individual job objectives. As a result, such work products require the collective effort of team members to make something specific happen that, in and of itself, adds real value to results. By contrast, simply gathering from time to time to make decisions will not sustain team performance.

• The specificity of performance objectives facilitates clear communication and constructive conflict within the team. When a plant-level team, for example, sets a goal of reducing average machine changeover time to two hours, the clarity of the goal forces the team to concentrate on what it would take either to achieve or to reconsider the goal. When such goals are clear, discussions can focus on how to pursue them or whether to change them; when goals are ambiguous or nonexistent, such discussions are much less productive.

and other stripes fade into the background. The teams that succeed evaluate what and how each individual can best contribute to the team's goal and, more important, do so in terms of the performance objective itself rather than a person's status or personality.

- Specific goals allow a team to achieve small wins as it pursues its broader purpose. These small wins are invaluable to building commitment and overcoming the inevitable obstacles that get in the way of a long-term purpose. For example, the Knight Ridder team mentioned at the outset turned a narrow goal to eliminate errors into a compelling customer service purpose.

- Performance goals are compelling. They are symbols of accomplishment that motivate and energize. They challenge the people on a team to commit themselves, as a team, to make a difference.

for success. A large number of people, say 50 or more, can theoretically become a team. But groups of such size are more likely to break into subteams rather than function as a single unit.

Why? Large numbers of people have trouble interacting constructively as a group, much less doing real work together. Ten people are far more likely than 50 to work through their individual, functional, and hierarchical differences toward a common plan and to hold themselves jointly accountable for the results.

Large groups also face logistical issues, such as finding enough physical space and time to meet. And they confront more complex constraints, like crowd or herd behaviors, which prevent the intense sharing of viewpoints needed to build a team. As a result, when they try to develop a common purpose,

## **For managers to make better decisions about whether, when, or how to encourage and use teams, it is important to be more precise about what a team is and what it isn't.**

- The attainability of specific goals helps teams maintain their focus on getting results. A product-development team at Eli Lilly's Peripheral Systems Division set definite yardsticks for the market introduction of an ultrasonic probe to help doctors locate deep veins and arteries. The probe had to have an audible signal through a specified depth of tissue, be capable of being manufactured at a rate of 100 per day, and have a unit cost less than a preestablished amount. Because the team could measure its progress against each of these specific objectives, the team knew throughout the development process where it stood. Either it had achieved its goals or not.

- As Outward Bound and other team-building programs illustrate, specific objectives have a leveling effect conducive to team behavior. When a small group of people challenge themselves to get over a wall or to reduce cycle time by 50%, their respective titles, perks,

Drama, urgency, and a healthy fear of failure combine to drive teams that have their collective eye on an attainable, but challenging, goal. Nobody but the team can make it happen. It's their challenge.

The combination of purpose and specific goals is essential to performance. Each depends on the other to remain relevant and vital. Clear performance goals help a team keep track of progress and hold itself accountable; the broader, even nobler, aspirations in a team's purpose supply both meaning and emotional energy.

Virtually all effective teams we have met, read or heard about, or been members of have ranged between two and 25 people. For example, the Burlington Northern piggybacking team had seven members, and the Knight Ridder newspaper team had 14. The majority of them have numbered less than ten. Small size is admittedly more of a pragmatic guide than an absolute necessity

they usually produce only superficial "missions" and well-meaning intentions that cannot be translated into concrete objectives. They tend fairly quickly to reach a point when meetings become a chore, a clear sign that most of the people in the group are uncertain why they have gathered, beyond some notion of getting along better. Anyone who has been through one of these exercises understands how frustrating it can be. This kind of failure tends to foster cynicism, which gets in the way of future team efforts.

In addition to finding the right size, teams must develop the right mix of skills; that is, each of the complementary skills necessary to do the team's job. As obvious as it sounds, it is a common failing in potential teams. Skill requirements fall into three fairly self-evident categories.

**Technical or Functional Expertise.** It would make little sense for a group of

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doctors to litigate an employment discrimination case in a court of law. Yet teams of doctors and lawyers often try medical malpractice or personal injury cases. Similarly, product development groups that include only marketers or engineers are less likely to succeed than those with the complementary skills of both.

**Problem-Solving and Decision-Making Skills.** Teams must be able to identify the problems and opportunities they face, evaluate the options they have for moving forward, and then make necessary trade-offs and decisions about how to proceed. Most teams need some members with these skills to begin with, although many will develop them best on the job.

**Interpersonal Skills.** Common understanding and purpose cannot arise without effective communication and constructive conflict, which in turn depend on interpersonal skills. These skills include risk taking, helpful criticism,

fact that their performance challenge was a marketing one. In fact, we discovered that teams are powerful vehicles for developing the skills needed to meet the team's performance challenge. Accordingly, team member selection ought to ride as much on skill potential as on skills already proven.

Effective teams develop strong commitment to a common approach; that is, to how they will work together to accomplish their purpose. Team members must agree on who will do particular jobs, how schedules will be set and adhered to, what skills need to be developed, how continuing membership in the team is to be earned, and how the group will make and modify decisions. This element of commitment is as important to team performance as the team's commitment to its purpose and goals.

Agreeing on the specifics of work and how they fit together to integrate individual skills and advance team performance lies at the heart of shaping a

all its human resources to a common purpose can a team develop and agree on the best approach to achieve its goals. At the heart of such long and, at times, difficult interactions lies a commitment-building process in which the team candidly explores who is best suited to each task as well as how individual roles will come together. In effect, the team establishes a social contract among members that relates to their purpose and guides and obligates how they must work together.

No group ever becomes a team until it can hold itself accountable as a team. Like common purpose and approach, mutual accountability is a stiff test. Think, for example, about the subtle but critical difference between "the boss holds me accountable" and "we hold ourselves accountable." The first case can lead to the second, but without the second, there can be no team.

Companies like Hewlett-Packard and Motorola have an ingrained performance ethic that enables teams to form organically whenever there is a clear performance challenge requiring collective rather than individual effort. In these companies, the factor of mutual accountability is commonplace. "Being in the boat together" is how their performance game is played.

At its core, team accountability is about the sincere promises we make to ourselves and others, promises that underpin two critical aspects of effective teams: commitment and trust. Most of us enter a potential team situation cautiously because ingrained individualism and experience discourage us from putting our fates in the hands of others or accepting responsibility for others. Teams do not succeed by ignoring or wishing away such behavior.

Mutual accountability cannot be coerced any more than people can be made to trust one another. But when a team shares a common purpose, goals, and approach, mutual accountability grows as a natural counterpart. Accountability arises from and reinforces the time, energy, and action invested in figuring out what the team is trying to accomplish and how best to get it done.

### A team opportunity exists anywhere hierarchy or organizational boundaries inhibit the skills and perspectives needed for optimal results.

objectivity, active listening, giving the benefit of the doubt, and recognizing the interests and achievements of others.

Obviously, a team cannot get started without some minimum complement of skills, especially technical and functional ones. Still, think about how often you've been part of a team whose members were chosen primarily on the basis of personal compatibility or formal position in the organization, and in which the skill mix of its members wasn't given much thought.

It is equally common to overemphasize skills in team selection. Yet in all the successful teams we've encountered, not one had all the needed skills at the outset. The Burlington Northern team, for example, initially had no members who were skilled marketers despite the

common approach. It is perhaps self-evident that an approach that delegates all the real work to a few members (or staff outsiders) and thus relies on reviews and meetings for its only "work together" aspects, cannot sustain a real team. Every member of a successful team does equivalent amounts of real work; all members, including the team leader, contribute in concrete ways to the team's work product. This is a very important element of the emotional logic that drives team performance.

When individuals approach a team situation, especially in a business setting, each has preexisting job assignments as well as strengths and weaknesses reflecting a variety of talents, backgrounds, personalities, and prejudices. Only through the mutual discovery and understanding of how to apply

When people work together toward a common objective, trust and commitment follow. Consequently, teams enjoying a strong common purpose and approach inevitably hold themselves responsible, both as individuals and as a team, for the team's performance. This sense of mutual accountability also produces the rich rewards of mutual achievement in which all members share. What we heard over and over from members of effective teams is that they found the experience energizing and motivating in ways that their "normal" jobs never could match.

On the other hand, groups established primarily for the sake of becoming a team or for job enhancement, communication, organizational effectiveness, or excellence rarely become effective teams, as demonstrated by the bad feelings left in many companies after experimenting with quality circles that never translated "quality" into specific goals. Only when appropriate performance goals are set does the process of

discussing the goals and the approaches to them give team members a clearer and clearer choice: They can disagree with a goal and the path that the team selects and, in effect, opt out, or they can pitch in and become accountable with and to their teammates.

The discipline of teams we've outlined is critical to the success of all teams. Yet it is also useful to go one step further. Most teams can be classified in one of three ways: teams that recommend things, teams that make or do things, and teams that run things. In our experience, each type faces a characteristic set of challenges.

**Teams That Recommend Things.** These teams include task forces; project groups; and audit, quality, or safety groups asked to study and solve particular problems. Teams that recommend things almost always have predetermined completion dates. Two critical issues are unique to such teams: getting off to a fast and constructive start and dealing with the ultimate handoff

that's required to get recommendations implemented.

The key to the first issue lies in the clarity of the team's charter and the composition of its membership. In addition to wanting to know why and how their efforts are important, task forces need a clear definition of whom management expects to participate and the time commitment required. Management can help by ensuring that the team includes people with the skills and influence necessary for crafting practical recommendations that will carry weight throughout the organization. Moreover, management can help the team get the necessary cooperation by opening doors and dealing with political obstacles.

Missing the handoff is almost always the problem that stymies teams that recommend things. To avoid this, the transfer of responsibility for recommendations to those who must implement them demands top management's time and attention. The more top managers assume that recommendations will "just

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happen," the less likely it is that they will. The more involvement task force members have in implementing their recommendations, the more likely they are to get implemented.

To the extent that people outside the task force will have to carry the ball, it is critical to involve them in the process early and often, certainly well before recommendations are finalized. Such involvement may take many forms, including participating in interviews, helping with analyses, contributing and critiquing ideas, and conducting experiments and trials. At a minimum, anyone responsible for implementation should receive a briefing on the task force's purpose, approach, and objectives at the beginning of the effort as well as regular reviews of progress.

**Teams That Make or Do Things.** These teams include people at or near the front lines who are responsible for doing the basic manufacturing, development, operations, marketing, sales, service, and other value-adding activities of a business. With some exceptions, such as new-product development or process design teams, teams that make or do things tend to have no set completion dates because their activities are ongoing.

In deciding where team performance might have the greatest impact, top management should concentrate on what we call the company's "critical delivery points"—that is, places in the organization where the cost and value of the company's products and services are most directly determined. Such critical delivery points might include where accounts get managed, customer service performed, products designed, and productivity determined. If performance at critical delivery points depends on combining multiple skills, perspectives, and judgments in real time, then the team option is the smartest one.

When an organization does require a significant number of teams at these points, the sheer challenge of maximizing the performance of so many groups will demand a carefully constructed and performance-focused set of management processes. The issue here for top

management is how to build the necessary systems and process supports without falling into the trap of appearing to promote teams for their own sake.

The imperative here, returning to our earlier discussion of the basic discipline of teams, is a relentless focus on performance. If management fails to pay persistent attention to the link between teams and performance, the organization becomes convinced that "this year, we are doing 'teams'." Top management can help by instituting processes like pay schemes and training for teams responsive to their real time needs, but more than anything else, top management must make clear and compelling demands on the teams themselves and then pay constant attention to their

performance challenge at hand or whether the group must deliver substantial incremental performance requiring real joint work products. Although the team option promises greater performance, it also brings more risk, and managers must be brutally honest in assessing the trade-offs.

Members may have to overcome a natural reluctance to trust their fate to others. The price of faking the team approach is high: At best, members get diverted from their individual goals, costs outweigh benefits, and people resent the imposition on their time and priorities. At worst, serious animosities develop that undercut even the potential personal bests of the working-group approach.

## Every company faces specific performance challenges for which teams are the most practical and powerful vehicle at top management's disposal.

progress with respect to both team basics and performance results. This means focusing on specific teams and specific performance challenges. Otherwise "performance," like "team," will become a cliché.

**Teams That Run Things.** Despite the fact that many leaders refer to the group reporting to them as a team, few groups really are. And groups that become real teams seldom think of themselves as a team because they are so focused on performance results. Yet the opportunity for such teams includes groups from the top of the enterprise down through the divisional or functional level. Whether it is in charge of thousands of people or just a handful, as long as the group oversees some business, ongoing program, or significant functional activity, it is a team that runs things.

The main issue these teams face is determining whether a real team approach is the right one. Many groups that run things can be more effective as working groups than as teams. The key judgment is whether the sum of individual bests will suffice for the perfor-

Working groups present fewer risks. Effective working groups need little time to shape their purpose, since the leader usually establishes it. Meetings are run against well-prioritized agendas. And decisions are implemented through specific individual assignments and accountabilities. Most of the time, therefore, if performance aspirations can be met through individuals doing their respective jobs well, the working-group approach is more comfortable, less risky, and less disruptive than trying for more elusive team performance levels. Indeed, if there is no performance need for the team approach, efforts spent to improve the effectiveness of the working group make much more sense than floundering around trying to become a team.

Having said that, we believe the extra level of performance teams can achieve is becoming critical for a growing number of companies, especially as they move through major changes during which company performance depends on broad-based behavioral change. When top management uses teams to run

things, it should make sure the team succeeds in identifying specific purposes and goals.

This is a second major issue for teams that run things. Too often, such teams confuse the broad mission of the total organization with the specific purpose of their small group at the top. The discipline of teams tells us that for a real team to form, there must be a team purpose that is distinctive and specific to the small group and that requires its members to roll up their sleeves and accomplish something beyond individual end products. If a group of managers looks only at the economic performance of the part of the organization it runs to assess overall effectiveness, the group will not have any team performance goals of its own.

While the basic discipline of teams does not differ for them, teams at the top are certainly the most difficult. The complexities of long-term challenges, heavy demands on executive time, and the deep-seated individualism of senior people conspire against teams at the top. At the same time, teams at the top are the most powerful. At first we thought such teams were nearly impossible. That is because we were looking at the teams as defined by the formal organizational structure; that is, the leader and all his or her direct reports equals the team. Then we discovered that real teams at the top were often smaller and less formalized: Whitehead and Weinberg at Goldman Sachs; Hewlett and Packard at HP; Krasnoff, Pall, and Hardy at Pall Corporation; Kendall, Pearson, and Calloway at Pepsi; Haas and Haas at Levi Strauss; Batten and Ridder at Knight Ridder. They were mostly twos and threes, with an occasional fourth.

Nonetheless, real teams at the top of large, complex organizations are still few and far between. Far too many groups at the top of large corporations needlessly constrain themselves from achieving real team levels of performance because they assume that all direct reports must be on the team, that team goals must be identical to corporate goals, that the team members' positions rather than skills determine their

respective roles, that a team must be a team all the time, and that the team leader is above doing real work.

As understandable as these assumptions may be, most of them are unwarranted. They do not apply to the teams at the top we have observed, and when replaced with more realistic and flexible assumptions that permit the team discipline to be applied, real team performance at the top can and does occur. Moreover, as more and more companies are confronted with the need to manage major change across their organizations, we will see more real teams at the top.

We believe that teams will become the primary unit of performance in high-performance organizations. But that does not mean that teams will crowd out individual opportunity or formal hierarchy and process. Rather, teams will enhance existing structures without replacing them. A team opportunity exists anywhere hierarchy or organizational boundaries inhibit the skills and perspectives needed for optimal results. Thus, new-product innovation requires preserving functional excellence through structure while eradicating functional bias through teams. And frontline productivity requires preserving direction and guidance through hierarchy while drawing on energy and flexibility through self-managing teams.

We are convinced that every company faces specific performance challenges for which teams are the most practical and powerful vehicle at top management's disposal. The critical role for senior managers, therefore, is to worry about company performance and the kinds of teams that can deliver it. This means top management must recognize a team's unique potential to deliver results, deploy teams strategically when they are the best tool for the job, and foster the basic discipline of teams that will make them effective. By doing so, top management creates the kind of environment that enables team as well as individual and organizational performance. □

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It won't surprise anyone to find an article on teams by Jon Katzenbach and Douglas Smith figuring into an issue devoted to high performance. While Peter Drucker may have been the first to point out that a team-based organization can be highly effective, Katzenbach and Smith's work made it possible for companies to implement the idea.

In this groundbreaking 1993 article, the authors say that if managers want to make better decisions about teams, they must be clear about what a team is. They define a team as "a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable." That definition lays down the discipline that teams must share to be effective.

Katzenbach and Smith discuss the four elements – common commitment and purpose, performance goals, complementary skills, and mutual accountability – that make teams function. They also classify teams into three varieties – teams that recommend things, teams that make or do things, and teams that run things – and describe how each type faces different challenges.

# The Discipline of Teams

by Jon R. Katzenbach and Douglas K. Smith

What makes the difference between a team that performs and one that doesn't?

**E**arly in the 1980s, Bill Greenwood and a small band of rebel railroaders on most of the top management of Burlington Northern and created a multibillion-dollar business in "piggy-backing" rail services despite widespread resistance, even resentment, within the company. The Medical Products Group at Hewlett-Packard owes most of its leading performance to the remarkable efforts of Dean Morton, Lew Platt, Ben Holmes, Dick Alberding, and a handful of their colleagues who revitalized a health care business that most others had written off. At Knight Ridder, Jim Batten's "customer obsession" vision took root at the *Tallahassee Democrat* when 14 frontline enthusiasts turned a charter to eliminate errors into a mission

of major change and took the entire paper along with them.

Such are the stories and the work of teams – real teams that perform, not amorphous groups that we call teams because we think that the label is motivating and energizing. The difference between teams that perform and other groups that don't is a subject to which most of us pay far too little attention. Part of the problem is that "team" is a word and concept so familiar to everyone. (See the exhibit "Not All Groups Are Teams: How to Tell the Difference.")

Or at least that's what we thought when we set out to do research for our book *The Wisdom of Teams* (HarperBusiness, 1993). We wanted to discover what differentiates various levels of

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team performance, where and how teams work best, and what top management can do to enhance their effectiveness. We talked with hundreds of people on more than 50 different teams in 30 companies and beyond, from Motorola and Hewlett-Packard to Operation Desert Storm and the Girl Scouts.

We found that there is a basic discipline that makes teams work. We also found that teams and good performance are inseparable: You cannot have one without the other. But people use the word "team" so loosely that it gets in the way of learning and applying the discipline that leads to good performance. For managers to make better decisions about whether, when, or how to encourage and use teams, it is important to be more precise about what a team is and what it isn't.

Most executives advocate teamwork. And they should. Teamwork represents a set of values that encourage listening and responding constructively to views

expressed by others, giving others the benefit of the doubt, providing support, and recognizing the interests and achievements of others. Such values help teams perform, and they also promote individual performance as well as the performance of an entire organization. But teamwork values by themselves are not exclusive to teams, nor are they enough to ensure team performance. (See the sidebar "Building Team Performance.")

Nor is a team just any group working together. Committees, councils, and task forces are not necessarily teams. Groups do not become teams simply because that is what someone calls them. The entire workforce of any large and complex organization is *never* a team, but think about how often that platitude is offered up.

To understand how teams deliver extra performance, we must distinguish between teams and other forms of working groups. That distinction turns on per-

formance results. A working group's performance is a function of what its members do as individuals. A team's performance includes both individual results and what we call "collective work products." A collective work product is what two or more members must work on together, such as interviews, surveys, or experiments. Whatever it is, a collective work product reflects the joint, real contribution of team members.

Working groups are both prevalent and effective in large organizations where individual accountability is most important. The best working groups come together to share information, perspectives, and insights; to make decisions that help each person do his or her job better; and to reinforce individual performance standards. But the focus is always on individual goals and accountabilities. Working-group members don't take responsibility for results other than their own. Nor do they try to develop incremental performance contributions requiring the combined work of two or more members.

Teams differ fundamentally from working groups because they require both individual and mutual accountability. Teams rely on more than group discussion, debate, and decision, on more than sharing information and best-practice performance standards. Teams produce discrete work products through the joint contributions of their members. This is what makes possible performance levels greater than the sum of all the individual bests of team members. Simply stated, a team is more than the sum of its parts.

The first step in developing a disciplined approach to team management is to think about teams as discrete units of performance and not just as positive sets of values. Having observed and worked with scores of teams in action, both successes and failures, we offer the following. Think of it as a working defi-

### Not All Groups Are Teams: How to Tell the Difference

#### **Working Group**

- Strong, clearly focused leader
- Individual accountability
- The group's purpose is the same as the broader organizational mission
- Individual work products
- Runs efficient meetings
- Measures its effectiveness indirectly by its influence on others (such as financial performance of the business)
- Discusses, decides, and delegates

#### **Team**

- Shared leadership roles
- Individual and mutual accountability
- Specific team purpose that the team itself delivers
- Collective work products
- Encourages open-ended discussion and active problem-solving meetings
- Measures performance directly by assessing collective work products
- Discusses, decides, and does real work together

**Jon R. Katzenbach** is a founder and senior partner of Katzenbach Partners, a strategic and organizational consulting firm, and a former director of McKinsey & Company. His most recent book is *Why Pride Matters More Than Money: The Power of the World's Greatest Motivational Force* (Crown Business, 2003). **Douglas K. Smith** is an organizational consultant and a former partner at McKinsey & Company. His most recent book is *On Value and Values: Thinking Differently About We in an Age of Me* (Financial Times Prentice Hall, 2004).

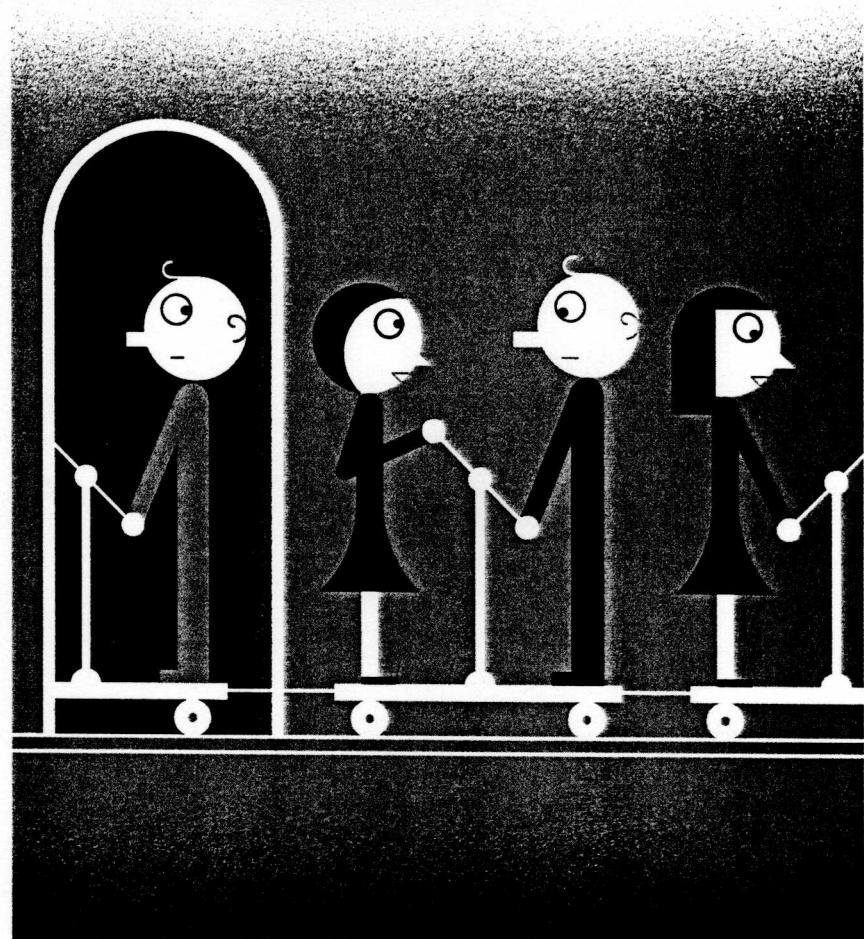
nition or, better still, an essential discipline that real teams share: *A team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable.*

The essence of a team is common commitment. Without it, groups perform as individuals; with it, they become a powerful unit of collective performance. This kind of commitment requires a purpose in which team members can believe. Whether the purpose is to "transform the contributions of suppliers into the satisfaction of customers," to "make our company one we can be proud of again," or to "prove that all children can learn," credible team purposes have an element related to winning, being first, revolutionizing, or being on the cutting edge.

Teams develop direction, momentum, and commitment by working to shape a meaningful purpose. Building ownership and commitment to team purpose, however, is not incompatible with taking initial direction from outside the team. The often-asserted assumption that a team cannot "own" its purpose unless management leaves it alone actually confuses more potential teams than it helps. In fact, it is the exceptional case – for example, entrepreneurial situations – when a team creates a purpose entirely on its own.

Most successful teams shape their purposes in response to a demand or opportunity put in their path, usually by higher management. This helps teams get started by broadly framing the company's performance expectation. Management is responsible for clarifying the charter, rationale, and performance challenge for the team, but management must also leave enough flexibility for the team to develop commitment around its own spin on that purpose, set of specific goals, timing, and approach.

The best teams invest a tremendous amount of time and effort exploring, shaping, and agreeing on a purpose that belongs to them both collectively and individually. This "purposing" activity continues throughout the life of the



## People use the word "team" so loosely that it gets in the way of learning and applying the discipline that leads to good performance.

team. By contrast, failed teams rarely develop a common purpose. For whatever reason – an insufficient focus on performance, lack of effort, poor leadership – they do not coalesce around a challenging aspiration.

The best teams also translate their common purpose into specific performance goals, such as reducing the reject rate from suppliers by 50% or increasing the math scores of graduates from 40% to 95%. Indeed, if a team fails to establish specific performance goals or if those goals do not relate directly to the team's overall purpose, team members become confused, pull apart, and revert to mediocre performance. By contrast, when purposes and goals build on one

another and are combined with team commitment, they become a powerful engine of performance.

Transforming broad directives into specific and measurable performance goals is the surest first step for a team trying to shape a purpose meaningful to its members. Specific goals, such as getting a new product to market in less than half the normal time, responding to all customers within 24 hours, or achieving a zero-defect rate while simultaneously cutting costs by 40%, all provide firm footholds for teams. There are several reasons:

- Specific team-performance goals help define a set of work products that are different both from an organization-wide

## Building Team Performance

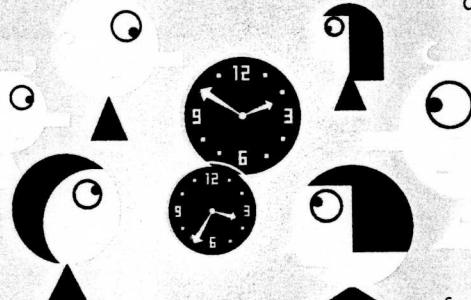
**A**lthough there is no guaranteed how-to recipe for building team performance, we observed a number of approaches shared by many successful teams.

**Establish urgency, demanding performance standards, and direction.** All team members need to believe the team has urgent and worthwhile purposes, and they want to know what the expectations are. Indeed, the more urgent and meaningful the rationale, the more likely it is that the team will live up to its performance potential, as was the case for a customer-service team that was told that further growth for the entire company would be impossible without major improvements in that area. Teams work best in a compelling context. That is why companies with strong performance ethics usually form teams readily.

**Select members for skill and skill potential, not personality.** No team succeeds without all the skills needed to meet its purpose and performance goals. Yet most teams figure out the skills they will need after they are formed. The wise manager will choose people for their existing skills and their potential to improve existing skills and learn new ones.

**Pay particular attention to first meetings and actions. Initial impressions always mean a great deal.** When potential teams first gather, everyone monitors the signals given by others to confirm, suspend, or dispel assumptions and concerns. They pay particular attention to those in authority: the team leader and any executives who set up, oversee, or otherwise influence the team. And, as always, what such leaders do is more important than what they say. If a senior executive leaves the team kickoff to take a phone call ten minutes after the session has begun and he never returns, people get the message.

**Set some clear rules of behavior.** All effective teams develop rules of conduct at the outset to help them achieve their purpose and performance goals. The most critical initial rules pertain to attendance (for example, "no interruptions to take phone calls"), discussion ("no sacred cows"), confidentiality ("the only things to leave this room are what we agree on"), analytic approach ("facts are friendly"), end-product orientation ("everyone gets assignments and does them"), constructive confrontation ("no finger pointing"), and, often the most important, contributions ("everyone does real work").



**Set and seize upon a few immediate performance-oriented tasks and goals.** Most effective teams trace their advancement to key performance-oriented events. Such events can be set in motion by immediately establishing a few challenging goals that can be reached early on. There is no such thing as a real team without performance results, so the sooner such results occur, the sooner the team congeals.

**Challenge the group regularly with fresh facts and information.** New information causes a team to redefine and enrich its understanding of the performance challenge, thereby helping the team shape a common purpose, set clearer goals, and improve its common approach. A plant quality improvement team knew the cost of poor quality was high, but it wasn't until they researched the different types of defects and put a price tag on each one that they knew where to go next. Conversely, teams err when they assume that all the information needed exists in the collective experience and knowledge of their members.

**Spend lots of time together.** Common sense tells us that team members must spend a lot of time together, scheduled and unscheduled, especially in the beginning. Indeed, creative insights as well as personal bonding require impromptu and casual interactions just as much as analyzing spreadsheets and interviewing customers. Busy executives and managers too often intentionally minimize the time they spend together. The successful teams we've observed all gave themselves the time to learn to be a team. This time need not always be spent together physically; electronic, fax, and phone time can also count as time spent together.

**Exploit the power of positive feedback, recognition, and reward.** Positive reinforcement works as well in a team context as elsewhere. Giving out "gold stars" helps shape new behaviors critical to team performance. If people in the group, for example, are alert to a shy person's initial efforts to speak up and contribute, they can give the honest positive reinforcement that encourages continued contributions. There are many ways to recognize and reward team performance beyond direct compensation, from having a senior executive speak directly to the team about the urgency of its mission to using awards to recognize contributions. Ultimately, however, the satisfaction shared by a team in its own performance becomes the most cherished reward.

mission and from individual job objectives. As a result, such work products require the collective effort of team members to make something specific happen that, in and of itself, adds real value to results. By contrast, simply gathering from time to time to make decisions will not sustain team performance.

• The specificity of performance objectives facilitates clear communication and constructive conflict within the team. When a plant-level team, for example, sets a goal of reducing average machine changeover time to two hours, the clarity of the goal forces the team to concentrate on what it would take either to achieve or to reconsider the goal. When such goals are clear, discussions can focus on how to pursue them or whether to change them; when goals are ambiguous or nonexistent, such discussions are much less productive.

and other stripes fade into the background. The teams that succeed evaluate what and how each individual can best contribute to the team's goal and, more important, do so in terms of the performance objective itself rather than a person's status or personality.

- Specific goals allow a team to achieve small wins as it pursues its broader purpose. These small wins are invaluable to building commitment and overcoming the inevitable obstacles that get in the way of a long-term purpose. For example, the Knight Ridder team mentioned at the outset turned a narrow goal to eliminate errors into a compelling customer service purpose.

- Performance goals are compelling. They are symbols of accomplishment that motivate and energize. They challenge the people on a team to commit themselves, as a team, to make a difference.

for success. A large number of people, say 50 or more, can theoretically become a team. But groups of such size are more likely to break into subteams rather than function as a single unit.

Why? Large numbers of people have trouble interacting constructively as a group, much less doing real work together. Ten people are far more likely than 50 to work through their individual, functional, and hierarchical differences toward a common plan and to hold themselves jointly accountable for the results.

Large groups also face logistical issues, such as finding enough physical space and time to meet. And they confront more complex constraints, like crowd or herd behaviors, which prevent the intense sharing of viewpoints needed to build a team. As a result, when they try to develop a common purpose,

## **For managers to make better decisions about whether, when, or how to encourage and use teams, it is important to be more precise about what a team is and what it isn't.**

- The attainability of specific goals helps teams maintain their focus on getting results. A product-development team at Eli Lilly's Peripheral Systems Division set definite yardsticks for the market introduction of an ultrasonic probe to help doctors locate deep veins and arteries. The probe had to have an audible signal through a specified depth of tissue, be capable of being manufactured at a rate of 100 per day, and have a unit cost less than a preestablished amount. Because the team could measure its progress against each of these specific objectives, the team knew throughout the development process where it stood. Either it had achieved its goals or not.

- As Outward Bound and other team-building programs illustrate, specific objectives have a leveling effect conducive to team behavior. When a small group of people challenge themselves to get over a wall or to reduce cycle time by 50%, their respective titles, perks,

Drama, urgency, and a healthy fear of failure combine to drive teams that have their collective eye on an attainable, but challenging, goal. Nobody but the team can make it happen. It's their challenge.

The combination of purpose and specific goals is essential to performance. Each depends on the other to remain relevant and vital. Clear performance goals help a team keep track of progress and hold itself accountable; the broader, even nobler, aspirations in a team's purpose supply both meaning and emotional energy.

Virtually all effective teams we have met, read or heard about, or been members of have ranged between two and 25 people. For example, the Burlington Northern piggybacking team had seven members, and the Knight Ridder newspaper team had 14. The majority of them have numbered less than ten. Small size is admittedly more of a pragmatic guide than an absolute necessity

they usually produce only superficial "missions" and well-meaning intentions that cannot be translated into concrete objectives. They tend fairly quickly to reach a point when meetings become a chore, a clear sign that most of the people in the group are uncertain why they have gathered, beyond some notion of getting along better. Anyone who has been through one of these exercises understands how frustrating it can be. This kind of failure tends to foster cynicism, which gets in the way of future team efforts.

In addition to finding the right size, teams must develop the right mix of skills; that is, each of the complementary skills necessary to do the team's job. As obvious as it sounds, it is a common failing in potential teams. Skill requirements fall into three fairly self-evident categories.

**Technical or Functional Expertise.** It would make little sense for a group of

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doctors to litigate an employment discrimination case in a court of law. Yet teams of doctors and lawyers often try medical malpractice or personal injury cases. Similarly, product development groups that include only marketers or engineers are less likely to succeed than those with the complementary skills of both.

**Problem-Solving and Decision-Making Skills.** Teams must be able to identify the problems and opportunities they face, evaluate the options they have for moving forward, and then make necessary trade-offs and decisions about how to proceed. Most teams need some members with these skills to begin with, although many will develop them best on the job.

**Interpersonal Skills.** Common understanding and purpose cannot arise without effective communication and constructive conflict, which in turn depend on interpersonal skills. These skills include risk taking, helpful criticism,

fact that their performance challenge was a marketing one. In fact, we discovered that teams are powerful vehicles for developing the skills needed to meet the team's performance challenge. Accordingly, team member selection ought to ride as much on skill potential as on skills already proven.

Effective teams develop strong commitment to a common approach; that is, to how they will work together to accomplish their purpose. Team members must agree on who will do particular jobs, how schedules will be set and adhered to, what skills need to be developed, how continuing membership in the team is to be earned, and how the group will make and modify decisions. This element of commitment is as important to team performance as the team's commitment to its purpose and goals.

Agreeing on the specifics of work and how they fit together to integrate individual skills and advance team performance lies at the heart of shaping a

all its human resources to a common purpose can a team develop and agree on the best approach to achieve its goals. At the heart of such long and, at times, difficult interactions lies a commitment-building process in which the team candidly explores who is best suited to each task as well as how individual roles will come together. In effect, the team establishes a social contract among members that relates to their purpose and guides and obligates how they must work together.

No group ever becomes a team until it can hold itself accountable as a team. Like common purpose and approach, mutual accountability is a stiff test. Think, for example, about the subtle but critical difference between "the boss holds me accountable" and "we hold ourselves accountable." The first case can lead to the second, but without the second, there can be no team.

Companies like Hewlett-Packard and Motorola have an ingrained performance ethic that enables teams to form organically whenever there is a clear performance challenge requiring collective rather than individual effort. In these companies, the factor of mutual accountability is commonplace. "Being in the boat together" is how their performance game is played.

At its core, team accountability is about the sincere promises we make to ourselves and others, promises that underpin two critical aspects of effective teams: commitment and trust. Most of us enter a potential team situation cautiously because ingrained individualism and experience discourage us from putting our fates in the hands of others or accepting responsibility for others. Teams do not succeed by ignoring or wishing away such behavior.

Mutual accountability cannot be coerced any more than people can be made to trust one another. But when a team shares a common purpose, goals, and approach, mutual accountability grows as a natural counterpart. Accountability arises from and reinforces the time, energy, and action invested in figuring out what the team is trying to accomplish and how best to get it done.

### A team opportunity exists anywhere hierarchy or organizational boundaries inhibit the skills and perspectives needed for optimal results.

objectivity, active listening, giving the benefit of the doubt, and recognizing the interests and achievements of others.

Obviously, a team cannot get started without some minimum complement of skills, especially technical and functional ones. Still, think about how often you've been part of a team whose members were chosen primarily on the basis of personal compatibility or formal position in the organization, and in which the skill mix of its members wasn't given much thought.

It is equally common to overemphasize skills in team selection. Yet in all the successful teams we've encountered, not one had all the needed skills at the outset. The Burlington Northern team, for example, initially had no members who were skilled marketers despite the

common approach. It is perhaps self-evident that an approach that delegates all the real work to a few members (or staff outsiders) and thus relies on reviews and meetings for its only "work together" aspects, cannot sustain a real team. Every member of a successful team does equivalent amounts of real work; all members, including the team leader, contribute in concrete ways to the team's work product. This is a very important element of the emotional logic that drives team performance.

When individuals approach a team situation, especially in a business setting, each has preexisting job assignments as well as strengths and weaknesses reflecting a variety of talents, backgrounds, personalities, and prejudices. Only through the mutual discovery and understanding of how to apply

When people work together toward a common objective, trust and commitment follow. Consequently, teams enjoying a strong common purpose and approach inevitably hold themselves responsible, both as individuals and as a team, for the team's performance. This sense of mutual accountability also produces the rich rewards of mutual achievement in which all members share. What we heard over and over from members of effective teams is that they found the experience energizing and motivating in ways that their "normal" jobs never could match.

On the other hand, groups established primarily for the sake of becoming a team or for job enhancement, communication, organizational effectiveness, or excellence rarely become effective teams, as demonstrated by the bad feelings left in many companies after experimenting with quality circles that never translated "quality" into specific goals. Only when appropriate performance goals are set does the process of

discussing the goals and the approaches to them give team members a clearer and clearer choice: They can disagree with a goal and the path that the team selects and, in effect, opt out, or they can pitch in and become accountable with and to their teammates.

The discipline of teams we've outlined is critical to the success of all teams. Yet it is also useful to go one step further. Most teams can be classified in one of three ways: teams that recommend things, teams that make or do things, and teams that run things. In our experience, each type faces a characteristic set of challenges.

**Teams That Recommend Things.** These teams include task forces; project groups; and audit, quality, or safety groups asked to study and solve particular problems. Teams that recommend things almost always have predetermined completion dates. Two critical issues are unique to such teams: getting off to a fast and constructive start and dealing with the ultimate handoff

that's required to get recommendations implemented.

The key to the first issue lies in the clarity of the team's charter and the composition of its membership. In addition to wanting to know why and how their efforts are important, task forces need a clear definition of whom management expects to participate and the time commitment required. Management can help by ensuring that the team includes people with the skills and influence necessary for crafting practical recommendations that will carry weight throughout the organization. Moreover, management can help the team get the necessary cooperation by opening doors and dealing with political obstacles.

Missing the handoff is almost always the problem that stymies teams that recommend things. To avoid this, the transfer of responsibility for recommendations to those who must implement them demands top management's time and attention. The more top managers assume that recommendations will "just

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happen," the less likely it is that they will. The more involvement task force members have in implementing their recommendations, the more likely they are to get implemented.

To the extent that people outside the task force will have to carry the ball, it is critical to involve them in the process early and often, certainly well before recommendations are finalized. Such involvement may take many forms, including participating in interviews, helping with analyses, contributing and critiquing ideas, and conducting experiments and trials. At a minimum, anyone responsible for implementation should receive a briefing on the task force's purpose, approach, and objectives at the beginning of the effort as well as regular reviews of progress.

**Teams That Make or Do Things.** These teams include people at or near the front lines who are responsible for doing the basic manufacturing, development, operations, marketing, sales, service, and other value-adding activities of a business. With some exceptions, such as new-product development or process design teams, teams that make or do things tend to have no set completion dates because their activities are ongoing.

In deciding where team performance might have the greatest impact, top management should concentrate on what we call the company's "critical delivery points"—that is, places in the organization where the cost and value of the company's products and services are most directly determined. Such critical delivery points might include where accounts get managed, customer service performed, products designed, and productivity determined. If performance at critical delivery points depends on combining multiple skills, perspectives, and judgments in real time, then the team option is the smartest one.

When an organization does require a significant number of teams at these points, the sheer challenge of maximizing the performance of so many groups will demand a carefully constructed and performance-focused set of management processes. The issue here for top

management is how to build the necessary systems and process supports without falling into the trap of appearing to promote teams for their own sake.

The imperative here, returning to our earlier discussion of the basic discipline of teams, is a relentless focus on performance. If management fails to pay persistent attention to the link between teams and performance, the organization becomes convinced that "this year, we are doing 'teams'." Top management can help by instituting processes like pay schemes and training for teams responsive to their real time needs, but more than anything else, top management must make clear and compelling demands on the teams themselves and then pay constant attention to their

performance challenge at hand or whether the group must deliver substantial incremental performance requiring real joint work products. Although the team option promises greater performance, it also brings more risk, and managers must be brutally honest in assessing the trade-offs.

Members may have to overcome a natural reluctance to trust their fate to others. The price of faking the team approach is high: At best, members get diverted from their individual goals, costs outweigh benefits, and people resent the imposition on their time and priorities. At worst, serious animosities develop that undercut even the potential personal bests of the working-group approach.

## Every company faces specific performance challenges for which teams are the most practical and powerful vehicle at top management's disposal.

progress with respect to both team basics and performance results. This means focusing on specific teams and specific performance challenges. Otherwise "performance," like "team," will become a cliché.

**Teams That Run Things.** Despite the fact that many leaders refer to the group reporting to them as a team, few groups really are. And groups that become real teams seldom think of themselves as a team because they are so focused on performance results. Yet the opportunity for such teams includes groups from the top of the enterprise down through the divisional or functional level. Whether it is in charge of thousands of people or just a handful, as long as the group oversees some business, ongoing program, or significant functional activity, it is a team that runs things.

The main issue these teams face is determining whether a real team approach is the right one. Many groups that run things can be more effective as working groups than as teams. The key judgment is whether the sum of individual bests will suffice for the perfor-

Working groups present fewer risks. Effective working groups need little time to shape their purpose, since the leader usually establishes it. Meetings are run against well-prioritized agendas. And decisions are implemented through specific individual assignments and accountabilities. Most of the time, therefore, if performance aspirations can be met through individuals doing their respective jobs well, the working-group approach is more comfortable, less risky, and less disruptive than trying for more elusive team performance levels. Indeed, if there is no performance need for the team approach, efforts spent to improve the effectiveness of the working group make much more sense than floundering around trying to become a team.

Having said that, we believe the extra level of performance teams can achieve is becoming critical for a growing number of companies, especially as they move through major changes during which company performance depends on broad-based behavioral change. When top management uses teams to run

things, it should make sure the team succeeds in identifying specific purposes and goals.

This is a second major issue for teams that run things. Too often, such teams confuse the broad mission of the total organization with the specific purpose of their small group at the top. The discipline of teams tells us that for a real team to form, there must be a team purpose that is distinctive and specific to the small group and that requires its members to roll up their sleeves and accomplish something beyond individual end products. If a group of managers looks only at the economic performance of the part of the organization it runs to assess overall effectiveness, the group will not have any team performance goals of its own.

While the basic discipline of teams does not differ for them, teams at the top are certainly the most difficult. The complexities of long-term challenges, heavy demands on executive time, and the deep-seated individualism of senior people conspire against teams at the top. At the same time, teams at the top are the most powerful. At first we thought such teams were nearly impossible. That is because we were looking at the teams as defined by the formal organizational structure; that is, the leader and all his or her direct reports equals the team. Then we discovered that real teams at the top were often smaller and less formalized: Whitehead and Weinberg at Goldman Sachs; Hewlett and Packard at HP; Krasnoff, Pall, and Hardy at Pall Corporation; Kendall, Pearson, and Calloway at Pepsi; Haas and Haas at Levi Strauss; Batten and Ridder at Knight Ridder. They were mostly twos and threes, with an occasional fourth.

Nonetheless, real teams at the top of large, complex organizations are still few and far between. Far too many groups at the top of large corporations needlessly constrain themselves from achieving real team levels of performance because they assume that all direct reports must be on the team, that team goals must be identical to corporate goals, that the team members' positions rather than skills determine their

respective roles, that a team must be a team all the time, and that the team leader is above doing real work.

As understandable as these assumptions may be, most of them are unwarranted. They do not apply to the teams at the top we have observed, and when replaced with more realistic and flexible assumptions that permit the team discipline to be applied, real team performance at the top can and does occur. Moreover, as more and more companies are confronted with the need to manage major change across their organizations, we will see more real teams at the top.

We believe that teams will become the primary unit of performance in high-performance organizations. But that does not mean that teams will crowd out individual opportunity or formal hierarchy and process. Rather, teams will enhance existing structures without replacing them. A team opportunity exists anywhere hierarchy or organizational boundaries inhibit the skills and perspectives needed for optimal results. Thus, new-product innovation requires preserving functional excellence through structure while eradicating functional bias through teams. And frontline productivity requires preserving direction and guidance through hierarchy while drawing on energy and flexibility through self-managing teams.

We are convinced that every company faces specific performance challenges for which teams are the most practical and powerful vehicle at top management's disposal. The critical role for senior managers, therefore, is to worry about company performance and the kinds of teams that can deliver it. This means top management must recognize a team's unique potential to deliver results, deploy teams strategically when they are the best tool for the job, and foster the basic discipline of teams that will make them effective. By doing so, top management creates the kind of environment that enables team as well as individual and organizational performance. □

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# 'What do you mean?' The importance of language in developing interdisciplinary research

L J Bracken (née Bull)\* and E A Oughton\*\*

Unity between human and physical geography continues to be debated widely. However, if geography is to take advantage of its unique positioning between the natural and social sciences, geographers need to be able to communicate more effectively and efficiently across human and physical specialisms. In this paper we focus on the significance and uses of language in interdisciplinary research practice. Interdisciplinary research faces a range of challenges in achieving effective communication between discipline-based experts, of which language is key. This paper draws on a discussion developing the initial ideas for a research application and a field day to familiarize the group members with the study area. *Dialects*, *metaphor* and *articulation* are identified as three overlapping aspects of language which play an important role in developing understandings between different disciplines. These three different aspects of language are illustrated through the analysis of three situations focusing on the words *dynamic*, *mapping* and *catchment*. We conclude that interdisciplinary projects must allocate time to the development of shared vocabularies and understandings. Common understanding derived from shared languages in turn plays a vital role in enhancing the relations of trust that are necessary for effective interdisciplinary working.

**key words** interdisciplinary language dialect metaphor articulation common understanding

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## Introduction

Science is increasingly specialised, talks different languages and has different areas of interest. (Dalgaard *et al.* 2003, 41)

language cannot be understood, much less translated, without reference to a great deal of knowledge about the world. (Quinn and Holland 1987, 5)

*Transactions of the Institute of British Geographers* has published a number of articles over the last 20 years that debate the unity, or lack of unity, within geography (e.g. Freeman 1986; Taylor 1986; Johnston 1986; Goudie 1986; Douglas 1986; Massey

1999; Lane 2001; Clifford 2001; Gregory *et al.* 2002; Johnston 2003). The unity to which they refer is that between the 'physical' and the 'social' emphases within geography. Volume 11, number 4, in 1986, contained six contributions on whether geography could continue as a single, integrated field or whether the diversity of research and teaching carried out under this umbrella should split into different subjects. These papers suggested unity had become an issue because of a failure of internal coherence within geography and an external need for solidarity. For example, Stoddart (1987) argues that increasing division into specialisms weakens the ability of geographers to deal with

critical and significant problems. Johnston also argues that

the internal divisions we have created in recent decades have substantially compromised our attempts to answering the question – ‘why do places differ? . . . subfields and the methodological and ideological divisions of geography will undoubtedly remain and contribute significantly to the advancement of knowledge . . . their members can interact to a much greater extent than they do at present, to the mutual benefit of all. (1991, 145)

Systematic fragmentation of the subject was seen as the greatest challenge, yet even in these early papers there was a strong expression of the need for interdisciplinary research. Most recently, over the last two years, there have been sessions organized at the Institute of British Geographers and the International Geographical Union international conferences on ‘conversations across the divide’, that is the cross-over and linkages between human and physical geography. This activity underlines the continued concerns with interdisciplinarity both within geography and the wider academy (see Harrison *et al.* 2004).

The debate was taken up again by Massey (1999), within the context of a broader argument for interdisciplinarity in the human and physical sciences, who searches for commonalities through reference to space-time concepts (developed further in Massey 2005). Lane (2001) agrees with the arguments for commonalities with the implication that we need understandings of cross-overs between disciplinary approaches. Both authors are concerned with the theoretical or conceptual models that underpin geographical research. Fragmentation has arisen not only from developments within the discipline, but has been aggravated by external pressures. This is highlighted by Clifford (2001), Gregory *et al.* (2002) and Johnston (2003), who are concerned with the limitations imposed on interdisciplinarity within geography by the institutional frameworks which have developed around publication and research funding.

At this point we need to clarify what we mean by the terms ‘discipline’ and ‘interdisciplinarity’. We take a discipline to be a branch of learning or scholarly instruction (OED 1993) which is defined by institutional boundaries constructed by the needs of teaching, funding, administration and professional development. The perceived boundaries of a discipline may change over time. Students are prepared for work within a discipline by an appropriate and specific training. As Dewsbury

and Naylor state, quoting Shapin (1998), ‘disciplines themselves are the outcome of “a variety of practices whose conceptual identities were the outcomes of local patterns of training and socialization”’ (2002, 255). Geography is regarded by many as a discipline, but clearly involves very different training for practitioners in human and physical aspects. Thus the issues surrounding geographers with different backgrounds working together are to a degree analogous to those around interdisciplinary working between the physical and social sciences. We are following the definition of interdisciplinarity from Balsiger (2004), which suggests that interdisciplinary is a collective term encompassing all forms of scientific collaboration where the field of a single discipline is transgressed. By examining working practices across human and physical geography we are therefore exploring interdisciplinarity. Moreover, because of the very different epistemologies and practices drawn on by human and physical geographers, we feel our arguments can be extended to the relation between the physical and social sciences.

Recognized differences between discipline-based experts that can produce problems for interdisciplinary research include: fundamental differences in epistemologies, knowledges and methods; different ways of formulating research questions; differences in communication (oral and written); and a range of attitudes across disciplines. Reductionism has been the philosophy behind Western science and technology in the last few decades and has resulted in expert knowledge becoming segmented and bureaucratized (see, for example, Brewer 1999; Karlqvist 1999; Balsiger 2004; Lawrence and Deprés 2004). This is one contributing factor that has led to researchers perceiving large differences between physical and social sciences.<sup>1</sup> Increasingly, there are calls for interdisciplinary approaches, especially in research concerning the natural environment, to bring quality research from different disciplines together to overcome increasing specialization (Hansson 1999). The appropriateness of interdisciplinary research is based on the premise that its associated collaboration and networking will produce innovative concepts and methods to answer complex research questions that are beyond the expertise of individual disciplines (Nissani 1997; Bruce *et al.* 2004). However, achieving good interdisciplinary research is not necessarily straightforward.

With the increasing appreciation of difficulties and barriers to undertaking interdisciplinary research, publications are now starting to recognize and highlight practice to assist successful collaboration (see, for example, Brewer 1999; Balsiger 2004; Bruce *et al.* 2004). Key suggestions are for longer start-up phases of projects to promote cohesion and to learn to value contributions from other disciplines, to develop projects which satisfy complex societal problems, as well as the need for effective and experienced management of interdisciplinary teams, the need for flexibility of researchers involved in conducting the research, and the need to understand the ways of thought and language of others.

There are theoretical and conceptual aspects of interdisciplinarity, but we argue that if we are to address issues of interdisciplinarity fully, we also need to concern ourselves with practice; with the methods by which these concepts are employed. In this paper we wish to contribute to the debate by focusing on one aspect of interdisciplinary practice, that is, the significance and use of language in the development and implementation of research. This is not a new problem but it becomes increasingly relevant as researchers attempt to work together to address problems of the environment.

Across geography we speak separate languages, do very different things. Many have abandoned the possibility of communicating with colleagues working not only in the same titular discipline but also in the same department. (Stoddart 1987, 330)

We believe that our experience and what we have learnt about interdisciplinary working has something to offer to geographers wishing 'to build bridges within the disciplinary archipelago' (Johnston 1991, 145). The concern over a fragmented discipline and the need to work more closely is an old one within geography but is still of relevance, as demonstrated by the recent article in *Area* with the title 'Thinking across the divide: perspectives on the conversations between physical and human geography' (Harrison *et al.* 2004). We first present the context for this paper by providing a background to our research project, to an initial field visit and to our research team. We then discuss the key differences between disciplines that need to be surmounted to enable interdisciplinary research, of which language is just one. Finally, we explore more fully the different ways in which language is an important tool for developing truly

interdisciplinary projects. We discuss three different aspects of the use of language in interdisciplinary research: *dialects*, *metaphor* and *articulation*. These three linguistic practices are different, but not necessarily exclusive, and to explain what we mean more clearly we focus our discussion on three words: *dynamic*, *mapping* and *catchment*. The paper draws on aspects of previously published work, but also uses analysis of our own experiences. In the penultimate section of the paper we reflect on some of the issues that arose during our discussions and field day, and we conclude with some proposals for practising interdisciplinary research.

We should make clear what we are *not* trying to do in the paper. There is a considerable literature within the social sciences and humanities on the role that language plays in relation to social theory and the theory of science, 'the linguistic turn' (e.g. Pryke *et al.* 2003). As Massey notes with reference to Rorty:

This is a very general epistemological position, in that it concerns the whole of our relationship, as linguistically able (indeed often linguistically defined) human beings, to the world beyond us. (2003, 81)

This paper is not about the linguistic turn, it is about communication in practice. We focus on language as a tool for undertaking interdisciplinary research. Learning to use this tool more effectively means better chances of achieving good practice, and doing successful research.

## Background: the place, the project and the people

This paper is based on our experience of developing a scoping study for the Rural Economy and Land Use programme (RELU).<sup>2</sup> The overall aim of RELU is to develop, within a socio-economic framework, future research-based options for sustainable land use that integrate social, political, economic, technical and environmental perspectives. Geography is well positioned as a discipline to take advantage of such opportunities, due to the range of subjects it covers, positioned in both natural and social science (Richards 2004). Previous initiatives to develop interdisciplinary work have tended to result in multidisciplinary research being undertaken from a range of different perspectives, rather than truly interdisciplinary research (Evans and Marvin 2004). RELU is managed jointly by the

Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council and the Natural Environment Research Council. Joint management enables RELU to pursue an integrated, interdisciplinary approach to research on rural issues, in order to exploit opportunities for synergy between the communities supported by the participating Councils and to maximize its added value. This framework for research funding is a very positive step forward in interdisciplinary research.

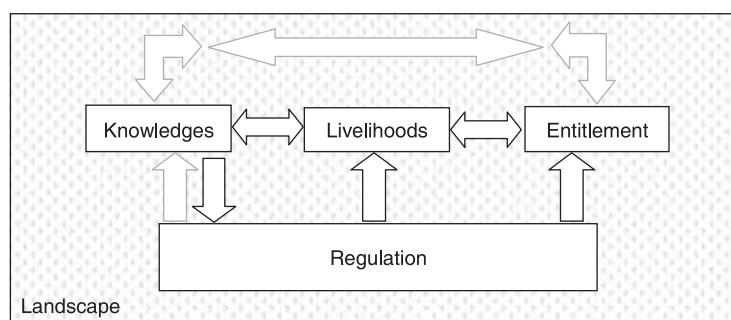
This paper has arisen from our efforts to design the research project and to gain a better understanding of the location where the research is to be carried out. It reflects on conversations in the office in Newcastle and on the banks of the River Esk in the English North York Moors. Our RELU application aimed to develop a practical framework for interdisciplinary discourse between science and non-science based stakeholders. Our hope was that on completion it would provide a conceptual and methodological basis for further research on the multiple interactions of rural populations and landscape resources. The research, now completed, has identified new research tools for more integrated understandings of the inter-relationships between land use and land users (social sciences) and fluxes of water, sediment and nutrients (physical sciences). We used social science methodologies to investigate an interdisciplinary problem. We did this through investigating the perceptions of stakeholders in rural areas in relation to themes of livelihoods, knowledges, regulation and entitlements, all operating within the physical landscape; all are challenges currently facing rural areas (Figure 1).

Our team of researchers consisted of five people drawn from a range of backgrounds: a full-time,

female, physical geography lecturer; a full-time, female, human geography research fellow; a male, part-time physical geography professor; a full-time, female, social economist professor; and a part-time, female, social economist, senior research fellow. The male, physical geographer was unable to take part in the discussion which developed the research proposal, or the initial field day, although he did comment on the proposal as it developed. Some of the group members have worked together on previous research projects, some had taught together, and others were friends, but the group as a whole had not previously collaborated. We should draw attention here to the micro-politics of the group: there was no competitiveness and no perception of hierarchy, but there was mutual respect for each other as people and for each others' work. We will return to this point later. We found this group to be an ideal forum for being reflective on the process of communication between scientists and social scientists, and more specifically communication between physical geographers, human geographers and social economists who all undertake research on rural environments.

### Bridging disciplinary divides with language

Before explicitly examining the role of language, we explore some of the difficulties we noted in the Introduction on the role that language may play in contributing to the division. Distinctions between specialisms are striking in terms of their epistemologies: the ways in which they develop research questions and the methodologies chosen to explore those questions. Interdisciplinary research requires an understanding of the disciplines themselves as



**Figure 1** The interplay of factors affecting rural landscape development

well as an understanding of how to connect disciplinary knowledge (Karlqvist 1999); methods and practice can therefore result in a barrier to this type of collaborative research. A simplistic view suggests that typically physical scientists treat the topic of study as an object, whereas to the social scientist the topic of study is the subject.<sup>3</sup> As a consequence, physical scientists generally use methods to monitor and evaluate the object; whereas social scientists adopt methods that include reflection on their own role and effect on the research subject. This in turn leads to different writing styles, which can present difficulties for reporting discussion and results. For example, in physical sciences the use of the first person is rare, and writing distances the researcher from the object of research, whereas in social sciences the first person is used as a means of acknowledging the role and responsibility of the investigator.

The scale of research may vary between disciplines, which can make it difficult to relate knowledges. Stereotypically, Dalgaard *et al.* (2003) argue that social science disciplines are often labelled as 'soft' and tend to work at more regional levels, whereas physical sciences and the 'harder' disciplines tend to work at smaller scales. However, both physical and social sciences work on a range of spatial scales from the plot/individual to the global. Similarly, they operate on varying temporal scales. In contrast, Massey (1999 2005) suggests that the concept of space-time provides opportunities for physical and human geographers to work together. However, spatial and temporal differences in scale may lead to different definitions, and result in gaps in information flows, and consequent misunderstandings. Scale variations produce very different starting points from which to view the environment and hence can lead to diverse research strategies. We have described Dalgaard as offering a stereotype of 'soft' and 'hard' to reflect differences between physical and social scientific approaches within geography. We disagree with the categorization of 'hard' and 'soft', but our own experience in presentations and conversation at a recent 'interdisciplinary' meeting suggests that these attitudes are still alive and kicking.<sup>4</sup>

An important but less recognized aspect of interdisciplinary work stems from the attitudes and feelings of the co-researchers. Lack of respect between physical and social scientists is mentioned in published articles (e.g. Bruce *et al.* 2004; Evans and Marvin 2004). This in turn leads to interdisci-

plinary research being regarded as of lower status; and as a consequence professional status and promotion may be affected adversely (Brewer 1999). There are also problems about where to publish results of interdisciplinary research, since often the nature of written articles does not sit happily within discipline-specific journals. This is a problem perceived as being exacerbated by the Research Assessment Exercise in British universities. Complementarity and cooperation rather than competitiveness may help in overcoming the negative effects of interdisciplinarity, and shared language has an important role to play here. Once knowledges are seen as embedded in different cultural contexts and there is mutual respect between specialisms, important lessons can be learnt and a much more fruitful collaboration instigated. More than this, the success of interdisciplinary research depends on nourishment drawn from shared disciplinary competence (Hansson 1999), which should remove any hierarchical value between different subjects.

Having touched briefly on the areas in which language has a key role in developing good interdisciplinary research, we now develop and explore this role in more detail. We are trying to improve our own practice in interdisciplinary work by understanding the ways in which we use language and how it may help or hinder our understanding of each other and our respective disciplines. Language is a living thing and evolves in everyday use; it also evolves in its use within disciplines. Referring back to dictionaries of human and physical geography shows how the emphasis in description of terms and the context for descriptions change, although noticeably less in the physical than the human references (Johnston *et al.* 1986 1994; Clark 1985). Subject dictionaries tend to be used to inform students and those outside the discipline of common understandings within. However, formal definitions fail to capture the breadth and dynamism of language in use. We are not attempting here a study of the changed meanings of commonly used terms within geography over the long term, but are concerned more with the contemporary, multiple meanings and uses of words in practice.

Language may determine the positionality of the researcher, the way in which the research question is framed, the translation of the 'field' to the academy and the development of the theoretical context (see, for example, Quinn and Holland 1987; Mirowski

1994; Pryke *et al.* 2003). Previously, Demeritt and Dyer (2002) have analysed the role of dialogue in geographical research, in particular the range of definitions of dialogue and how these map onto ongoing controversies within geography. However, within their paper there is little reference to everyday practice. In the course of our work there have been occasional but important instances where the meaning or intent of the speaker has not been understood by the listener. So far we have identified three distinct issues: *dialects*, *metaphor* and *articulation*. We will explore each of these within their ethnographic context as they appeared in the use of three words: *dynamic*, *mapping* and *catchment*.

### Dialects

The first aspect of the use of language which we wish to highlight is what Wear (1999) refers to as *dialects*. *Dialects* represent the difference between everyday use of a word and expert use, and the ways in which different disciplines use the same word to mean different things. *Dialects* are also produced by the same word having slightly different meanings within different disciplines (Bruce *et al.* 2004), again different from the everyday meaning. Words which are in everyday use by non experts tend to be those that cause the most difficulty for the unwary practitioner. These misunderstandings may be exacerbated by the fact that academics, articulate by nature, are unlikely to question the meaning of a word with which they are already familiar. As Wear notes:

Language is most important because scientists speak in dialects that are specialised to their disciplines. Unfortunately, these dialects can at times sound like common language, leading the uninitiated reader to the mistaken conclusion that she understands what is being said. (1999, 299)

The conversation may be well developed before it becomes apparent that a particular word has a specific disciplinary interpretation as well as its everyday use. This situation is bound to lead to frustration on both sides.

The word we wish to use as an example here is *dynamic*. The context is our visit to the River Esk. Our analysis is of a discussion about processes and methodology that took place in the field. The intention was for the social scientists to familiarize themselves with the location and for the physical scientist to explain her current research. This

involved visiting a reach of the river where instrumentation was already in place and she described her methods and the ways in which her research related to the detailed processes of landscape evolution. The physical scientist described a process using simple scientific terms with the intention of giving a generic description of sediment transport. In a discussion of farmers' understanding of the landscape, the physical scientist described the catchment response to rainfall as being *dynamic*. She argued that farmers would understand the gross effects, but would not necessarily understand the detailed hydrological processes.

The social scientists as a group queried the method and context of the fluvial geomorphology research, for example, the choice of location of measuring equipment, changes in location, frequency of measurements, choice of scale and the boundaries of the research. They took for granted that farmers would understand the process through their experience of living on and working the land. This different understanding of the word *dynamic* led to a series of heated debates about different stakeholders' knowledge of the landscape. For a while we left the subject and moved on to other things. Once we had returned from the field, we (the authors) were reflecting on how difficult and interesting the day had been and started to work back from the disagreements over stakeholders to try and understand how our differences had arisen. We traced it back to the word *dynamic*.

*Dynamic* has both everyday meanings and discipline-specific meanings. As an adverb, the OED (1993) defines *dynamic* as 'of force in actual operation', and this was understood and implicitly used by both participants in the conversation. The problem lay in the differences in the perceived time and spatial scales to which *dynamic* referred between disciplinary and normal use. To the physical geographer, *dynamic* meant that stream discharge would be variable depending on the antecedent moisture conditions of the catchment over very short timescales of a few hours to a few days. The social scientists understood *dynamic* to mean relatively rapid changes over longer timescales, undefined. This confusion could easily have been clarified on the spot had we recognized this as a *dialect* word. The implications for planning the research in the field were huge, and snowballed from a very simple misunderstanding. This example shows how we got to very different endpoints from a poor matching of understanding of one word. In

the company of experts of the same discipline, this misunderstanding would (probably) not have happened.

### Metaphor

The second aspect of language is *metaphor*. At the simplest level, metaphors clarify and illuminate an argument and are commonly used to assist in teaching. At a more complex level, Klamor and Leonard (1994) discuss 'heuristic metaphor', meaning a metaphor that develops thinking in a new direction, and which is open to further development in a systematic manner through further analogy. This allows us to understand in ways that 'a literal rendering cannot'. Heuristic metaphor is commonly drawn on by specialists in talking to each other. The significant aspect of heuristic metaphor is that the metaphor itself does not say, it suggests. This implies that those who do not share the context do not necessarily interpret the metaphor.

Experimentally, the problem of interpretation is illustrated by presenting even a common metaphor to young children or to anyone likewise removed from your 'speech community'. (Klamor and Leonard 1994, 29)

The significance of 'speech community' for communication between disciplines is well illustrated by the following reference to the economists' use of language:

economists, as well as those in other fields, communicate mainly with powerful figures of speech – in particular metaphors and appeals to authority – that offer up a compact and rich way of communicating within a peer group (even when these figures are enacted without a full understanding of their content). They also have the effect of excluding others from the conversation. (McCloskey in Wear 1999, 299)

At a third level Klamor and Leonard refer to 'constitutive metaphor'; the metaphor interprets a world which is unknowable, 'or at least unknown'. The example they use is that of genes being represented by a code. In this case the metaphor may become so entrenched it is regarded as being true. All three types of metaphor are common in our everyday discourse. They are embedded in our language and we rarely think about them or are aware that we use them. For the most part we share the speech community. For good interdisciplinary practice we need to be aware of the times at which we move into separated speech

communities and when the form of metaphor being used may be misinterpreted.

The metaphor that we draw on is *mapping*. The context of the discussion was the development of the analytical framework to underpin our study (Figure 1). Our understanding and use of metaphor did not bring about the type of discipline-related disagreement that *dialects* had generated. In this case, we were conscious of the role that *mapping* played as a metaphor. We did not intend to use the term in the sense of either 'relational hieroglyphics to represent the landscape' or as a diagrammatic systems framework as used by both physical and human geographers. We were seeking a framework that would allow us to relate differently conceived social relations and embed them within the physical landscape, to explore the complex interrelationships ongoing within rural areas between different groupings of humans, but also between humans and the landscape. We worked on this idea together and the metaphor *mapping* provided us with a name for this activity. In this way we could achieve agreement because we were using a relatively empty metaphor. This conjures up an image of a multilayered, complex web which is both affected by and affects everyday life. *Mapping* is the systematic description of the processes involved. This is also a very different interpretation of *mapping* from that used in everyday language, and is therefore a dialect word as well. Its use was clear to us because we developed it explicitly to meet our needs in this research project. However, were we to simply refer to our work in discussion with others as 'mapping catchment interactions', a completely different product could be imagined.

In this particular example, metaphor was a positive contribution to interdisciplinary development. However, further reflection revealed the very large number of specifically disciplinary metaphors that we draw upon and the potential pitfalls that they present. The process of developing our common understanding of metaphor draws us into our final area of language to be discussed and that is *articulation*.

### Articulation

The term *articulation* is borrowed from Ramadier (2004). This aspect of language differs from the first two in that it is a process rather than a register of speech. *Articulation* as described by Ramadier involves deconstructing one's own disciplinary knowledge in conjunction with those of other

disciplines in order to understand the building blocks and thereby reconstruct a common understanding. It should be made clear, however, that

articulation is what enables us to seek *coherence* within paradoxes, and *not unity*. (Ramadier 2004, 432; our emphases)

We find this idea of *articulation* particularly stimulating, and an accurate description of the very active discussions that we had when we visited our field site.

The context for our discussion was the first meeting to discuss the aims of the land and water theme in the RELU programme. The physical scientist started to talk about her work in the Esk catchment. One of the social scientists asked what *catchment* meant. The physical scientist described a *catchment* as the area of land defined by the watershed (drainage boundaries) of a particular river. The social scientists were willing to accept this, but were concerned that it had little meaning as a boundary for social and economic processes related to the physical landscape. Furthermore, the economist and human geographer had different conceptions of what these might be. That is not to imply that the physical scientist didn't recognize that human activities affect the environment, but that she chose to discount these, since they are not seen as *immediately* relevant to the physical processes. This was an uncomfortable moment for the physical scientist, although we all appreciated that this type of challenge was an important part of articulation. It was in the process of building a common understanding of the word *catchment* that the physical scientist recognized the implications of limiting research to a narrow definition based solely on physical topography, i.e. looking at a landscape without including human beings.

These slightly different definitions of *catchment* also serve to highlight two alternative starting points in terms of thinking about the landscape, related to disciplinary backgrounds. The social scientists' premise for thinking about the landscape was based on the ways in which human beings interact with the environment and how this interaction and behaviour is then affected by environmental processes. On the other hand the physical scientists' premise was based on the river producing a signal which reflected the processes ongoing in the landscape. The river therefore responds to a series of inputs, primarily physical processes, although these can be subject to modification by

human beings. Different disciplines therefore tend to have different starting points for thinking about the landscape, as well as being trained to think in different ways. This results in conceptual boundaries being drawn in very different ways and at different spatial and temporal scales.<sup>5</sup> Using the process of articulation to deconstruct these together and in an interdisciplinary manner allowed us to produce a more complex definition of catchment and a much more powerful basis from which to formulate research questions.

This was an important moment. We felt that we had built up a much better understanding by clarifying, justifying and arguing. Through this process we moved much closer to the crux of the problem that we wished to explore and gained a deeper insight into what interdisciplinarity really meant. One aspect of this progress was to define a whole that was greater than the sum of its parts. A second aspect emerged through the process. Each member of the team was constantly tested in their assumptions and perceptions, and whilst the process was difficult and time consuming it was rewarding and resulted in a much stronger basis from which to develop research. It is here that the micro-politics of relationships become important. There is a potential pitfall here that we need to make explicit and that is one of trust. Intellectual egos may be fragile and within our group we recognized that we felt that we were taking risks. As we have pointed out, although we had not all worked together before, we did form a network of friends and did not feel vulnerable by exposing our lack of knowledge. It was important to be able to expose disciplinary ignorance, acknowledge weaknesses and build on strengths.<sup>6</sup>

### Reflecting on language and listening

Analysis of our experiences leads to a number of interesting findings. Initially, explaining disciplinary knowledge to other academics may appear easy, whereas in reality communicating the formal knowledge is easy, but the more subtle intricacies and detailed theoretical context are much more difficult to communicate. A problem for the person speaking is that they need to be able to imagine their knowledge outside of their usual working context and practice in order to be able to communicate effectively. This is a point at which it is particularly important to recognize different cultural dialects and metaphors. The differences

between 'expert' knowledge and vernacular knowledge and the implications of the differences are discussed in existing literature (Sillitoe 2004; Briggs and Sharp 2004). As a result of our experience we wish to suggest a third type of knowledge: 'engaged' knowledge (Carrithers 1992). By this we mean that practitioners of 'other' disciplines bring a generic epistemology to areas outside of their own expertise. But because of their different training they do not have the subtleties of discipline-specific language and metaphor. They are aware of the structural framework of research: the skeleton. However, they lack the training that provides the specific structure or processes which make the framework function. Continuing the metaphor, they have no knowledge of the ligaments, tendons and muscles that make the skeleton work. Each contributor in the discussion may believe that they have knowledge of the others' understanding, although this will not necessarily be so. Only through a process of active and engaged articulation can these shortfalls come to light.

Academics bring with them a commitment to discovery and are active learners. A feature of articulation that is likely to arise when talking to other academics is a feeling of being challenged very quickly by experts in other fields. This can generate frustration, defensiveness or even feelings of superiority, as it becomes difficult for the practitioner to make themselves understood. Very quickly, they may even feel that their work is being undervalued by others. On the other hand, there is a danger of appearing cavalier about other people's knowledge. Emotions such as these can make the team vulnerable to disciplinary competitiveness, which can immediately limit the effectiveness of the interdisciplinary research. We can illustrate this with a general example from our field day.

We had arranged our visit to the River Esk to learn about the work that the physical scientist already had in place. She described the physical processes operating in catchments, her experiments and the instruments used, and she was impressed at how the social scientists understood the meanings and processes very easily and readily. In response, the three social scientists started to ask very specific questions which the physical scientist felt pulled the understanding in a number of different directions, away from the key point which she wanted to make. Since the three social scientists are intelligent lay people engaging with physical environmental processes, their questions were

quick, sharp and incisive. Whilst the social scientists did understand the logic of the processes described, it was de-contextualized from the everyday practice of the physical scientist and hence was not embedded within relevant theory. This led the physical scientist to feel that her own replies were 'bitty' and foreshortened, and didn't follow the 'normal' practices of discussion in those areas. She was thrown off balance by the situation. It was only on reflection later that we all realized what had happened and why there had been feelings of unease amongst us.

The communication of scientific research both within science and to those outside has historically adopted a reductionist approach in which abstract representations of complex systems are used to form the basis of investigation. Science is experimental and the scientist presents her work in order that it may be repeated and validated or refuted. There are two linked but slightly different points that arise from this: positionality and reflexivity. In the practice of science, the investigator sees herself outside of the system being studied. In comparison, in social science it is well accepted that researchers see themselves as part of the process, thus influencing the outcome: research is reflexive. This has a very strong effect on the language used. The practice of presenting science suggests it is objective; hypotheses may be tested with an associated degree of confidence, and what this communicates to others is that the practice of science is not responsive or reflective. This is argued by Dalgaard *et al.*, who write that:

Science reporting is unusual principally because of its impersonal manner, conveying an impression of non-prejudice and disinterestedness from the reported work. Thus, the impersonality and care taken in reporting science stems from knowledge that results and conclusions are likely to be challenged by others. It is thus part of a scientist's duty to facilitate this examination in the interests of the wider scientific enterprise. (2003, 43)

What emerged from our field day showed that this wasn't necessarily the case. The language used to present science makes it seem certain and well defined, rather than presenting the fuzzy boundaries and uncertainty that exist. Both the language and the presentation also hide the many points at which decisions are taken and revisited during an investigation and which actually result in field methods being responsive. There is no room in scientific writing to explore the myriad places in the practices of fieldwork where value

judgements and uncertainties play a role. The institutions of good practice in science in general do not permit this.

A final aspect of the process of articulation that we recognized from our field day was the significance of the micro-politics within the group. During discussions it became evident that there was a need for more than one representative of a discipline (not necessarily a specialist, but someone with a shared disciplinary background) to be engaged in the conversation. Two people can bring different perspectives and if one explanation flounders, then the second person can draw on alternative language and examples to assist cross-disciplinary understanding. Although it may appear a minor point, it is also important because a disciplinary colleague can give moral support and help to prevent some of the frustration and defensiveness developing. The cumulative effect of frustrated and ineffective communication and a feeling of disciplinary vulnerability may be disastrous. If the negative emotions become too great it may seem easier to just walk away, and engage in parallel rather than true interdisciplinarity research.

Micro-politics play a significant role in the ability to practise good interdisciplinary work. The notional hierarchies of disciplines, the personal ambitions and competitiveness of colleagues, not to mention the implicit and longstanding issues of power surrounding gender relations, all play an important part in determining interactions within the research group. Understanding the role of language in interdisciplinarity is not going to solve these problems – however, it does offer a route to making them visible. Sharing and exploring a speech community involves transparency. There is nothing to hide behind if you are sincerely translating your work for others and simultaneously are engaged in actively listening to their contributions. This process involves becoming vulnerable and thus open to the misuse of power. Good interdisciplinary work therefore is not possible without mutual trust and respect. We argue that recognizing the roles of dialects, metaphor and articulation is a move towards creating a new space for interdisciplinary, intellectual engagement.

### **Conclusions: proposals for practice**

Analysis of our own experience in developing an interdisciplinary research proposal and undertaking a day's field excursion has made us very

aware of the importance of language in achieving common understandings. We are not arguing for the development of a common language for interdisciplinary research, since this would result in the dumbing down of disciplinary knowledge and expertise, and as Hansson (1999) notes, one of the key benefits of interdisciplinary research is that it draws on disciplinary knowledges. However, what is key to effective research is the development of awareness of language differences and of the time needed to ensure that experts from different disciplines develop a common understanding. It is also vital for practitioners to develop 'active listening' to work in conjunction with careful use of language. This means that all researchers involved in interdisciplinary research need to be mindful of developing a common understanding irrespective of speaking or listening roles at different times in the interdisciplinary research team.

If there is to be any chance of success in developing common understandings, the first step is the development of trust between disciplinary representatives. In this process we may be reminded of our own disciplinary limitations and they will become clear to others too. This is a strength, a return to basics from which to build a more powerful interdisciplinary model. Explaining and clarifying the *dialects* and *metaphors* is the first step towards being able to translate effectively. We must be realistic though – academic egos may be fragile, and building trust and the confidence to develop a common understanding may be a difficult and slow process. One way of conceiving of this process is to think of building academic capital, much as we conceive of social or human capital. Interdisciplinary academic capital can provide a new reference against which to test the relative strength of new approaches to complex problems. Stoddart (1987) argued that geography was in danger of ignoring the big questions through fragmentation into (sub) disciplines. If geography is to take advantage of its unique position as an inherently multi-disciplinary subject which crosses the boundaries of both social and physical sciences, it must develop interdisciplinary strength and develop new ways of working. This will involve careful self-reflection on our uses of language.

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## Notes

- 1 The experiences that we are discussing in this paper relate specifically to differences between social sciences and environmental physical sciences rather than bench sciences. However, some of the literature to which we refer and our perceptions prior to our field visit stemmed from a general view of physical science that included both bench and environmental sciences.
- 2 These ideas were first presented in a paper in a session under the rubric of 'Conversations Across the Divide' at the 2004 International Geographical Union.
- 3 Only relatively recently in the social sciences has there been a move away from claims of objectivity, positivism and reductionism towards a more complex, nuanced and reflexive approach. Within economics, viewed by many as the 'gold standard' of social science, the underlying conceptual framework is still more aligned with that of physics. In this paper it is the more recent, self-reflexive approach that we refer to as social science.
- 4 Rural Economy and Land Use: Enabling Knowledge Exchange January 2006.
- 5 We recognize that catchment boundaries have been used historically to organize human activity (Smith 1969). We are not arguing that this has never been so, but that the current organization of human activity does not necessarily fit the boundaries of a drainage basin.
- 6 We should note here that there were only women present at this discussion and the presence of a male may have produced a different outcome.

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# **Virtual Team Environment for Collaborative Research Projects**

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**Abstract** Large amounts of money are spent all over the world on research and development, in order to ensure future sustainability. However much of this research fails to meet its full potential. This escalates into bigger problems as research aims at global level projects that are needed to mobilise the knowledge, technological skills, money and experience required for today's complex products, services and processes. There is a wide scale of problems emanating from the management of such large-scale projects. These projects are often costly and inefficient especially when coupled with the problems associated with working in a virtual team environment, involving members from different countries and geographical regions. Problems surface when the knowledge of the many parties involved in the innovation project has to be shared and put to work to generate new knowledge and use it to create new products, processes and services. One of the main limiting factors that reduce the potential output of this type of project is the poor communication and knowledge sharing between members of the virtual team. In this context collaboration and virtual teams management are key issues that need to be addressed by today's innovation projects. This paper presents a literature review developed on the concept of collaboration between individuals working in a team and the advantages and requirements of virtual teams. Presenting a possible solution for the development of a virtual team environment that fosters innovation and ensures a good collaboration between individuals working in an innovation project. This solution was built using the Microsoft Sharepoint Services Beta 2 collaborative platform.

**Keywords:** Virtual Teams, Collaboration, Microsoft Sharepoint II, Distributed Innovation.

## **1. Introduction**

Globalisation coupled with the instability that characterises the markets today and the technological explosion in the last few years that accelerated the rate of knowledge and information flow has put many organisations in difficulty to keep up to the extraordinary level and diversity of knowledge, experience and skills required to develop and successfully bring to market new services, products or processes. More and more companies are faced with the necessity to get the knowledge and expertise they require in different projects from different domains and areas. In many cases the knowledge necessary in development of these new products, services or processes do not fully reside inside the organisational boundaries. Consequently the 50-70's competition, become the 70-90's cooperation and evolved in the 21'st century collaboration. This transition from competition to collaboration in the development of new products raises one main problem: collaboration (Amidon, 2003). This problem comes from the fact that in order for the collaboration to be fructuous the people involved in the process, product or service development have to be open to share and acquire knowledge, skills, experience and expertise with other individuals. They have to be able to communicate at a high level with all the team members and use their knowledge and the knowledge acquired from others to come up with new ideas that can be put in practice or can become the germinating seed for other ideas.

Research has shown that 50-70 % of innovation project fail (Strebel, 1999). The causes for this high rate of failure are numerous and varied and poor collaboration between the team members has been identified as one of the key factors (Dooley et al., 2000). Poor collaboration, or in other words poor communication and knowledge sharing, between members of the project team highly reduces the potential output of the projects resulting in redundant information and knowledge and increased costs and lost of time. These problems

are accentuated when the team is a virtual team that consist of individuals that are located in different geographical areas, which come from different backgrounds and domains, different languages and cultures. When these issues are coupled with unstructured collaboration methods such as e-mails, conference calls and meetings, even if these methods are quick and familiar, new problems arise such as version control, work redundancy and maintenance of up-to-date information for all the members involved in the project. Various authors such as Nonaka and Takeuchi (Nonaka and Takeuchi, 1995), Davenport (Davenport and Prusak, 2000) and others identified and researched these knowledge management and collaboration problems. Different collaborative platforms have been developed in the last few years that strive to resolve the problem of collaboration between project team members whether they are located in the same or in different geographical areas from the same organisation or different organisations. Lotus Domino, eRoom, WelcomeHome, Microsoft SharePoint are just a few of the collaborative platforms that have developed to help organisations with the collaboration challenges. They answer in one way or another to the problems rose by collaboration and knowledge sharing. The success of these tools depends mainly on the level of involvement of the team members.

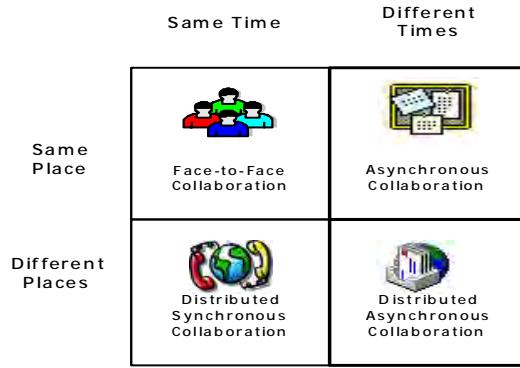
This paper presents, in the first part, a literature review that describes the concept and the types of collaboration and the dynamics of virtual team concept, which comprises of the virtual team definition, the advantages and disadvantages that come with the organisation of individuals in this type of team. The second part presents Microsoft Sharepoint Services as a platform for developing a virtual team environment and the virtual team environment developed using this platform for an innovation project.

## **2. Collaboration**

To respond to competitive challenges, the complex customer requirements and the high instability on the market, firms have become more open to collaboration with other parties

than in the past. The creation of today's complex new products, processes or services requires a mixture of knowledge from diverse disciplines and professions and it is absolutely necessary to get the expertise from a variety of areas like information technology, technical design, engineering, manufacturing, and marketing etc. The experience, expertise and skills that are needed for an innovation project are usually distributed both within and outside a company. Therefore, people from different companies often need to work together to bring the entire knowledge and experience that are needed for the success of a new product, process or service. An effective knowledge management approach in these conditions can be the difference between success and failure of this type of inter-organisational collaborations. Knowledge sharing and transfer is not possible without willingness of employees to share and without a proper structure of the information to be shared. Tiwana (Tiwana, 2000) affirms that "knowledge based activities related to innovation and responsiveness are intensively collaborative", in other words the process of creating, sharing, and applying new knowledge and experience involves collaboration. According to Cormican and O'Sullivan (Cormican and O'Sullivan, 2001), a great deal of what people learn and implicitly what the organisation ends knowing results from interaction among and between the members of the teams that exist inside and between organisations. This underlines the importance of a good collaboration and communication between the members of projects teams that involve organisations that struggle to manage successfully their knowledge and innovation. The benefits of synchronized and collaborative working project team members are being recognised with team members being actively encouraged to work together more closely and to exchange project information in a more structured way (Anuba et al., 2002).

Based on the type of time and space the collaboration between the team members takes place Anuba et al (Anuba et al., 2001) identified four types of collaboration. Figure 1 depicts the space and time matrix for this collaboration types.



**Figure 1:** Collaboration types – Adapted from (Anuba et al., 2001)

The four types of collaboration classified by Anuba (Anuba et al., 2001), based on the space and time the collaboration takes place, are Face-to-Face Collaboration, Asynchronous Collaboration, Distributed Synchronous Collaboration and Distributed Asynchronous Collaboration. The four types of collaboration will be presented in more detail next:

### 2.1. Face-to Face Collaboration

The face-to-face collaboration involves meetings in a common venue such as a meeting room, of the team members that are engaged in face-to-face discussions. An example could be a “kick-off” meeting at the beginning of a project between all the partners, and the discussions between the team members and the end customers for requirement gathering etc. This type of collaboration is the most common and requires good communication skills.

## **2.2. Asynchronous Collaboration**

Asynchronous collaboration it is another type of collaboration between team members that has been identified by Anuba et al. (2001). The asynchronous collaboration process can be conducted using different mediums like notice/bulletin boards within an organisation or in a virtual environment that involves the same space/ environment but different times. In other words people can view the information, knowledge displayed at different times.

## **2.3. Distributed Synchronous Collaboration**

The third type of collaboration identified by Anuba et al. (2001) as distributed synchronous collaboration involves communication between team members using the current technologies and techniques that imply the real-time exchange of information and knowledge between parties that are located in different geographical areas. There are various techniques available today such as telephony, video-telephony, computer-mediated conferencing, video conferencing, and electronic group discussions/editing facilities or online chats. This type of collaboration has become more and more used lately due to the extraordinary technological advancements and globalisation.

## **2.4. Distributed Asynchronous Collaboration**

Finally, distributed asynchronous collaboration, the fourth type of collaboration involves collaboration between people that are located in different areas or places, which access the knowledge and information at different times. This mode of communication involves communication via the post, fax machines, telephone messages, voice mail, pagers, email, etc. The knowledge transmitted during this type of collaboration is an explicit knowledge that can be expressed in words, numbers and sentences.

A team, by its very nature, involves collaboration. In an organisation that facilitates collaboration the boundaries of the teams are usually flexible and unconstrained by the organization chart, department or even the company. In other words the team becomes an entity that is able to accommodate change without feeling any significant impact on its functionality, or that is able to quickly absorb the eventual impact. In a highly collaborative team the tasks are distributed to the team members based on their expertise, skills, and experience (Duffy, 1996). The refined blending of knowledge from different areas and domains required for the development of today's complex new products, processes or services required has changed the notion of the team involved in a project. In many cases, the participants in a project are geographically distributed, and need effective information and communication technologies in order to be always up to date with the information and knowledge in the project. In the last decade, a new term emerged, virtual team.

### **3. Virtual Team**

Virtual teams bring up a different picture from the one of people in the same organization working together in the same place. Unlike traditional teams were all the members are located in the same organisation, department or building, and have the same working hours, share the same language and culture, the members of the virtual team work across space, time and organisational boundaries. They form webs of communication and can be from different geographic locations, different languages, cultures, time zones and even different organisations (Johnson et al., 2001). Different cultures, background domains, and research areas lead to issues that even an effective knowledge-sharing strategy might not resolve entirely. The virtual team members come from different disciplines and often “lack understanding of the critical process factors for areas other than their own” (Davenport et al., 2000). Contrasting with the traditional workspace, which is an office, department etc., the workplace of the virtual team is a “virtual workplace where productivity, flexibility and collaboration reach new levels” (Chase, 1999). With all these differences from the

traditional teams, new problems rise and old ones become critical. If the environment and collaboration were a problem in the traditional teams in the virtual team the need for a good collaboration and a proper environment for this collaboration are critical. To these problems are new ones added such as contradictory physical space, geography, time, language, culture and knowledge sharing. For the virtual teams to be successful and have high performance results and a different kind of management of the team approach, an appropriate technological infrastructure and a well-developed environment are required.

In order to successfully and efficiently get all the experience needed in developing new products and services more and more organisations are forced to move from traditional face-to-face teams to virtual teams or adopt a combination between the two types of teams, lately. This shift of team management has its causes, mainly because of the advantages that come with the new team structure and the pressure placed on the companies by the markets with the variety and increasing change rate of information and knowledge and the high competitiveness, by the customers that are becoming more and more demanding, and by the employees. Some of the basis for adopting a combination between a virtual team and a traditional team or for moving completely to a virtual team approach researched by Johnson et al (Johnson et al., 2001) are:

- Flexible hours for the employees – a high flexibility is given to the employees. The working hours are not strict and they are the ones that are planning their working hours, as long as the team members do a good job and finish their work on time. Through this pressure and stress that is put on the employees working at a fixed location following a strict timetable is reduced.
- Creates and disperses improved business processes across organisations – using the virtual team the best practices can be much easier presented and are quicker absorbed as the resistance to change is more diminished.

- Supports cross-divisional interaction – the virtual team structure of the team gives the companies the possibility to hire people that are from different domains and areas encouraging the team member in changing knowledge and information and creating the sense of a community crossing over the department, company or team boundaries
- Changes the direction of the company from a production-oriented company to a service/information-oriented company, as the focus is not as much on the product as on the team members' knowledge and ways to capture it to result in new, original ideas that will in the end bring profit. The new asset becomes the company's knowledge.
- Reduces costs for commutation between places by allowing the team members to interact regardless of their location.
- Allow organisations to hire and retain people, regardless of location
- Increased communication between team members, which leads to network building.
- Collaboration across organisational boundaries that facilitates the flow of information and knowledge between team members and constantly provides new ideas and new knowledge that can result in new products.
- Focus on measuring contributions and outcomes rather than on number of hours worked, as the knowledge and the original offspring generated by this knowledge are what is considered the asset in the new team structure.
- Faster response times to tasks as the result of each team member's work can be seen and evaluated by all the team members and because of that the sense of responsibility is more developed.

As the virtual team allows members to work together without requiring their physical presence in the same location, outside consultancy from anywhere in the world can be used, but without expenses for travel, lodging, and down time, partnerships between companies around the world can be realised to work on different projects without the relocation of the

team members. This way knowledge from many disciplines can be brought together along with the experience of the team members. While there are great advantages that come from the adoption of the virtual teams, new challenges rise with them. The main one involves satisfying the need for sharing, collaborating and exchanging information. There are some main requirements that have to be fulfilled so that the successful implementation of the virtual team can be realised. Some of these requirements researched by Lipnack and Stamps (1997) are:

- Collaborative efforts, e.g. co-authoring, document version controlling, applications development, group editing and reviewing, annotating, sharing information and ideas.
- Communication for e.g. sending notes, announces, talking, faxing, having meetings, providing commentary, and having interactive discussions.
- Co-ordination applications that keep track of communications and activities of workers in a group, preparation of group documents, and responses to questions received regardless of geography.
- Information sharing that helps users navigate the information rather than monitoring and controlling the communications patterns of the group.
- Managing and tracking, e.g. project management, corporate calendar, scheduler, version tracking.
- Analysis and decision making tools to support collaborative examination of information, consideration of possible decisions, and development of best decision.
- Developing collaboration between people who work at a distance from each other and who might not be from the same culture is a new organisation challenge (Pellecchia, 1998).

As discussed previously there are many advantages that come with the adoption of the virtual teams. The challenge is to provide an environment for the team were the team

members can communicate and efficiently manage the knowledge existing in the team and share it between the members of the team so that it will result in new ideas leading to new products, processes or services.

Due to the increased demand for a virtual team environment that will facilitate the collaboration between the members of the virtual team and will ensure the efficient exchange and management of knowledge in a project involving parties from different geographic areas, different domains and cultures a number of collaborative platforms and tools such as Microsoft Sharepoint, Lotus Domino, WelcomeHome emerged in the last few years. These tools have more or less common features such as discussion forums, instant messaging and chats, document storage, sharing and versioning, notice boards for announcements and notices and user administration features. This paper focuses on the Microsoft SharePoint Services as a collaborative platform for building a structured environment for a virtual team working in an innovation research and development project.

#### **4. Building A Virtual Team Environment with Microsoft Sharepoint Services Beta 2**

Microsoft Sharepoint Services is a virtual team website solution developed by Microsoft Corporation. It allows the development of a virtual team environment where the team members can store, share, and collaborate on-line on documents, contacts, tasks and knowledge necessary in the virtual team's efficient functioning. Different collaborative tools such as on-line discussions, announcements, notices and document sharing are available. These collaboration features can be extended as integration with Microsoft Outlook, MSN messenger and Net Meeting are available.

The platform allows the user to create a fully-featured website with build in functionalities such as announcements, meetings, discussion management, email notification and address book, survey, tasks and hyperlinks and also permits the development and creation of user-

defined functionalities. Other very important features, which address the interest of this research, include automatic hyperlink management, team management, and high team interaction. The website built using Microsoft SharePoint can be easily customized to meet the specific project demands using any web page editor such as Macromedia Dreamweaver MX, Microsoft Visual Studio Net or Microsoft FrontPage, which is fully integrated with Microsoft SharePoint, or other editors (Microsoft, 2002).

A virtual team environment was generated for a development and research innovation project using the Microsoft Sharepoint Services Beta 2 platform. The team members were distributed in different locations and they needed a working environment that would allow communicating and collaborating on different problems, ideas and documents regarding the project over the Internet.

By providing a user friendly interface and easy to use functionalities Sharepoint allowed the creation of the on line virtual team environment in a few easy to follow steps: fill in the name of the website, choose and website address, choose the website's type (virtual team environment, blank site, meeting workspace, document workspace, etc.), and finally chose a template. Figure 2 displays a screen shot of the Sharepoint web page for the creation of a new module/ page in the team website.

#### ***4.1.1 Sharepoint Build-In Features***

A number of built-in features are implicitly generated when the SharePoint team site is created, such as Libraries, Lists, Discussion Boards, Surveys and Web Pages and will be presented in more detail next.

#### **4.1.2   *Libraries***

A library is a collection of files that are shared between team members. There are three types of libraries that can be created in SharePoint. These are document, picture, and form libraries. A built-in library named Shared Documents for storing, sharing and version tracking of the project's documents is implicitly created when the team environment is first generated (Microsoft, 2002).

#### **4.1.3   *Lists***

A list is a collection of three preformatted forms module that allow the users to create, view, edit and delete different elements (entities) for storing and structuring project data information and knowledge.

A number of built-in lists are automatically generated when the virtual team environment which can be easily populated with project information and, if needed easily customisable the lists if desired. These lists are announcements (for sharing small amounts of information), links (for sharing of resources outside the team environment), events (for generating calendar-based view of meetings, deadlines, and other important events), contacts (for creating, sharing and managing information about the people that in a way or other interact with the team), issues (for creating lists of problems that appear), and tasks (for tracking the team members work progress). Additional lists can be created based on the built-in lists or based on the custom-designed lists. Once a list is created it can be saved as a custom-designed list and later be used as a base for generating new lists. Lists can also be created from spreadsheets from a compatible spreadsheet program such as Microsoft Excel 2002, and Microsoft Internet Explorer 5 or later browser. The hyperlink to a list in the website can be set to appear in the home page in the Quick Launch bar (Microsoft, 2002).

#### **4.1.4 Discussion boards**

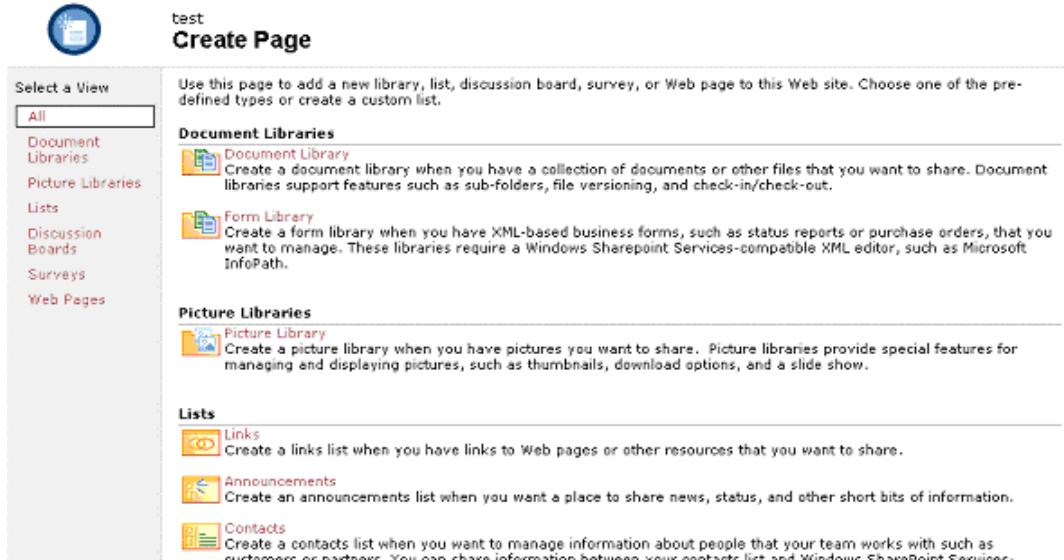
Discussion boards offer the team members a forum where they can discuss or chat about topics of interest for the team. Comments and reply to others' comments can be posted eliminating the need for the e-mails and offering a knowledge centre for the other team members. A default discussion board named General Discussion is implicitly generated when the team environment is created (Microsoft, 2002).

#### **4.1.5 Surveys**

Surveys provide a method of finding team members opinion about different things of interest for the successful implementation of the project. To generate a survey, the survey's questions have to be defined together with the specifications on how the team members should enter their answers (Microsoft, 2002).

#### **4.1.6 Web Pages**

The Web Pages are used to add a new basic page, a web part page or a site under the team's website. A basic page can contain text, images and tables. A web part page provides a method for creating pages where web parts containing listings information from the website. Additional sites and work spaces can be created under the team's web site such as document or discussions sites (Microsoft, 2002).



**Figure 2: Create Page – Screen Shot**

#### 4.2. Implicit Home Page Structure

A default home page for the virtual team is also generated when the new on line environment is created. The page is structured in four main areas:

- At the top of the home page a main toolbar - depicted in Figure 3 - with hyperlinks to the home page of the new virtual environment, the documents and lists/ modules in the environment, to the web page where new components can be added to the web site, to the site settings web page and to the parent website (if there is one) are displayed. Extra hyperlinks can be added edited or deleted from the toolbar using Microsoft FrontPage. This toolbar is implicitly displayed on all the pages in the website and can be removed using Microsoft FrontPage.



**Figure 3: Main Toolbar – Screen Shot**

- Under the main toolbar an area with the website's name and brief description are displayed. The information displayed here is the one filled in when the new web site was created and it can be changed from the Site Settings web page
- A Quick Launch toolbar on the left hand side of the home page containing hyperlinks to the main modules in the website. The Quick Launch toolbar can be modified directly from the browser or from the web page editor. It implicitly displays the implicit modules
- A content area on the right hand side of the home page. This content area can be customised directly from the browser by dragging and dropping previously created web parts or from a web page editor such as Microsoft FrontPage.

#### **4.3. Site Settings**

The Site Settings web page depicted in Figure 4 is generated when the website is created and provides the authenticated team members with administrator rights to manage customise and change profile information and modify the structure of the site.

The administrators of the site can manage the users and the sites and workplaces that have been created on the website. The users can modify the title and the description of the site that appear on the first page under the main toolbar, to customise the home page and to modify the site content by adding new modules or modifying the created once. The user's profile can be modified from this page as well as depicted in Figure 4.

The screenshot shows the 'Site Settings' page for a site named 'eEnableSME'. At the top, there's a brief introduction about managing the site. Below it, the 'Administration' section includes links for managing users, sites, and workspaces, along with options for creating new site and workspace. The 'Customization' section allows changing the site title, theme, content, and homepage. The 'Manage My Information' section provides links for updating personal information, viewing alerts, and viewing information about other site users.

eEnableSME

## Site Settings

Use the links on this page to manage this Microsoft Windows SharePoint Services 2.0 (6.0.2.4920) site. From this page you can manage sites and workspaces, change the appearance and content of the site, update your personal information, and navigate to other administrative tasks.

### Administration

Use the links in this section to add or remove users, add or remove sites, or navigate to other site administration features.

- Manage users
- Manage sites and workspaces
- Allow site and workspace creation
- Go to Site Administration

### Customization

Use these links to change the look of the site, update lists and document libraries, or modify the text displayed at the top of each page of the site.

- Change site title and description
- Apply theme to site
- Modify site content
- Customize home page

### Manage My Information

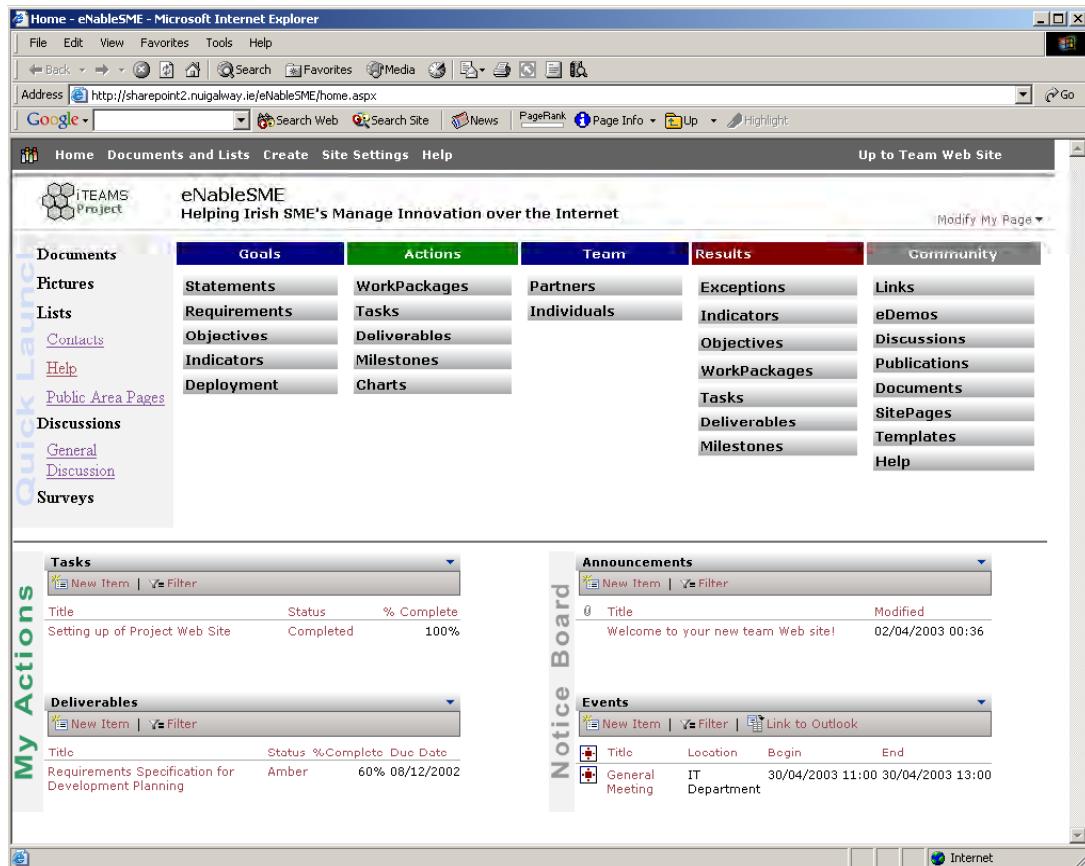
Use these links to view or update the information stored about you, and to manage the list of documents or other items in this site for which you receive alerts.

- Update my information
- My alerts on this site
- View information about site users

**Figure 4:** Site Settings web page – Screen Shot

#### 4.3.1 Virtual team environment for project innovation management

Using the features provided by Sharepoint Services and the Microsoft FrontPage web page editor a virtual environment has been structured so that it facilitates the exchange of knowledge and the management of the innovation process in an innovation project. Figure 5 depicts the main page of the virtual team environment.



**Figure 5:** Virtual Team Environment Home Page – Screen Shot

The home page is the main page of the virtual environment and allows the users to access all the modules and sub-modules in the environments. The implicit main page generated when the virtual environment was generated has been customised so that it will provide the required environment for the management of project innovation process. The logo of the application, the name of the project and the project mission are displayed at the top of the page. The content of the Quick Launch toolbar was modified so it displays other hyperlinks as shown in Figure 5. The content of the home page has been modified and divided in three sections. On the top, the Main Menu is displayed. This menu is comprised from five main areas: Goals, Actions, Teams, Results, and Community. At the bottom of the page two columns are displayed. The first column contains the ‘My Actions’ area where the actions that are assigned to the ‘logged in’ user are displayed. The second column contains the

Announcements and the Events sub-modules, with the announcements and notices that have been published in the project.

The main software modules displayed in the Main Menu are divided into five key areas. The Goals area reflects the ‘goals’ of the innovation project. The Actions area reflects the ‘actions’ element of the project (tasks, deliverables, milestones). The Teams area on the other hand represents the resources of the innovation project. The Results area corresponds to the ‘results’ element of the innovation project, while the Community area reflects the ‘community’ element of the innovation project. These five areas effectively encompass the entire project innovation process and provide the team members and the project managers with tools necessary for its management. Each area has a number of modules that allow the project team members develop competence within specific areas. The software system eliminates the duplication of information as the data may be shared between different modules and sub-modules within the system and provides an environment for the effective collaboration between the virtual team members.

#### **4.4. Goals**

The Goals module of the menu corresponds to the Project Goals in the innovation project and allows the generation of four different forms relating to the project goals. These are Statements, Requirements, Objectives, and Indicators. They provide a structure for formulating the goals element of the project innovation process. Through the software the project management are encouraged to correlate the project’s requirements, objectives and indicators and formulate a project’s vision statement.

##### **4.4.1 Requirements**

The Requirements specification represents the internal and external demands on the project from key stakeholders. It involves identifying the stakeholders, defining the stakeholder

requirements and defining all change ideas. Each requirement has an acronym and a title. The title of the requirement has to be short and to summarise in few words the quintessence of the requirement, a more elaborate explanation can be given in the description field. Each requirement corresponds to one of the demands of one of the project stakeholders. The stakeholder can be selected from a drop-down list of stakeholders that includes the project funding agency, the project partners and team members, etc.

#### **4.4.2 *Indicators***

The performance indicators forms that can be created in the Indicators sub-module in Goals area are metrics used to measure the performances of the project. They permit the continuous evaluation and improvement of the project performance. The Indicators need to be concise, easily measured, time bound and realistic. The Firm Target field indicates a short-term goal for a specific indicator. Stretch Target indicates a goal for up to the end of the project and its value is more a ‘best performance’ point than real allowing team members to ‘stretch’ their efforts to achieve them.

The four forms of Statements, Requirements, Objectives and Indicators permit the definition of goals that the project team will pursue, and their communication to the team members through the various views of data. The Goals module provides the team members with various views of data entered through other modules. The Deployment sub-module includes views that identify the relationships that exist between requirements, objectives, indicators and workpackages, and tasks.

### **4.5. Actions**

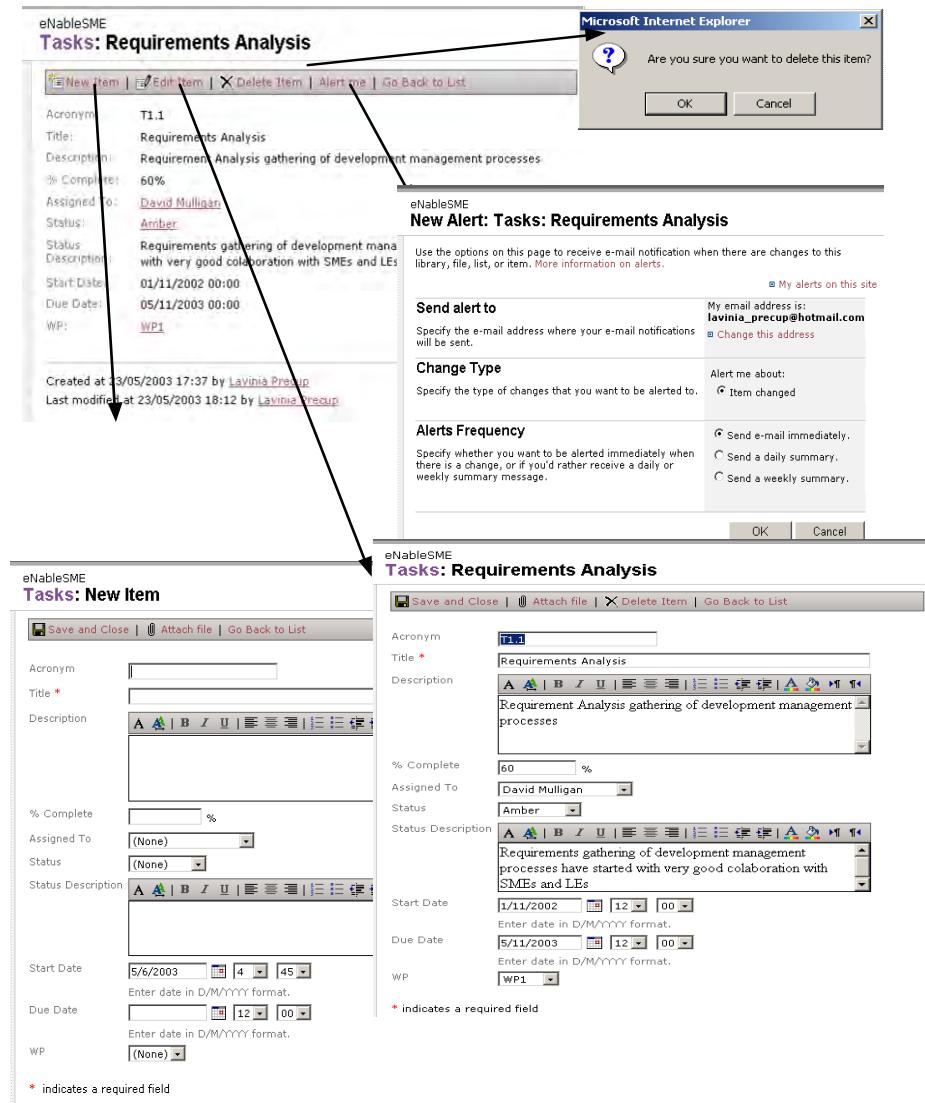
The Actions module represents the actions in the innovation project. These actions are carried out to successfully achieve the project’s goals. The software sub-modules of Workpackages, Tasks, Deliverables and Milestones are the project’s activities.

The Tasks sub-module is designed to structure and capture the minimum information necessary to enable the team members to implement the action and monitor the evolution and the success of the action's implementation. When the user clicks on the Tasks hyperlink in the CPIM home page (see Figure 5) a page with all the tasks is displayed as pictured in Figure 6.

Acronym	Title	Assigned To	Start Date	Due Date	% Complete	Status	WP
T1.1	Requirements Analysis	David Mulligan	01/11/2002 00:00	05/11/2003 00:00	60%	Amber	WP1
T1.2	eDev Tools	Owen O'Leary	01/11/2002 00:00	01/11/2004 00:00	20%	Amber	WP1
T1.3	Design of module architecture and data structures	Owen O'Leary	11/03/2003 17:45	11/11/2003 00:00	70%	Green	WP1
T1.4	Development of Java based modules for domino server	Owen O'Leary	09/01/2003 17:45	08/01/2003 00:00	100%	Completed	WP1
T1.5	Testing, debugging and proof of concept at selected SMEs	David O'Sullivan	06/01/2003 17:05	12/01/2004 00:00	40%	Green	WP1
T2.1	Research into XML-based B2B industry standards.	Owen Molloy	01/11/2003 17:55	01/01/2004 00:00	50%	Green	WP2
T2.2	Research for supplier D2D integration	Owen Molloy	01/11/2002 17:55	05/01/2004 00:00	70%	Green	WP2

**Figure 6:** View page for Tasks module- Screen Shot

In this view all the tasks in the project are listed. The main information about each task is displayed. The information in a list can be grouped, sorted or filtered. New columns can be added to the view and new views can be created. The team members can also subscribe to the page to be alerted every time the information is changed. The team members can drill down into each task record by clicking on the name of the task. A page with the task's details will be displayed. The team members can add, edit, view subscribe and delete one element from the list. The web pages corresponding to these functions are implicitly generated when the module is created. Figure 7 depicts the web pages corresponding to these functions for the Tasks module.



**Figure 7:** the functions for the Tasks module – Screen Shot

Figure 7 depicts the structure of the tasks forms. The Priority field is used to indicate the importance of the task for the success of the project. The %Complete and Status fields are used to monitor the evolution of the task implementation. The value of the Status field can vary from Red (the task requires immediate attention), to Amber (there are some minor problems in implementing the task), to Green (the task implementation is going well) to Complete (the task has been implemented). The Status Description field gives more details

on the status of the task. Each task is part of a WorkPackage and has an acronym, title, a start and an end date, and a responsible that has to ensure that the action is well implemented and it meets the project goals. The tasks can be tracked back to the project goals using the data from the Requirements field. Attachments can appended to each record in the list. The feature allows the team members to attach relevant documents and files to the tasks. For example if there are few individuals that work on the task they can attach the necessary files to the task. This way all the information needed for the correct implementation of the task is up to date and is held in one single place.

#### **4.6. Teams**

The project constraints also influence the implementation of innovative actions in the innovation project and are reflected through Teams module in the first page. The Team module addresses the constraining element of the innovation process. This module allows the identification of the human elements that interact within the innovation process and permits the effective management of their involvement. The Team module manages the human resources of the project through the two sub-modules: Partners and Individual. The Partners sub-module holds all the information about the organisations that are partners in the project. The Individual sub-module allows the capture of information about the project team members, their name, personal details, biography, and role in the project etc. Each Individual in the project has a user name assigned by the administrator of the CPIM, works in an organisation and has a status (role) in the project, which can be Research Engineer or Project Manager, etc. Other information that is captured about the individuals involved in the project is: the email address, phone, extension, web site address, and biography.

The virtual environment developed with Microsoft Sharepoint Services help allows the assignment of human resources to the development and implementations of innovation actions. The software functionality permits each team member to visualise the actions that

are assigned to him/her (Figure 5). The Team module acts as a communication tool, providing the project team members with up to date information about the other individuals and organisations involved in the project.

#### **4.7. Results**

Actions are implemented with the purpose of contributing to the project goals achievement. The Results module allows the project management to evaluate how successful the implementation of the project is. The goal-results relationship allows the project managers to evaluate the performance of the project and take corrective actions so that the project goals are successfully implemented. The results information is available through the WorkPackages, Tasks, Deliverables, Milestones, Indicators, and Objective result views, to all the team members so that they can act in order to correct the problems that appear. This gives them empowerment, helps the knowledge generation of the team members' knowledge, and reduces their resistance to the changes adopted by the project managers.

The Exception sub-module identifies all the actions and goals that require immediate attention due to their red status. A red status signifies that there are problems with implementation of the action or project goal achievement. Action needs to be taken to remedy the evolution of the action implementation so that the status of the actions and/or goals improves.

#### **4.8. Community**

The Community module offers the team members tools that facilitate and sustain the collaboration between the team members. There are three types of collaboration that are ensured through this module. These are asynchronous collaboration, distributed synchronous collaboration, and distributed asynchronous collaboration. The fourth type of collaboration, face-to-face collaboration, very important in sharing tacit knowledge is

ensured as well through meetings and workshops. The tools available for sustaining and facilitating the collaboration between team members are: Documents, eDemos, Publications, Meetings, Announcements, Discussions, Templates, and Links.

Documents sub-module allows the users to share documents, edit, discuss over the changes and subscribe to the documents so that they will receive an email when a change appears in the library or document they subscribed to. Versioning control, access control and send it for review is also available.

The Publications, eDemos, Links, and Templates sub-modules allow the dissemination of knowledge between the team members in different forms (documents, links to outside sources of knowledge, presentations, etc.).

## **5. Discussion**

Microsoft Sharepoint Services (Sharepoint II) provides a platform that facilitates an easy implementation of a virtual team environment. The platform comes with a friendly user interface and provides features that ensure an effective and successful collaboration and knowledge sharing between the team members. Microsoft Sharepoint Services fulfils the main requirements for the successful implementation of a virtual team environment.

The importance of the collaboration has been underlined previously in this paper for the successful implementation of a project that involves virtual teams. Sharepoint Services supports three of the four types of collaboration identified by Anuba et al. (2001), which are implemented in the case study virtual environment. These types are:

- Asynchronous collaboration: that is supported by the Announcements and Notices modules, which display information in the form of notice boards and also by the Documents module that allows versioning and discussion over documents.
- Distributed Synchronous Collaboration supported by the Discussions module and by the integration with MSN for on line chats
- Distributed Asynchronous Collaboration supported through the integration with Microsoft Outlook which allows the users to subscribe to be alerted whenever the information on the site is modified.

Lipnack and Stamps (Lipnack and Stamps, 1997) and Pellecchia (1998) have identified the main requirements that have to be fulfilled so that the virtual team can successfully work and fulfil its functions. This requirements presented in the Virtual Team section of the paper are also fulfilled by Microsoft Sharepoint Services:

- Collaborative efforts are supported by Sharepoint which allows co-authoring, document version controlling, group editing and reviewing, annotating, sharing information and ideas, approval and author tracking for the documents.
- Communication is supported through the three types of collaboration implemented in Sharepoint.
- Co-ordination of the virtual team is also supported as all the teams actions are tracked. The evolution of work in the project is monitored in the case study environment in the modules of the Results area in the first page.
- Information sharing through document sharing and discussion forums, chats, links surveys, notices and announcements.
- Managing and tracking, project management are also supported by the Microsoft Sharepoint.

- Analysis and decision making tools to support collaborative examination of information, consideration of possible decisions, and development of best decision are the surveys and issues modules implicitly provided by Sharepoint and in the case study the Exception module which lists all the project actions that are not meeting their targets, fail to implement the project goals and require immediate attention.
- Microsoft Sharepoint encourages the development of collaboration between people who work at a distance from each other and who might not be from the same culture is a new organisation challenge through its three types of collaboration modules and through the integration with Microsoft Outlook that allows the translation of documents from one language to others.

Project innovation cannot be successful unless the knowledge and information in the project are effectively captured, shared and internalised by the project virtual team members. It is important for the success of the project that the new issues that arise from the virtual team management, and collaboration are addressed as the effective management of them will lead to the achievement of the project goals, and formation of knowledge that will not be lost at the end of the project but will be used to successfully implement new projects and continue to innovate. The virtual team environment developed using Microsoft Sharepoint Services effectively addresses this issues and allows for an easy and user-friendly management of the innovation project and of the virtual team working on the innovation project. At the time of going to press, Sharepoint II is in beta test mode and due for release in the Spring of 2004.

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# **Large-Scale Research Projects and the Humanities**



**Report prepared by the**  
**Canadian Federation for the Humanities and Social Sciences**

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## Humanities Forum

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## I Introduction

Throughout the SSHRC transformation discussions, questions about the place of humanities research were frequently raised. For many humanities scholars, these discussions reinforced their perception that humanities research did not fit into the granting council's plans for the future, with its emphasis on collaborative, interdisciplinary and applied forms of research. Similar concerns had also been raised about the Initiative on the New Economy (INE), the Major Collaborative Research Initiatives (MCRI) and the Community-University Research Alliances (CURA), but it was SSHRC's February 2005 meeting regarding the Strategic Research Clusters Design Grant competition that brought the issue fully into the open.

Participants expressed their concern with lack of funded projects led by humanists and even those in which humanities scholars were fully involved. Some speakers sought assurances that new models of collaboration and application would not overlook the traditions and strengths of research in the humanities. Others questioned whether there was space for such projects or whether there was in fact a need. What is the place of these projects in the future development of humanities research, and what kind of support should they receive?

While large projects do exist across many disciplines in the humanities -- with substantial funding from SSHRC -- there is a dearth of analysis and understanding of the impact of these projects, including whether they have been successful or not, if they have created an effective environment for research training, and how or if they provide models for future humanities research.

With a grant from the Social Sciences and Humanities Research Council of Canada, the Canadian Federation for the Humanities and Social Sciences took on the task of examining these questions and others in this report, "Large-Scale Research Projects and the Humanities." The Federation drew upon three major sources for this work: the expertise and input from a representative group of humanities and social sciences scholars, referred to as the Humanities Forum; a review of existing scholarly works on research in the humanities, its traditions, practices and methods; and primary data and secondary analyses of major research programs provided by SSHRC.

The report places particular emphasis on the fundamental question of the distinctiveness of humanities research, on the consideration of how to develop successful large-scale projects in these fields within the research community, and how SSHRC might best provide support for such projects.

This final report incorporates recommendations made by the Federation's Board of Directors at their November 2005 meetings and by SSHRC Council's Research Support

Committee last fall, and incorporates analysis of statistical data on large-scale research programs provided by SSHRC.

## **II The Nature of Humanities Research**

In exploring the nature of humanities research, we encounter the risk of over-simplifying and magnifying the differences between the humanities and social sciences. Identifying common characteristics among humanities researchers and illustrating them in contrast to their social science counterparts implies a dramatic dichotomy that is rarely so pronounced in reality. Few scholars fall into such tidy categories.

We recognize that all research falls on a continuum of approaches and methodologies and that some of the characterizations attributed to humanists apply equally to some social scientists and applied researchers, just as they do not apply to some humanists. The differences in approach, however, are sufficiently distinct to allow these general conclusions to be drawn and to provide a foundation for examining the interrelation of large-scale research projects and the humanities.

### **1 Methods and Approaches**

Acknowledging that there are far more similarities than differences, differences do indeed exist. A recent study of peer review in major American fellowship competitions suggests that researchers in the humanities and social sciences vary in the manner in which they choose appropriate topics for study and by their methodological orientation (Mallard, Lamont & Guetzkow, 2002).

Humanists are generally more concerned with pursuing interesting questions than with the search for answers. The American peer review study confirms this noting that “original data [sic] excites humanities scholars, because it opens new opportunities for interpretation. ... In contrast, social scientists are more focused on answering or informing specific conceptual questions. ... As such, they tend to value original methods and research designs most highly, because these hold the promise of informing theories and contributing to progress in answering specific conceptual questions or ‘resolving old debates.’” (Guetzkow, Lamont, & Mallard, 2004: 202)

The terminology researchers use offers considerable insight into how they approach their work. The same study reports that humanists, including historians, never mentioned hypotheses whereas social scientists often did. The materials humanists work on, usually texts or other cultural artefacts, are referred to as sources rather than data. They prefer terms such as critique, criticism and interpretation over analysis. While humanities

scholars value intellectual rigour, they rarely refer to their approaches as systematic, a form of scientific rigour. Indeed a review of studies of historians' research habits indicates that historians *prefer* an unsystematic approach which involves browsing and serendipity, a preference which persists even with technological changes (Speck, no date).

## 2 Collaborative practices in the humanities

The definition of collaboration in the transformation consultations seemed to many humanities scholars to be particularly problematic. Humanists do collaborate. However, how their collaboration manifests itself is poorly recognized in existing systems. For example, a SSHRC-commissioned study of research collaboration states, "The proportion of articles written by more than one author reflects the level of *overall* collaboration by Canadian scholars. An article has to have been attributed to at least two authors to be considered the result of a collaborative activity." (Larivière, Labelle, & Lamelin, 2004:13) While it is true that an article "attributed to at least two authors" must be the result of collaboration, the converse is not necessarily the case. All collaboration does *not* result in publications with multiple authors. Thus, measures of co-authorship will not necessarily reflect "the level of overall collaboration". In the humanities, and in some social sciences, collaboration may manifest itself not in co-authorship but in acknowledgements.<sup>1</sup>

The importance of the process of writing to the overall research process in the humanities goes a long way to explaining some of the resistance to co-authorship as a means to recognizing some types of research contributions. This is a fundamental difference between humanists and positivist social scientists. At the risk of oversimplifying, we can say that for this group of social scientists, language tends to be a neutral vehicle for expressing ideas and findings and writing isn't seen as a dynamic process that invites the reader to participate in the construction of meaning. This may explain why even though one person holds the pen (at least for the final draft), they are comfortable with co-authorship: the writing is merely a technical process required for dissemination findings, not necessarily a part of the process of analysis or interpretation.

For the humanist, the form the writing takes, the choice of language, and the literary style of the piece are all part of the scholarship and can be very individual. Even where the ideas contained in the work are strongly influenced by participation in collaborative activities, a particular piece of writing is more than just the ideas it contains. As Cottingham points out in Science Next Wave (the online sister publication of Science), "Although authorship gives credit where credit is (hopefully) due, it also assigns responsibility for the data contained in a paper should questions arise" (Cottingham,

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<sup>1</sup> The fact that these are not captured in databases is a further limitation to the validity of bibliometrics in social sciences and humanities (in addition to other factors enumerated in Archambault & Vignola Gagné, 2004).

2001). In the context of humanities scholarship, it is perhaps more appropriate to say that it assigns responsibility for the interpretations contained in the paper.

The evaluation of the Major Collaborative Research Initiatives, for example, states that most funded projects produced a mix of single authored and co-authored publications (Kishchuck, 2005: 23). It would be wrong to assume that the single authored publications were not equally the result of collaborative research, particularly given that many projects developed mechanisms to ensure “that team members would be able to access, read and discuss ongoing work from all other team members” and the high level of satisfaction among researchers with the collaborative experiences (Kishchuk, 2005: 28-29). The report notes that researchers felt that “it had benefited their work as well as advancing the collaborative research agenda in ways that would not have happened through other types of structures” (Kishchuck, 2005: 29).<sup>2</sup>

Donna Heiland, in her contribution to the Alternative Wor(l)ds conference, points out “Disciplinary and multidisciplinary work not only complement but to some extent generate each other.” Read in the light of the findings of the MCRI performance report, the balance between interdisciplinary and disciplinary, sole-authored and joint-authored, publications in MCRI projects may reflect more than simply a reaction to the realities of the academic rewards system. It may reflect the complexity of the results of such collaboration, which are not easily captured in measures such as co-authorship or interdisciplinary publication.

Despite the very limited use of co-authorship in the humanities, collaboration is not uncommon in humanities scholarship. While all scholars present their work at conferences, humanities scholars in particular depend upon conferences and scholarly associations as important locations of collaborative work. Often organized by their scholarly associations, conferences are crucial to the process of conducting humanities research by allowing for various types of interaction: the play of ideas, of debate and discussion in the formation of ideas and the production of interpretations. With the focus taken away from the production of results, answers, or resolutions, the conference is not *just* part of the dissemination phase of the research (as it might be for scientists or social scientists). It is also a forum in which ideas are tested and intellectual rigour is enhanced. Thus the reading of papers, with the emphasis on language and development of argument, is an essential part of humanities scholarship and is a collaborative process.

Interdisciplinarity should be used with some precision in these debates. Although interdisciplinary research often proceeds through collaboration, multiple researchers are

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<sup>2</sup> It should be noted that there is a debate within scientific and social scientific disciplines about the ethics of co-authorship and various attempts are being made to specify what sorts of contributions may be considered ‘authorship’ and what sorts of contributions should be acknowledged in some other way. (see e.g. Whitbeck, no date; International Committee of Medical Journal Editors, 2004; British Sociological Association, no date; American Psychological Association, no date).

not necessary for interdisciplinary research to take place. Interdisciplinarity sometimes arises out of the subject of research. Thus historians of science have more than a passing familiarity with the scientific disciplines they study. Biographers or literary editors, to borrow Helland's example, require knowledge of the fields in which their subjects wrote and/or worked. Such interdisciplinarity may be vital to certain humanities disciplines.

### **3 Collaboration and independence**

The importance of sole authored publications speaks to the importance of independence for humanities scholars. During the transformation consultations, statements supporting the value of independence were often interpreted as opposing collaboration. Yet, for humanities scholars, intellectual autonomy is directly linked to intellectual authenticity (Guetzkow, Lamont & Mallard, 2004: 203). **In large-scale research projects, an appropriate balance must be struck between collaboration and independence.**

The hierarchical nature of relationships between researchers in the natural and physical sciences are implicit in debates about the ethics of authorship within these disciplines. Attempts to codify an ethics based on the recognition of the level of contribution and responsibility for the data and results suggest that current practices of attributing authorship are based on other criteria including status in the hierarchy of the laboratory (e.g. Cottingham, 2001). These formal mechanisms for the attribution of authorship based on status in a team are at odds with the value of intellectual autonomy and the modes of collaboration most common in the humanities.

While large-scale research projects require co-ordination and management, there may be effective models of collaboration which are less hierarchical. Attentiveness to the overlap between learning and research creates a context in which all researchers involved in such a project benefit from "opportunities to develop and share their own ideas and work in a climate of constructive criticism."<sup>3</sup> The purpose of the collaboration would be framed, not in terms of the possible results or solutions, but in terms of the questions or the sources. The knowledge produced through collaboration might result in sole-authored and co-authored publications as well as anthologies, both within disciplines and in interdisciplinary areas. New conventions could be developed to take account of multiple authorship by using a simple rule of alphabetical listing for equal credit and variations on such listing to indicate unequal credit. Some discipline-based large scale projects such as the Dictionary of Canadian Biography and Records of Early English Drama have worked out individual schemes to acknowledge the independent contributions of collaborating scholars.

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<sup>3</sup> To echo Kishchuk (2005: 48) on the value to students of such involvement.

## 4 The products and impact of humanities research

With the federal government's increasing emphasis on targeted programs, accountability and results, the discourse during the transformation discussions seemed to drift from the broad notion of maximizing impact to a narrower sense of impact on public policy, especially in the federal arena. Such narrow definitions of the utility of knowledge can restrict the overall objective of maximizing impact. Replace policy maker with student, member of the public, stakeholder or other audience to whom we might address our research and the impact of humanities research becomes clear.

Reframing the issue of impact in this light prompts the questions: What is useful for society or more broadly for humanity? Do policy makers, community organizations, and members of the public need answers or are their projects advanced by new ways of framing the problem or new interpretations of the evidence we already have? The value that humanists place on reframing questions, producing new interpretations, and on synthesizing interpretations from different perspectives may be of particular conceptual value.

A recent study of research utilization in a range of government agencies demonstrates that conceptual use of research – “using results for general enlightenment” (Landry, 2004: 77) – is more common than instrumental or symbolic use of research (Landry, 2004: 98). Although the study looked at social science research in government agencies, this finding suggests that the less solution-oriented research from the humanities also has the potential for broad impact within government.

Lamont and Mallard note that in broad terms humanists are more likely than social scientists to consider “giving voice” to underprivileged or stigmatized groups to be a legitimate contribution to knowledge. “This finding suggests that different types of social impact should be emphasized for the humanities and the social sciences” (Lamont and Mallard, 2005: 13).

Impact may be achieved in a range of ways and through many different products of research. Effective knowledge mobilization strategies extend far beyond straightforward dissemination practices. Lectures, essays, annotations, media commentary and performances – these means, and others, allow scholars to communicate the results of their research and influence audiences beyond their discipline and even the academy. This is true for both social scientists and humanists, but has special significance for the latter group because of their propensity to use such methods.

### **III Humanities participation in large-scale research programs**

An analysis of awards made in the Standard Research Grants competition between 1998-99 and 2002-03 indicated that the performance of social sciences and humanities disciplines is roughly equivalent to their proportions in the eligible research community. While this is reassuring, it is perhaps unsurprising that in a competition adjudicated by discipline based committees, parity should prevail. Epistemological differences, and the consequent disagreements over what constitutes "a significant contribution to the advancement of knowledge," will be minimized or contained within well understood boundaries within a discipline based committee.

However, most other competitions, including those for large scale research projects, are adjudicated by a single multi-disciplinary committee. In such a committee the scope of epistemological differentiation could be assumed to be greater. In addition, most of these competitions have more precisely defined objectives than the Standard Research Grants, including specific requirements to address "broad and critical issues of intellectual, social, economic and cultural significance" (MCRI objectives) or "the creation of new knowledge in areas of importance for the social, cultural or economic development of Canadian communities" (CURA objectives), for example. Humanities scholars have expressed concern that the interpretation of these additional criteria is not sensitive to the nature of humanities research and the types of contributions humanities might make. The concern becomes real when all research programs are included in the analysis. Between 1998/99 and 2003/04, we can observe a noticeable trend that favours the social sciences as the ratio of expenditures as a percent of total research program expenditures between the humanities and the social sciences goes from double (28.1/59.3) toward treble (28.1/65.6).

The Strategic Research Clusters Design Grants competition highlighted the seriousness of the issues of large-scale research projects for the humanities. This program was relatively small and may not be representative of all large scale research funded by SSHRC. However, only 29 of the 136 researchers funded (in 31 teams) were in humanities disciplines. Of these 13 were in history (a discipline widely regarded to include both humanities and social science scholars) and 5 were in philosophy. The range of humanities disciplines funded was thus very limited.

#### **1 The MCRI – Multi-Collaborative Research Initiatives**

SSHRC funds large scale research projects through several programs. The most longstanding of these is the Major Collaborative Research Initiatives (MCRI) program which was established in 1993. The Community-University Research Alliances (CURA) program was launched in 1999. Some of the strategic programs have also had

components that fund networking activities or networks. In 2001 SSHRC launched the Initiative on the New Economy, a 5-year, \$100 million suite of programs requested by the federal government to address what it saw as a pressing need for new knowledge. The initiative included a program modeled on the MCRI, the INE Collaborative Research Initiatives, and one modelled on the CURA, the INE Research Alliances.

According to the MCRI performance report (Kischuk, 2005), between 1993 and 2003 SSHRC funded 49 MCRI projects with a total of 1,069 individual researchers involved as applicants, co-applicants and collaborators. Teams ranged in size from 4 to 76 members with a mean team size of 24. Each project listed 3 main disciplines: 33.8 percent were in humanities and 47.4 percent were in the social sciences. This is roughly equivalent to the proportion of humanities scholars in the SSHRC eligible community.<sup>4</sup>

Data on the main discipline listed by each participant yields a list of 22 disciplines that appear 10 times or more. Of these, 8 (36 percent) are in the humanities. If the various literature disciplines are combined, then 6 of 20 disciplines (30 percent) which have more than 10 individual researchers involved in MCRI research over a 10 year period are in the humanities. The exclusion of disciplines with fewer than 10 representatives leaves 965 researchers. 30.7 percent of these researchers are in humanities disciplines and 66.7 percent are in social sciences disciplines (the remainder being interdisciplinary, science disciplines, or other). Humanities scholars are thus somewhat underrepresented.

The three most represented humanities disciplines are linguistics (with 14 projects and 110 researchers), history (with 11 projects and 55 researchers), and literature (with 14 projects and over 77 researchers<sup>5</sup>). Two of these (history and linguistics) are often seen as straddling the humanities-social sciences divide in that scholars in these disciplines may identify themselves with either broad grouping. Interestingly, given its representation in the Clusters competition, philosophy is not represented at all in MCRI projects over the 10-year period from 1993-2003.

SSHRC has provided comparative data for 8 relevant programs<sup>6</sup> for the period 1999-2000 to 2005-2006. This data is slightly different from that analysed in the MCRI performance report but allows comparison of both project discipline (first discipline listed) and researcher discipline. For the MCRI, in the period 1999-2000 to 2005-2006, 14.7 percent of the 34 projects funded were in the humanities and 17.6 percent of the researchers associated with all MCRI projects were humanists. The level of involvement of humanists

<sup>4</sup> SSHRC estimates that in 2000, 35.5 percent of SSHRC eligible faculty in Canadian universities were in the humanities and 64.5 percent in social sciences.

<sup>5</sup> This figure is arrived at by combining more specific literature disciplines. As there were fewer than 10 researchers in Modern Languages and literatures it is impossible to arrive at an accurate figure though it will be between 78 and 86.

<sup>6</sup> These programs are: MCRI, Inter-Council Grant/Consortiums, INE Outreach Grants, INE CRI, INE RA, Aid to Research Workshops and Conferences, CURA, Strategic Research Clusters.

in MCRI projects is thus well below their proportions in the academic community as a whole.

An analysis of interdisciplinarity within these projects, by discipline cluster, that the objective of interdisciplinary knowledge creation is only being met in its most narrow sense: 93.1 percent of all researchers associated with humanities MCRI projects are humanists. A more detailed examination indicates that all of the non-humanists are associated with the same project and one project has researchers almost solely within one discipline. A similar analysis of social science projects is complicated by the overall imbalance in the numbers of social science and humanities researchers. However, almost half of all humanists associated with MCRI projects are associated with social science projects.

The INE Collaborative Research Initiative funded fewer projects over the same period and had lower representation of humanists: 12.5% of projects are in the humanities and 5.8% of researchers are humanists. The disciplines (both humanities and social sciences) cluster in a very narrow range that may be influenced by the published relevance criteria. The humanities disciplines represented are very different from the MCRI program with communications and media studies and philosophy dominating here (and absent from the MCRI program). As with the MCRI program, though, humanists are evenly distributed between humanities and social science projects.

## **2 The CURAs – Community-University Research Alliance**

The Community-University Research Alliances program shows a similar pattern to the MCRI although the representation of humanities is even lower (over a larger number of projects and researchers funded): 10 percent of projects and 12 percent of researchers are in humanities disciplines. These researchers are distributed evenly between humanities and social science projects (50.4 percent/49.6 percent). There is also greater interdisciplinarity across the discipline clusters: 38.4 percent of researchers associated with humanities projects are social scientists. The INE RA is a much smaller program with very similar representation of humanities.

The range of humanities disciplines in the CURA is very narrow. The eight humanities projects funded are in only 3 disciplines: 4 in history, 3 in fine arts, and 1 in archival science. Just over half of the 112 researchers associated with these 8 projects are in just two disciplines: 33 percent in fine arts and 19% in history. The social sciences data also show a very restricted pattern of discipline involvement with a very different group of dominant disciplines to the MCRI program. For example, there are far fewer faculty in economics and more in education, sociology, social work and urban and regional studies in the CURA. Management has a very strong showing in the CURA data. It is possible, that traditionally ‘applied’ disciplines (including the community arts tradition in fine arts)

are dominating this program. Given the praise that the CURA program received during the SSHRC transformation consultations as a model for maximizing impact and a training environment for students, this apparent concentration of disciplines already involved in applied research should be a cause for concern. The potential for the CURA program to build capacity for interaction between a broad range of academics and the communities in which they work is clearly not being realized.

### **3 The Initiative on the New Economy (INE)**

This potential is somewhat evident in the small INE Outreach grants program. Although applicants were required to have received funding under the INE, thus limiting the potential involvement of the humanities, and the average number of researchers per project was much lower (2 compared to 17 for the INE Collaborative Research Initiatives and 13.5 for the INE Research Alliances), the involvement of humanists was as high as it was in the other programs (9% of both projects and programs). This suggests both that those humanists involved in the INE were central to the program and that humanists have significant contributions to make to knowledge mobilization.

### **4 Strategic Research Clusters**

In the light of this data, the Strategic Research Clusters program, which inspired this investigation, looks somewhat different. Representation of the humanities is higher than in the more established large-scale research programs despite the fact that the number of researchers per project is significantly lower (4.6 compared to 17.5 for the MCRI): 26 percent of projects and 24.7 percent of researchers are in humanities disciplines. As with other programs, the projects were concentrated in a few familiar disciplines: 8 in history, 6 in communication and media studies, 4 in philosophy, and one each in literature and fine arts. However, a similar pattern of concentration within disciplinary clusters is found with some projects having very little interdisciplinarity (e.g. of the 33 researchers associated with the 8 history projects, 31 are historians).

### **5 Additional Considerations**

All of the current programs funding large-scale research projects focus on interdisciplinary research. No funding programs exist for large scale disciplinary research projects.<sup>7</sup> Discipline based collaborative projects that produce reference tools such as dictionaries and new data for analysis such as the Dictionary of Canadian Biography and Records of Early English Drama, may be equally important to bringing international recognition to Canadian research and to producing results that will have a major impact

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<sup>7</sup> This is the case for both humanities and social sciences. Social scientists also lament the lack of such funding, particularly for longitudinal studies.

on Canadian scholarship and society. This may also account for the relatively limited interdisciplinarity of MCRI projects. Are scholars using the MCRI to pursue important questions within their disciplines, bringing in scholars from closely related areas to meet the interdisciplinarity criterion? The Strategic Research Clusters competition did not explicitly require interdisciplinarity and some of the successful clusters are made up of scholars mainly from one discipline or closely related disciplines. Arguably there is a demonstrated need for funding for such projects. The Inter-Council Grant/Consortium funds are currently meeting some of this need. A large proportion of the funds disbursed in this program are going to humanities projects of the editorial or dictionary type. However, this is not an open program and avenues for funding for new projects are not obvious.

A key issue has been the time limits on large-scale projects. SSHRC is already taking some steps to answer these charges and to provide for large-scale single discipline projects. A continuum of funding proposal that was presented to Council in October 2005 would amend the SRG program to allow applicants to apply for five year funding up to a maximum of \$750,000. Similarly, in the Report on the Clusters Design Grants Process (Graham, with Ravignat, 2005), the intent is to expand the Cluster program so that a group could potentially receive funding up to \$7 million over 14 years. The question remains whether or not we should see the introduction of 10 year renewable grants that would be designed specifically to accommodate large-scale editorial

## **IV Systemic barriers to application and to grants**

Research on both faculty involvement in outreach activities and on involvement in interdisciplinary research shows that both intrinsic and extrinsic factors influence behaviour (see e.g. O'Meara, 2005; Rhoten, 2004). Looking at humanists and large-scale research projects, these factors may limit both the extent to which they pursue involvement in such projects and also the success of their applications within the broader pool of projects.

### **1 Encouraging applications**

As any humanities scholar will tell you, language matters. The language of program descriptions and detailed application instructions can constitute a barrier to application, affect the ways in which applicants describe their proposed research, and/or contribute to the general feeling in the humanist community that they must distort their work to fit a social science model.

The MCRI program description<sup>8</sup> is very well written from the point of view of the issues raised above regarding the nature of humanities research. The objectives focus on the advancement of knowledge and encouragement of discussion and debate. The synthesis of issues is highlighted as a separate objective. All objectives relating to stakeholders and partnership are worded in terms of *promoting* development of links or active partnerships. The description refers to researchers with different "perspectives" which they bring to "complex research questions".

Given the sensitivity of the language used in the program description, it is somewhat surprising to find in the application instructions (available with the application form in the secure online application system) specific instruction that "The detailed description of the research proposal should: ... describe succinctly the research hypotheses, questions, theory and concepts as well as the methodologies." The language of this instruction, the only one which specifically refers to the research approach, is alien to most humanists and many social scientists. Leading with hypotheses is particularly problematic given Guetzkow, Lamont and Mallard's finding that "none of the humanists and virtually none of the historians we interviewed expressed concern about a proposal's hypotheses – in contrast to social scientists, who mentioned it frequently" (2004: 202). This instruction sets up the description of the research itself in terms of a concern with results over questions and interpretations. This focus on results also appears explicitly in the instructions relating to dissemination strategies although in this context it might be interpreted more broadly. Interpretations and new ways of framing questions might well be disseminated but they are not anticipated by a hypothesis.

The CURA program description<sup>9</sup> is similarly broad although the long lists of examples contained in the first paragraph of the 'Context' section and the paragraph on research themes or areas may make it more difficult for humanities scholars to imagine how their research might contribute to debates and activities beyond the academy, an imagining that might be nurtured by exploring possible research themes and areas with potential community partners. This may account for the apparent dominance of applied disciplines in the CURA program.

The CURA instructions, although they do not mention hypotheses, frequently use the term 'methodology' where the term 'research approach' might be more appropriate not only to signal openness to humanists but also to signal openness to the variety of research approaches which may be extant in partner organizations, not to mention among other social scientists. The instruction to "Justify the choice of methodologies and explain the specific instruments or procedures you will use" is a shift towards the

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<sup>8</sup> [http://www.sshrc.ca/web/apply/program\\_descriptions/mcri\\_e.asp](http://www.sshrc.ca/web/apply/program_descriptions/mcri_e.asp), accessed 9 August 2005.

<sup>9</sup> [http://www.sshrc.ca/web/apply/program\\_descriptions/cura\\_e.asp](http://www.sshrc.ca/web/apply/program_descriptions/cura_e.asp)

language of the social, physical and natural sciences that is at odds with the practices of most humanists. The example given refers specifically to a social scientific method.

The section of the CURA instructions referring to evaluation criteria avoids some of these problems by referring more generally to "methodology and research approach" and the rationale for and quality of these in relation to the research objectives. Nevertheless, the "outcomes" criterion (worth 40 percent) includes "likelihood of producing significant *results and impacts*" (emphasis added). While the humanist concern with questions and interpretations may have a significant impact (as might involvement in the research process itself, if one is considering impact on communities or students), it is less clearly identifiable as results.

The Initiative on the New Economy<sup>10</sup> was particularly problematic in this respect. Despite a liberal sprinkling of 'cultural' in the description of the overall program and the 'General New Economy Issues' theme, the illustrative research questions (in all themes including the general one) are very focused on areas likely to be of interest to only a narrow range of social science disciplines. An initiative mandated by the federal government and notably not SSHRC itself, the program was designed with emphasis on results, with measures in place to ensure that "significant" results were produced in the 5-year time frame.

In all of these large-scale research programs the focus on results is likely to be interpreted by applicants and committee members as a focus on new theories and new findings. This may systematically disadvantage humanities scholars who are more likely to value new approaches. (see Guetzkow, Lamont & Mallard, 2004: 206).

## **2 Editorial projects and discipline-based reference tools projects**

All of the current programs funding large-scale research projects focus on interdisciplinary research, with no funding programs dedicated to large-scale disciplinary research projects nor to 'hybrid' disciplinary/interdisciplinary projects.<sup>11</sup> This leaves large editorial projects, arguably some of the largest-scale projects possible within humanities scholarship, ineligible for support under the present grant programs. Such projects are as important as their interdisciplinary counterparts in producing results that will have a major impact on Canadian scholarship and society and in bringing international recognition to Canadian research.

A key issue for all large-scale projects is restricted time limits. This is especially the case for these projects. SSHRC is already taking some steps to answer these charges and to

<sup>10</sup> [http://www.sshrc.ca/web/apply/background/ine\\_about\\_e.asp](http://www.sshrc.ca/web/apply/background/ine_about_e.asp) and links to themes, accessed 11 August 2005.

<sup>11</sup> This is the case for both humanities and social sciences. Social scientists also lament the lack of such funding, particularly for longitudinal studies.

provide for large-scale single discipline projects. A continuum of funding approach has been proposed that would amend the SRG program to allow applicants to apply for five year funding up to a maximum of \$750,000. Similarly, in the Report on the Clusters Design Grants Process (Graham, with Ravignant, 2005), the intent is to expand the Cluster program so that a group could potentially receive funding up to \$7 million over 14 years. Specific consideration equally should be given to the introduction of 10 year renewable grants that would be designed specifically to accommodate large-scale editorial projects give the impact of these.<sup>12</sup>

### 3 Student development

In much of the debate surrounding SSHRC transformation a beneficial link was made both implicitly and explicitly between large-scale research projects and student development opportunities. Humanists tend to be among those sceptical of this link. Their concerns centre around three areas: autonomy of work, quality of training and completion rates.

Necessarily there is some connection between the work of the advisor and the work of the student – in approach, in the larger questions being investigated, or in the sources used. However, doctoral work that is too close to that of the student's advisor might be characterized as derivative. "Doctoral students were sometimes the object of a particular kind of scorn when their work was seen in relation to their advisor's work." (Guetzkow, Lamont & Mallard, 2004: 204). As with the broader question of collaboration, many humanists do not view co-authorship with graduate students as being beneficial to their students although they may expect their contribution as a supervisor to be acknowledged in sole-authored publications arising from doctoral research.

The question of graduate development in the context of specifically *interdisciplinary* research raises a separate set of quality concerns with regard to the appropriate balance between depth and breadth as well as the appropriate relationship between disciplinary specialization and interdisciplinary research. Kamboureli summarizes these concerns: "Unless we foster specialization along with interdisciplinary methodologies, we run the risk of producing a kind of general knowledge that will lack depth and substance, a general knowledge whose pedagogical, cultural and political implications will not serve our communities' needs."<sup>13</sup>

The MCRI Performance Report contains evidence that there can be drawbacks for the PhD completion rates and future academic employment of young scholars associated with interdisciplinary projects (Kishchuk, 2005: 36-37). The evidence is based on a

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<sup>12</sup> For example, the Dictionary of Canadian Biography website experienced over 1 million visits and over 7 million total page views in the year ending March 2006.

<sup>13</sup> Alternative Wor(l)ds Conference, 2000.

sample too small to validate such conclusions, based on interviews with only 9 students and postdoctoral fellows from a total of 385 involved in the 11 case study projects. But with similar negative effects found in other studies of interdisciplinary research, (see Rhoten, 2004: 9), there is enough concern to warrant further study of what value academic rewards systems (including hiring, tenure, promotion and the awarding of grants and prizes) place on interdisciplinary work, co-authored publications, and involvement in large-scale research projects.

At present, SSHRC does not collect information about students working on projects it funds of any size, with the exception of financial information on expenditures. Under the current structure, students receive no official recognition for their contribution to the project and there is no formal reporting mechanism for the training outcomes of the project, the impact on time to completion, or the contribution to the student's dissertation and other publications (sole or co-authored).<sup>14</sup> The experience of long term discipline based research projects who have successfully trained many students in research techniques should be considered.

More detailed statistics on two key indicators will help interpret issues surrounding graduate student training: the application rates and the acceptance rates of large-scale research projects involving the humanities. In the absence of this information, we can suggest that if humanities scholars are less likely to apply for large-scale research project, it may be partially attributable to their distrust of the benefit to their graduate students. If the acceptance rate proves lower in humanities applications, it could result from the applications' lack of component for graduate student training within the large-scale project itself.

Given the limited information about contributions to research training requested in the SSHRC CV,<sup>15</sup> it is unclear what evidence committees use to judge the likely quality of such training. Some evidence will be available to committees in the publications list for those who co-author publications with their students. However, the lack of such evidence could not be reliably interpreted as a lack of effective research training due to variation in traditions of authorship. Similarly the value of autonomy in humanities scholarship may lead humanists to underestimate their contribution to student research.

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<sup>14</sup> The final research report only requests information on student *employment*. As a comparison, NSERC collects much of this information, as well as information on what students went on to do after their involvement in the project, from researchers in the application form ([http://www.nserc.gc.ca/forms/pdf/F100\\_e.pdf](http://www.nserc.gc.ca/forms/pdf/F100_e.pdf) see page 4).

<sup>15</sup> Cf. NSERC's personal information form ([http://www.nserc.gc.ca/forms/pdf/F100\\_e.pdf](http://www.nserc.gc.ca/forms/pdf/F100_e.pdf) see page 4).

## 4 A multidisciplinary adjudication committee

In contrast to the strategic programs, the performance of social sciences and humanities disciplines in the Standard Research Grants competition between 1998-99 and 2002-03 is roughly equivalent to their proportions in the eligible research community.<sup>16</sup> It is perhaps unsurprising that in a competition adjudicated by discipline-based committees, parity should prevail. Epistemological differences, and the consequent disagreements over what constitutes “a significant contribution to the advancement of knowledge,” will be minimized or contained within well understood boundaries within a discipline-based committee.

In contrast, large-scale research programs are adjudicated by one committee but receives applications from a range of disciplines. While one member of the committee is likely to be in the same discipline as any particular applicant, the committee as a whole will not. One could assume that the experience of this multidisciplinary group of evaluators would be similar to that of researchers in the early stages of an MCRI:

Researchers spoke of the ‘collision’ and ‘tectonic shock’ of ideas that occurred at these sessions... Among the most painful but rewarding experiences for many team members, was an unforeseen realization that some of their most basic concepts, terminology and methodological precepts were not shared by collaborators from other disciplines, and that they had been using the same terms without recognizing the conceptual gulf that separated them.(Kischuk, 2005: 26)

Lamont has examined how members of committees negotiate epistemological differences to arrive at consensus decisions regarding the quality of proposals. While reviewers do favour “interesting work” that favours their own style of research, they follow a series of unspoken rules that enable consensus to be reached on the best work submitted. These rules include “deference to disciplinary expertise, strategic voting, horsetrading, and the bracketing of personal ties” (Lamont & Mallard, 2005: 13).

## 5 Evaluation criteria for peer review

The primary evidence used in peer evaluations of grant proposals is the applicants' past research performance, usually shown as a list of publications in the CV. Publishing traditions vary within and between disciplines making comparisons difficult in multi-disciplinary committees. Authors who publish articles, most frequently social scientists, are more likely to use quantitative data and statistics and to cite references within their discipline” (Lamont and Mallard, 2005: 15) allowing a numerical measure to convey the

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<sup>16</sup> SSHRC, no date [report prepared by Boris Stipernitz]

quality of the research for those outside of the discipline. For applicants who publish mostly in books and for whom bibliometrics have little value, their reviewers need a familiarity with the norms and the status of particular journals or publishers within a range of disciplines to be able to compare quite different publication records with each other. Thus it is crucial that peer review committees compare the number and type of publications of applicants from different disciplines in ways that eliminate systematic bias against particular disciplines and to support work that is most influenced by, and to have the most influence on, a wide range of academic work.

## 6 Prior collaboration requirement

In most competitions for large-scale research projects, some evidence of prior collaboration is also sought. Again, the evidence available to peer reviewers is limited and consists mainly of publications. Because traditions of authorship vary by discipline and co-authorship is very uncommon in the humanities, in particular, the use of co-authorship as a measure introduces a systematic bias against humanities scholars. While the MCRI performance report recognizes the criticisms of co-authorship as a measure of collaboration (Kishchuk, 2005: 22-23 & 36-27) these criticisms do not seem to affect the nature of the evaluation nor the recommendations; this despite the fact that publication strategies which balance interdisciplinary and disciplinary, co-authored and sole-authored publications receive some praise (Kishchuk, 2005: 23 & 39).

## 7 Instrumental objectives

The 2005 Lamont and Mallard study reports that "outcomes were strongly influenced by the directives the funding agencies gave panellists concerning the criteria to be used in evaluating." Thus the language issues regarding the program description and particularly the evaluation criteria may limit the extent of the arguments a particular committee member may deploy based on their disciplinary expertise.

Most of the large-scale research programs have more precisely defined objectives than the Standard Research Grants including, for example, specific requirements to address "broad and critical issues of intellectual, social, economic and cultural significance" (MCRI objectives) or "the creation of new knowledge in areas of importance for the social, cultural or economic development of Canadian communities" (CURA objectives).

Humanities scholars have expressed concern that the interpretation of these additional criteria is not sensitive to the nature of humanities research and the types of contributions humanities might make. The concern becomes real when all research programs are included in the analysis. Between 1998-99 and 2003-04, we can observe a noticeable trend that favours the social sciences as the ratio of expenditures as a percent

of total research program expenditures between the humanities and the social sciences goes from double (28.1/59.3) toward treble (28.1/65.6).

## 8 Institutional support and recognition

While many researchers are under pressure from their universities to apply for funds from programs like the MCRI, this is largely due to financial pressures on institutions and the amount of overall funding available for large-scale research projects. Success in securing such funds enables an institution to support more students and post-doctoral fellows and free up internal money to provide conference travel funds and other research support for faculty members. In addition, research funding for institutions (e.g. SSHRC Institutional Grants, Canada Research Chairs and Indirect Costs) is often based on the amount of tri-council funding received. The specific requirement for the projects to involve multiple institutions combined with the recognition of only the institution of the principal investigator create a complex web of incentives and disincentives for participation across institutions and variability in the extent to which individual participation will be valued.

Universities are also involved in encouraging collaborative interdisciplinary research through the creation of research centres and other mechanisms. However, as a study of several such initiatives in the United States shows, "many universities are simply adopting the interdisciplinary labels without adapting their disciplinary artefacts" (Rhoten, 2005: 9). This creates disincentives to participate in interdisciplinary research through, for example, the lack of recognition of involvement in interdisciplinary research in tenure and promotion processes administered at the departmental level. Rhoten also argues that it creates structures "that are inherently incapable of achieving the very goals they seek to accomplish". While the MCRI performance report (Kishchuk, 2005) indicates that SSHRC explicitly addresses some of the crucial problems identified in this and other research, it also contains evidence that the lack of a parallel institutional structure creates disincentives to participation (or incentives to exit) especially for early career scholars.

What is not known is whether the rewards system varies by discipline, thus contributing to the pattern of participation by discipline, particularly the humanities, that we see above. Tenure, promotion and hiring are generally administered by committees of peers within an administrative framework set by the institution (often through collective bargaining). Thus, the issues seen in the review of grant applications will arise in these processes as well. Lamont's finding that humanists associated autonomy with intellectual authenticity and scorned those whose work was too close to that of their supervisor (Guetzkow, Lamont & Mallard, 2004: 204), supports the view that tenure and promotion committees do not value research done in collaborative projects as highly as individual

research, at least in the humanities. A review of the research on (changing) academic rewards systems commissioned by SSHRC suggests that there are numerous examples of mechanisms for rewarding a broader range of research activity, whether this involves interdisciplinarity, collaboration, or outreach. (O'Meara, 2005) Such examples indicate the scope for instituting change at the institutional, or perhaps even departmental, level. Almost no research has been conducted on the academic rewards system in Canada but the disciplinary variation in participation in large-scale funded research suggests that there may be variation in the extent to which departmentally based processes recognize such involvement.

## V The potential contribution of humanities to large-scale projects

*In my view, the humanities has something special to offer in such team interdisciplinary scholarship. Not only do they bring the wisdom offered by centuries of reflection on human self-understanding in many cultures, but they also provide a 'common ground' upon which all the disciplines can meet, share and synthesize knowledge in an interdisciplinary fashion, for the Humanities are, by definition, broadly interested in all knowledge. Further, humanists specialize in imagination, which is essential for the glimpsing of new possibility, and metaphor, which is a key tool for the communication of technical knowledge both across disciplinary boundaries and to the general public.*

- Harold Coward to the Alternative Wor(l)ds conference, 2000

Beyond the role envisioned by Dr Coward, what particular contributions can the humanities make to collaborative research? How can the practices and traditions of humanities scholarship discussed earlier contribute to large-scale research projects?

### 1 Approaches, questions and integration

The MCRI performance report indicates the importance of open debate and in-depth discussion in establishing and maintaining successful collaboration (Kishchuk, 2005: 26). The report stresses the importance of informal discussion to the development of the

necessary respect for other disciplinary approaches and a sufficient understanding of these to form a common conceptual framework for collaborative research. “The case study informants were unanimous that the realizations they gained about other disciplinary perspectives could only have happened in this type of interaction” (Kishchuk, 2005: 26). The resonance with the more informal style of humanities research and the importance of new combinations of approaches or sources is clear. Whereas many social scientists may find this informal approach disconcerting, humanists may have the experience and skills to lead such integrative scholarship (to borrow a term from Boyer, 1990<sup>17</sup>). By valuing the *particular* strengths of humanists, collaborative research can be enhanced.

One of the objectives of large-scale research projects is to generate knowledge out of the interaction between different perspectives, “addressing new problems in fundamentally new ways” (Rhoten, 2004). Research on successful collaboration (and successful knowledge mobilization) indicates that full involvement in the framing of the research questions is key to success. Expanding the relatively limited range of disciplines found in many large-scale projects should lead to a broadening of our understanding of what sorts of knowledge may be useful – to include new and interesting questions and interpretations in addition to resolutions to social problems. Humanists’ perspectives on the major questions facing humanity should be central to the framing of the projects.

The humanities arguably have important perspectives and approaches to contribute to interdisciplinary research as well as important skills in the scholarship of integration. They can play an active role as facilitators of interdisciplinary debate and cross-cultural understanding amongst those of different disciplinary cultures.

## 2 Ways forward

It is critical to work toward a continuum of opportunity for humanities research. Not all humanists need to be part of collaborative research as we traditionally understand it, while others’ contributions are essential to fully realize large-scale research projects.

There are distinguishing features of humanities research, especially within certain disciplines, that make the work of many humanists better suited to their own methods of collaboration than to large-scale research projects as they are currently structured. It is equally true that the work of other humanists not only enhances, but is essential to realizing the full potential of large-scale research. The following recommendations are intended to work toward a continuum of opportunities for humanities research within SSHRC’s large-scale research projects.

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<sup>17</sup> The *scholarship of integration* refers to “making connections across the disciplines, placing specialties in larger context, illuminating data in a revealing way, often educating non-specialists.” (Boyer, 1990: 18)

## **Recommendation #1**

**As part of the work on the continuum of research underway at SSHRC, a specific pilot program be developed to support humanities in relation to large-scale research projects, with special attention to humanists both as contributors to interdisciplinary projects and as the leaders of humanities-based projects.**

SSHRC's new continuum in the Standard Research Grants program is a positive endorsement of diversity among research traditions, methods and outcomes. To extend this recognition of diversity into the area of large-scale research projects, a pilot program would explore two major aspects: first, the contribution humanists can make as contributors to social science centred and/or applied research oriented investigations and, second, the nature of large-scale research projects based firmly in humanities traditions.

Finding ways to increase opportunities for humanities-driven large-scale research projects will populate the continuum. Because federal government departments are most frequently the partners of strategic program funding for humanities and social sciences research, scholarly associations, research centres and their universities, the Federation and SSHRC should work collaboratively with departments to identify specific areas of strategic cultural research (for example, Canadian Heritage, Canada Council, museums, historic sites) as these would provide greater opportunities for humanities scholars both to lead and to participate in large-scale research projects.

## **Recommendation #2**

**Create a new category of funding for discipline-based large scale research projects to complement the existing programs for interdisciplinary projects. More specifically, the funding must be structured to permit long-term editorial projects and discipline-based collaborative projects that produce reference tools.**

While the social sciences community has many of the data tools required for their research, humanities disciplines have only begun to build such corpora of research tools. Major long-term projects, such as the Dictionary of Old English or the Dictionary of Canadian Biography, generate advances in humanities scholarship both nationally and internationally. They must become one of SSHRC's essential core programs, either by changing the criteria of existing large-scale research projects so that these projects are eligible or by introducing a new program solely for such projects.

### **Recommendation #3**

**Broaden the definition of collaboration to encompass diversity among methods.**

Humanities scholars enjoy a tradition of collaboration that differs markedly from their social sciences counterparts. For example, humanists reflect collaboration through acknowledgments, footnotes and citations, rather than by assigning co-authorship to a researcher whose work has informed the final research paper. The definition of collaboration must be expanded so that its meaning encompasses not only the existence of more than one researcher or author, but also the various forms of collaboration that are employed.

Scholarly associations should provide input into the patterns of authorship and attribution, the nature of 'editing' and 'annotation' in literary and other humanities disciplines, their relationship to particular research methods and ethical traditions will be essential. Such input will enhance our understanding of the value of co-authorship as a measure of collaboration and the relationship among authorship, acknowledgement, and autonomy.

### **Recommendation #4**

**Define research products, impact and knowledge mobilization to reflect the nature of humanities scholarship.**

Since adequate quantitative measures may be difficult to determine, qualitative indicators that reflect the humanities must be developed. Scholarly associations can take the lead in defining the range of scholarship in their fields, the range of 'outputs' associated with such scholarship, and the ways in which humanities scholarship has an impact both within disciplines, on other disciplines, and beyond the academy.

Integral to this definition is identifying the variety of forms in which scholarly research might be disseminated, including the recognition of more creative written forms and of teaching and lectures as a mode of research dissemination.

A provision specifically addressing the mobilization and impact of humanities research should be included in the forthcoming SSHRC program on Knowledge Mobilization Units.

### **Recommendation #5**

**Investigate graduate development within different disciplines to ascertain its role in large-scale research projects.**

As graduate student development varies greatly among disciplines, we need to achieve a more finely-grained picture of what good training and a good mentoring environment looks like for specific disciplines. The specific contributions large scale research projects can offer toward graduate student development must flow directly from what is best for the student in a particular field of study. If large-scale projects are used explicitly for the purpose of student development, then different funding mechanisms for student involvement may be required to train future humanities scholars.

SSHRC can provide the basis for this work by collecting more robust data on the role of students in research projects, the types of training provided to them, and the quantitative and qualitative outcomes (including completion rates, completion times, future study or employment, and publications). Recognition of the distinction between student employment and student training should form the basis of such data collection and analysis.

## **Recommendation #6**

**Instructions and application forms for all SSHRC competitions should use language that is more inclusive of the humanities.**

For example, replace “methodology” with “plan of work” or “research approach” as the heading for the project description and eliminate all references to “hypotheses”. The term ‘interpretation’ should be paired with ‘analysis’ wherever possible. When SSHRC enters into partnerships with agencies to develop or implement strategic initiatives, it should encourage language in the applications that is inclusive of the humanities.

## **Recommendation #7**

**Make immediate adjustments to the peer review system.**

Directly linked with the long term processes of academic rewards systems is the need for change to the peer review system. A number of amendments with a shorter horizon can be undertaken for peer review without systemic change across the whole academic reward system.

Building upon the earlier discussion points, once developed, measures of collaboration and of impact can be used in the adjudication of proposals and the evaluation of programs that can accommodate the different methods and products of humanities and social sciences research. The results of this work would serve as an aid to scholars who sit on peer review committees of various sorts and/or design programs of graduate training.

In the short term, revisions to SSHRC's application forms can ensure that peer review committees have appropriate information available to them to judge the quality of training provided in the past. This might include specific requests for details of student involvement and student outcomes (publications, completion time, future employment or training). SSHRC could also examine the guidance given to applicants regarding the proposed contribution to training, and consider requesting training objectives.

## **Recommendation #8**

### **Begin the long-term goal of changing the peer review and academic rewards systems.**

The community of humanities scholars must recognize its own participation in the creation and maintenance of the peer review and academic rewards systems. To ultimately influence existing academic reward systems, humanities scholars – in their roles as members of peer review committees (for grants, hiring, tenure or promotion), of faculty associations, of university administrations – must ensure that decisions are based on a sound understanding of the reality of humanities research in all its diversity. All should work towards recognizing the diversity of scholarly activity rather than increasing expectations for scholars to engage in all types of valued activity.

The Federation, working with the national associations of deans, must urge universities to initiate internal discussions and reviews of the rewards system with a view to recognizing a wider diversity of modes of scholarship and clarifying expectations for faculty within the context of their particular mission and strategic objectives.

June, 2006

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## Appendix A

### **Humanities and Large Scale Research Projects Data on SSHRC funded projects 1999-2000 to 2005-06**

Following a request submitted as part of the working group on large-scale projects and the humanities, SSHRC has provided data on 8 funding programs:

- MCRI
- Inter-Council Grant/Consortiums
- INE Outreach Grants
- INE Collaborative Research Initiative Grants
- INE Research Alliances
- Aid to Research Workshops and Conferences in Canada
- CURA
- Strategic Research Clusters

Information on both project discipline and researcher discipline were provided with analysis at the level of discipline clusters – humanities and Social Sciences, interdisciplinary, other. Only Principle Investigators and Co-Investigators are included in the data because the role of collaborators is unclear. It is assumed that those listed as principle or co-investigators have significant involvement in the project. Because the number of projects funded is relatively small, details of the specific disciplines were also provided enabling an impressionistic analysis of the range of disciplines within each cluster represented in these funded programs.

The data on workshops and conferences was requested because the Working Group had indicated that this is an important form of collaboration in the humanities. Over the period in question 876 conferences and workshops were funded with an approximately even split between humanities (47.3%) and social sciences (52.7%). Of the 8 programs examined here, this is the only one with such an even distribution between the two discipline clusters. It seems reasonable given that conferences and workshops are important for all research disciplines as a way of both disseminating research results and engaging in collaborative activity. The data we received includes only one researcher per application and thus there is not much we can say about this program, based on this data.

Of the remaining 7 programs, 2 (MCRI and CURA) are established and continuing programs. The 3 INE programs were established for a fixed term. Two of these are

modified versions of the established programs (INE Collaborative Research Initiatives: MCRI; INE Research Alliances: CURA) and the third is a new program with relatively small amounts awarded specifically for knowledge mobilization activities related to projects funded under other INE programs. The Strategic Research Clusters is an experimental program arising directly out of the Transformation consultations. The Inter-Council Grant/Consortiums is a poorly defined category. There is no information on the SSHRC website regarding these funds. Below, I will discuss each in turn; combining the relevant INE program with its 'sister' established program as well as giving an overview of the 3 INE programs.

## **Major Collaborative Research Initiatives (MCRI)**

The MCRI program is rooted explicitly in the view that new forms of knowledge can arise from interdisciplinary collaboration and thus interdisciplinarity is a requirement of the program. In the report of the Working Group, it was suggested that humanists, due to the nature of their work, had important contributions to offer to interdisciplinary knowledge creation. The analysis of the data will look at both the extent of humanists' involvement in projects funded under this program and the extent of interdisciplinarity across the discipline clusters. The INE CRI will also be considered given its similarity.

In the period 1999-2000 to 2005-06, 34 projects were funded in the MCRI program of which 5 (14.7%) have a project discipline within the humanities cluster. 683 researchers were associated with these 34 projects of whom 120 (17.6%) are humanists. The level of involvement of humanists in MCRI projects is thus well below their proportions in the academic community as a whole. The INE CRI funded 16 projects in this period of which 2 (12.5%) list their project discipline in the humanities. Interestingly these are disciplines little represented in the main MCRI projects – Philosophy and Communications & Media Studies. 276 researchers are associated with these projects of whom 16 (5.8%) are humanists. The involvement of humanists in the INE CRI is thus even lower than in the MCRI program, perhaps due to the definition and application of the relevance criteria.

The interpretation of these numbers is somewhat complicated by the imbalance between social sciences and humanities in the program. If we examine the researchers, we can see that 55.8% of the humanists associated with MCRI projects are associated with humanities projects, suggesting that those humanists involved in large collaborative interdisciplinary projects are about evenly distributed between predominantly humanities and predominantly social science projects. In the INE CRI, the humanities researchers (even smaller in number) are also evenly distributed between humanities and social science projects.

When one looks at the researchers in projects of particular discipline cluster, it is clear that there is very little interdisciplinarity across the discipline clusters. 93.1% of all

researchers associated with humanities projects are humanists. An examination of the detail by program shows that all 5 non-humanists associated with humanities projects are in the same project. 4 of the 5 humanities MCRIIs have no social scientists associated with them. One of these has very little interdisciplinarity even within the humanities, 10 of the 12 researchers coming from the same discipline. The potential contribution of the humanities to interdisciplinary knowledge creation does not appear to be being met at this time.

A similar analysis of the social science projects is severely limited by the effect of the overall numbers on the percentages. Despite the fact that almost half of all humanists associated with MCRII projects are associated with social science projects, their numbers are so low, comparatively, that 91.3% of all researchers associated with social science projects are social scientists. The social science projects also seem to have a concentration of researchers from one discipline in each project, although none as marked as this particular humanities example. The low number of humanists overall is also reflected in the fact that the humanities projects in the INE CRII program are dominated by social scientists (78.9% of the 38 researchers associated with humanities projects are social scientists).

The range of humanities disciplines represented in these competitions is relatively narrow, dominated by history, literature and fine arts. Some of the disciplines that appear several times (in both project and researcher lists) are also ones that span the boundary between social sciences and humanities (e.g. history, communications & media studies, library and information science, archival science). This makes it difficult to determine from the data whether systemic bias against humanities approaches exists in the program description and instructions and/or in the epistemological approaches of panel members. What is clear is that not only are the humanities under represented in this program but certain humanities disciplines are, at present, wholly absent. Further research is needed to determine the reasons for this absence.

## **Community University Research Alliances (CURA)**

80 projects have been funded under the CURA program during this period of which 8 (10%) are in the humanities. There are 1142 researchers associated with these projects of whom 137 (12%) are humanists. As with the MCRII, the humanists are distributed more or less equally between humanities and social science projects (50.4% to 49.6%). In this program, the stark divide between the two clusters is less evident. While 96.4% of all researchers associated with social science projects are social scientists, this is partly an artifact of the overall imbalance between social scientists and humanists in the program. Humanities projects, while dominated by humanists (69 of the 137 researchers

(61.6%) associated with these 8 projects are humanists), there is significant involvement of social scientists (38.4% of researchers), as well.

Again, humanities involvement is concentrated in relatively few disciplines. The 8 humanities projects are in only 3 disciplines: 4 in History, 3 in Fine Arts, and 1 in Archival science. And just over half (52%) of the 112 researchers associated with the 8 humanities projects are in just 2 disciplines: 37 (33%) in Fine Arts and 21 (19%) in History.

In the INE RA the number of projects funded is very small, making analysis of the data less reliable. We see some similar trends, however. Of the 10 projects funded, 1 (10%) is in the humanities. And 9 (6.7%) of the 135 researchers are humanists. As with the other programs examined, the humanities researchers are distributed evenly between humanities and social science projects. And as with the INE CRI, the humanities projects are somewhat dominated by social scientists though not to the same extent (64.3% of the researchers associated with humanities projects are social scientists). Again, the disciplines involved are different from those in the main CURA program, with Communications and Media Studies (a boundary discipline) being the main humanities discipline represented for both projects and researchers.

## **Initiative on the New Economy (INE)**

This suite of programs was established with additional funds for a specified period and clear expectations from the federal government. SSHRC has some scope to define the delivery mechanisms and relevance criteria but the suite of programs did not operate in exactly the same way as other SSHRC programs. The number of projects funded was relatively small (16 CRI and 10 RA). As we have already seen, both the CRI and RA programs within the INE had very low involvement of humanities researchers and perspectives. Even within the social sciences, a relatively restricted range of disciplines is represented, with management, education, and economics dominating.

Because of the explicit requirement that the knowledge generated by this suite of programs should be made available to a wider public and policy makers, an additional program of Outreach Grants was created. Having been funded by one of the other INE programs was a prerequisite for this program, thus limiting the potential involvement of humanists. Nevertheless, of 55 projects funded, 5 were in the humanities (9.1% consistent with the proportion of humanities projects in the CRI and RA programs) and of 122 researchers associated with these projects, 11 (9%) are humanists. The average number of researchers per project is lower in this program (2 compared to 17 for the CRI and 13.5 for the RA) suggesting that the humanists that have been involved in the INE are not peripheral. In addition, the humanities projects in this program are dominated by humanists (60% of researchers associated with humanities projects are humanists) a

reversal of the trend seen in the CRI and RA programs. This suggests that humanists do have significant contributions to make to knowledge mobilization.

## Strategic Research Clusters

This program was the initial focus of concern prompting analysis of the program and discussion of how to remedy any systemic issues that would exclude humanists. The data provided here indicates that 77 projects were funded of which 20 (26%) were humanities projects. As with other programs, these projects clustered in a few familiar disciplines (8 history, 6 communications & media studies, 4 philosophy, and one each in literature and fine arts).

328 researchers were associated with those projects, of whom 81 (24.7%) were humanists. Humanities involvement in this program is thus higher than in the MCRI program despite the fact that the number of researchers per project is lower (4.6 compared to 17.5 for the MCRI). Nevertheless, there is a similar pattern of concentration within disciplinary clusters to that found in the MCRI. 89.5% of researchers associated with humanities projects are humanists and there is little disciplinary variety within the group of projects in each discipline with the exception of communications and media studies projects (e.g. of the 33 researchers associated with the 8 history projects, 31 of them are historians).

## Inter Council Grant/Consortiums

Although the statistics for this program indicate a similar humanities/social sciences distribution to the other 7, on closer inspection almost all 14 non-humanities projects list the project discipline as 'other'. The researchers associated with these projects are overwhelmingly humanists. This is the program that funds dictionaries and similar large-scale humanities projects as well as several projects on research ethics. The awards range in value from \$4 000 to \$500 000 with the humanities projects receiving the larger amounts and the ethics projects receiving relatively small amounts. This program is clearly an exception but indicates that there is substantial funding going to some large-scale single-discipline humanities projects.

## The Overall Picture

The humanities are relatively under-represented in all of the existing large-scale research programs at SSHRC. In addition, a relatively limited range of humanities disciplines is involved in large-scale projects and some of those best represented are disciplines that span the boundary between humanities and social sciences (e.g. history, communications

& media studies, library and information science). The data does not rule out a systemic bias against humanities approaches although it does not demonstrate such bias either.

The problem is worse in the Initiative on the New Economy suggesting that the potential contribution of humanists to knowledge creation in this area went unrecognized by some or all of those responsible for defining the relevance criteria, putting forward proposals, and adjudicating the relevance and likely significance of the proposals submitted.

Although not as severe, the dominance of particular disciplines (especially applied social science disciplines) in the Community-University Research Alliances program suggests a similar lack of imagination regarding the potential contribution of more 'academic' disciplines (including the humanities) to community-based research.

Interdisciplinary programs dominate large-scale research programs and yet the scope of interdisciplinarity is relatively limited. The detailed evidence seems to suggest that the objective of interdisciplinarity is only being met in a rather narrow sense. The MCRI evaluation described the challenges faced by researchers conducting collaborative interdisciplinary research. With several years of experience, it may be time to challenge researchers to push the boundaries a bit further. The potential for humanities to contribute to interdisciplinary knowledge creation is also far from being realized. This is not only because social scientists do not recognize the value of humanities scholarship, as humanists have also failed to engage across this boundary as well. There is clearly considerable scope for humanists to become more involved in collaborative interdisciplinary projects.

Funding for large-scale single-discipline projects is also rather limited. The Inter Council Grant/Consortiums seems to be providing some funding for large-scale humanities projects although it is unclear how new projects would seek funding. The complete lack of funding for large-scale single discipline social science projects (including longitudinal research), suggests that humanists might work with social scientists to raise awareness of the need for such funding across the humanities and social sciences.

## Appendix B

### Projects in the Humanities and Social Sciences supported by SSHRC, 1999-2000 to 2005-2006 to 2005-2006

**APPENDIX B - Projects in the Humanities and Social Sciences supported by SSHRC 1999-2000 to 2005-06**  
**Annexe B - Projets subventionnés par le CRSH dans les人文學科 et sciences sociales 1999-2000 à 2005-2006**

Project discipline / Discipline du projet	Projects # / Projets	% of total / %	Humanities / Humanités #	% of total / %	Researchers' discipline of expertise / Expertise discipline des chercheurs		
					SS, Interdisc. & Other / SS, Interdisc. et autre #	% of total / %	Total Researchers / Chercheurs % of total / %
<b>Major Collaborative Research Initiatives / Grands travaux de recherche concertée</b>							
Humanities / Humanités	5	14.7	67	55.8	5	0.9	72 10.5
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	28	85.3	53	44.2	558 88.5	99.1	611
<b>Total</b>	<b>34</b>	<b>100.0</b>	<b>120</b>	<b>100.0</b>	<b>563</b>	<b>100.0</b>	<b>683 100.0</b>
<b>Inter Council Grant/Consortiums / Subvention inter-conseils/consortiums</b>							
Humanities / Humanités	8	36.4	35	81.4	2	20.0	37 68.8
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	14	63.6	8	18.6	8 30.2	80.0	16
<b>Total</b>	<b>22</b>	<b>100.0</b>	<b>43</b>	<b>100.0</b>	<b>10</b>	<b>100.0</b>	<b>53 100.0</b>
<b>INE Outreach Grants / Subventions de diffusion de l'INÉ</b>							
Humanities / Humanités	5	9.1	6	54.5	4	3.6	10 8.2
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	50	90.9	5	45.5	107 91.8	96.4	112
<b>Total</b>	<b>55</b>	<b>100.0</b>	<b>11</b>	<b>100.0</b>	<b>111</b>	<b>100.0</b>	<b>122 100.0</b>
<b>INE Collaborative Research Initiative Grants / Initiatives de recherche concertée de l'INÉ</b>							
Humanities / Humanités	2	12.5	8	50.0	30 13.5		
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	14	87.5	8	50.0	230 86.2	88.5	238
<b>Total</b>	<b>16</b>	<b>100.0</b>	<b>16</b>	<b>100.0</b>	<b>260</b>	<b>100.0</b>	<b>276 100.0</b>
<b>INE Research Alliances / Alliances de recherche de l'INÉ</b>							
Humanities / Humanités	1	10.0	5	55.6	9 14		
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	9	90.0	4	44.4	117 121	92.9	135
<b>Total</b>	<b>10</b>	<b>100.0</b>	<b>9</b>	<b>100.0</b>	<b>126</b>	<b>100.0</b>	<b>135 100.0</b>
<b>Aid to Research Workshops and Conferences in Canada / Aide aux ateliers et aux colloques de recherche au Canada</b>							
Humanities / Humanités	414	47.3	372	84.0	42 47.3		
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	462	52.7	71	16.0	391 52.7	90.3	462
<b>Total</b>	<b>876</b>	<b>100.0</b>	<b>443</b>	<b>100.0</b>	<b>433</b>	<b>100.0</b>	<b>876 100.0</b>
<b>Community-University Research Alliances (CURA) / Alliances de recherche universités-communautés (ARUC)</b>							
Humanities / Humanités	8	10.0	69	50.4	43 47.3		
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	72	90.0	68	49.6	962 52.7	95.7	1030
<b>Total</b>	<b>80</b>	<b>100.0</b>	<b>137</b>	<b>100.0</b>	<b>1005</b>	<b>100.0</b>	<b>1142 100.0</b>
<b>Strategic Research Clusters / Subventions de réseaux stratégiques de recherche</b>							
Humanities / Humanités	20	26.0	68	84.0	8 76		
Social sciences, interdisciplinary, and other / Sciences sociales, interdisciplinaire, et autre	57	74.0	13	16.0	239 76.8	96.8	252
<b>Total</b>	<b>77</b>	<b>100.0</b>	<b>81</b>	<b>100.0</b>	<b>247</b>	<b>100.0</b>	<b>328 100.0</b>

Source: SSHRC



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# Communication and Trust in Global Virtual Teams

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## Abstract

This paper explores the challenges of creating and maintaining trust in a global virtual team whose members transcend time, space, and culture. The challenges are highlighted by integrating recent literature on work teams, computer-mediated communication groups, cross-cultural communication, and interpersonal and organizational trust. To explore these challenges empirically, we report on a series of descriptive case studies on global virtual teams whose members were separated by location and culture, were challenged by a common collaborative project, and for whom the only economically and practically viable communication medium was asynchronous and synchronous computer-mediated communication. The results suggest that global virtual teams may experience a form of "swift" trust, but such trust appears to be very fragile and temporal. The study raises a number of issues to be explored and debated by future research. Pragmatically, the study describes communication behaviors that might facilitate trust in global virtual teams.

(*Global Virtual Teams; Virtual Teams; Global Teams; Virtual Organizations; Trust; Swift Trust; Computer-Mediated Communication; Group Development*)

customer sales and postsales services, as do other organizations that service global clients with interdependent customer needs crossing country boundaries (Jarvenpaa et al. 1995).

A virtual team is an evolutionary form of a network organization (Miles and Snow 1986) enabled by advances in information and communication technology (Davidow and Malone 1992, Jarvenpaa and Ives 1994). The concept of virtual implies permeable interfaces and boundaries; project teams that rapidly form, reorganize, and dissolve when the needs of a dynamic marketplace change; and individuals with differing competencies who are located across time, space, and cultures (Mowshowitz 1997, Kristof et al. 1995). As companies expand globally, face increasing time compression in product development, and use more foreign-based subcontracting labor, (Peters 1992, Stewart 1994), virtual teams promise the flexibility, responsiveness, lower costs, and improved resource utilization necessary to meet ever-changing task requirements in highly turbulent and dynamic global business environments (Mowshowitz 1997, Snow et al. 1996).

While the promises are laudable, a dark side to the new form also exists: such dysfunctions as low individual commitment, role overload, role ambiguity, absenteeism, and social loafing may be exaggerated in a virtual context (O'Hara-Devereaux and Johansen 1994). Moreover, customers might perceive a lack of permanency, reliability, and consistency in virtual forms (Mowshowitz 1997). Recommending only limited use of the virtual setting in global teams, some inculcate initial lengthy face-to-face gatherings with repeated same-time and same-place encounters interspersed throughout the project (De Meyer 1991). Handy (1995) questions whether virtual teams can even function effectively in the absence of frequent face-to-face interaction.

The heart of Handy's argument centers on trust and a belief that "trust needs touch" (p. 46). Paradoxically though, only trust can prevent the geographical and organizational distances of global team members from becoming psychological distances (O'Hara-Devereaux and

## Introduction

... you cannot build network organizations on electronic networks alone.... If so, ... we will probably need an entirely new sociology of organizations.

Nohria and Eccles, 1992, pp. 304–305.

Contrary to Nohria and Eccles's assertion, organizations are in fact forming virtual project teams that interact primarily via electronic networks (Grenier and Metes 1995, Lipnack and Stamps 1997). VeriFone, a multinational company, is reported to rely on teams that interact electronically to run its everyday business. Company management, including its top executives, are distributed geographically (Stoddard and Donnellon 1997). Microsoft uses virtual teams to support major global corporate

Johansen 1994): trust allows people to take part in risky activities that they cannot control or monitor and yet where they may be disappointed by the actions of others (Deutch 1958, Luhmann 1988, Lewis and Weigert 1985, Bradach and Eccles 1989, Gambetta 1988).

This paper reports an exploratory study that examined trust in teams that relied on virtual interaction only, unconfounded by any influences of face-to-face interaction. The study was guided by three questions. First, can trust exist in global virtual teams where the team members do not share any past, or have any expectation of future, interaction? Second, how might trust be developed in such teams? Third, what communication behaviors may facilitate the development of trust? The global virtual teams had members who (1) were physically located in different countries, (2) interacted through the use of computer-mediated communication technologies (electronic mail, chat rooms, etc.), and (3) had no prior history of working together. The next section of the paper will review relevant literature. The third section presents the methodology. The fourth section reports the analyses. The fifth section presents a discussion of the results, and the sixth section concludes the paper.

## Conceptual Foundations

Following Kristof et al. (1995), we define a global virtual team to be a temporary, culturally diverse, geographically dispersed, electronically communicating work group (Figure 1). The notion of temporary in the definition describes teams whose members may have never worked together before and who may not expect to work together again as a group (Lipnack and Stamps 1997, Jarvenpaa and Ives 1994). The characterization of virtual teams as global implies culturally diverse and globally spanning

members who can think and act in concert with the diversity of the global environment (Jackson et al. 1995, DeSanctis and Poole 1997). Finally, it is a heavy reliance on computer-mediated communication technology that allows members separated by time and space to engage in collaborative work.

## Trust in Teams

Can trust exist in global virtual teams? Noting the lack of shared social context in such teams, much of the theoretical and empirical literature on interpersonal and organizational trust would suggest a negative response to this question.

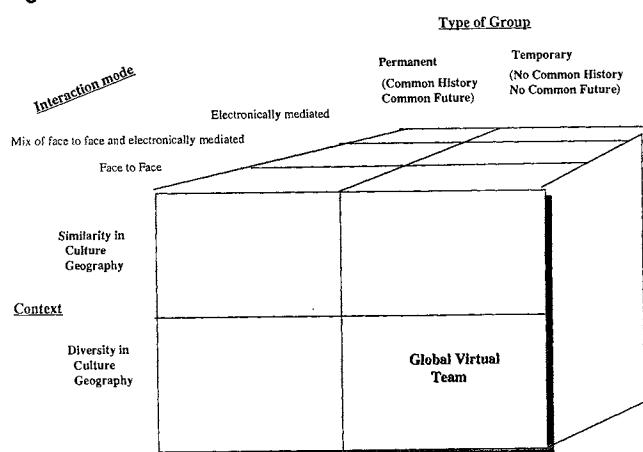
Cummings and Bromiley (1996) maintain that a person trusts a group when that person believes that the group “(a) makes a good-faith effort to behave in accordance with any commitments both explicit or implicit, (b) is honest in whatever negotiations preceded such commitments, and (c) does not take excessive advantage of another even when the opportunity is available” (p. 303). Several factors, such as shared social norms, repeated interactions, and shared experiences, have been suggested to facilitate the development of trust (Bradach and Eccles 1988, Mayer et al. 1995, Lewis and Weigert 1985). Another factor asserted to promote trust and cooperation is the anticipation of future association (Powell 1990). Such anticipation of future association is higher among group members who are collocated than among physically dispersed members. Colocation, or physical proximity more generally, is said to reinforce social similarity, shared values, and expectations, and to increase the immediacy of threats from failing to meet commitments (Latane et al. 1995). Furthermore, face-to-face encounters are considered irreplaceable for both building trust and repairing shattered trust (Nohria and Eccles 1992, O’Hara-Devereaux and Johansen 1994).

## Developmental View

Yet, trust is pivotal in a global virtual team to reduce the high levels of uncertainty endemic to the global and technologically based environment. How might trust be developed in such teams?

The developmental views of trust are closely intertwined with the relationship development processes (Lewicki and Bunker 1995). McGrath’s (1991) Time, Interaction, and Performance (TIP) theory describes work groups as time-based, multifunctional, and multimodal social systems. Effective groups are engaged simultaneously and continuously in three functions: (1) production (problem solving and task performance), (2) member support (member inclusion, participation, loyalty, commitment), and (3) group well-being (interaction, member

**Figure 1** Definition: Global Virtual Team



roles, power, politics). Member support and group well-being relate directly to relationship development. Teams carry out the three functions by means of activities that relate to four possible modes: (Mode 1) inception and acceptance of a project, (Mode 2) problem solving, (Mode 3) conflict resolution, and (Mode 4) project execution. The modes/functions are not a fixed sequence of phases, but rather are dependent on the team, tasks, technology, time, and other environmental contingencies (McGrath and Hollingshead 1994). McGrath's TIP theory (1991) suggests that a team with no past history that is working on a challenging problem with much technological and environmental uncertainty (such as a global virtual team) will have to engage in all four functions and modes to avoid detrimental effects on performance. Yet, at the same time, because the technological environment may constrain and limit the group's functions and modes (McGrath 1990, Warkentin et al. 1997), the development of trust may be inhibited.

The media richness (e.g., Daft et al. 1987) and social presence theories (e.g., Short et al. 1976) also question the possibility of relationship development, and subsequent trust development, in virtual teams. These theories suggest that computer-based communication media may eliminate the type of communication cues that individuals use to convey trust, warmth, attentiveness, and other interpersonal affections. However, contrary to the theories, empirical studies have found relational information sharing in computer-mediated teams (Walther 1992, 1994, 1995, 1997; Adler 1995; and Chidambaram 1996). According to Walther's social information processing theory (1996, 1997), computer-mediated communication does not differ from face-to-face communication in terms of the capability of social information exchange, but rather in terms of a slower rate of transfer. Others studies have concurred that communication is more a function of the context, setting, and timing than the characteristics of the media (Zack 1993, Markus 1994, Parks and Floyd 1996, Ngwenyama and Lee 1997).

Walther found that social discussion, depth, and intimacy were greater in computer-mediated communication groups than in face-to-face groups, even for groups with geographically dispersed and culturally diverse partners who had never met face-to-face (Walther 1995, 1997). Building on the Social Identification/Deindividuation theory (SIDE) (Lea and Spears 1992, Lea et al. 1992), Walther (1997) developed a hyperpersonal model to explain his results. The SIDE theory argues that people categorize themselves as either part of the in-group or out-group based on the characteristics of others in the group (Deaux 1996, Francis 1991, Turner et al. 1983). Similarity with others positively reinforces members' own identities and contributes to their willingness to cooperate.

The SIDE theory suggests that in the absence of individuating cues about others, as is the case in computer-mediated communication, individuals build stereotypical impressions of others based on limited information (Lea and Spears 1992). Walther (1997) acknowledges this tendency to resort to categorical information processing, overattributions on minimal social cues, and idealization of the communication partners in computer-mediated communication groups, but also predicts that the effects from deindividualization should decrease in the face of information on individual differences, particularly if the team has diverse membership. Yet, the greater the team member diversity, the more time will be required for team members to form strong bonds (DeSanctis and Poole 1997). Moreover, some teams may develop strong bonds and trust despite heterogeneity and short time spans, whereas others may not (DeSanctis and Poole 1994, Poole and DeSanctis 1992). Thus, the third question we will explore is what communication behaviors enable trust to be established.

### Cross-Cultural Communication

The global nature of virtual teams merits a discussion of possible cross-cultural differences in communication behaviors. While there is a wealth of research on computer-mediated communication and on cross-cultural communication, there is a paucity of research on cross-cultural computer-mediated communication. As part of the third research question, we will consider the possible influence of cultural differences on the communication behaviors of global virtual team members.

Individuals from different cultures vary in terms of their communication and group behaviors, including the motivation to seek and disclose individuating information and the need to engage in self-categorization (Gudykunst 1997). One major dimension of cultural variability is individualism-collectivism (Hofstede 1980). In individualistic cultures, the needs, values, and goals of the individual take precedence over the needs, values, and goals of the in-group. In collectivist cultures, the needs, values, and goals of the in-group take precedence over the needs, values, and goals of the individual (Gudykunst 1997, Hofstede 1980). The research suggests that individuals from individualistic cultures tend to be less concerned with self-categorizing, are less influenced by group membership, have greater skills in entering and leaving new groups, and engage in more open and precise communication than individuals from collectivist cultures (Hofstede 1980, 1991; Hall 1976). In addition, the willingness to respond to ambiguous messages, interpreted

by Pearce (1974) to be a trusting behavior, has been shown to be higher among members of individualistic cultures than among members of collectivist cultures (Gudykunst et al. 1996). These findings suggest that individuals from individualistic cultures might be more ready to trust others than individuals from collectivist cultures in computer-mediated communication environments.

Finally, previous cultural exposure is an important factor influencing communication behavior (Wiseman et al. 1989). People with high confidence in their knowledge of other cultures tend to be more willing to explore cultural topics. This might suggest that people who are more culturally experienced might seek and disclose individuating information more than those who are less culturally experienced. The social dialog in turn might help develop trust on the team, at least in the eyes of the culturally experienced person.

### **Swift Trust in Temporary Teams**

The theory of swift trust suggests that the research questions of whether trust is possible and how it might be developed via communication behavior may be the wrong questions to ask. The more appropriate questions might be: from where is trust imported to the global virtual team and how is trust maintained via electronic communication?

Meyerson et al. (1996) developed the concept of "swift" trust for temporary teams whose existence, like those of global virtual teams, is formed around a common task with a finite life span. Such teams consist of members with diverse skills, a limited history of working together, and little prospect of working together again in the future. The tight deadlines under which these teams work leave little time for relationship building. Because the time pressure hinders the ability of team members to develop expectations of others based on firsthand information, members import expectations of trust from other settings with which they are familiar. Analogous to the SIDE and hyperpersonal model, individuals in temporary groups make initial use of category-driven information processing to form stereotypical impressions of others.

After the team has begun to interact, trust is maintained by a "highly active, proactive, enthusiastic, generative style of action" (Meyerson et al. 1996, p. 180). High levels of action have also been shown to be associated with high-performing teams (Iacono and Weisband 1997). Action strengthens trust in a self-fulfilling fashion: action will maintain members' confidence that the team is able to manage the uncertainty, risk, and points of vulnerability, yet the conveyance of action has as a requisite the communication of individual activities. In summary,

whereas traditional conceptualizations of trust are based strongly on interpersonal relationships, swift trust deemphasizes the interpersonal dimensions and is based initially on broad categorical social structures and later on action. Because members initially import trust rather than develop trust, trust might attain its zenith at the project's inception (Meyerson et al. 1996).

Developed to explain behavior in temporary teams such as film crews, theater and architectural groups, presidential commissions, senate select committees, and cockpit crews (Meyerson et al. 1996), the theory of swift trust assumes clear role divisions among members who have well-defined specialties. Inconsistent role behavior and "blurring" of roles erode trust. Moreover, the theory seems to presuppose that participants come from many different organizations, have periodic face-to-face meetings, and report to a single individual. By contrast, in global virtual teams, members remain in different locations and often are accountable to different individuals. Such teams are assembled less on the basis of members' specific roles and more on their knowledge differences, partially related to the geographic location of the individual who provides the team with greater knowledge of that environment. These differences may have significant implications for swift trust. In the temporary teams described by Meyerson et al. (1996), what is at stake are the professional reputations of members, the reputations of the persons to whom the team members report, impending threats from closely knit social and professional groups to which members and the supervisor belong, and perceived interdependence among the team members. In global virtual teams, the reputational and professional network effects may be weak because of less clearly defined and bounded professional networks and less emphasis on roles.

### **Methods**

The case study method was chosen to enable us to capture the social context and dynamics of global virtual teams in order to explore what communication behaviors appeared to facilitate trust in global virtual teams. Data for the cases was generated from electronic mail archives and questionnaires.

The global virtual teams were organized via a collaboration of professors of information systems from graduate business programs around the world. Three hundred and fifty master's students from 28 universities participated in a global virtual collaboration organized over a period of six weeks during the spring semester of 1996. Every continent was involved except Antarctica. The students' learning objectives were to experience collaboration with

others in a virtual setting and to obtain international exposure by working with people from different countries. Participants were recruited through contacts with professors who had participated in previous collaborations (see Knoll and Jarvenpaa 1995). The letter soliciting participation explicitly stated that one of the conditions for participation included having the exercise comprise at least 20% of the students' course grade. To further motivate the students' participation, the professors were provided with reports on their students' levels of activity after the second and fourth weeks. Additionally, a monetary reward (\$600) and industry publicity were promised for the highest performing team.

The students were assigned to teams of four to six people in such a manner that each member on a team resided in a different country. The students from a given university were assigned to teams based on the order that their names appeared on their professor's list. The teams were self-managing and were charged with completing three tasks: two voluntary assignments lasting one week each and a final project lasting four weeks. The students' course grade as well as the \$600 reward were based solely on the successful completion of the final project. The students were also told that each team member would evaluate the others' contributions at the end of the final project and that this information would be shared with their professors.

### Assignments

The first two voluntary assignments were designed to encourage the participants to exchange information about themselves and gain experience with the World Wide Web (WWW) technology platform. The first assignment asked the participants to send a description of themselves to their team members. The second required each team member to locate one website that they felt was relevant to business persons with information systems (IS) responsibilities and provide a paragraph explaining the relevance of the site.

The third assignment—the final project—required the teams to propose and develop a WWW site providing a new service or offering to IS World Net that would be of interest to IS practitioners in all the countries in which the members of a particular team resided. The proposal was to be a three- to five-page justification of the site. (IS World Net is an electronic community, comprised of IS practitioners and academicians around the world, that communicates and disseminates information via the Internet and newsgroups). The students were told that all team members were to submit the same final deliverable to their professors and the team deliverable was to represent the collective efforts of the group. The final assignment was expected to take about 20–30 hours of each student's time over the four-week period.

### Technology

The host institution established a WWW site on the Internet (<http://uts.cc.utexas.edu/~bgac313/index.html>). The purpose of this central repository of information was to ensure that all students had access to the same information at the same time. Students communicated solely through electronic means. Electronic mail reached the individual team members via a "team address." Occasionally students used the reply function to respond to messages sent by individuals, thereby communicating with that individual alone.

### Data Collection and Survey Analyses

Data for the research was provided by the team members' e-mail message archives, by the members' responses to the demographic questions in the first exercise, and by the members' responses to two questionnaires. Students were notified at the start of the exercise that all e-mail messages sent to the "team address" were archived. Team members were sent an electronic survey to complete immediately following the deadline for the second voluntary exercise (Time 1). The survey was designed to assess the level of trust in the team. The survey also contained questions designed to assess various antecedents of trust as described in Jarvenpaa et al. (1998). A second survey identical to the first, but with some additional questions related to outcomes of trust, was sent to the team members a day following the deadline for the completed final project (Time 2). The students were not required to complete the surveys and were not prodded to do so by their respective professors. Repeated questionnaire reminders were perceived to violate the goal of maintaining a realistic project atmosphere.

### Measurement

Two separate measures were used to ascertain the level of trust on the team. One measure was a modified five-point scale version of Schoorman et al.'s instrument (1996) based on Mayer et al.'s (1995) overall conceptualization of trust; the other was a modified five-point scale measure of trustworthiness from Pearce et al. (1992). Both instruments were modified to reflect the team, rather than the original dyad, as the unit of analysis. These measures capture a general construct of trust. Since the purpose of the study was to explore the nature of trust in virtual teams, it was important to have an independently developed and validated measure of trust.

Data on culture was obtained from responses to the first team exercise. For all students who provided their birthplaces, the information was coded according to Hofstede's (1980) classification of countries as having individualistic or collectivist cultures as follows: students were considered as coming from an individualistic culture

if they were born and reared in Australia, Austria, Canada (excluding Quebec), Denmark, Finland, Germany, Great Britain, Ireland, New Zealand, Norway, Switzerland, or the United States. Individuals were coded as coming from a collectivist culture if they reported being born in Brazil, Catalonia, China, France, India, Indonesia, Italy, Macedonia, Pakistan, Philippines, Quebec, Singapore, Spain, or Vietnam.

Data on international experience was also obtained from the responses to the first exercise. Students who spoke only one language and reported not having traveled or lived in another country, and were not married to someone from another country, were coded as having no prior international experience. Students who reported speaking a second language or who had traveled to other countries were coded as having moderate international experience. Students who had lived in a foreign country for at least one year or who were married to someone from a country different from their own were coded as having extensive international experience.

### Statistical Analyses

Before selecting teams for case analysis, a standard item reliability test was performed to determine the items that contributed to the reliability of the trust measures. Because, as mentioned, there were many questions on the surveys designed to assess variables other than the two trust measures of interest in the current paper, a factor analysis was performed before the reliability tests to ensure that the trust measures were unique constructs. The two trust measures did form two separate constructs, although a few items that did not have a loading of greater than 0.4 on the proper construct were eliminated. Following the factor analysis, the reliability analysis was conducted with the remaining items for the two measures of trust.

To determine if there were differences in perceptions of trust related to culture at Time 1 or Time 2, t-tests were conducted. Also, to determine if the individuals with little versus extreme prior international exposure perceived different levels of team trust at Time 1 or Time 2, t-tests were conducted. The above tests were conducted at the individual level of analysis.

Next, the responses of the members of each team were averaged to form a team measure of trust. All remaining statistical tests were done at the team level. First, a test for nonresponse bias was performed. Then, after having selected only those teams with more than two respondents on both surveys, we performed a paired t-test to determine if trust changed significantly from Time 1 to Time 2. Lastly, after having selected the 12 teams for case analysis, we performed t-tests of trust at Time 1 and Time 2

on each team, computed within each team the interrater reliability of the team members' perceptions of trust, and computed the descriptive statistics for the 12 cases.

### Case Selection and Analysis

Case analysis was used to answer the original research questions. First, can trust exist in global virtual teams? Second, how might trust be developed in such teams? And third, what are the communication behaviors that might facilitate the development of trust? Only teams with more than two respondents on both surveys were included in the sample to be considered for the case analysis. Of the 75 teams, 29 teams had two or more members who completed both the first and the second surveys. The 29 teams were assigned to one of the following categories: (1) lower than the mean trust of the sample at Time 1 and Time 2 (LoLo); (2) lower than the mean trust at Time 1, but higher than the mean trust at Time 2 (LoHi); (3) higher than the mean trust at Time 1, but lower at Time 2 (HiLo); and (4) higher than the mean at Time 1 and Time 2 (HiHi). Of the 29 teams, ten teams fell into the LoLo category, four into the LoHi category, five into the HiLo category, and ten into the HiHi category (see Figure 2). The three most extreme teams in each category were chosen for the in-depth case analyses.

Many different approaches to case research have been advocated, some recommending that researchers go to the field without preconceived notions of research questions, concepts, variables, etc., (Glaser and Strauss 1967) and others recommending predetermined research questions, themes, and data collection plans (Eisenhardt 1989, Miles

**Figure 2** *The Change in Team Trust over Time*

Low (below mean); High (above mean)

### Trust at Time 1

		Low	High
		Trust at Time 2	
		Low	High
Trust at Time 1	Low	10 Teams	5 Teams
	High	4 Teams	10 Teams

and Huberman 1984). We began our analysis with broad research questions, but did not have a set of a priori constructs or a data-coding theme. Because the literature contained no rich descriptions of the form trust might be expected to take in the virtual team context, we felt that it was premature to develop a coding scheme. In summary, our case descriptions were based on naturally occurring communication, and the analysis procedures attempted to preserve the situated context of the teams' communication.

The following process was used in analyzing the data for the cases: first, each team's mail archives were analyzed message by message, noting the date, time, message initiator, and message content in a table. Second, a three-to five-page case write-up was prepared for each team. Next, the cases were condensed into one page each with only the essential facts of each case included. These one-page cases form the basis of the next section. The cases were compared and contrasted with the other cases in their category, resulting in the summaries of each category. Lastly, a comparison of cases across categories was undertaken.

## Results

### Preliminary Results of the Statistical Tests

The first survey had a response rate of 47%, and the second a response rate of 61%. Given that most teams had several inactive members, the response rates are reasonable. Inactive members were not expelled from participation as it was felt that coping with them was an important part of the team's experience. The two measures of trust were correlated ( $p = 0.019$  at Time 1 and  $p = 0.003$  at Time 2) although the Pearce et al. scale had the higher reliability of 0.92, compared to 0.66 for the Mayer scale. We hence used the Pearce et al. modified measure of trust in all further tests. Table 1A in Appendix 1 shows the final items used to measure trust.

There was no significant difference in perceived trust at Time 1 or Time 2 for individuals for individualistic versus collectivist cultures ( $t = -0.68$ ,  $p = 0.5$  at Time 1;  $t = 0.07$ ,  $p = 0.9$  at Time 2). Nor were there significant differences in perceived trust at Time 1 or Time 2 between any of the levels of international experience (see Table 1). Because of insignificant results on culture and international experience, we did not consider these issues in selecting teams for the case analysis.

To test for nonresponse bias in the whole sample, a t-test was conducted comparing the perceived trust at Time 1 of those teams with at least two respondents at Time 1 but without two respondents at Time 2 ( $\bar{X} = 3.93$ ), versus those teams with at least two respondents at Time 1 and

**Table 1** *t-Tests of Trust by Degree of International Experience*

Level of International Experience	None			Moderate			Extensive		
	Mean	St. Dev	N	Mean	St. Dev	N	Mean	St. Dev	N
Trust Time 1	3.9	0.43	15	4.1	0.537	23	3.87	0.67	75
Trust Time 2	3.87	0.94	13	4.32	0.685	20	4.04	0.712	67
t-Tests									
Experience	None vs. Moderate		None vs. Extensive		Moderate vs. Extensive				
	t	p	t	p	t	p			
Trust Time 1	-1.16	0.236	0.16	0.831	1.42	0.116			
Trust Time 2	-1.52	0.15	-0.76	0.533	1.43	0.157			

Time 2 ( $\bar{X} = 3.76$ ). Likewise, a t-test was conducted comparing the perceived trust at Time 2 of those teams with at least two respondents at Time 2 but not Time 1 ( $\bar{X} = 4.02$ ), versus those teams with at least two respondents at both time periods ( $\bar{X} = 4.03$ ). There were no significant differences ( $t = -1.12$ ,  $p < 0.236$  for the first test;  $t = 0.42$ ,  $p < 0.674$  for the second test). Hence, it does not appear that the level of trust biased respondents into responding, or not responding, to the surveys.

A paired-comparison t-test was conducted on the sample of 29 teams to determine if there was an overall significant difference in trust from Time 1 ( $\bar{X} = 3.95$ ) to Time 2 ( $\bar{X} = 4.04$ ). The test was insignificant ( $t = -1.35$ ,  $p < 0.188$ ).

### Case Analyses

Of the 12 teams selected for in-depth analysis, only two had less than three respondents to the first survey, and only two had less than three respondents to the second questionnaire (see Table 1). In addition, as seen in Table 2, there was a small variance among the members' ratings of trust, with the exception of Team LoLo2 at Time 1 and Team HiLo1 at Time 2. The interrater reliabilities for each team were computed for trust at Time 1 and Time 2. As seen in Table 2, in 20 of the 24 instances, the reliability is above 0.8.

To verify that there was a significant difference in perceived trust among the teams chosen for the case analyses, t-tests were conducted. The differences in the mean levels of perceived trust varied significantly ( $t = -7.78$ ,  $p = 0.000$ ) for those teams reporting low trust at Time 1 ( $\bar{X} = 3.36$ ) versus those perceiving high trust at Time 1

**Table 2** Number of Respondents in the 12 Teams

Team	Trust Time 1 Responses	Mean	St. Dev	Interrater Reliability	Trust Time 2 Responses	Mean	St. Dev	Interrater Reliability
LoLo1	2	3.00	0.57	0.84	2	3.00	0.62	0.81
LoLo2	3	3.33	1.10	0.40	4	3.48	0.88	0.61
LoLo3	3	3.67	0.46	0.89	4	3.75	0.50	0.88
LoHi1	3	3.43	0.42	0.90	3	4.15	0.44	0.90
LoHi2	2	3.40	0.85	0.64	4	4.40	0.49	0.88
LoHi3	3	3.87	0.55	0.85	2	4.10	0.14	0.99
HiLo1	3	4.07	0.12	0.99	4	3.67	1.33	0.12
HiLo2	5	4.25	0.44	0.90	3	3.60	0.57	0.80
HiLo3	4	4.30	0.46	0.90	3	3.93	0.42	0.90
HiHi1	5	4.44	0.55	0.85	4	4.60	0.42	0.91
HiHi2	4	4.56	0.46	0.80	4	4.60	0.40	0.92
HiHi3	5	4.47	0.20	0.99	4	4.60	0.46	0.90

( $\bar{X} = 4.34$ ). The differences in the mean levels of perceived trust also varied significantly ( $t = -5.19$ ,  $p = 0.001$ ) for those teams with low trust at Time 2 ( $\bar{X} = 3.57$ ) versus those with high trust at Time 2 ( $\bar{X} = 4.4$ ).

### Within-Case Analyses

Twelve cases were written from the transcripts, three per category. Table 3 reports background information on each case study team: the number and home country of team members, the total number of messages in the first two weeks and the following four weeks, and who, using fictitious names, sent the messages. We next provide brief synopses of the 12 cases.

#### Category 1: Low Initial Trust and Low Final Trust (LoLo)

*Team LoLo1.* Team LoLo1's first message was, "Hi! Anybody there?" sent by Chao, the member who would send 41 of the 81 total messages. Six days later a response arrived from Paulo, asking if his message made it through, and from Richard. A fourth member, Pierre, sent a total of two messages in six weeks. The fifth member, Martin, was not heard from until after the first assignment. Chao took the role of the team coordinator and suggested that they assign roles. She asked for volunteers for various roles but received no response.

She submitted her contribution to the second assignment before the other members and after a four-day lapse in communication, reminded the other members of the deadline and wrote: "Are you not in the GVT assignment anymore?" Two of the other members, Richard and Pierre, sent their parts to the second assignment on time. Chao again asked if Paulo and Martin were still in the group. There was no response.

Only three of the five members contributed to the final project for which Chao developed a schedule of tasks and deadlines, solicited comments, and wrote, "I have observed that effective groups are those who communicate constantly and are committed to all datelines set." A day later, Paulo asked the team to continue "on the next step" but did not comment on Chao's message. Chao gave an idea for the final project and asserted that she was "seriously and eagerly looking forward to communicate with you." Paulo provided brief feedback on Chao's idea, but disappeared for several days. Martin apologized for his lack of participation and reasserted his desire to "be a part of the team" and volunteered to complete a part of the project. Richard volunteered to write code for their Web page. Paulo contributed links for their Web page as did Martin, but Chao responded with an explanation of why they were not relevant for the project. After writing a draft of their proposal, Chao requested feedback but received none. Team LoLo1 completed the final project. Martin thanked Chao and Richard, "without whom there would not have been any team." None of the other members sent final greetings.

*Team LoLo2.* As a result of technical difficulties, the first few messages sent by various team members of Team LoLo2 were not received until a week after they were sent. The first message received was from Kathy, who would be the most active of the members, sending 47 of the 109 total messages. As early as the first week, she sent a schedule with tasks and deadlines for the team. Becky was uncertain about the functioning of the server and asked for confirmation of her message. She volunteered to send the team's first exercise to the project coordinator. The members all submitted their first and second exercises on time although the exercises were terse,

**Table 3** Information About the 12 Teams

Team	Total Messages Sent	Messages Before Survey 1	Messages After Survey 1	Trust Time 1	Trust Time 2	Country	Number Messages by Member Before Survey 1	After Survey I
LoLo1	81	20	61	3.00	3.00	Australia Denmark France Philippines U.S.A.	Chao: 11 Martin: 1 Pierre: 2 Paulo: 2 Richard: 4	30 13 0 8 9
LoLo2	109	34	75	3.33	3.48	Australia Canada Finland France Ireland	Kathy: 9 Becky: 12 Matti: 4 Mireille: 5 John: 4	38 17 3 4 13
LoLo3	169	39	130	3.67	3.75	Australia Austria Denmark Finland Philippines	James: 16 Heike: 4 Cecilie: 6 Liisa: 8 Leo: 5	30 27 29 11 33
LoHi1	122	48	74	3.43	4.15	Australia W. Australia Brazil France Ireland Netherlands	Lawrence: 8 Olivia: 23 Alejandro: 2 Vanessa: 5 Kelly: 4 Lars: 6	11 35 2 9 11 6
LoHi2	57	16	41	3.40	4.40	Australia Austria Canada Denmark Finland	Moti: 4 Andreas: 3 Shelli: 4 Mans: 2 Magnus: 3	15 7 11 0 8
LoHi3	58	28	30	3.87	4.10	Australia Austria Brazil U.S.A.	Huan: 8 Franz: 4 Javier: 9 Dan: 7	9 9 4 8
HiLo1	97	39	58	4.07	3.67	Australia Brazil Denmark Netherlands U.S.A.	Jun: 8 Carlos: 10 Rune: 3 Henrik: 9 Michael: 9	16 11 3 16 12
HiLo2	71	21	50	4.25	3.60	Australia Brazil Canada Denmark Ireland	Howe: 4 Andre: 4 Thomas: 7 Marj: 2 Stephen: 4	17 11 8 7 7
HiLo3	103	36	67	4.30	3.93	Australia Austria Canada Denmark Finland Thailand	Jenny: 6 Leike: 7 Vern: 14 Flemming: 2 Paivi: 7 Jasmine: 0	12 4 33 1 7 

**Table 3 (continued) Information About the 12 Teams**

Team	Total Messages Sent	Messages Before Survey 1	Messages After Survey 1	Trust Time 1	Trust Time 2	Country	Number Messages by Member Before Survey 1	After Survey 1
HiHi1	216	40	176	4.44	4.60	Australia Denmark Finland Ireland U.S.A.	Linda: 5 Anders: 7 Riikka: 10 Emma: 11 Donna: 7	22 44 35 51 24
HiHi2	168	44	124	4.47	4.60	Australia Canada France Netherlands Philippines	Janet: 1 Pattie: 20 Anne: 4 Machtelt: 11 Randy: 8	31 18 14 27 34
HiHi3	114	35	79	4.56	4.60	Australia Canada Denmark Netherlands Philippines	Julian: 5 Melissa: 8 Karl: 6 Boris: 11 Hirod: 5	31 18 14 27 34
MEAN				3.95	4.04			
ST DEV				0.42	0.40			

with little social content. Becky encouraged the team to think about the final project early but stated that she found “the subject hard to find.” John volunteered to be responsible for developing the Web page and sent an idea for the final project.

Team LoLo2 had a lapse in communication of five days following completion of the second exercise. During the following seven-day period, John, Kathy, and Becky were the only members to contribute. They agreed on the idea suggested by John and decided upon roles: one individual doing research (Kathy), two working on the Web page (John and Matti), and two working on the written document (Becky and Mireille). Mireille’s response to the role assignments was to say that she was “kind of confused, still, about all that. I am not sure I can be very helpful.” She subsequently announced on April 17 that she would be leaving town April 25, so any contribution from her would have to be made before then. Kathy devised a schedule for the final project with tasks, members, and deadlines. She began researching their topic and sent the text of ten articles she found in the library. However, she did not provide ideas about how to incorporate the articles.

Only one individual assigned to the document, Becky, contributed. (Mireille’s only contribution was to say it

“looks great” and that she had nothing to add.) Likewise, John developed the prototype of the Web page with Matti’s sole contribution being to congratulate John. Kathy aggregated her work with Becky’s and reminded the team that “This is OUR PRODUCT.” The feedback was again “Great job.” Kathy then enclosed a revised file for review and Becky erupted: “What’s going on!!! First, we had decided on a schedule, nobody follows it. Second, we decided on who would do what, nobody cares. . . . Is this a team project or what?” She was upset because Kathy had not included some additions she had made to an earlier draft. Kathy apologized—she had “accidentally overlooked” one of Becky’s messages with the new information. The remaining four days of the project were spent finalizing the Web page. The team completed the assignment on time but no pleasantries were exchanged at the end.

*Team LoLo3.* Team LoLo3 exchanged a large number—169—of messages among all five members and conducted chat sessions. James, the most active member for whom this was a “first ever group project,” expressed concern early on over “the lack of control that a group project entails” and “what should I do when there is no communication.” James volunteered to submit the first assignment and summarized what should be done. The

day of the deadline coincided with technical difficulties, and James failed to receive some of the contributions. He wrote, "So far we have only had really easy things to do, and we still have failed to meet the deadline properly." The group finished the second assignment on time.

Heike, who had not contributed to the first assignment, was the first to provide ideas for the final project. Leo provided two ideas and, like Heike, provided brief explanations. James gave an idea with substantial explanation. Heike proposed to combine the ideas, and Liisa and Leo responded agreeably, to which James responded, "Heike ranks technology transfer highest, but does anyone know anything about this? Please can EVERYONE provide DETAILS about the idea they like most. I am scared because I can't see how to proceed." He then went into great detail (over five pages) on his idea. Leo thanked James "for his more rational thinking." Leo, Heike, and Liisa agreed to go with James's idea.

James maintained responsibility and control for the Web page development, Leo took responsibility for the written proposal, and Heike, Cecilie, and Liisa promised to contribute links for the Web page. In a period of 48 hours, Cecilie, Liisa, and Heike each sent James a large number of URL addresses, but without any written explanation about the sites. James wrote, "Whoah!!! hang on a minute . . ." and "Please please please do not send me any more links . . . I must have written about 10 times about the reason why links to technical manuals are not appropriate for our page." With one week left, James became concerned that someone would turn in the incorrect version of the proposal to their professor. He had "put way too many hours into this project" to risk receiving a poor mark. As a practice assignment, he wanted each member to try to decode a copy of the paper sent by Leo as an enclosure in a message. Heike stated that she could not decode it, and Cecilie and Liisa did not respond. Leo and James completed the project. Heike stated in her closing message that "although some things didn't work well it was a good experience to see IF it is possible to work in such a virtual environment. In my opinion, it's much more complicated to communicate in such a way without face-to-face contact." The team did not exchange departing messages.

*Summary of LoLo Teams.* Besides having technical problems, LoLo teams lacked optimism, excitement, and initiative. LoLo3 had members with initiative and willingness to complete their role assignments, but the negative or distrustful leader suppressed excitement over the project. The teams also suffered from major lapses in communication or, as in case of LoLo3, a fear of communication lapses. None of the teams had messages with much social content.

## Category 2: Low Initial Trust and High Final Trust (LoHi)

*Team LoHi1.* Team LoHi1 consisted of six members (three active members) and exchanged a total of 122 messages. The initiator of team activity, Olivia, described herself as "very reliable—if I say I will do something, I do it." Olivia asked for a volunteer to collate the first assignment but did not volunteer herself. Lars volunteered and asked if anyone objected. When only two members replied that they did not objects, he responded, "not everyone has responded to my 'vote' for me collecting" the information. Olivia responded, "just do it" and proposed a rule that "silence indicates consent." This triggered discussion on rules such as respecting others' ideas, checking e-mail regularly, and avoiding the flaming of other members.

The team had technical problems early on: one member contributed to the first assignment on time, but several did not receive the contribution; the member, in turn, did not receive others' contributions. Another member stated that he did not understand what to do for the second assignment even though two members had already submitted their parts of the assignment to the group. Two members explained what to do, but he still submitted his part two weeks late with the excuse that he had been busy.

Several messages were exchanged on the final project idea. Lawrence sent an idea which Olivia was not sure "really fit" the objective of the project, but she gave no alternative. Vanessa returned from vacation and expressed discomfort with the idea but also gave no alternative. Kelly gave an alternative idea, which was accepted. Afterwards, the team focused solely on the project. There were no references to rules of any kind, and the nonparticipating members, Alejandro and Lars, were not assigned any tasks.

Lawrence, Kelly, and Olivia communicated frequently during the final weeks. The members had assigned tasks, but they overlapped. Lawrence and Kelly worked simultaneously on coding two separate sets of Web pages. Kelly asked why there was duplication of effort. Lawrence suggested that the pages were not "in competition" but that he intended to take the best from both pages. Well before the project deadline, Olivia produced a lengthy written proposal; likewise, Lawrence and Kelly produced the html code with sufficient time for comments. After the drafts had received feedback and were revised, Lars reemerged from what he said was an illness, expressed surprise that the deadline was in two days, but then gave extensive comments and suggestions on the proposal draft which were incorporated. The active members expressed satisfaction with their project as well as their team.

*Team LoHi2.* Of all twelve teams, Team LoHi2's five members exchanged the smallest number of messages in the first two weeks. The members engaged in very little social introduction; they did, however, reflect about the challenges of virtual work in their opening messages. Said one, "Quickly establishing a mutual understanding is not an easy task." Said another, "Everyone makes an introduction, but the impression you get is like via a letter." A third member echoed the potential paradox of virtual work: the "virtual environment can either allow a person to be more honest than they may be face-to-face or the exact opposite, they can hide behind a facade so you may not be getting truth."

Even before completion of the second assignment, Shelli asked the other members to think about the final project and proposed an idea to which the others responded and gave optional ideas. The team agreed to go with Shelli's initial idea. Andreas developed a home page listing the days and hours he would be available to work on the project, and upon his request, the other members sent their schedules for posting on the page. Moti proposed a framework to discuss ideas—he set up a Web page with initial ideas and asked others to respond; he continually updated the page according to submitted ideas. The members did not hesitate to commit, evident in such statements as "I promise to do a paragraph or two as Moti suggested." Each member also followed through with the work they promised to do. At one point, Moti wrote, "Dear Virtual Teammembers: now you are almost becoming real to me." Shelli stated that she "was worried after assignment 2 but this was quickly alleviated by everyone's enthusiasms." Each member expressed satisfaction with the final outcome as well as with the teamwork achieved. Wrote one, "I think it is great the way we could build upon each others' ideas." And another, "I enjoyed very much working with you. You all did what you promised to do. In teamwork, it's the most important thing." The name of the fifth team member who had only sent two messages was not included on the final project or the website.

*Team LoHi3.* Like Team LoHi2, Team LoHi3 sent relatively few messages—60 in total. The first member to send a message, Huan, wrote that he had never used "this technology" before and that he hoped "my mail could reach you." He sent a second message three hours later saying the same thing. Javier responded, but did not introduce himself. Huan sent a third and fourth message with the earlier message content. A third member, Franz, wrote that he received a "terrible lot of mail day after day" and requested them to identify the project in the subject of each message. A fourth member, Dan, gave a

long introduction and compared working in a virtual environment to "playing chess with one move made every 24 hours." Dan initiated the first two team assignments. Huan expressed his gratefulness for Dan's initiatives but also wrote that he was "a bit jealous of the other group" who had "a lot of conversation." He suggested that Dan or Franz serve as the team leaders, Franz announced that he would be unavailable until May 6 (the project was due on April 31).

The concept of a leader was never mentioned again although Dan remained the initiator; he did not assign tasks to others, but reminded others of what needed to be done and by when, Franz reemerged on April 5 and offered to "take care of coordinating and giving a final touch to the website." Franz set up a background for a website before the team actually chose a topic and a day later commented that "If I am not mistaken—at least that's what I learn from the log files, then Huan is the only one who has found the time to at least look at what is going at the yet to be filled GVT51 Web page." The other members visited the site and one wrote, "I finally visited our home page. I got really happy with this. . . Friends, I am very happy today (as I see our home this evening)." Huan checked the page regularly and commented on Pete's changes. On April 28, Dan sent a lengthy (six page) document describing the page, its design, its contents, and the justification. Wrote Franz in response, "I believe, you will understand, that I would have been much happier if only you had managed to confront me with any new/summarising material by Friday as indicated a week ago. Nonetheless, it is nice to see that you did invest more time to bring our project to an end before long." Dan politely explained how his changes implied only minor coding changes. Huan and Dan both maintained an upbeat and friendly tone in the final messages and sent goodbyes as well.

*Summary of LoHi Teams.* The LoHi trust teams appeared to differ from the LoLo trust teams in that they had predictable, though infrequent, communication, more equal participation across members, and a focus on the task after the initial assignments. Like LoLo teams, LoHi team members did not exert an effort to get to know each other, and hence the members' relationships were purely professional or task focused. These teams seemed to be initially preoccupied with the establishment of rules to manage the uncertainty they felt. The teams appeared to have increased their trust by successfully overcoming (or simply learning to ignore) the initial uncertainties they felt, focusing on the task, and resisting distractions that did not contribute to the task.

### **Category 3: High Initial Trust and Low Final Trust (HiLo)**

*Team HiLo1.* Team HiLo1 exchanged a total of 99 messages, a little under half of which were exchanged during the first two weeks. The group began by exchanging many social messages. One wrote, "How hard is it to carry out an entire project without having those boring professional meetings." Rune volunteered to compile the first assignment but did not follow through because he did not receive confirmation of the role. Another member, Henrik, submitted the assignment and received praise from the others: "Well done, buddy." After the first assignment, the members were exuberant: "I had very good impressions of you, and I think we'll have a great time working together. Success for Team 60!!!" Another wrote, "Hey guys, I think we've done it." And another, "I think we've started this collaboration in a good way. It's nice working with you guys." And the fourth, "Congratulations everybody! We did complete our first assignment on time!" When one of the members failed to complete the second assignment on time, the coordinating member added one of his own ideas under the absent member's name before turning in the assignment.

After the second assignment, Michael announced that he "would love to just do it and get it over." Carlos complained of technical problems at his university, stating that "it seems every time I go to school to surf on the Net, the only room with direct Internet access is closed." Rune failed to communicate for over a week, and others sent messages: "Where is Rune?" He reemerged after two weeks but contributed only two messages thereafter. With three weeks remaining before the final project deadline, one member suggested the need for rules although he did not suggest any particular ones. The others also agreed on the need for rules but proposed none. Likewise, the members were aware of the need to provide ideas for the final project—"I think it would be nice for us to brainstorm a little before we decide the subject"—but only one member, Jun, actually proposed any ideas. Jun sent a long task-oriented message with ideas for the project. The message was received enthusiastically—"Great Huray for the Jun, Excellent initiative my friend, I applaud your idea"—but there was no discussion over the content of the proposal. Michael stated that he had no experience in the proposed area but made no other suggestion. Another wrote: "If you send me a topic that I can research, I'll be happy to do so." Wrote a third, "But plz plz plz mail me in what way I can contribute. . . . I still am a little confused. Just tell me what I need to contribute." Jun then suggested that the final project be a compilation of one topic per member, and asked each member to send their topics to him. Two members contributed brief paragraphs

of content for the project. Jun was left to finalize the project. No greetings were exchanged at the end.

*Team HiLo2.* Team HiLo2 had 73 messages in total. Thomas was the first to communicate: "To move things along, I'm starting the ball rolling with a personal description." One member subsequently suggested that Thomas take on "the role of a team coordinator" because of his "technical experience and ambitions to go into management." Thomas did not acknowledge the role in writing, but did take initiative in moving the second assignment and final project along. All members contributed to the first two assignments on time, except for one member, Andre, who sent his part for the first assignment late with the excuse that he was having technical problems.

A long lapse in communication occurred after the second assignment. Between April 3 and April 15, only Thomas sent messages, one on April 11 and the following on April 14. On April 14, Thomas wrote, "I've just spent a very dull few hours looking through the ISWorld site in preparation for Part III. The next and final assignment is due on April 29 and, as is the custom of most students, we're leaving it rather late." He offered an idea for the project. He received no immediate response and sent a second message asking if his message was received. The following day, Howe wrote that he had been having technical difficulties and would respond shortly. A day later, Stephen gave no idea of his own for the project but asked, "Can we agree on a topic . . . ? Also, I would like to hear from someone apart from Thomas."

One member, assumed by the others to be Thomas, sent a message to the project administrator complaining that none of the other members were contributing. The message was forwarded to the professors of each member on the team. One of the members responded, "That sort of behavior does nothing for the spirit of the team." Another member agreed: "In my humble opinion, things are somewhat out of order in this exercise." Thomas sent just three more messages in a ten-day period, one with his contribution to the project, one thanking a member for coding the page, and a third stating that he was unavailable to do any more work on the project.

Stephen and Howe were left to complete the project. Stephen sent a series of links and suggested someone else should "take on the job of organising them." The only response was from Howe who wrote that he was working on the proposal and "would have expected more from Andre and Samal." On April 25 Stephen sent another message to the members to "just have a look at our page and try to give me your feedback as to how to make it look better." The following day, he sent a message stating

that he had "just checked my mail . . . and I was disappointed to see that there have been no replies about the project." Howe submitted a proposal draft for review containing several sections where he had inserted "need help here," but the only feedback received was that it "looked fine" and was actually "more than I expected." The team submitted a final project with several sections containing asterisks next to the words "need help here."

*Team HiLo3.* Team HiLo3 exchanged a total of 107 messages of which almost half, 46, were from a single member, Vern, who was elected to be team leader. Team HiLo3's communication began with lengthy personal introductions and claims such as, "I am looking forward to working with you all." A few members experienced problems in receiving mail, but Vern reassured them that this was common so not to worry. Vern proposed procedures for the group to follow, and the group agreed upon them. All members contributed to the first and second assignments on time except for one individual, Flemming. Vern wrote, "It would have been nice to get his opinion on the numerous points raised."

After the second assignment, Paivi summarized the ideas expressed for the final project to that point and proposed additional team rules. On April 10, Vern wrote that "judging from the pace we have demonstrated so far, we should be done by Christmas," and he did not want "to sound cranky." Even though the team had exchanged 53 messages at this point, many more than some other teams, he stated that "they need to start interacting more often as a team." Paivi thanked Vern for stimulating the group, again summarized the ideas submitted to that point, and noted which idea she preferred.

Without any prior warning, Paivi withdrew herself from the project on April 15 and stated that "the actual teamwork could have anyhow been more intensive." The members reacted strongly. Jenny explained that she had "no ability to work without their help" and begged them to "please do our work together!!!" Vern asked the remaining members to identify a role for themselves. Ten hours later, Vern sent another message stating that "this will continue to be a frustrating experience for many unless everyone participates fully . . ." and that if "anyone is in for a free ride, get out." He counted the number of task-related messages in the past week and described the situation as "extremely frustrating." Jenny thanked Vern for "trying to wake them up" and defined her role. Vern then listed tasks to be done and "appointed" volunteers. He requested confirmation of the message containing negative remarks: "The situation is not very encouraging. UNLESS ALL TEAM MEMBERS START CONTRIBUTING SERIOUSLY NOW, WE WILL NOT GET A SATISFYING RESULT." Vern continued to work on

his own tasks and prodded for feedback. Leike and Jasmine offered excuses relating to technical problems and a lack of a clear understanding of their tasks. Vern completed the project and wrote, "I would have expected this exercise to be a real collaborative effort which, unfortunately, it has not really been."

*Summary of HiLo Teams.* The teams that shifted from high trust to low trust exhibited initial enthusiasm and excitement. Ironically, their optimism coincided with a lack of serious reflection on the challenges of working in a virtual environment. This optimism and excitement waned gradually in one case, but rather abruptly in two cases. In one case, the trust seemed to fall as the members exhibited a pattern of desultory followers looking for a leader who did not emerge. The other two teams explicitly chose leaders only to be abandoned by them. The very choice of a single leader appears quixotic: the existence of a stated leader seemed to lessen the felt need to contribute among the other members. Since the members had betrayed their leaders, it was no surprise that the leaders betrayed their teams.

#### **Category 4: High Initial Trust and High Final Trust (HiHi)**

*Team HiHi1.* Team HiHi1 was characterized by many messages—222, 142 of which came during the last five days of the project. The members' initial messages expressed enthusiasm about the project—"I'm really enthusiastic and committed to this project"; "I'm waiting forward to hearing from you!"; "This project is really exciting to me." The members were also curious about the potential of the virtual environment—"Can we trust the things we see, read, or hear?" All but one member, Emma, submitted the first assignment, but the members asked Emma to complete her assignment even after the deadline so they could get to know her. There were many social exchanges during the first two weeks. When the members returned after Easter, the first few messages were also social—describing their weekends, what they ate, and what they drank.

This team did not establish team rules nor spend time deciding upon procedures. A member proposed a schedule for the final project with four milestones, each with a deadline. The other members agreed to the schedule with some minor modifications. Anders, Linda, and Riikka provided ideas for the project with thorough explanations as did Donna, who summarized all the ideas received. The team agreed on a topic and divided into roles. After finding a link that accomplished what her team had planned to do, Donna sent a message with the subject heading "URGENT!!! Idea taken?" and suggested they change the topic. Linda, Anders, and Emma all responded that they

should just differentiate the site. The team wavered for days. Donna maintained her position and persuaded Emma. The team was divided and a sense of urgency developed as they were "running out of time!" Donna then suggested that they stick to the original idea. At this point, the members were well behind their own schedule but seemed to maintain a confidence—"Don't worry I am sure we will get it done with a little concentration some hard work and keeping in touch," wrote Linda. With four days left, 91 messages had been exchanged. In the remaining four days, 111 more messages were exchanged. Emma and Anders coordinated their working times, as did Riikka and Linda because of overlap in their work. The team managed near real-time communication: when a member asked, "p.s. is anybody there?", she meant "right now"—as opposed to a larger time frame within the project. The members exchanged and edited several versions of the paper and the html code before completing the final version. They each thanked the others for their great work, expressed satisfaction with having worked on such a team ("Super much thanks to everyone!!! I loved working with you!"; "You are great!!!"), and exchanged personal e-mail addresses.

*Team HiHi2.* The first two weeks of the five-member HiHi2 team's communication was dominated by Pattie, a 50-year old former nurse. As early as her third message, Pattie expressed a desire to keep in touch with the other members after the project. Randy claimed to be "equally enthusiastic" to work with the team. One member, Hans, never sent a single message, and the members concluded that Hans was not part of the team. Team HiHi2 missed the deadline for the first and second assignments. Wrote Pattie, "One of the frustrations I have with this virtual team process is that there seems to be no way of knowing what has been sent or received." The team developed a system of numbering messages and agreed to confirm receipt of messages by referring to the number. The members continued to express enthusiasm: "This is fun isn't it! I came home tonight looking forward to reading mail from my team." Janet suggested a schedule with tasks and deadlines. Randy followed up with three pages of discussion on what their project page should look like and what the target should be. Pattie took on mostly a social and process role, such as sending greetings and recounting daily events.

Only two ideas for the final project were proposed. Janet wrote that Randy's idea received the most support so they should go with it. When there were no comments to her message, she asked, "Can you all PLEASE allocate time to this exercise." Pattie apologized for a seven-day absence, thanked Randy and Janet for their leadership, and informed the team that she would be busy for two

more days. Machtelt expressed confusion over the topic, saying that she was "not quite sure what to do, and what to write" and asked them to describe to her "in short clear terms." Randy said that he felt "that we are stagnating."

Janet wrote an introduction for Randy's idea and asked each member to contribute a section. Randy and Janet began to develop a draft of the paper and kept the team apprised of their progress. Janet then realized that she and Randy had had a misunderstanding over the nature of the topic. She decided they must go with Randy's interpretation. Pattie then reemerged after four days with a nine-page summary of what she found on Janet's original interpretation of the topic. This exasperated Janet, who felt "like I have just wasted my whole weekend on this assignment . . . we've gone backwards. It is very depressing." Randy and Pattie sent "calming e-mails" to encourage Janet.

Seventy-two messages were sent during the final week of the project. Pattie, Randy, and Janet did the majority of the work. Machtelt and Anne sent positive feedback. Pattie wrote that she was "eating, sleeping, and dreaming" the project, and Machtelt was "very impressed, and much heartened" by the results. Pattie praised the other members with phrases such as "good thinking lady!" to Janet and "You said it perfectly well!" Randy was likewise enthusiastic ("Heaps of Mails! Excellent!"), as was Janet ("It's fun isn't it.")

*Team HiHi3.* Team HiHi3 exchanged 131 messages. Julian, a 39-year-old former doctor, initiated the communication, stating that "the first couple of weeks . . . will be largely about sorting out what the project even is." The members did not exchange social messages although they expressed commitment and excitement. The first assignment was completed by all members on time. The team agreed upon procedures at the start of the second week—they would read all messages before responding to any, use meaningful subject headings, code their messages for easy reference, and divide into roles. Julian was nominated as a leader. The second assignment was completed on time by all members except Melissa.

After the second assignment, the team arranged for numerous chat sessions and always summarized the session for one member who was unable to attend because of technical or time problems. Julian, since "someone called me the LEADER," even developed a list of tips on how to chat properly—with upwards of 15 tips included. The members discussed the proper way to exchange versions of the paper well before anything had been written. After a week of synchronous and asynchronous discussions about procedural issues, the group focused on task content. Responding to an idea from Boris that he considered too complex, Julian suggested that he preferred the simple

"Melissa and Julian approach." Melissa was annoyed and suggested that no one "speak on behalf of anyone else." She proceeded to expand on Boris's idea. A lapse in communication ensued, leading Melissa to state, "I hate to be the one to bring this up, but it has been 97 hours since our chat, and I have not received anyone's contribution." Responded Julian, "The ongoing contribution is coming from members who support Boris's idea—where are you Boris?" Julian volunteered himself for a portion of the work and made suggestions on which members would do the other tasks.

The team's work progressed smoothly from this point on, and the communication was focused on the task content. Julian continued to play the leadership role and encouraged the team with such statements as, "Everyone just keep pulling together and we can do this." The pace began to intensify well before the deadline, and the members often wrote portions of the paper synchronously during chat sessions. The biggest spurt of messages occurred the week before the project deadline. The members were excited—"This is great!"—with the way they were working together and finished the project several days early. The members congratulated each other on their contributions, exchanged personal addresses, and departed with warm greetings.

*Summary of HiHi Teams.* The HiHi teams engaged in social introductions that allowed the team members to get to know each other. Periods of intense online communication further strengthened the group identity. The HiHi teams experienced difficulties, but were able to overcome them. For example, two of the HiHi teams failed to fully complete the first two exercises on time, but this was not viewed as a setback by the members; rather, they kept prodding the members who did not complete the exercises to complete them after the deadline, not because the completion was needed but because they were generally interested in the other members' responses. The team members all or nearly all showed initiative, and roles emerged for each member. In the HiHi teams, the members engaged in frequent communication, gave substantive feedback on fellow members' work, and notified each other of forthcoming absences.

### Analysis Across the Categories of Cases

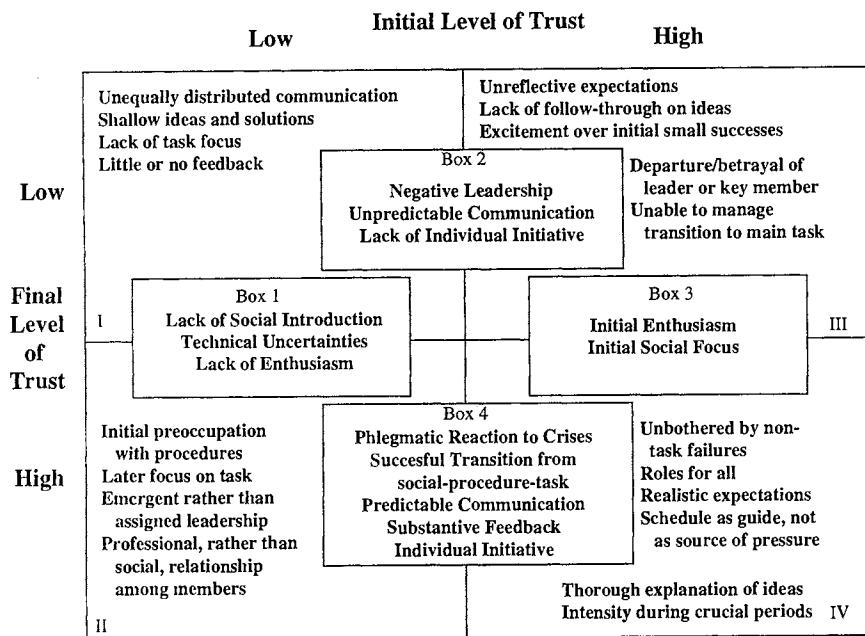
The case descriptions reveal sources of vulnerability, uncertainty, and expectations in all teams. The LoLo and HiLo teams appeared to be less equipped to deal with them than the HiHi and LoHi teams. Figure 3 captures the behaviors that surfaced in the case analyses by each category (the major quadrants) as well as the behaviors that were common across categories (the four boxes transversing the quadrants). The teams that began and finished

the project with low trust (Quadrant I) were marked by unequally distributed communication, shallow ideas, a lack of task focus, and little feedback, as contrasted with the teams that began with low trust but finished with high trust (Quadrant II), who managed a shift from a procedural focus to a task focus, were able to resolve technical difficulties, and established a predictable communication pattern as the project progressed. The teams that began with high trust but finished with low trust (Quadrant III) began enthusiastically but were unable to manage a successful shift to a task focus, failed to develop capabilities to deal with the unreliable technology, appointed a leader who had no followers, or had followers with no leader. By contrast, the teams that began and finished the project with high trust (Quadrant IV) began with high enthusiasm but were also able to address technical problems, were able to dynamically address issues of who would do what, when and with whom, provided detailed explanations of content contributions, quickly responded to others' initiatives, and were immersed in the task.

Several commonalities were observed in teams that began the project with low levels of trust (the LoLo and LoHi teams): a lack of social introduction, concern with technical uncertainties, and a lack of enthusiasm (see Box 1 of Figure 3). The teams that began with high trust (the HiLo and HiHi teams) exhibited roughly the inverse pattern of high initial enthusiasm and extensive social dialog (see Box 3 of Figure 3). Those teams that finished the project with low trust (LoLo and HiLo) displayed a common problem of negative leadership, lack of individual initiative, and unpredictable communication (see Box 2 of Figure 3), whereas those teams that finished the project with high trust (the LoHi and HiHi teams) benefitted from a successful transition to the task following the initial communications, predictable communication, substantive feedback, strong individual initiative, and calm reaction to problems (see Box 4 of Figure 3). As is noticeable, the behaviors observed in teams with low levels of early trust are the inverse of those behaviors observed in teams with high levels of early trust; likewise, the behaviors observed in teams with low levels of trust at the end are the inverse of those associated with teams with high levels of trust at the end. Table 4 categorizes these major characteristics in terms of communication behaviors and member actions that appear to facilitate the existence of trust early on and communication behaviors and actions that might help maintain trust in the later stages. Following the table, we describe these in more depth.

### Communication Behaviors Facilitating Trust Early On

*1. Social Communication.* Social exchanges appeared to facilitate trust early on in the team's existence. Whereas

**Figure 3** Within and Cross-Category Case Analysis

the teams with low initial trust exchanged few social messages in the first two weeks, the initial communication among members of teams beginning with high trust was largely social. For instance, almost half of all messages exchanged for two of the HiLo teams were done so during the first two weeks of participation and contained social (nontask) comments: they discussed their hobbies, their weekend activities, and their families at length. This extensive social discussion appeared to foster trust in the

beginning of the project but was insufficient in maintaining trust over the longer term. Two of the HiHi teams developed an amicable social rapport early on and continued to exchange social information until the final week, but this information was always integrated into otherwise task-oriented messages. These team members appeared to be careful not to use social dialog as a substitute for progress on the task.

**2. Communication Conveying Enthusiasm.** In teams with low initial trust, the messages revealed markedly little enthusiasm or optimism. Whether the low-trust team members actually had little enthusiasm, or simply failed to express it, is not clear. In HiHi teams there was a great deal of excitement about the project: the members referred to their teams as their "virtual family" and as a "virtual party," claimed that "we are beginning to feel like friends, not just teammates," and encouraged each other with such statements as "This is getting exciting!" and "great work everyone!!!" The HiHi teams encouraged each other on the task, with such statements as, "Everyone just keep pulling together and we can do this" and with references to working together "on producing the best IS page ever." The teams that moved from low to high trust expressed enthusiasm and optimism as the project progressed. For example, it was after the first two weeks that the members of LoHi2 began encouraging one another.

**Table 4** Trust-Facilitating Communication Behaviors and Member Actions

Communication Behaviors that Facilitated Trust Early in a Group's Life	Communication Behaviors that Helped Maintain Trust Later in a Group's Life
<ul style="list-style-type: none"> <li>• Social communication</li> <li>• Communication of enthusiasm</li> </ul>	<ul style="list-style-type: none"> <li>• Predictable communication</li> <li>• Substantial and timely responses</li> </ul>
Member Actions that Facilitated Trust Early in a Group's Life	Member Actions that Helped Maintain Trust Later in a Group's Life
<ul style="list-style-type: none"> <li>• Coping with technical uncertainty</li> <li>• Individual initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Successful transition from social to procedural to task focus</li> <li>• Positive leadership</li> <li>• Phlegmatic response to crises</li> </ul>

### **Member Actions Facilitating Trust Early On**

*3. Coping with Technical and Task Uncertainty.* The teams that reported low initial trust were unable to develop a system of coping with technical uncertainty and the unstructured task. Although the leader of LoLo3, for example, gave his work and home telephone numbers for the other members if they were experiencing prolonged technical problems beyond their control, this was not a realistic solution because of time zone differences and the expense of telephone calls. The low-trust teams also fuelled the feeling of an uncertain technological environment by blaming their problems and tardiness on the technology. The excuses given were rarely challenged beyond statements such as, "I find it very hard when there is no communication . . . I don't know if it is because of technology failing, or people not coming in to work or what." Members of low-trust teams also expressed uncertainty over the task goals—"I find the subject hard to find" and "I am kind of confused . . . not sure I can be very helpful"—but failed clarify the task among all the team members.

The HiHi trust teams developed schemes to deal with the technological and task uncertainty. One such scheme was the use of numbering systems so that all members would be aware if they had missed a message. Another scheme was simply informing the other members in advance of the times they would be working or would be unavailable to work. The HiHi teams also exchanged many messages purporting to clarify and develop consensus on the requirements of the task.

*4. Individual Initiative.* The teams with low initial trust, and those that remained at low trust, had members who did not take initiative: several members on each LoLo team revealed a desire to be told what to do and simply waited for others to make the important decisions. The members would state that a topic needed to be decided upon without making a suggestion. Similarly, teams that shifted from high to low trust exhibited a lack of initiative in pushing the project forward. For example, a member of HiLo trust team asked, "Can we agree on a topic or on what we are going to do?" but did not take initiative in suggesting an idea. A member on HiLo2 stated that she was waiting for someone "to give the signal" on the topic. Likewise, a member suggested the need to be proactive—"The only way to make the experience enjoyable and valuable was for all members to be as proactive as possible."—without actually proactively initiating a task. The teams reporting low trust at the end were hesitant to commit, evident in such statements as "I think (not a promise) I'll be able to have the page (at least the skeleton of it) done early next week." Furthermore, the teams ending with low trust revealed simple task ideas

and solutions with little explanation. One cannot blame the medium for the lack of richness in their ideas; rather, the members simply failed to provide details with their ideas. In this sense, the medium was more of a shield against having to explain themselves than a factor that limited their ability to fully explicate their ideas. By contrast, the HiHi teams were characterized by initiative: members would make topic suggestions instead of asking for suggestions, and would volunteer instead of asking for volunteers. In HiHi teams, even though a leader emerged, the majority of the members took initiative at different times.

### **Communication Behaviors Maintaining Trust Later On**

*5. Predictable Communication.* Unequitable, irregular, and unpredictable communication hindered trust. Teams ending with low trust were characterized less by the overall level of communication than by unpredictable communication patterns, with one or two members responsible for the majority of the communication. Members would express concern over where the other members were, such as a member from LoLo3 wondering, "What is happening to the rest of the team apart from James?" A member from LoHi1 wrote during the first two weeks that "I was away for a few days and everybody thinks I died or something." However, without forewarning of communication absences, it proved difficult for these members to maintain confidence in their teams. What appeared to reestablish confidence in LoHi teams was explicitly setting an expectation of how regularly messages would be sent. Thus, even though they did not necessarily communicate frequently, they had a regular pattern of communication established, which assuaged uncertainties over team members' commitments. Likewise, the members of all HiHi trust teams forewarned one another about upcoming absences. The members of two of the HiHi trust teams managed a near real-time environment during the crucial periods of the final project.

*6. Substantive and Timely Response.* A key difference between HiLo and HiHi teams was that HiHi team members received explicit and prompt responses verifying that their messages, and their contributions to the assignments, were thoroughly read and evaluated. Even though all three HiHi teams divided the work, each member contributed to the work of the others. Even less adept members (either due to language or technical challenges) managed to contribute positively. By contrast, the feedback in HiLo trust teams might have been positive, but the failure to elaborate reflected a cursory perusal rather than a perspicacious evaluation of others' contributions. Often, the low trust teams received no feedback and were left,

as stated a member from LoLo3, to "just . . . use my own creativity as I haven't had any real comments."

### **Member Actions Facilitating Trust Later On**

7. *Leadership.* A problem that was common for the HiLo and LoLo teams was ineffective and/or negative leadership. Team HiLo1 exhibited a desire for leadership although no leader emerged. The other two HiLo teams experienced negative posturing from their elected leaders and other key team members. The leaders of these teams were chosen not based on their greater level of experience but apparently because they were the first to communicate or they had sent the largest number of initial messages. The appointed leaders of the HiLo teams engaged in negative rather than positive reinforcement—complaining about other members' lack of participation, complaining about too little communication, comparing the team unfavorably to other teams, or sending messages of complaint to the project coordinator. They described the work as "extremely frustrating" and as a "frustrating experience." These actions were viewed as betrayals by the other team members and did little to reinforce commitment among the team.

By contrast, the leadership role of the high trust teams emerged after an individual had produced something or exhibited skills, ability, or interest critical for the role. Moreover, the leadership role was not static but rather rotated among members, depending on the task to be accomplished. Those taking leadership roles maintained a positive tone, such as in HiHi2 where Pattie prodded a member for one of the assignments but explained that she was "not complaining, just letting you know" and where Julian of HiHi3 sent a private message to a member who failed to complete an assignment, rather than singling her out with a message to the entire team.

8. *Transition from Procedural to Task Focus.* HiLo trust teams exchanged many messages on rules, or procedures. The emphasis on procedures, such as on how often to check e-mail, helped to provide an illusion of certainty, but in the absence of any mechanism to enforce the rules or even monitor the other members' compliance, any member could reemerge and blame his absence on technological problems. The HiLo teams were unable to move beyond setting rules. In contrast, all LoHi teams demonstrated an ability to move from a procedural orientation to a task orientation. Once they began focusing on the task, they were undisturbed by negative comments or by missing team members. The HiHi teams were also able to make a successful transition from a social and/or procedural focus to a task orientation.

9. *Phlegmatic Reaction to Crisis.* All three HiHi teams experienced some turbulence that could have permanently disrupted the teams. Yet these teams were

marked by an ability to remain phlegmatic during crises. All three teams experienced difficulties related to the choice of a topic for the final project—two teams discovered after they had chosen a topic that other websites existed covering the same idea; one team had difficulty reaching an agreement over an idea. Another temporary source of turbulence for one team coincided with a sudden change in the communication regularity of the key member and disagreement over the division of work. Even in the early stages, the HiHi trust teams, unlike the LoLo trust teams, were unconcerned over failing to fully complete the first two exercises on time; rather, they kept prodding the members who did not complete the exercises to complete them after the deadline, not because the completion was needed but because they were generally interested in the other members.

## **Discussion**

The objective of this study was to explore via an analysis of communication behaviors whether and how trust exists and/or develops in global virtual teams comprised of individuals who communicate electronically across time, space, and culture on a short-term basis without any prior common history or anticipated future. The research was directed by three questions. We will next discuss the results for those three questions.

### **Trust in Global Virtual Teams**

The first question explored whether trust can exist in global virtual teams. The global virtual team was defined by three dimensions: (1) no common past or future, (2) culturally diverse and geographically dispersed, and (3) communicating electronically (see Figure 1). The traditional conceptualization of trust assumes that trust resides in personal relationships and past or future memberships in common social networks that define the shared norms of obligation and responsibility (Bradach and Eccles 1988; Powell 1990). The lack of past and future association decreases the potential existence of trust. The diversity in cultural and geographic backgrounds should similarly challenge the potential existence of trust (Bradach and Eccles 1989, Mayer et al. 1995). Finally, Handy (1995) argues that trust needs physical touch, which the current technological context also eliminated.

The 12 case studies portray many challenges that the global virtual teams had. But did the teams exhibit trusting behavior? The current study explored this question by examining electronic mail archives (case studies) of teams with various levels of self-reported trust obtained via questionnaire data. On one hand, the teams that reported high levels of trust in the beginning and at the end appeared to be more capable of managing the uncertainty,

complexity, and expectations of the virtual environment than the teams that reported low levels of trust in the beginning and/or at the end. On the other hand, the communication archives contained little evidence of the depth of socialization, courtship, and social identification that is traditionally associated with interpersonal or socially based trust (Lewicki and Bunker 1995, 1996; Sheppard and Tuchinsky 1996). Trust in the HiHi and possibly in LoHi teams may have taken the form of swift, depersonalized, action-based trust. Trusting behavior may itself have provided the cognitive and emotional basis for the trust that was then captured by self-reports on trust.

### **Developmental View**

Question two explored how trust might be developed in a team. In swift trust (Meyerson et al. 1996, p. 192), "unless one trusts quickly, one may never trust at all." The survey data suggest that out of the 29 teams, only four teams shifted to a high trust condition from a low initial trust condition. The first messages on the team appeared to set the tone for how the team interrelated. The adage "you can never give a second first impression" seems to apply to electronic impressions as well.

Consistent with the SIDE model, members of the HiHi and HiLo teams appeared to enter the team collaboration with confidence and optimism although they had no information on which to assume the trustworthiness of the other members. In the LoLo and LoHi teams, the members appeared to be more skeptical in their early communication about what the team would be able to accomplish. Meyerson et al. (1996) maintain that in swift trust, members make categorical judgments of others based on positive stereotypes. Given that the members in our global virtual teams were not identifiable by their roles nor necessarily by their national origin (many members were located in countries other than their home country), it is unclear what stereotypes might have been evoked. Hence, it might be that trust was created swiftly based on the members' imported propensity to initiate or to respond to the first electronic communication stimuli rather than based on any particular stereotypes.

The findings are consistent with other research on the temporal aspects of group development (Gersick 1988, Gersick and Hackman 1990). In her study of naturally occurring groups, Gersick (1988) was struck by how the behavioral patterns that emerged in the first meeting persisted through the first half of the group's life. According to Gersick (1988), the patterns appeared "as early as the first few seconds of a group's life" (p. 33). Gersick and Hackman (1990) maintain that these early and lasting patterns occur either (1) by importation or (2) by creation. Importation happens when an outsider prespecifies the

pattern of behavior, or alternatively, when a homogeneous team shares the same a priori expectations of appropriate behavior. Creation occurs when the team is new, heterogeneous, and self-managing. In such cases, team members bring in propensities for initiating and responding to communication stimuli and interaction processes rather than transporting ready-made patterns from other contexts. The way members respond to particular stimuli in the first communication event will generate patterns that will last persistently in the team. Under the creation scenario, we would expect to see very widely diverse communication behaviors across different groups as we did across the 12 case studies. Interestingly, Gersick's (1988) finding of midpoint transitions in project teams was not evident in the current teams' communication archives: only one of the 12 global virtual teams appeared to go through a clear midpoint transition that allowed a dramatic change in communication behaviors. This might suggest that in global virtual teams, it is particularly challenging to encourage groups to reflect upon, learn from, and redirect, as appropriate, their communication behaviors.

### **Communication Behaviors**

The third research question, intertwined with the second question, explored what communication behaviors might facilitate trust in global virtual teams. McGrath's (1991, 1994) TIP model suggests that new teams that work on a complex and unfamiliar task and face technological uncertainty will have to engage in all four production modes: inception, problem solving, conflict resolution, and execution. Such teams must also devote time to the various modes of group well-being and member support to be able to progress through problems and conflict. Our case results suggest that when faced with technical/task uncertainty early in the group's life, teams high on trust were able to solve problems and resolve conflicts in an environment where they were limited to electronic communication. The study also found that teams communicate both task and social information.

The theory of swift trust discounts member-support and group well-being functions as unnecessary (Meyerson et al. 1996). By contrast, the TIP theory maintains that the relational links between the members and between the member and the rest of the group are of paramount importance for new teams with no common past. Our results suggest complementarity between these two theories: those teams that did not become strongly focused in their communication on the task reported low levels of trust at the end, yet the task focus in communication could co-exist in parallel with the social focus. Two of the HiHi teams continued to exchange social messages throughout

the project although they were clearly task focused. These results are consistent with findings that social exchanges can make computer mediated groups "thicker" as long as the social exchange is not at the expense of a task focus (Adler 1995, Walther and Burgoon 1992, Chidambaram 1996).

The current study also extends the theory of swift trust. Meyerson et al. (1996) deemphasized commitment ("There is less emphasis on . . . commitment . . .") because of the long-term reputational effects and clear role clarity. In the teams with high trust, there were explicit verbal statements about commitment, support, and excitement. Although prior research has found that members in computer mediated groups tend to express less excitement and support (Rice and Love 1987), the expression of such enthusiasm, if achieved, increases the attraction to the group, tendency for agreement, and cooperation (Fulk 1993).

Another finding of the study that might be endemic to virtually communicating temporal teams was the role of response. Our data supports the view of Meyerson et al. (1996) that initiatives (e.g., volunteering to complete tasks) appear to strengthen and unify the team, but the case data also suggest that the responses to the initiatives might be even more important. Because computer mediated communication entails greater uncertainty than face-to-face communication, there tends to be an "intense need for response" (Hawisher and Moran 1993). A response is an endorsement that another person is willing to take the risk of interpreting the first person's message and, if necessary, supplying the missing elements to make it understandable. Interpreted by Pearce (1974) to be a trusting behavior, a response also suggests involvement, and involvement conveys attraction, intimacy, attachment, and affection (Manusov et al. 1997).

Finally, one might be surprised by the lack of cultural effects in the study. The insignificance of culture in predicting perceived levels of trust as well as the lack of individuating information exchange may be related to the fact that the respondents were of similar ages, functional backgrounds, and educational levels. Additionally, electronically facilitated communication may make cultural differences insalient: the lack of nonverbal cues eliminates evidence of cultural differences, such as different ways of dressing, gesticulating, and greeting. Likewise, the written media eliminates the effect of accents which would again reduce the saliency of differences in cultural background. In addition, because the asynchronous mode gives individuals more time to process messages and respond, there might be fewer language errors, particularly among nonnative speakers of the language being used by the group, which would in turn reduce the saliency of

differences in cultural background. Hence, by making cultural differences less noticeable, the medium may thereby increase the perceived similarity among members.

In summary, the results of the study suggest that in global virtual teams, trust might take on a form of swift trust with some variations. Trust might be imported, but is more likely created via a communication behavior established in the first few keystrokes. Communication that rallies around the project and tasks appears to be necessary to maintain trust. Social communication that complements rather than substitutes for task communication may strengthen trust. Finally, responding behaviors are as critical as initiating behaviors, and members have to explicitly verbalize their commitment, excitement, and optimism.

### **Limitations**

There are several limitations that warrant mention before discussing implications. Although we observed naturally occurring teams, these teams were student teams where risks and rewards were grade based. The team members used primarily asynchronous electronic mail technology, and, on occasion, chat room technology; videoconferencing was not possible. The characteristics of the communication medium influence the communication behaviors (Straus and McGrath 1994). On the one hand, one might argue that the context was inordinately contrived by limiting teams to electronic communication. On the other hand, the context provides a rare opportunity to examine pure virtual interaction free from the influences of face-to-face interaction. Such research will, in the long run, not only afford us instruction as to the extent to which teams are able to work virtually, but also provide insight into the appropriate design of technology and group processes that facilitate virtual interaction.

The study can be criticized in several ways from the way trust was operationalized. Trust assumes that risk is present (Deutch 1958) and that members have alternatives (Luhmann 1988). The final project was designed to be a collaborative task, and the students were graded on their contributions to the task by their team members. This information was shared with their professors. All professors whose students were invited to participate were informed that the collaboration should count between 20% to 40% toward a grade in a course a student was taking at a time. Nevertheless, there were discrepancies in course credit and reputational effects, and hence in the participants' risk level. As an alternative to team cooperation, the project could conceivably have been completed by one person, although the workload was immense. The students could also have colluded with members of other teams who resided in the same university.

What is unknown is the extent to which participants were aware of these alternatives. Also, the study did not have any self-report measures of swift trust, only traditional conceptualizations of trust. Finally, the members were not assigned to teams to serve well-defined roles as the theory of swift trust assumes.

Another methodological weakness relates to the response rates of the surveys. It is possible that many of the least effective teams (and perhaps, least trusting) were not considered for analysis since the failure to receive at least two responses to the survey may have indicated a low level of participation on the team. Additionally, the lack of an objective measure of effectiveness renders conjectures about the implications of trust on objective team effectiveness impossible.

The external validity of the results might be faulted on having used students as participants. One should note, however, that the students were in master's programs and that most had significant work experience. Finally, the group size of all the teams was between four and six members. Such large-sized groups might face greater difficulties in the computer-mediated communication environments (Valacich et al. 1992). Perhaps the most serious concern of external validity is that the exercise represented many students' first experience in virtual teams (Hollingshead et al. 1993).

## Implications

### Theoretical Implications

Integrating research on trust and temporary organizational forms with group development literature as well as with computer-mediated and cross-cultural communication research, this study suggests implications for the specific theories. The boundaries for the traditional conceptualizations of trust may need to be reexamined and possibly reopened: trust in virtual teams appears to be somewhat depersonalized, but perhaps not as depersonalized as described in Meyerson et al.'s swift trust (1996). Also, trust might be initially created, rather than imported, via communication behaviors in global virtual teams. The case studies portray marked variations in the levels of communication richness across teams, suggesting that the information richness is an interaction between the people, tasks, the organizational context, and perhaps familiarity with the technology in use. The study also raises questions about how technology might obliterate, reduce, or delay the effects of culture and cultural diversity on communication behaviors when the setting is totally virtual.

The above theoretical implications must take into consideration that this study cannot provide any definite answers as to the existence and nature of trust in global

virtual teams. Nevertheless, the case studies provide a rich basis for proceeding with such questions. In our case studies, the types of problems (unreliable technology, agreeing on ideas, dealing with nonparticipating members) were common in low and high trust teams; hence, the LoLo teams and HiHi teams were not distinct in terms of the circumstances they faced, but rather in the individual members' and teams' reactions to these circumstances. We therefore proffer, in contradiction to the opening quote of this paper, that it is viable to build upon and extend theories from the traditional communication contexts rather than assume that an entirely new sociology of group communication and interaction behavior is needed.

### Implications for Practice

Some practical implications can be drawn from the study. For the manager of a virtual team, one of the factors that might contribute to smooth coordination early in the existence of the team is a clear definition of responsibilities, as a lack of clarity may lead to confusion, frustration, and disincentive. Particularly if the work is only part of the team members' organizational responsibilities, which is likely to be the case, providing guidelines on how often to communicate and, more importantly, inculcating a regular pattern of communication, will increase the predictability, and reduce the uncertainty, of the team's coordination. Furthermore, ensuring that the team members have a sense of complementary objectives and share in the overall aim of the team will help prevent the occurrence of desultory participation.

Another critical factor will be the effective handling of conflict. One strategy is to address perceived discontent as early as noticed: emotions left unchecked in the virtual environment might erupt into sequences of negative comments which will be difficult to resolve asynchronously. Another strategy in handling conflict will be to address as much as possible only the concerned individual and to avoid sending the entire team those messages dealing with the potentially conflict. Finally, not all individuals may be equally adept at handling the uncertainty and responsibilities inherent in virtual work. Managers should carefully choose individuals for virtual teamwork; such qualities as responsibility, dependability, independence, and self-sufficiency, while desirable even in face-to-face settings, are crucial to the viability of virtual teamwork.

For the participants on virtual teams, there are some observations derived from our study which may be relevant to practice. Although it is not necessarily critical to meet in person, it is critical to engage in an open and thoughtful exchange of messages at the beginning of the

team's existence. Cavalier attitudes that the virtual environment is no more challenging than a face-to-face environment prove to have ephemeral effects on participant enthusiasm, and once difficulties arise, the team lacks a substantive foundation upon which to overcome the real challenges imposed by the virtual context. Participants should also be aware of the importance of providing the others with timely and detailed accounts of the work they are doing. Likewise, participants must be aware of the need to provide thorough feedback on the contributions of the other members. Finally, participants should be aware that it is not the quantity, but the quality and predictability, of their communication that is most critical to the effective functioning of the team.

### Suggestions for Future Research

Future research is encouraged to continue to address the three research questions that guided this work. Does trust exist in virtual teams and on what is it based? It is qualitatively different in terms of its antecedents, development, and decline from the traditional conceptualizations of trust as well as from swift trust as described in Meyerson et al. (1996)? Why are some groups capable of addressing problems and conflicts early on in the group's life, whereas others are not? What are the necessary conditions for virtual teams to learn dynamically and engage in team processes that allow the teams to redirect their activities at a halfway point or at a similar logical point of their life? What are the most effective ways of communicating social information in virtual teams? Additionally, systematic research is needed on the virtual team member profile, task requirements, technology capabilities, and other environmental circumstances that allow the team members to react in such a manner as to thicken rather than enervate the team in the face of the inevitable crises that occur in global settings. We need to understand the effective leadership styles and contrast virtual teams with and without initial face-to-face contact. The issues of member diversity also await exploration. Finally, from an organizational standpoint, how is knowledge and learning best transferred from one globally dispersed virtual team to another?

### Conclusion

The virtual environment environment is bespeckled with uncertainty: Are other individuals reading the messages, and if not, why not? Are they having technical problems, or are they not committed? Such uncertainties militate against the development of trust and challenge the viability and longevity of global virtual teams. This has led to the argument that trust may not be possible in global virtual teams (Handy 1995). Yet, our exploratory study

suggests that trust can exist in teams built purely on electronic networks. The study describes a number of communication behaviors and member actions that distinguished global virtual teams with high trust from global virtual teams with low trust. Encouraging such behaviors and actions on the part of members of global virtual teams might help to foster a climate conducive to the existence of trust.

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### Appendix 1

#### Measures of Trust

##### **Trust (adapted from Mayer et al. 1995)**

If I had my way, I wouldn't let the other team members have any influence over issues that are important to the project.

I would be comfortable giving the other team members complete responsibility for the completion of this project.

I really wish I had a good way to oversee the work of the other team members on the project.

I would be comfortable giving the other team members a task or problem which was critical to the project, even if I could not monitor them.

##### **Trust (adapted from Pierce et al. 1992)**

Members of my work group show a great deal of integrity.

I can rely on those with whom I work in this group.

Overall, the people in my group are very trustworthy.

We are usually considerate of one another's feelings in this work group.

The people in my group are friendly.

There is no "team spirit" in my group.

There is a noticeable lack of confidence among those with whom I work.

We have confidence in one another in this group.

These questions were responded to on a five-point scale of 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = strongly agree.

**Table 1A Final Items and Reliability of the Trust Measure**

	Alpha if item deleted
Overall, the people in my group were very trustworthy.	0.88
We were usually considerate of one another's feelings on this team.	0.91
The people in my group were friendly.	0.91
I could rely on those with whom I worked in my group.	0.90
Overall, the people in my group were very trustworthy.	0.88
Overall Alpha:	0.92

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# **Is Anybody Out There? Antecedents of Trust in Global Virtual Teams**

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AND DOROTHY E. LEIDNER

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**ABSTRACT:** A global virtual team is an example of a boundaryless network organization form where a temporary team is assembled on an as-needed basis for the duration of a task and staffed by members from different countries. In such teams, coordination is accomplished via trust and shared communication systems. The focus of the reported study was to explore the antecedents of trust in a global virtual-team setting. Seventy-five teams, consisting of four to six members residing in different countries, interacted and worked together for eight weeks. The two-week trust-building exercises did have a significant effect on the team members' perceptions of the other members' ability, integrity, and benevolence. In the early phases of teamwork, team trust was predicted strongest by perceptions of other team members' integrity, and weakest by perceptions of their benevolence. The effect of other members' perceived ability on trust decreased over time. The members' own propensity to trust had a significant, though unchanging, effect on trust. A qualitative analysis of six teams' electronic mail messages explored strategies that were used by the three highest trust teams, but were used infrequently or not at all by the three lowest trust teams. The strategies suggest the presence of

"swift" trust. The paper advances a research model for explaining trust in global virtual teams.<sup>1</sup>

KEY WORDS AND PHRASES: antecedents of trust, global teams, global virtual teams, swift trust, transnational teams, trust, virtual organizations, virtual teams.

"Virtuality . . . [means] without a place as its home. Virtuality requires trust to make it work." [10, p. 44]

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TRUST IS CRITICAL IN NEW ORGANIZATIONAL ARRANGEMENTS where the traditional social controls based on authority give way to self-direction and self-control [26]. Trust is reported to reduce transaction costs [2, 10], increase confidence and security in the relationship, and promote open, substantive, and influential information exchange [4, 17, 40].

A global virtual team is an example of a new organization form, where a *temporary team* is assembled on an as-needed basis for the duration of a task, and staffed by members from the far corners of the world [11, 20, 25]. In such a team, members (1) physically remain on different continents and in different countries, (2) interact primarily through the use of computer-mediated communication technologies (electronic mail, videoconferencing, etc.), and (3) rarely or never see each other in person [13, 27].

Although trust is important in any type of team, trust is pivotal in preventing geographical distance from leading to psychological distance in a global team [33]. Trust is even more essential in global *virtual* teams. According to O'Hara-Devereaux and Johansen [27], "Trust is the glue of the global workspace—and technology doesn't do much to create relationships" (pp. 243–244). First, the global virtual context renders other forms of social control, such as direct supervision, inoperable. Second, other factors known to contribute to social control and coordination, such as geographical proximity, similarity in backgrounds, and experience, are often absent.

The challenge is that both the virtual context and the global context constrain, or perhaps even impede, the development of trust. Handy [10] points out that, in virtual organizations, trust requires constant face-to-face interaction—the very activity the virtual form eliminates. This study explores, in a virtual-team setting, the effect of factors that have been identified as sources of trust in traditional face-to-face relationships.

## Conceptual Foundations

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### Concept of Trust

TRUST CAN BE VIEWED FROM A RATIONAL OR SOCIAL perspective. Most research on trust takes a rational perspective [15]. The rational perspective centers on the calculus of self-interest. Increases in trust decrease transaction costs of relationships because individuals have to engage less in self-protective actions in preparation for the

possibility of others' opportunistic behavior [16]. Thus, the existence of trust enables people to take risks. The social perspective of trust, alternatively, centers on moral duty. A social group holds values regarding one's obligations to others. "Hence, people help others and/or their group because they feel it is the morally appropriate action" [16, p. 5].

Within the rational perspective, some authors have studied trust as an individual personality difference [7], others as an institutional phenomenon [19, 32], some as a cross-cultural issue [6], and most in terms of interpersonal relations [3, 22]. In this paper, we take the last view, which allows us to take an affective, cognitive, behavioral, or "integrated" view of trust [2, 22, 24]. We will take an "integrated" view and adopt Mayer, Davis, and Schoorman's [22] definition of trust: "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (p. 712). In short, trust is based on the expectation that others will behave as expected.

## Antecedents of Trust

Trust in a dyadic relationship arises from attributes associated with a trustee and a trustor [22]. The trustee attributes are his or her perceived (1) ability, (2) benevolence, and (3) integrity. *Ability* refers to the group of skills that enable a trustee to be perceived competent within some specific domain. *Benevolence* is the extent to which a trustee is believed to feel interpersonal care and concern, and the willingness to do good to the trustor beyond an egocentric profit motive. *Integrity* is adherence to a set of principles (such as study/work habits) thought to make the trustee dependable and reliable, according to the trustor.

In terms of the trustor attributes, *propensity to trust* is a general personality trait that conveys a general expectation of how trusting one should be. This trait is assumed to be stable during the relationship as well as from one situation to another, and is influenced by a trustor's cultural, social, developmental experiences, and personality type [22]. In terms of trustor versus trustee attributes, prior research has found that the trustee attributes explain more of the variance in interpersonal trust than does the trustor's general propensity to trust [31].

Trust on a collective level (i.e., trust in a group, team, or organizational unit) is more complicated than dyadic trust because there are multiple trustees, each with different attributes. Collective trust, as defined by Cummings and Bromiley [2, p. 303], is "a common belief among a group of individuals that another individual or group (a) makes good-faith efforts to behave in accordance with any commitments . . . (b) is honest in whatever negotiations preceded such commitments and (c) does not take excessive advantage of another even when the opportunity is available." Extrapolating from the dyadic trust literature to the collective trust context, we explore trust antecedents in a global virtual-team setting. Our baseline hypothesis is:

*H1: In a global virtual team, team trust is a function of other team members' perceived ability, integrity, and benevolence, as well as of the members' own propensity to trust.*

### Relative Importance of Trust Antecedents

In a traditional face-to-face context, trust takes time to evolve. Cummings and Bromiley [2] suggest that collective trust has an affective, cognitive, and behavioral intent component. McAllister [24] found cognitively based trust factors to be a precursor to the development of affectively based trust. Mayer et al. [22] maintain that, in the early stages of a relationship, integrity is more important than benevolence to the formation of trust. Assessing benevolence requires information, which takes time to gather. Although Mayer et al. [22] do not categorize the antecedents of ability, integrity, and benevolence into affective and emotional dimensions, they do associate **benevolence with the process of relationship building**.

In a virtual-team context, we might expect integrity and ability to be particularly strong predictors of trust because the context is a barrier to relationship formation. In this study's context, team members were limited to asynchronous electronic mail communication and to the occasional use of text-based synchronous "chat" facilities. According to Zack [42], "the degree to which the mode of [electronic] communication allows participants to experience each other as being psychologically close" (p. 211) depends on the richness of the existing shared interpretative context. This finding was reinforced by Markus [21] who found that "lean" electronic mail can be rich in the situation where the parties know each other, but if the parties are confined to electronic communication for long periods of time, they expected their relationships to be "cold and impersonal" (p. 520). Among strangers who do not share a common past and are unfamiliar with each other's personalities, there is no shared context. Hence, electronic communication can be expected to be impersonal and task-focused. Trust in a virtual-team context might therefore be more strongly related to ability and integrity, and less to benevolence.

*H2: In the early phases, a global virtual team's trust is predicted more strongly by team members' perceptions of the other members' integrity and ability than by the other members' benevolence.*

In traditional relationships, Mayer et al. [22] predict that, with time, benevolence should increase. The interactions will reveal information about the benevolence of others. Recent work on computer-mediated teams suggests that benevolence might predict team trust after the members have interacted for a while. Walther [38] found that geographically dispersed and culturally diverse partners, who relied totally on computer-mediated communication and were never able to meet each other physically, communicated more affection and reported higher levels of intimacy, as well as social and physical attraction, than did colocated partners. In another study, Walther [36] did not find computer-mediated communication groups to be any more task-oriented than face-to-face teams. On the basis of his studies, Walther [34, 35, 36, 37, 38] developed a hyperpersonalization theory for groups limited to computer-supported communication. The theory argues that, because individuating information (cues that help others understand if they are similar or different, for example, physically) is so scarce in a virtual context, members assume similarity and tend to reveal factors and

cues about themselves that only reinforce this similarity. In turn, this overattribution of similarity may nurture perceptions of concern, care, and a belief in the virtue of a team relationship. Hence, we predict:

*H3: Over time in a global virtual team, team members' perceptions of others' benevolence will have a stronger effect on team trust.*

## Team Building

To perceive integrity and ability, members must make their assessments of others on the basis of past history, namely, other's track record or recent performance in a team. This in turn suggests that, for integrity to be rated high, a member has to have information available on how consistently others met their past commitments and how closely their performance matched expectations of fairness and norms of reciprocity [24]. Likewise, to rate ability high, team members would have to have detailed information on the other members' backgrounds, work experiences, and current organizational contexts. To perceive benevolence, personal information must be revealed by others to reinforce beliefs about shared goals, rewards, and interest in establishing a good relationship. Thus, team exercises that focus on increasing information exchange among team members and encourage commitment and completion of tasks early in the collaborative process might be expected to have a positively impact on perceptions of other members' ability, integrity, and benevolence, as well as team trust overall. The effect on team trust is expected because the exercises should not only reveal information about the members, but also help create a team identity, which is an important facilitator of trust in a collective context [14]. Hence, we advance the fourth hypothesis:

*H4: The level of participation in the team-building exercises will be positively associated with team trust as well as with other team members' perceived ability, integrity, and benevolence.*

Figure 1 summarizes the research model tested via the four hypotheses.

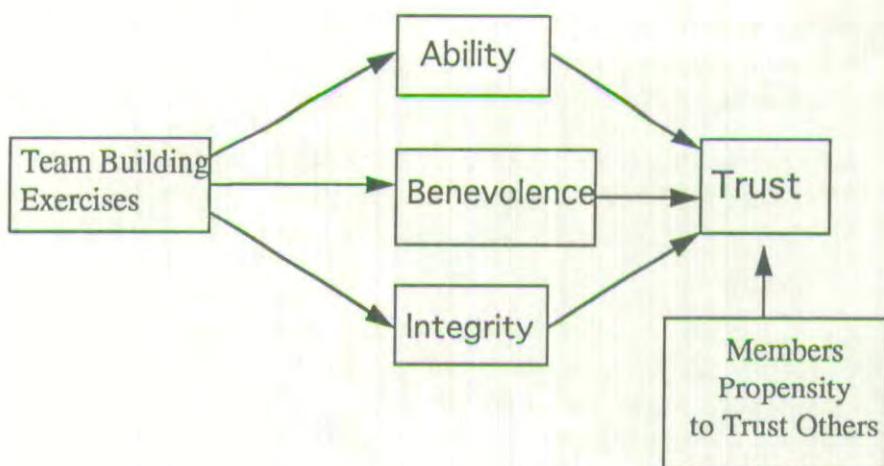
## Methodology

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THE UNIVERSITY OF TEXAS AT AUSTIN HELD A GLOBAL VIRTUAL collaboration for masters' students over a period of eight weeks during the spring semester of 1996. Three learning objectives guided the collaborative process: to learn how to collaborate with others in a virtual setting, to obtain international exposure by working with people from different countries, and to learn about the Internet. This section describes the collaboration participants, collaboration activities, data collection, and measurements.

### Collaboration Participants

Potential participants were recruited through contacts with professors who had participated in previous collaborations [13], correspondence with academic colleagues,



*Figure 1.* Research Model

word-of-mouth inquiries, and advertising via a newsgroup servicing information systems professionals and academicians. All professors received a common letter explaining the conditions for student participation.

Although the letter explicitly stated that one of the conditions for participation included having the exercise comprise 20 to 40 percent of the students' course grade, the context of the students' participation varied. Most professors folded the exercise into one of their regularly scheduled courses where it counted for 20 percent to 75 percent of their course grade. In a few cases, however, professors asked some students to participate in the project without any connection to a specific course. To further motivate the students' participation, the professors were provided with reports on the number of electronic mail messages their students sent after the first two and four weeks. Also, a monetary reward (\$600) was promised for the best web site. Finally, all team members were asked to rate each other's contribution to the final project.

Three hundred and eighty-five masters' students from twenty-eight universities around the world elected to participate in the exercise (appendix A lists the universities). Of these students, 350 students sent at least one message to their teammates. The teams had the following characteristics: (1) Each member on a team resided on a different continent or subcontinent of the world. (2) Each team had a mix of students from low- and high-context cultures.

## Tasks

The teams were charged with completing three tasks: two team-building exercises and a final project (see Table 1 for the timing of the exercises). The team-building exercises were voluntary. The students' course grade and the \$600 reward were based solely on the successful completion of the final project.

**Table 1.** Collaboration Schedule

March 4	Collaboration began
March 24	Team-building exercise I completed
March 31	Team-building exercise II completed
April 2	First questionnaire administered
April 29	Final project completed
April 30	Second questionnaire administered

### The Team-Building Exercises

The first two voluntary tasks encouraged participants to exchange information about themselves that would be relevant for assessing one another's project-related skills (ability), their motivations for contributing to the team effort (benevolence), and their work/study habits believed to be compatible with a successful effort (integrity). The first exercise asked participants to send a description of themselves to their team members. The first paragraph was to include a brief personal description. The second paragraph was to contain professional information—to describe past job experience, their current focus of study and why they chose to study that subject, what their aspirations were, and any international experience they had. The third paragraph was to answer two questions: what they wanted to learn from this project and what skills they had that would enable them to contribute to the project. The final paragraph was to describe what they felt would be the challenges of working in an international virtual environment and to raise any concerns they had with regard to the successful completion of the project.

The purpose of the second exercise was to enable the team members to assess how well their team members met their commitments and completed their work tasks (integrity) before the final assignment commenced. This exercise required each team member to locate one web site he or she felt was of relevance to business persons. Each team member was to report the address of the site as well as a one-paragraph explanation of what made the site relevant. Team members were asked to consider information-related characteristics and features of the page that made it relevant—the quality of links, the accessibility of the page, the options included in the page, and so forth.

### The World Wide Web Project

The third assignment, the final project, asked the teams to propose a World Wide Web site (or pages) providing a new service or offering to ISWorld Net (ISWorld Net is an organization committed to disseminating information to both IS practitioners and academicians via the Internet and newsgroups). The teams were to present information of interest to global information technology practitioners working in a global business setting. The students had four weeks to complete this project. Each team member was required to submit the same deliverable, representing the collective efforts of the group, to his or her professor.

## Technology

Students communicated solely through electronic means. The host institution established a WWW site on the Internet (<http://uts.cc.utexas.edu/bgac313/index.html>). The purpose of this central repository of information was to ensure that all students had access to the same information on the assignments, a schedule for completing the voluntary team building exercises and the required final project, pointers to other WWW sites containing relevant information, advice for virtual collaborators, decision-making methods and software tools, a list of time zones based on Greenwich Mean Times, a bulletin board addressing technical and assignment issues, and a research paper describing virtual collaborations.

## Data Collection

The list processor archived students' mail messages sent to the "team address." Students were notified at the start of the exercise that messages were being collected. Occasionally students used the reply function to respond to messages sent by individuals, thereby communicating with that individual alone. In prior global virtual-team collaborations, we learned from student interviews and from questionnaire responses that team members rarely sent individual messages, and when they did, they sent very few [13]. Furthermore, when teams held chat sessions (and invariably not everyone could attend because of time zone constraints), our analysis of the electronic mail archives suggests that attendees summarized the meeting results for others.

Team members were sent an electronic survey to complete immediately following the deadline for the second trust-building exercise (after the first month). The team members were able to complete and submit the survey electronically. A second survey was sent to the team members the day following the deadline for the completed final project (after the second month).

## Measurements

The items for each construct are reported in appendix B. The trust-building exercises were coded to give a measure of the participation in the exercise. A team was given one point for each member that contributed to an exercise. Thus, for a four-person team, the maximum number of points was eight if each member contributed to both exercises. The total points were added per team and then normalized to account for the differences in team sizes.

Because trust was the central variable of concern, we used two separate scales for trust that had been used before. Both were used because neither had been found definitive by previous research. The first measure was used by Pearce et al. [28, 29] to measure trustworthiness. The trustworthiness scales were modified to reflect the team rather than the organization as the unit of analysis. The second measure was a modified version of the Schoorman, Mayer, and Davis [30] instrument on trust. Schoorman et al.'s [30] measures were also used to assess ability, benevolence, and

integrity, and propensity to trust. The modifications to the Schoorman et al. instrument involved adapting the questions that were originally designed for a dyadic relationship to fit the context of multi-interdependencies found in a team context. Individuals were asked about their perceptions of the attributes of the other members (as opposed to a single other trustee). We could have asked each individual to respond to their perceptions of each trustee (i.e., each team member), but this would have been excessively tedious and might have reduced the response rate. In addition, trust in a collective entity is possible even if one particular individual is deemed less capable, benevolent, or honest than the others. The measure of propensity to trust was modified to take into account the international context. Because trust has an object—one trusts in someone or something—it is necessary to provide an object to the general propensity to trust. We felt that the international context might pose a major challenge to the teams because collective trust is suggested to be difficult to establish among culturally heterogeneous groups [12]. The modified measure captured propensity-to-trust students from other countries (i.e., foreign students). All of the above items were measured on a five-point scale ranging from 1 (to no extent) to 5 (to a great extent).

## Analysis and Quantitative Results

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IN TOTAL, 165 OF THE 350 TEAM MEMBERS COMPLETED THE FIRST SURVEY for a response rate of 47 percent. Two hundred and thirteen of the 350 team members completed the second survey for a rate of 61 percent. The response rates are reasonable given that most of the teams had one or two inactive members—members who did not send any messages to their team. Inactive team members were not expelled from participation since we felt that coping with such lack of commitment was a part of the learning process.

Of interest was team trust and trust antecedents at a team level of analysis. As such, for each team, it was necessary to collapse the responses of the various team members into a single team score. This was accomplished by averaging the responses of the individual members on each team. Before so doing, teams with responses from fewer than two members were eliminated from the data set because a single respondent was not a good representation of the team.

In general, the factor analyses supported the proposed scales with some exceptions. For example, one of the items of the benevolence scale, "The other team members were very concerned about the ability of the team to get along," was not retained. The items comprising each of the constructs are shown, with their factor loadings, in Table 2. The reliability measures are also shown. All variables exceeded 0.8 on the reliability score except the trust construct. Since trust and trustworthiness were highly correlated at time period 1 ( $p = 0.019$ ) and time period 2 ( $p = 0.003$ ), we dropped trust from further analysis and used the measure of trustworthiness to represent trust.

## Descriptive Statistics

The descriptive statistics on a team level are shown in Table 3. The first section of the table shows the responses on the first survey administered upon completion of the

Table 2. Factor Analysis and Reliability

Variable	Alpha	Items	Loading
Trust	0.66	If I had my way, I would not let other members have any influence over important issues (-) I really wish I had a good way to oversee the work of the other members I would have been comfortable giving the other members complete responsibility for completion of this project	0.78 0.64 0.72
Trustworthiness	0.92	Overall, the people in my group were very trustworthy We were usually considerate of one another's feelings on this team The people in my group were friendly I could rely on those with whom I worked in my group Overall, the people in my group were very trustworthy (-) There was a noticeable lack of confidence among my team members	0.81 0.76 0.76 0.82 0.82 0.71
Ability	0.90	The other team members had much knowledge about the work that needed to be done The other team members seemed to be successful in the activities they undertook I felt very confident about the other team members' skills The other team members had specialized capabilities that increased our performance The other team members were well qualified The other team members were very capable of performing their tasks	0.72 0.78 0.84 0.70 0.84 0.76
Integrity	0.92	The other team members displayed a solid work ethic The other team members tried hard to be fair in dealing with one another I liked the work values of the members on my team The other team members were strongly committed to the project (-) The other team members did not behave in a consistent manner	0.90 0.77 0.84 0.86 0.83
Benevolence	0.85	The outcomes of this project were very important to the other team members The other team members did not knowingly do anything to disrupt the project The other team members were concerned about what was important to the team The other team members did everything within their capacity to help our team perform	0.77 0.81 0.87 0.84

Table 2. Continued

Propensity to trust	0.86	Most foreign students tell the truth about the limits of their knowledge	0.70
		Most foreign students answer personal questions honestly	0.83
		Most foreign students are very competent in terms of their studies	0.68
		Most foreign students are honest in describing their experiences and abilities	0.84

trust-building exercises. The second section of the table shows the responses to the second survey administered upon completion of the final project. The third section shows the descriptive statistics for the teams having at least two respondents on both of the surveys. Table 4 shows the correlations among the variables. To compute the correlations, the data set was composed of those teams that had two or more respondents on both the first and the second surveys. This reduced our sample size to twenty-eight teams. Overall, trust and antecedents of trust increased over time. Of seventy-five teams, one team was combined with another team after the trust-building exercises because the team had only one active member. All other teams had at least two participating members. Only one of the remaining seventy-four teams did not submit the final assignment.

### Hypothesis Testing

Hypothesis 1 predicted that, within a global virtual team, team trust is a function of members' ratings of the other team members' perceived ability, integrity, and benevolence, as well as of the members' own propensity to trust students from other countries. Hypothesis 2 predicted that early in the team's formation the team's trust would be predicted more strongly by perceptions of the other team members' integrity and ability than by others' benevolence. Hypothesis 3 predicted that others' perceived benevolence would have a greater effect on trust over time.

A MANOVA was run to test these hypotheses, followed by an ANOVA. The MANOVA used trust at time period 1 and time period 2 as the dependent variables and the antecedents of trust (ability, integrity, benevolence, and propensity to trust) as the independent variables ( $F(16, 28) = 12.28, p > 0.000$ ). This first hypothesis was partially supported. Ability ( $b = 0.190, p > 0.043$ ), integrity ( $b = 0.533, p > 0.000$ ), and propensity to trust ( $b = 0.198, p > 0.033$ ) at time period 1 were significant predictors of trust taken directly after the team building exercises (after the first month). Benevolence was not significant at time period 1. At the end of the project (after two months), integrity ( $b = 0.443, p > 0.004$ ), benevolence ( $b = 0.333, p > 0.004$ ), and propensity to trust students from other countries ( $b = 0.152, p > 0.044$ ) were significant predictors of trust at time period 2, but ability was not (see Table 5). Hence, hypothesis 2, which emphasized the salience of integrity after the first month, was supported, as was hypothesis 3, which predicted that the relative effect of benevolence on trust would increase with time.

Table 3. Descriptive Statistics

	Mean	St. dev.	Min	Max	<i>N</i>
Teams with at least two respondents on the first survey					
Trust1	3.86	0.45	2.93	4.60	48
Ability1	3.70	0.41	2.67	4.42	48
Integrity1	3.70	0.50	2.40	4.60	48
Benevolence1	3.70	0.51	2.33	4.75	48
Propensity to trust1	3.82	0.38	3.00	4.60	48
Trust-building score	1.69	0.32	0.80	2.00	48
Teams with at least two respondents on the second survey					
Trust2	4.06	0.52	2.20	4.90	60
Ability2	3.77	0.57	1.75	4.92	60
Integrity2	3.72	0.71	1.60	4.93	60
Benevolence2	3.70	0.65	1.25	4.80	60
Propensity to trust2	4.00	0.43	3.00	5.00	60
Teams with at least two respondents on both surveys					
Trust1	3.95	0.42	3.00	4.60	28
Ability1	3.81	0.32	2.67	4.35	28
Integrity1	3.81	0.43	2.80	4.60	28
Benevolence	3.76	0.45	2.88	4.50	28
Propensity to trust1	3.85	0.39	3.00	4.47	28
Trust-building score	1.80	0.25	1.00	2.00	28
Trust2	4.04	0.40	3.00	4.60	28
Ability2	3.75	0.39	2.50	4.42	28
Integrity2	3.65	0.65	1.80	4.53	28
Benevolence2	3.66	0.49	2.25	4.42	28
Propensity to trust2	3.91	0.36	3.00	4.53	28

Hypothesis 4 predicted that the level of participation in the team-building exercises would be positively associated with ratings of other team members' ability, integrity, and benevolence, as well as overall team trust. The team-building exercises were designed to encourage participants to share information concerning their abilities that would be of value to the team (ability), their motivation for participating in the project (benevolence), and their work/study habits (integrity). Correlations were used to test this hypothesis. Hypothesis 4 was only partially supported. The exercise did significantly correlate with the antecedents of trust: ability ( $r = 0.377, p > 0.024$ ), integrity ( $r = 0.300, p > 0.061$ ), and benevolence ( $r = 0.424, p > 0.012$ ) at time period 1. Surprisingly, though, the trust-building exercise did not positively and significantly correlate with the measure of trust at time period 1 ( $r = 0.2210, p > 0.109$ ) or with the level of trust measured at time period 2 ( $r = 0.2335, p > 0.095$ ). Hence, it seems that the exercise did increase the team members' knowledge of each other, but the exercise did not directly affect trust. Hence, any effect that the exercises had on trust appeared to occur indirectly through the antecedents.

Table 4. Correlations (Pearson Coefficients and Their Significance Levels)

	At time period 1						At time period 2					
	Ability1	Integrity1	Benefo-lence1	Propensity to trust1	Trust2	Ability2	Integrity2	Benefo-lence2	Propensity to trust2	Trust-build-ing score		
Trust1	0.400	0.784	0.739	0.619	0.610	0.380	0.506	0.556	0.485	0.248		
Ability1	0.017	0.000	0.000	0.000	0.023	0.003	0.001	0.004	0.101			
Integrity1	0.257	0.156	0.448	-0.065	0.142	-0.111	-0.064	-0.020	0.377			
Benefo-lence1	0.094	0.213	0.008	0.372	0.236	0.288	0.374	0.459	0.024			
Propensity to trust1		0.701	0.365	0.544	0.358	0.482	0.597	0.390	0.300			
At time period 2												
Trust2				0.744	0.885	0.801	0.627	-0.033				
Ability2				0.000	0.000	0.000	0.000	0.433				
Integrity2					0.791	0.728	0.389	-0.049				
Benefo-lence2					0.000	0.000	0.020	0.403				
Propensity to trust2						0.905	0.470	-0.052				
						0.000	0.006	0.397				
							0.337	0.061				
							0.040	0.379				
								-0.089				
								0.327				

Table 5. ANOVAs for Hypothesis Testing

Dependent variable: Trust at time 1						
Independent variables: Ability, Integrity, Benevolence, Propensity to trust (at time 1)						
	DF	F	p >	Regression coefficient	t	p >
	4	45.2	0			
Ability				0.190	2.084	0.043
Integrity				0.533	4.179	0.000
Benevolence				0.149	1.192	0.240
Propensity to trust				0.198	2.206	0.033

Dependent variable: Trust at time 2						
Independent variables: Ability, Integrity, Benevolence, Propensity to trust (at time 2)						
	DF	F	p >	Regression coefficient	t	p >
	4	76.7	0			
Ability				0.065	0.584	0.562
Integrity				0.443	2.972	0.004
Benevolence				0.333	3.029	0.004
Propensity to trust				0.152	2.066	0.044

In summary, the quantitative results suggest that the traditional antecedents of trust from the dyadic relationship literature were associated with team trust in a global virtual-team context. It appears to take time for benevolence to affect trust. Ability seems to be a significant predictor at the outset, but not after two months followed by a major task accomplishment. Mayer et al. [22], in discussing trust in dyadic face-to-face relationships, predicted that integrity would be most salient early in the relationship and that benevolence would increase as the relationship among the parties developed. Mayer et al. [22] made no specific predictions with regard to the temporal effects of ability on trust. Hence, our results are consistent with the predictions of Mayer et al. [22] with the additional caveat that the effect of ability on trust also seems to change with time. As the relationship forms among the members, the effect of ability decreases. The team-building exercises had a positive effect on the antecedents of trust related to perceptions of the other team members. The exercises did not appear to have any direct effect on trust.

### Qualitative Analysis of High- and Low-Trust Teams

Although the above results are interesting, they revealed little about the behaviors and strategies that distinguished high-trust teams from low-trust teams. To explore this question about behaviors and trust, an analysis was conducted of the communication transcripts for the three teams with the highest final trust score and the three teams with the lowest final trust score. The transcripts for each team were treated as a case. The data analysis followed guidelines proposed by Eisenhardt [5]. The goal was to

identify similarities and differences across the six cases. Table 6 reports on the number of members, the total number of messages, and the countries in which the team members resided. A summary of the six cases follows. (All member names are disguised.)

### Team A: High Trust

Team A was composed of five members, all of whom made contributions to the project and three of whom carried the majority of the load. This team exhibited a high level of optimism and excitement, task orientation, rotating leadership, good time management, a clear sense of task goals, and most of all high levels of individual initiative and accountability. The team was mindful of the need to communicate frequently and, even during their weekend trips, provided the team members with alternative ways to communicate with them. Even though three of the five members did most of the work, all members continued to address the whole team. The team members were cognizant of maintaining "team spirit," as they themselves referred to it.

From the start, all members expressed excitement about the forthcoming collaboration ("Looking forward very much to working with you all"; "It is exciting to work in a team with so wide a background and I think we can make a good assignment") and, rather than waiting for others to ask for their personal information, volunteered it with their first message. This optimism prevailed throughout the project. The team revealed many instances of positive reinforcement such as "great job!" and members would send messages congratulating a member on his or her excellent work. The positive individual and team references increased as the project went on and escalated at the end with vast amounts of enthusiasm at the effectiveness and commitment of the team members. In addition, many comments were made comparing their team to other teams, invariably referring to the problems that they had heard their colleagues speak about, whereas they found themselves on an extraordinary team. The final messages conveyed a sense of accomplishment and warm feelings toward team mates ("I shall be in touch soon, to congratulate us all on winning!!"; "It's been great fun as well as rewarding, keep in touch"). This team seemed to have trust from the start and maintained it through an upbeat tone in communication.

The team was task-oriented and rarely engaged in social comments of any kind, except for twice alluding to European football scores. The team had a clear sense of task goals and was very aware of time constraints, reminding each other of forthcoming deadlines. This team had their eye constantly on the clock even in the beginning weeks. For example, early during the project members stated, "We need to keep meeting the deadlines or the project will slip," "We don't have a large amount of time," and "there is this deadline." Compared with other teams, this team's communication was relatively free of excuses for not contributing to the team. Initially one member attributed lack of participation to access problems caused by a strike at his university; another member attributed lack of contact to a flu, and a third to a recent move to a new apartment. However, the third quickly noted, "Do you know what the devil's grandmother died of? Bad excuses. So therefore I will stop apologizing—and start working." From then on, there were few excuses about why members had not

Table 6. Communication Events of the Six Teams

Team	No. of members	No. of members*who dropped out	Total no. of messages	Messages per member**	Countries represented	No. of less active members***
A	5	0	114	22.8	Philippines Austria Denmark Finland USA	0
B	5	1	123	24.6	Brazil Ireland USA South Africa	0
C	4	1	123	30.75	Denmark Brazil Ireland Canada Austria/Denmark	1
D	4	0	49	12.25	England Australia The Netherlands Austria Finland	2
E	4	0	34	8.5	France Ireland USA Denmark	1
F	4	0	69	17.25	Finland Austria USA Denmark	2

\* Does not include members that dropped out of the project.

\*\* Does not include messages from members that later dropped out of the project.

\*\*\* Member considered less active when other members ask each other what happened to the member.

contributed. Rather, the members tended to inform each other in advance of forthcoming constraints.

The characteristic that most marked team A is that the members volunteered for explicit roles and engaged in independent work activities. That is, each individual took a great deal of initiative with regard to managing the group process and the major content work. Moreover, the members exhibited confidence in their abilities and in

their own independent tasks and did not wait for the approval of the group before embarking on their individual tasks. In several cases the strong individual initiative led to redundancy, with two members having worked on essentially the same thing unaware that someone else was working on it simultaneously: "Here is my weekend masterpiece. . . . Again, I made this without being aware that Jim already made an abstract. But it's okay . . . at least, now we're all in full gear! All the best to our group." Often a third member would collate the work of the two members who had been working independently and come up with a final version that merged the best ideas from the two (e.g., "Dear Virtuals! Mike and Jim have ideas that I like and I have things to add so I was going to do a cut and paste thing and add in my own bits").

In addition to independence of work, this team was characterized by rotating leadership in the sense that individuals acted as leaders when they saw the need. All five members made process suggestions and content contributions. Never did one person nag the other team members to give feedback, to complete their work, or to volunteer for tasks. Indeed, this team began with Jim immediately volunteering, "unless you prefer to have a vote," to coordinate the team-building exercises. Later, a member, Steven, suggested that the team have one member as leader each week, but that the leader rotate. He proposed a five-week/five-leader chart. The chart proved needless as leadership responsibilities rotated smoothly as the need arose. At one point, one member took the lead in preparing the final paper to be turned in, but a different member sent a message to the team to encourage everyone to review the document quickly and provide feedback so that the first team member could finalize the document for submission.

The team also had internalized a clear mutual goal ("a winning proposal") and kept reminding each other that the goal was within their reach ("we can do this together. Let's not give up the fight now! GO-GO-GO Team xx!!!"). This seemed to have a contagious motivational effect on members. At one point a potential problem appeared when Jim announced on April 19 that he would be unavailable until April 28 because he was tired and taking a trip. This would mean that he would be absent during the majority of the project time. The problem was ignored by the other members who continued working on the content of a draft proposal. Two days later, he informed the team that, having reread the contributions to date, he decided to postpone his trip. Jim then ended up contributing perhaps more than any other single team member as he completed a proposal draft, the html code for their web page, and the final paper.

Finally, team A had a serious focus on substantive comments: Rarely did members respond "looks good," "ok," "fine with me," when reviewing another member's work. Their feedback was specific, in-depth, and thoughtful, indicating a careful reading of each submission and a concern to contribute to the improvement of the material. There were in fact very few questions submitted among the 113 communication events—the members worked, submitted work, and responded to the work submitted by others. Team members did not ask "shall I do this" but merely acted and then asked for feedback. This is in marked contrast to some of the low-trust teams where individuals would ask what needed to be done, give very minor feedback, and always state what needed to be done but not actually do it themselves. Team A, in fact, wasted very little

time actually deciding what to do; on the contrary, individual members acted and then shared their results for improvement.

### Team B: High Trust

Team B was above all characterized by frequent communication with a positive tone, by a very explicit division of labor, by acute attention to time management, and by proactive action. From the start, the team members sought to establish clear goals for the project and also to minimize redundant efforts. Compared with team A, this group exchanged more messages on "how," not just "what." That is, the members did not just divide work and work independently, but rather divided the work and gave each other detailed comments on how to accomplish the work. Like team A, team B communicated their excitement and optimism in their first messages ("I am very excited about working on the project with all of you . . ."; "I am really looking forward to work with you . . . the assignments do look very interesting"). Also like team A, team B engaged in very little socialization outside of the initial team-building exercises although short pleasantries were exchanged (e.g., "Happy Easter").

Team B engaged in a continuous stream of communication. This team sent several messages each day. Indeed, one member wondered why the other members wanted to have chat sessions when e-mail was working so well. The team did, nevertheless, engage in several chat sessions. In most cases not all members were able to connect. In order not to exclude these members, detailed minutes were kept and e-mailed to the nonchatting members.

As with team A, the leadership role of team B was neither fixed nor constant. Although the team discussed the appointment of a team leader and other roles given their past group work experience, each member was a leader of his or her portion of the work, with process leadership shared among all members. One member took a leadership role in terms of setting a schedule and defining procedures (such as agreeing to check mail at least once a day); however, the other members revised her suggestions until the entire group agreed.

This team was conscious of time and managed it by repeatedly setting milestones and revising them accordingly. A team member wanted to prepare explicitly for unexpected emergencies by including "buffer time" in the schedule. The team also deliberately tried to accomplish parallel although highly interdependent activities (e.g., design of the layout of the page and the content of the page) to save time.

This team was highly proactive: At the outset, the team had decided that members should push forward without waiting for approval from others, although redundancies should be minimized. The team also discussed how each should notify others of upcoming constraints. This team established early on an expectation of participation. This threatened the functioning of the team when a new member, Tom, was added after the team-building exercises. After an initial flurry of messages, this new member was silent for nine days. An active team member wrote, "Where is Tom?" On the following day, another team member wrote: "Some of us may have trouble devoting time, even if only an hour or so, on a daily basis till project completion. If we have

competing demands on our time, we should communicate our constraints and make efforts to contribute in a meaningful matter at the same time." Shortly after this message, Joe sent a message about a possible chat session specifically including Tom's name and asking Tom what he thought. Then, several days later Tom responded, "I am not missing. I am still chasing all your work. . . . You can thought [sic] that I am an investigator, not your teammate." Four days later, Anna remarked in the message, "We don't know what's become of Tom." Tom responded that the group's activities were beyond his ability. Seven days later, Anna again noted, "Does anyone know whether Tom has dropped out or is he still part of this team?" Joe responded, "I think he has dropped out: no participation in 'chat' session, no contribution, no news, no ideas . . . ." Then Anna sent a message to the whole team asking Tom to withdraw. Tom responded, "No problem." Although the whole situation could have resulted in some significant group disagreement, because of the initiative taken by one of the members to remove him from the team, the group norms of acceptable participation were reinforced.

In team B, successful team work was associated with rapid and thorough response to the ideas of others in the group, whether they were procedural or content-based, and whether they were in complete agreement or carefully stated disagreement. The members were very cognizant of letting others know when they would, and when they would not, be available. Indeed, the team grew so accustomed to rapid feedback that at one point a member seemed startled that no one had submitted comments to her abstract—when she had sent the abstract less than twenty-four hours before! Rarely did the members have to ask for comments and even more rarely did members only cursorily peruse their teammates' work; rather, their feedback gave evidence of thorough and thoughtful reading of their teammates' work. The members developed close affinity with each other, and the final messages conveyed a strong expectation of future interactions.

### Team C: High Trust

Perhaps the most unique aspect of team C was that this team went through a metamorphosis or distinct transition halfway through the main task assignment. Before the metamorphosis, the team was very unlike team A and B, but after the transition, the team exhibited many of the characteristics of team A and B. The early messages from the members of team C were lukewarm at best and charged with social content and anxiety ("Am I alone here?"). The members kept begging for feedback and rarely received more than "GREAT" or a one-line response. The team was preoccupied with procedures about how members should label their messages, how the team should make decisions, how to behave in a chat session, who should do what, how much the project weighed toward a member's grade, and so on. The team had difficulty obtaining content from anyone—all the members seemed reluctant to proceed forward without approval from the others. One member constantly reminded the team of all of his work on the project, as if to imply that they were not working hard enough. Team members disappeared for days without prior notice, leading the

team to invent the notion of AWAL ("Absence Without Authorized Leave"). The progress was slow and largely accomplished as a result of external crises (e.g., a member had to report on the team's work in an organized class at his university).

Midway through the project, Kathy, after a two-day delay, reviewed the work that had been done and asked why her comments were "so bluntly" included in the page without discussion. She found this "a bit frustrating" and was "sad" that her contribution was not as much as the others. This seriously outraged another member, Jim, who felt that he was doing so much work and what did he get in response, complaints. The incident, however, was handled very promptly. Before even receiving any responses and only six minutes after her complaint, Kathy sent two messages stating that the team was nevertheless very good and she was very pleased. Evidently, before reading Kathy's two follow-up messages, Jim responded with his emotionally charged message, but he also immediately sent two follow-up messages apologizing (the first 25 minutes later and the second 72 minutes later)—before he, too, had heard anyone's response. Within hours the third active member, Jeff, wrote that disagreements were normal and that they were still a great team and should continue with the work. The incident, which easily could have permanently disrupted this team, instead helped to focus them and encouraged them to give feedback on each other's ideas.

After the incident, the members organized themselves, gave point-by-point feedback to each others' work, and felt greater confidence in their own portion of the work—indicated by less direct request for feedback. They also gave more positive feedback and thanks to each other for the work they were doing, as well as making remarks about how well the team worked together. The members themselves noticed the change in the team. At one point Kathy stated that she liked the "new group atmosphere"; the others readily agreed.

The team proactively excluded inactive team members. One member, who was receiving no course credit for the project, dropped off the team after a complaint that he was not contributing. Another member, Alex, made no comment for a long period and the other members informed the coordinator that he should be dropped from the team. However, he then returned and made some contributions that turned out to be of no value—a page of links he had designed without so much as a sentence description of where the links went and a set of pictures that were irrelevant to the project. This member again disappeared for a long period and the members began to ask "where is Alex?" and tried to decide what to do. One member sent another message to the coordinator that Alex should be dropped from the team. Alex again reappeared but this time was not forgiven. He tried to get into the good graces of one of the members, Jim, by addressing his message to Jim and stating that, while he knows that Kathy would never forgive him, he would like to rejoin. Jim did not respond. He then sent a second message to Jim saying that all the messages with documents from Jeff were unreadable, which he knows "may be on purpose," but he would still like to read them. Again, Jim did not respond. Alex sent a third message to Jim asking for the html code; again, there was no response. The team took active steps to redefine the team. From this point on, the team acted as if it were composed of three individuals.

The team established clear roles and divided work. Kathy searched for the informa-

tion that would be contained in the homepage, Jeff wrote the paper that was to be turned in and wrote definitions to be included in the homepage, and Jim did the page layout and coding for the homepage. Jim was the leader in terms of work; he consistently gave direction to the other two members on what needed to be done. At one point, Jim sent a fake message from Bill Gates that congratulated the team on their web pages. This message heightened the team's excitement and had continued motivational value even after Jim admitted sending the fake message. One of the other members took the lead in keeping an eye on the deadlines. This team consistently made promises of dates when they would do certain things and consistently stuck to their promised dates. They also made a point of notifying the members of dates when they would be unavailable to check their mail. Nine messages contained information concerning when they would not be available.

In summary, team C was able to make a transition from a rather passive team to one of the most active teams in the face of disaster. In the latter half of the main project, the team exhibited characteristics similar to teams A and B. Like teams A and B, the members expected to have future interactions, either virtual or face-to-face, reflecting the closeness that members had developed with one another.

### Team D: Low Trust

Team D was characterized from the beginning by little communication, few goals for the project, and very little feedback. The team began the collaboration by checking to see if others were already on-line and if the system worked without actually introducing themselves. However, even when responding to members that their messages were received, the other members merely replied "ok, got the message" but neither introduced themselves nor greeted the other members. In what could be interpreted as a sarcastic reply, one member wrote "reply reply reply reply reply" in response to another member's request for a reply if his message was received. While the message may not have been intended as sinister, the failure to include a greeting or a closing as well as the fact that it was the first message sent by this individual would certainly not be expected to create positive feelings among the recipients.

The first several messages indicated a lack of understanding of the project and the lack of task goals. In an early message, one member asks "what the heck" they are supposed to do. One response was "I also don't know what to do." Another was similar. The same individual repeated the question one week later. Another individual responded by giving the URL address where the instructions could be located but did not summarize for the member what the project entailed.

The members of this team showed great reluctance to take on individual responsibility and be proactive. Rather than volunteer, members would ask who would like to volunteer to do this or that. Eventually one member, Blake, emerged as a leader. There was only one instance of positive feedback where a member thanked another for providing leadership.

Indeed, the only member who made any progress was the leader. Others were silent or absent. For example, on April 23, Blake had completed a draft site and gave the

location to the other members and asked for feedback. There was no feedback except by a member who asked, "anyone out there?" Blake sent the address again, along with a long description of the work he had done. The only reply was "Er . . . nice page . . . should I know these words . . ." There would be no further communication in team D from this point until the end of the project. In this message, the leader responded to his own messages—"Hi Blake. No, I have no comment. Bye, Blake"—in what can be interpreted as a cynical reflection of the lack of feedback from the other members. The leader completed the final assignment alone and submitted it from "Team D" without mentioning inactive members. Ironically, three weeks later a member sent a desperate request for the URL—he needed it to receive course credit. There was no response.

### Team E: Low Trust

Team E suffered from so little communication that it appeared as if no one on the team was willing to contribute, unlike team D, where at least one member was willing to work. The first word to describe team E is blasé; the second is noncommittal. Each member in his or her introduction stressed time pressures. One member stated that his goal for the project was "to spend as little time as necessary but still get a decent grade." The other members had no particular goals. The concern with other commitments was evident throughout. One member asked each member to state how much the project was worth toward their grade. She appeared to want to know who should be mostly responsible for the project (i.e., the one for whom the project counted the most). This sort of logic appeared to be very destructive to the smooth functioning of a team. The same member later stated in a message how many projects she was working on. In a following message from another member, he too stated the number of different projects he was working on as though to suggest that she deserved no special leniency just because she had other work to do. The next message was from the third participating team member who stated that he had not checked his mail recently because he had "so much work" to do.

This team also suffered from lack of leadership. One member did volunteer to turn in the first team-building assignment and one member volunteered to code the team's project into html form. However, the latter offer was a mixed blessing as the member refused to do any other work, including giving feedback on ideas, aside from taking a final proposal and converting it to html form. The team was very task-oriented and never engaged in social comments of any kind. Only two instances of positive feedback were given—both when one individual thanked another for turning in the material.

The team communication was astoundingly low. At one point there was an eight-day lapse in communication (April 5–13) at a critical juncture in the project where the teams needed to choose their topic and define the parameters. On April 14, a member gave two seemingly interesting possible topics but never received any feedback on the ideas. On April 19 he asked again for feedback "even if you don't have strong feelings." Three days later there was a message—a team member volunteered to code

the project into html. She said, "Can we PLEASE try to respond" but did not even mention a word about the previous member's ideas. On April 22, a member gave four more ideas, again without commenting on the original two ideas presented by a member on April 14 and repeated on April 19. The contributor of the original ideas did provide feedback on the new ideas and contributed one more possible topic. The third participating member preferred the latter topic and that was the topic chosen. This member agreed to be responsible for two of the sections. He completed the sections by the determined date but his material lacked depth. The same problem occurred with the member responsible for the other three sections. Hence, the final product was a weak proposal prepared by individuals who divided the work and commented on no one's portions other than their own. This team did not choose the final topic until April 28—two days before the project was due!

Interestingly, this team had one nonactive member. One member asked what had happened to this member but no one responded. The nonactive member was ignored, perhaps because even the "active" members were barely active.

### Team F: Low Trust

Team F was characterized by both lack of individual initiative and an unwillingness to give substantial feedback to others' work. Like team E, team F suffered from infrequent participation. Two individuals were primarily responsible for the total output of the project and both of them refused to put forth full individual effort given the lack of commitment from the other members.

Although the team members expressed their interest and commitment in early messages, no member was willing to take charge. Each time something was needed, a member would ask who was going to do the activity rather than volunteering. This began with the first exercise in which a member said that someone needed to coordinate the activity and asked for a volunteer. No one volunteered. The member who asked the question eventually volunteered himself. This same member later asked three times, "who is writing the paper?" but did not contribute so much as a sentence or an idea. Only one individual gave any ideas for the project itself. Another individual gave feedback on the ideas, essentially stating that they were all unfeasible because of their scope or difficulty, but gave no additional ideas himself. Another member said the ideas were too general but offered no suggestions on how to focus.

This team had participants who would give very minor contributions—such as a URL site to be included in the page—but would give no description of the site, hence leaving the work of deciding what to call the link, and how to describe it in the paper, to someone else. That "someone else" was the member who stated early on that he wanted to be responsible for coding and page layout. As with the coder in team E, this individual was entirely unwilling to make any decisions regarding content. Throughout the project, he reminded the others that he was just coding the information they sent—they were supposed to tell him what to include and what not to include. Each time a URL address was sent, he replied, "am I supposed to include this?" He neither reviewed the link independently nor gave any comments concerning its suitability.

Rather than the messages full of content found in the high-trust teams, the messages of this team were brief and full of questions. At one point a member asked if it was all right if he sent some site addresses he found, instead of just sending them and describing them. The response was: "alright, alright, alright." Team F members were also unwilling to do anything beyond what they already knew. The person coding the pages was very experienced with page development and hence insisted on doing the coding but would do nothing else. Toward the end, the coder informed the other team members that he was going on vacation and had "already done" his "share of the work."

At best, the members of this team, excluding the one member who did send some ideas and wrote sections of the paper, can be described as inactive. Only three instances of positive feedback occurred, two of which were rather mixed, "nice work, but . . ." The team was unable to complete the final assignment.

## Discussion

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A PATTERN-MATCHING APPROACH [5, 41] WAS USED TO INFER behaviors and strategies common to the high-trust teams, but less common to, or nonexistent in, the low-trust teams. Table 7 summarizes the results on the strategies. Strategies inferred were: proactive action, task versus procedural orientation, positive tone, rotating leadership, task goal clarity, role division, time management, nature of feedback, and frequent, sometimes intense bursts of interaction. The strategies are reinforcing of each other.

### Proactive Orientation

The case studies suggest that the members in high-trust teams exhibited individual initiative, volunteered for roles, and met their commitments. The high-trust teams also dealt decisively with members who were perceived to be free-riders. The low-trust teams were opposite in these respects. The low-trust teams suffered from inaction, characterized by the asking of questions but rare delivery of any substantive work, and by asking for volunteers but rarely volunteering. The team members also rarely notified the team in advance of their absences.

On all three high-trust teams there were instances of members stating in advance that they would be out of town for the weekend, or for as much as a week, and then finding a computer from which to log in and contribute. The exertion of extra effort reinforced the level of perceived commitment the members had toward the team.

The high-trust teams dealt with free-riders by confronting, rather than ignoring or accepting, the problem. The teams took initiatives to inform the project coordinator of any nonactive members. Even though the teams were unaware of whether or not their complaints resulted in the official withdrawal of the nonactive member from the project, they were more comfortable as a team if they identified the members who were not contributing and redefined the team around the active members. By contrast, the low-trust teams ignore the free-riders.

Table 7. Strategies between High- and Low-Trust Teams

Behaviors/strategies	High-trust teams	Low-trust teams
1. Style of action	• Proactive	• Reactive
2. Focus of dialog	• Task output driven	• Procedural
3. Team spirit	• Optimistic	• Pessimistic
4. Leadership	• Dynamic	• Static
5. Task goal clarity	• Team's responsibility	• Individual responsibility
6. Role division and specificity	• Emergent and interdependent	• Assigned, independent
7. Time management	• Explicit/process-based	• Nonexistence
8. Pattern of interaction	• Frequent, few gaps	• Infrequent, gaps
9. Nature of feedback	• Predictable, substantive	• Unpredictable, nonsubstantive

### Task versus Procedural Orientation

In high-trust teams, the action orientation meant that team members were highly focused on results. The communication almost exclusively rallied around the assignments. Rarely did the teams have time for social dialogue. One of the high-trust teams discussed topics unrelated to the assignments, but this was only in the early stages when the team had difficulty in making progress. Although the communication in the high-trust teams was task-oriented, it is important to note that it was still empathetic. The team members discussed each others' tasks and results in a very supportive and amicable fashion, which in turn reinforced the team's collective commitment and good will.

Like the high-trust teams, the low trust teams engaged in little social communication. Yet, unlike the high-trust teams, the low-trust teams rarely expressed empathy: What little emotion was expressed tended to reflect uncertainty about whether anyone was reading their messages or frustration and disappointment that no one else was contributing.

Interestingly, the high-trust teams did not spend much time on group procedures, except one team in the early slow stages. Rather than being concerned that someone else was working on precisely the same thing, individuals on the high-trust teams tried to produce high-quality work and then share the work with the team for feedback and improvement. The low-trust teams spent relatively more time on procedures as members tried to evade responsibility and get others to do the work.

### Positive Tone

The high-trust team members expressed excitement and showered other members with compliments and encouragement. On several occasions, the high-trust teams expressed how fortunate they were to have such a well-functioning team. Even at the end, the team members made explicit attempts to laud each other for excellent work.

Two of the high-trust teams were convinced by the start of the third assignment that they would be the winning team.

The high-trust teams handled disagreements so gently that it was barely perceptible that a disagreement had occurred. If a member made a suggestion with which another member disagreed, such as the suggestion of a member of team C that they should use majority vote to determine the idea chosen for the final project, the dissenting member responded not by directly addressing the point of disagreement but by offering an alternative along with an explanation.

The low-trust teams lacked positive tone in their communications. Compared with the high-trust teams, the low-trust teams exhibited little emotion of any kind in their messages. Nor did the team members express any interest in winning the \$600 award; rather, the low-trust teams focused on what they might lose if they performed poorly rather than on what they might gain if they performed well. In addition, the low-trust teams were inordinately concerned with the differences in the course credit that team members received for completing the final project. The low-trust teams had few instances of disagreement, but because they were giving so little feedback on the other members' work, there was not much opportunity to disagree.

### Rotating Leadership

The high-trust teams rotated leadership—the members each demonstrated certain leadership traits during the course of the project but the actual leader was neither chosen nor consistent throughout. As the perceived need for a member to press the others to present ideas arose, a member filled the position. As the need arose for someone to organize the remaining work, a member filled that position. In terms of the output, the same would apply. The members were leaders in their particular area of skill and the other members followed their directions. The members who took on responsibility for writing the html for the projects directed the other teammates during the coding period, whereas the members responsible for writing the draft made suggestions to the other team members concerning what to do. By contrast, the low-trust teams had no leadership or, in one case, a leader with no followers.

### Task Goal Clarity

The high-trust teams discussed the goals of the assignments to a greater extent than the low-trust teams. In case of ambiguity in the assignments, the members in the high-trust teams did not hesitate to contact the coordinator with questions rather than making their own assumptions. Already during the team-building exercises, the high-trust teams exhibited knowledge of the assignment objectives and expressed what their personal goals were in the context of the overall collaboration and the assignments. Contrary to the high-trust teams, the low-trust teams undertook little discussion of task goals. Most of the communication concerning task goals was in the context of a member not knowing what they were supposed to do. In these instances, a member in the low-trust teams tended to provide only the URL to the site where the

assignment information resided rather than summarizing the assignments him or herself for the benefit of others. Members of the low-trust teams did not exhibit knowledge of the assignments and did not tie their own personal goals to the assignments during the team-building exercises beyond statements of "spend as little time as necessary."

### Role Division and Specificity

Although the role of an individual team member tended to emerge after the individual had produced something on his or her own, each of the high-trust teams exhibited various roles for the team members. The fact that individuals were not assigned to teams based on their particular specialization or skill may have necessitated a flexible role arrangement whereby the role was decided after an individual took initiative for a certain task and produced a result ("You will be our webmaster"). Also in high-trust teams, the division of work did not mean complete independence. Rather, one person would come up with the first iteration of the work and others would provide detailed feedback. Hence, the high-trust teams associated roles with independence followed by several iterations of feedback and rework. The low-trust teams appeared to associate division of work with complete independence of work. In summary, the high-trust teams appeared to use roles so that they were able to reduce team interdependence to moderate levels. The low-trust teams divided work so that they could eliminate their interdependence.

### Time Management

The high-trust teams explicitly discussed the assignment schedules, established milestones, monitored the milestones, and kept a close eye on time, reminding other members of impending deadlines. Furthermore, the high-trust teams were more aware of time zone differences and how to manage the global clock to reduce the "downtime" when no one was working on the common parts. The low-trust teams did not discuss time management apart from reminding others of the date when the assignment was due. The low-trust teams only referred to the time zone differences in the context of who should submit the completed assignments. The low-trust teams were also more likely to ask the coordinator for extra time. In short, the low-trust teams exhibited neither a sense of urgency from impending deadlines nor a notion of managing time.

### Nature of Feedback

In the high-trust teams, members gave substantial feedback oriented toward improving the content of a fellow member's work. The feedback frequently involved some content contributions to add to the work, as well as some organizing and editing comments. In the low-trust teams, feedback was often a very minor "ok" or "looks good to me" statement that added very little value to the actual work. Thus, even if a

member specifically requested feedback on his or her work, he or she was likely to get only an acknowledgment that the work was perused, however cursorily.

### Frequency and Pattern of Interaction

Probably to reduce the uncertainty of the global context, high-trust teams engaged in frequent communication, gave substantive feedback on fellow members' work, and notified each other of their absences and whereabouts. Overall, some of the high-trust teams had four times the message volume of a low-trust team. Frequent, and sometimes intense, bursts of interaction appeared to reinforce trust in the high-trust teams. Low-trust teams repeatedly issued messages of "Is there anyone out there?"

In both high- and low-trust teams, individuals were reluctant to believe that their messages were actually successfully sent if they did not receive fairly rapid feedback. As a means of appeasing the stress related to not knowing whether one's message was received and, if so, whether it was read, the members on the high-trust teams were careful to inform their teammates when they would, and when they would not, be available to check their messages. This gave the other members a degree of certainty concerning when their messages would be viewed and answered. By contrast, the low-trust teams suffered from lengthy unexplained lapses in communication followed by sudden unexpected reemergences.

### A Model of Trust in Global Virtual Teams

Triangulation of our qualitative results with the recent literature on trust suggest that the three high-trust teams might have exhibited a form of "swift" trust. Swift trust [21] was developed to explain behaviors in face-to-face temporary teams. In a temporary team, team members "have never worked together and do not expect to work again" [21, p. 168]. Members of such teams do not have the time to develop trust in a gradual and cumulative fashion. Rather, the team members act as if trust is present from the start.

Whereas trust is typically conceptualized as either an affective or a cognitive construct, swift trust is a form of depersonalized action. According to Meyerson, Weick, and Kramer [23], "There is less emphasis on feeling, commitment, and exchange and more on action, . . . and heavy absorption in the task" (p. 191); "swift trust may be a by-product of a highly active, proactive, enthusiastic, generative style of action" (p. 180). The "swift trust" enables members to take action, and this action will help the team maintain trust and deal with uncertainty, ambiguity, and vulnerability while working on complex interdependent tasks with strangers in a situation of high time pressure.

Besides the action orientation, the other strategies associated with the three high-trust teams seem to align with the Meyerson et al. [23] coping mechanisms of temporary teams and hence to be associated with swift trust. Meyerson et al. discuss how there are few purely social exchanges in temporary teams because "anything that subtracts from task performance . . . should be a glaring threat" (p. 177). We found

the global virtual teams to be task-oriented. Meyerson et al. [23] also point to the need to have a moderate level, not a high level, of dependence on any particular member to reduce perceived vulnerability. The strategy of rotating leadership reduced dependence on any particular person. The strategies of clear task goals, role division, and specificity gave the teams a sense of clear expectation and task systems and thereby provided the illusion of reduced vulnerability. The sense of limited time and explicit time management is related to Meyerson et al.'s [23] comment that "temporary teams rarely exhibit certain kinds of dysfunctional group dynamics" that deal with "jealousy, misunderstandings, and hurt feelings" (p. 190). According to Meyerson et al. [23], "there is simply not enough time for things to go wrong" (p. 190). Finally, high levels of interactivity tend to reduce ambiguity and uncertainty and should strengthen trust in temporary teams [23]. In the three high-trust teams, members communicated frequently and provided extensive and substantive feedback to each other.

The high-trust teams appeared to exhibit swift trust from the outset. In particular, the teams' early messages contained traces of initiative and trustful actions. The low-trust teams did not exhibit any overt lack of trust in the beginning; hence, we can only assume that trust also existed *ex ante* in these teams. However, this trust decreased almost immediately, because the members lacked action and initiative. By contrast, the action orientation in the high-trust teams appeared to reinforce and strengthen trust. Hence, action seems to be an important antecedent as well as an outcome of trust. Action that went beyond the call of duty strengthened trust.

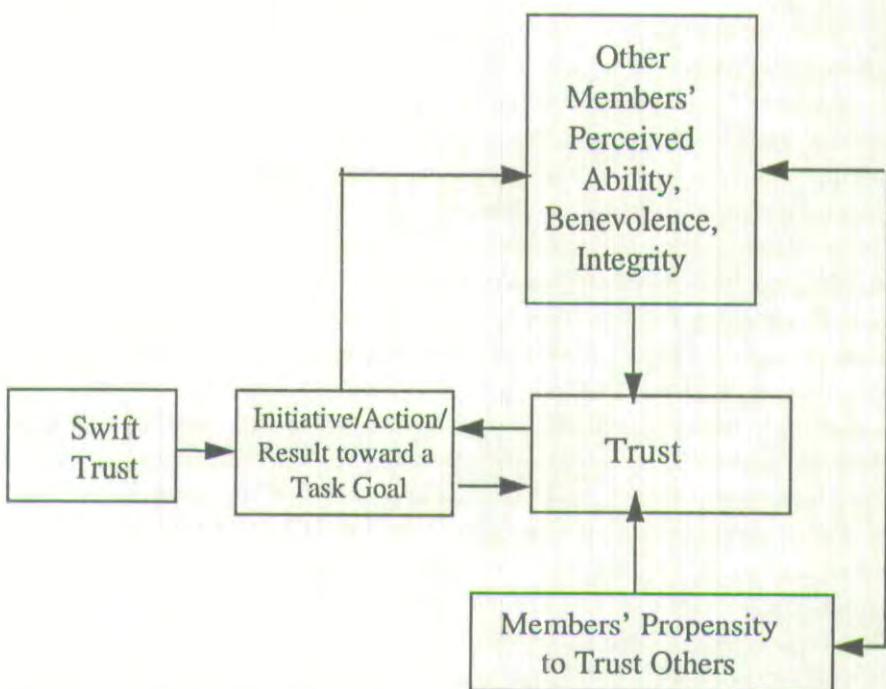
The current case analysis does not provide clear evidence on the relationship between action and the other antecedents of trust: integrity, ability, benevolence, and propensity to trust. Boyle and Bonacich [1] maintain that trusting behavior will affect trust directly. By contrast, Mayer et al. [22] argue that trusting behavior will influence trust indirectly through the antecedents of trust; that is, inactivity might be interpreted as a lack of goodwill (benevolence), a lack of ability to contribute (ability), and/or a lack of reliability and honesty (integrity).

In summary, trusting action is as much an antecedent of trust as an outcome of it. The relationship between action and trust appears to be highly recursive in a virtual-team context. Figure 2 advances a model of trust for global virtual teams.

## Conclusion

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THE PURPOSE OF THE REPORTED STUDY WAS TO EXPLORE the antecedents of trust in global virtual teams. Although the team-building exercises had a positive effect on the perceptions of other members' integrity, ability, and benevolence, they did not have a direct effect on trust. In the early phases of teamwork, team trust was predicted more strongly by perceptions of other team members' integrity, and least strongly by the perceptions of their benevolence. The salience of other members' perceived ability on trust decreased over time. The members' own propensity to trust had a significant, although unchanging, effect on trust. Perhaps the most interesting finding was that the qualitative case analysis suggests that high-trust



*Figure 2.* A Model of Trust in a Global Virtual Team

teams exhibit swift trust [23]. Prior to discussing implications for research and practice, we consider some of the limitations.

### Limitations

Given that the teams did not have an opportunity to meet in person or use telephone or video conference facilities, one might argue that the current context was contrived. Nevertheless, from a practical standpoint, our study provides a glimpse of the future where compressed time windows and project budgets do not allow people to travel for overseas team meetings. The study provides a rare opportunity to examine pure virtual interaction free from any influences of face-to-face interaction.

The study's methodology can be criticized in several ways. First, the team-building exercises might have been too brief or might have been considered artificial by the participants. Devising exercises to increase trust in teams is a potentially lucrative project but was beyond the scope of the current study. Second, the tasks might not have been appropriate to all participants even though we had no evidence suggesting that certain participants found the project irrelevant to their studies. Third, the case analyses relied on members' using the team address rather than direct their mail to the individual members' addresses. Hence, the team analyses might be based on limited information. Our prior studies [13] suggest that teams send relatively infrequent individually directed messages because it is much easier to use a team address. Fourth, the measurements of trust and the antecedents of trust were modified from a scale

intended for dyadic, as opposed to team, relationships. Finally, although professors whose students were invited to participate were informed that the collaboration should count for 20 to 40 percent of a student's course grade, there were wide discrepancies in course credit and hence in participants' risk level.

The external validity of the results might be faulted for the use of students as participants. One should note, however, that the students were in masters' programs and most of the students had significant work experience. The theory of swift trust assumes that people are assigned to teams on the basis of their ability. In the current study this was not the case because we did not start this study by exploring swift trust. Many transnational teams have an appointed project leader. The current teams were self-directed and, unless they appointed a leader, a leader emerged, or leadership was shared, the teams were "leaderless." In addition, some teams had only two active members, where other teams had as many as four or five active members. Unfortunately, we were not able to ascertain whether or not all active members completed the survey. Hence, there is a potential bias in the responses in that some active team members may not have completed the surveys and we cannot determine the reasons for their failure to provide responses. Finally, the teams were limited to electronic mail and occasional chat sessions: No video conference or telephone conference facilities were available. Hence, the technology was of lower bandwidth than might be expected in situations where team members do not travel.

### Implications for Research

The research on trust in global virtual teams is a wide open field. Future research should examine the relationship between trusting behavior and the other antecedents of trust. Our earlier study alluded to the importance of structure and norms in well-functioning virtual teams [13]. Future work might study how norms emerge and how they are enacted. The current study suggests tentatively that, once the high-trust teams agreed on, for example, the acceptable time lapse between messages, the members adhered to this relatively well and those who did not were asked to leave the team. It remains unclear whether the existence of trust allowed these norms to emerge or whether the consensus of norms reinforced the trust. We suspect both are true. Future studies should also examine if virtual teams go through the type of transition between inertia and revolution in the work behaviors and themes found by Gersick [8] in face-to-face teams. Such transition was only explicitly evident in team C, but our qualitative analysis of three high- and three low-trust teams might not have been in-depth enough. Future research also needs to verify the current findings and more rigorously assess swift trust and the means to maintain it. The initial list of strategies may or may not be unique to our context. Also, future work needs to develop an understanding of the relationship between swift trust and team behavior and should explore distrust versus trust in a virtual context. Finally, future research should study whether dyadic and team trust are substantially different and require fundamentally different measures.

Finally, much work remains in terms of the type of tasks, individuals, team size, and

the length of project duration that are most suited to virtual collaboration. There is a plethora of issues related to global clock management and the best ways to divide and integrate work in a team dispersed around the world. Future studies should assign individuals to teams on the basis of skill or specialization and should examine the concept of roles in virtual teams.

### Implications for Practice

For practicing global virtual teams, the study suggests a number of strategies that they might deploy to reinforce trust and, in turn, to improve their team process outcomes. These strategies include proactive behavior, empathetic task communication, positive tone, rotating team leadership, task goal clarity, role division, time management, and frequent interaction with acknowledged and detailed responses to prior messages. The study also points out the importance of having as virtual members those who have a high propensity to trust. But, perhaps most important, virtual members should have high levels of initiative, results orientation, and integrity.

### Concluding Note

The current paper has explored the emerging phenomenon of global virtual teams where only virtual, not face-to-face, interaction is possible. The antecedents commonly associated with trust in face-to-face dyadic relationships—trustor's perceived ability, benevolence, integrity, and trustee's propensity to trust—were found to predict trust in the virtual-team context. A number of behavioral strategies were identified that appeared to distinguish the highest-trust teams from the lowest-trust teams. These strategies suggested the presence of swift trust. The paper proposed a preliminary model of trust for global virtual teams.

Although the current analysis was on the team level, one might be able to infer implications for individuals. Those individuals who perform best in global virtual teams are not likely to be entirely different from individuals who perform best alone: individuals who are action-oriented, who are willing to take initiative on their own, and who are goal-driven. Latham and Lock [18] found that, in an international setting, a team member skilled in self-management, in goal setting, self-monitoring, and self-assessment was critical for performance. Snow, Snell, and Davison [33] found similar results: In successful transnational teams, team members were committed to the team's mission and norms, could be counted on to perform their respective tasks, and enjoyed working in a team. When such capable individuals commit to a team, they are able successfully to manage the uncertainties and unknowns of a global virtual-team environment.

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## APPENDIX A: Participating Universities

Aarhus School of Business, Denmark	Keio Business School, Japan
Asian Institute of Management, Philippines	Latrobe University, Australia
University of Auckland, New Zealand	University of Montreal, Canada
University of Caen, France	National University of Singapore
University of Calgary, Canada	University of Ottawa, Canada
University of Canberra, Australia	Universiteit van Pretoria, South Africa
Copenhagen Business School, Denmark	University of Sao Paulo, Brazil
De Montfort University, Great Britain	San Jose State University, U.S.
University College Dublin, Ireland	University of Texas at Austin, U.S.
Ecole des HEC, France	Thammasat University, Thailand
Erasmus School of Business, Netherlands	Turku University, Finland
Fundacao Getulio Vargas, Brazil	University of Twente, Netherlands
University of Gdansk, Poland	Vienna University of Economics, Austria
University of Jyvaskyla, Finland	University of Western Australia, Australia

## APPENDIX B: Measured Used

The items measuring benevolence, ability, integrity, trustworthiness, trust, and propensity to trust are as follows:

### Benevolence

The other team members were very concerned about the ability of the team to get along.

The outcomes of this project are very important to the other team members.

The other team members would not knowingly do anything to disrupt or slow down the project.

The other team members are concerned about what is important to the team.

The other team members will do everything within their capacity to help the team perform.

### Integrity

The other team members try hard to be fair in dealing with one another.

The other team members have a strong sense of commitment.

I never am doubtful about whether the other team members will do what they promised.

I like the work values of the members on this team.

The other team members do not behave in a consistent manner—I am never sure if they are going to do what they promise or not.

The other team members display a solid work ethic.

### Ability

I feel very confident about the other team members' skills.

The other team members have much knowledge about the work that needs to be done.

The other team members have specialized capabilities that can increase our performance.

The other team members are well qualified.

The other team members are very capable of performing their tasks.

The other team members seem to be successful in the activities they undertake.

### Trust

If I had my way, I wouldn't let the other team members have any influence over issues that are important to the project.

I would be comfortable giving the other team members complete responsibility for the completion of this project.

I really wish I had a good way to oversee the work of the other team members on the project.

I would be comfortable giving the other team members a task or problem that was critical to the project, even if I could not monitor them.

### Trustworthiness

Members of my work group show a great deal of integrity.

I can rely on those with whom I work in this group.

Overall, the people in my group are very trustworthy.

We are usually considerate of one another's feelings in this work group.

The people in my group are friendly.

There is no "team spirit" in my group.

There is a noticeable lack of confidence among those with whom I work.

We have confidence in one another in this group.

### Propensity to Trust

One should be very cautious when working with foreign students.

Most foreign students tell the truth about the limits of their knowledge.

Most foreign students can be counted on to do what they say they will do.

If possible, it is best to avoid working with foreign students on projects.

Most foreign students are honest in describing their experience and abilities.

Most foreign students answer personal questions honestly.

Most foreign students are very competent in terms of their studies.

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# The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration

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## Abstract

This paper proposes that maintaining “mutual knowledge” is a central problem of geographically dispersed collaboration and traces the consequences of failure to do so. It presents a model of these processes which is grounded in study of thirteen geographically dispersed teams. Five types of problems constituting failures of mutual knowledge are identified: failure to communicate and retain contextual information, unevenly distributed information, difficulty communicating and understanding the salience of information, differences in speed of access to information, and difficulty interpreting the meaning of silence. The frequency of occurrence and severity of each problem in the teams are analyzed. Attribution theory, the concept of cognitive load, and feedback dynamics are harnessed to explain how dispersed partners are likely to interpret failures of mutual knowledge and the consequences of these interpretations for the integrity of the effort. In particular, it is suggested that unrecognized differences in the situations, contexts, and constraints of dispersed collaborators constitute “hidden profiles” that can increase the likelihood of dispositional rather than situational attribution, with consequences for cohesion and learning. Moderators and accelerators of these dynamics are identified, and implications for both dispersed and collocated collaboration are discussed.

(*Dispersed Collaboration; Dispersed Teams; Distributed Work; Virtual Teams; Mutual Knowledge; Information Exchange; Information Sharing; Shared Understanding; Attribution; Proximity; Computer-Mediated Communication; Systems Dynamics; Cognitive Load*)

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The organization of group work and the means of communication to support it are changing. Developments in communication and collaborative technologies have made it feasible for groups to work together despite physical dispersion of members. Organizations have been quick to experiment with geographically dispersed work teams to take advantage of interorganizational and international opportunities and maximize the use of scarce resources. This is likely to be an increasingly prevalent and important form of work in the years ahead (Arthur and

Rousseau 1996, Boudreau et al. 1998, DeSanctis and Poole 1997, Handy 1995, Kemske 1998, O’Hara-Devereaux and Johansen 1994, Townsend et al. 1998).

Geographically dispersed teams are groups of people with a common purpose who carry out interdependent tasks across locations and time, using technology to communicate much more than they use face-to-face meetings (adapted from Lipnack and Stamps 1997, and Maznevski and Chudoba 2000). The use of such teams has outpaced our understanding of their dynamics, and inexplicable problems have been noted. In a field description of dispersed collaboration, Armstrong and Cole (1995, p. 187) observe these puzzles: “A decision made in one country elicits an unexpected reaction from team members in another country . . . Conflicts escalate strangely between distributed groups, resisting reason. Group members at sites separated by even a few kilometers begin to talk in the language of ‘us and them’.”

This paper utilizes the communications literature on “mutual knowledge” to explore challenges of communication and collaboration under dispersed and technology-mediated conditions. Mutual knowledge is knowledge that the communicating parties share in common and know they share (Krauss and Fussell 1990). In the work of communication theorist Herbert Clark and his associates, mutual knowledge is referred to more broadly as “common ground,” and considered integral to the coordination of actions (Clark 1996, Clark and Carlson 1982, Clark and Marshall 1981). But members of dispersed teams do not stand on common ground. Indeed, the usage “common ground” suggests how deeply engrained physical copresence and shared physical setting may be to establishing shared understanding and affiliation. In 1990, Krauss and Fussell raised the question of how the use of new communications technologies to support cooperative work would interact with the problem of establishing mutual knowledge. This paper takes up that question and adds to it two additional ones: “How does geographic

dispersion of team members affect the mutual knowledge problem?" and "To the extent that geographic dispersion and use of new communications technologies affect the mutual knowledge problem, what are the consequences for collaboration?"

## The Mutual Knowledge Problem

Establishing mutual knowledge is important because it increases the likelihood that communication will be understood (Clark 1996, Clark and Carlson 1982, Clark and Marshall 1981, Fussell and Krauss 1992, Krauss and Fussell 1990). People may start with the same information, have a shared experience, or share information through communication. In each case, mutual knowledge consists not only of the information itself but also the awareness that the other knows it. For example, Clark (1996) describes standing on a beach on a beautiful day, examining a rare conch shell. If his son joins him, their mutual knowledge now includes the characteristics of the beautiful day, the beach and the sea, the presence of Clark, the presence of the son, the conch shell between them, and their awareness that they share this knowledge in common. When they talk with each other then and later, they can refer to aspects of this experience with considerable confidence that what they say will be understood by the other. They also can coordinate future actions with the help of this mutual knowledge. For example, they could agree to meet back at the same place in an hour.

Mutual knowledge increases the likelihood of comprehension because it allows speakers "to formulate their contributions with an awareness of what their addressee does and does not know" (Krauss and Fussell 1990, p. 112). Proceeding without mutual knowledge, people may speak and understand what is said on the basis of their own information and interpretation of the situation, falsely assuming that the other speaks and understands on the basis of that same information and interpretation (Blakar 1985). Krauss and Fussell (1990) describe three mechanisms by which mutual knowledge is established: direct knowledge, interactional dynamics, and category membership. The next sections draw on several research literatures to consider how dispersed collaboration and use of new communication technologies impact these three mechanisms.

### Direct Knowledge

Direct knowledge is created in the course of firsthand experience with individuals (Krauss and Fussell 1990). One can make informed guesses about what they know and do not know on the basis of experiences shared with them and knowledge of their habits and environment

gleaned from firsthand observation. The mutual knowledge that Clark and his son have concerning their day at the beach is direct knowledge because it is based on shared experience in a particular setting. For members of dispersed collaborations, opportunities to achieve unmediated knowledge of their partners and their partners' situations are likely to be limited. Rather than absorbing direct knowledge by visiting each other's offices, walking through the same building, attending the same meetings, and driving the same streets, dispersed collaborators must find other means to establish what their remote partners do and do not know: interaction and category membership.

### Interactional Dynamics

In lieu of direct knowledge, mutual knowledge can be established through interaction. However, research concerning information sharing and media effects in groups raises questions about the likelihood of success under dispersed and technology-mediated conditions. It is well established that groups that meet face-to-face tend to dwell on commonly held information in their discussions and overlook uniquely held information (Stasser and Stewart 1992; Stasser et al. 1995; Stasser and Titus 1985, 1987). According to Stasser and his colleagues, group members engage in discussion by sampling from their pool of information. As the number of people who have a particular piece of information increases, so does the mathematical probability that it will be mentioned in the group's discussion. Moreover, when it is mentioned, it probably will be salient to a larger proportion of the group because they have encountered it previously. By contrast, pieces of information known to only one or a few people must compete in the information pool with more commonly held information. If mentioned, uniquely held information may not be as salient to group members as commonly held information, and fail to draw attention.

When a group's discussion is mediated by technology, the problem seems to be worse. Three experimental studies compared information exchange in groups using synchronous text-based computer conferencing and face-to-face groups. They found information exchange to be less complete and discussion more biased in the groups using technology to communicate (Hightower and Sayeed 1995, 1996; Hollingshead 1996). The computer-mediated groups exchanged less information overall and took more time doing it. One of the most robust findings concerning the effect of computer mediation on communication is that it proceeds at a slower rate than does face-to-face (Lebie et al. 1996, Straus 1997, Straus and McGrath 1994, Walther and Burgoon 1992). There is considerable evidence that groups using this medium take longer to complete tasks

than groups working face-to-face (Kiesler et al. 1985, McGuire et al. 1987, Weisband 1992). The slower rate has been attributed to the time required to type words rather than say them (Siegel et al. 1986) and the effort required to convey nuances in text without paraverbal and nonverbal cues such as tone of voice, facial expression, and gesture (Hightower and Sayeed 1995, 1996; McGrath and Hollingshead 1994). For these reasons, it appears that groups communicating through such means are not able to sample as much information from their information pool during a given period of time as can groups working face-to-face. As a consequence, less uniquely held information is aired, and their discussion is more biased by commonly held information.

Warkentin et al. (1997) got somewhat different results in a follow-up study under different conditions. They compared information exchange in student groups meeting face-to-face without computer support with information exchange in groups whose members were located at three different universities across the United States and who used asynchronous computer conferencing to communicate. The dispersed groups still exchanged less unique information than the collocated groups; however, the relationship did not reach significance in this study. It is possible that the technology used (an asynchronous rather than synchronous mode) and the longer time frame given the dispersed groups (three weeks versus 25 minutes) allowed for improved information exchange by giving group members offline time to assess information and frame their contributions.

It is important to note how the study conditions differ from geographically dispersed collaboration in practice in organizations. Tasks were relatively straightforward. People did not have to gather information themselves; they were given a packet of clues. By contrast, dispersed collaborators in organizations typically work on complex tasks for which the relevant information must be distinguished from millions of other details. Hightower and Sayeed (1995) note that when groups using computer-mediated communication were given a higher information load, their discussion became even more biased. They express concern about how groups communicating through such media will handle ambiguous and complex information problems.

Dispersed collaboration is distinguished both by heavy use of mediated communication and distribution of partners across more than one location. Thus far, we have examined media effects on information sharing. It is also important to consider the effects on information sharing of differences among locations and distribution of information across locations. The locations of dispersed collaborators may differ in their physical layout and travel

requirements, holidays and customs, access to information, available equipment and support, strength of competing demands, and so forth. For dispersed team members to understand each other and coordinate their work, they must achieve mutual knowledge concerning such differences. However, information about one's own location and context may be uniquely held information. According to the principle of group discussion based on sampling from the information pool, such information is less likely to be mentioned and heeded in group discussions than is commonly held information.

When people attempt to achieve mutual knowledge through interaction, they must both share information and confirm that the information has been received and understood. Electronic mediation poses hurdles not only to information sharing but also confirmation. Give and take is hampered by the slower pace and greater effort required by most forms of mediated communication. In particular, conversations conducted through computers do not typically provide efficient back-channel feedback (Brennan 1998). Back-channel feedback includes head nods, brief verbalizations such as "yeah" and "m-hmmm," smiles, and the like (Kraut et al. 1982, Yngve 1970). These non-verbal and brief verbal cues efficiently signal the state of mutual knowledge without taking over the speaking turn. In addition, feedback lags associated with mediated communication and dispersed collaboration are likely to have a devastating impact on the establishment of mutual knowledge. "A delay of 1.6 seconds is sufficient to disrupt the ability of the sender to refer efficiently to the . . . stimuli, despite the fact that the back-channel response is eventually transmitted," observe Krauss and Fussell (1990, p. 132).

Thus, the communication literature raises the following questions: Will uniquely held information be shared and recognized in geographically dispersed, computer-mediated teams? Will feedback in such teams confirm receipt and understanding of information exchanged? In other words, can interaction effectively establish mutual knowledge in dispersed computer-mediated teams?

### Category Membership

Finally, people make assumptions about others' knowledge on the basis of the social categorizations they apply to them (Clark and Marshall 1981, Krauss and Fussell 1990). For example, they assume that a cabdriver knows the route to the airport and that a fellow American knows the words to the national anthem. In dispersed collaborations, people may assume mutual knowledge on the basis of shared professional status or organizational membership. However, achieving mutual knowledge will be

more difficult if a dispersed team spans functional, cultural and organizational boundaries. Many dispersed collaborations do span such boundaries.

In addition to influencing assumptions about shared knowledge, social categorization affects the development of relationships among people communicating via computer mediation. Lea and Spears (1991, 1992, 1993) have observed that the medium reduces the number of cues available to communicators about each other relative to face-to-face communication. According to their social identity/deindividuation (SIDE) theory, when people communicate with others they do not know well through such media, they experience feelings of isolation, anonymity, and deindividuation. As a consequence, they "overattribute" on the basis of the few social cues they glean. They use relatively meager information to assign remote others to social categories and treat them accordingly. If they conclude that they share an identity with a remote partner, they are more likely to view the relationship and the remote other positively than if they find no shared social identity. Thus, SIDE theory asserts that social categorizations exert considerable influence over conclusions drawn about remote others, positive and negative feelings about them, and affiliation with them in lieu of the individuating information available in relationships carried out face-to-face.

The salience of social categorization for dispersed collaborators raises the following questions: Does social categorization help dispersed collaborators establish mutual knowledge of important matters? If people assign remote others to social categories on the basis of meager information, will they form inappropriate expectations about what they know? If they form inappropriate expectations, what are the consequences for the relationship?

### **Consequences of Failure to Establish Mutual Knowledge**

The preceding discussion suggests that it may be difficult for geographically dispersed, technology-mediated teams to achieve mutual knowledge. This section considers the consequences of failure to establish mutual knowledge. In the communications literature, mutual knowledge is considered to be a precondition for effective communication and the performance of cooperative work. However, according to Krauss and Fussell (1990), this does not mean that communication must be error free. It depends on whether the consequences of misunderstandings are major or minor, and whether the dynamics of conversation provide mechanisms for detecting and correcting errors. Beyond this, there is little discussion in this literature of specific consequences of failure to establish mutual knowledge. "What is important for us," writes

Clark (1996, p. 121) is "how common ground gets staked out and exploited." Therefore, I turn to other literatures to explore the consequences of failure to establish mutual knowledge on decision quality, productivity, and relationships in dispersed teams, taking into account the moderating factors noted by Krauss and Fussell (1990).

*Decision Quality and Productivity.* As discussed above, when task-relevant information is distributed among members of a group, there is a risk that they will fail to share and heed uniquely held relevant information. Research shows that the consequence is poorer decision quality (Dennis 1996, Stasser and Titus 1985). The risk may be greater for dispersed teams relative to collocated teams for two reasons. First, there is a significant probability that task-relevant information will be distributed across locations and that critical pieces of information will surface at isolated locations. Second, a dispersed group's means of communication will likely restrict interaction, such that sampling from the information pool is less than it would be for a collocated team, with the consequence of poor decision quality.

Groups may attempt to protect decision quality by monitoring and correcting failures of mutual knowledge. In this case, a critical consideration is the ease and speed of detecting and correcting errors (Krauss and Fussell 1990). The more arduous and time-consuming this process is, the greater the probable loss in productivity. This could be a problem for dispersed groups using computer-mediated communication because the interaction required to detect and correct communication errors seems to be less efficient in conversations involving computers than in face-to-face conversations (Brennan 1998; Hightower and Sayeed 1995, 1996; McGrath and Hollingshead 1994; Siegel et al. 1986). Hightower and Sayeed (1995, p. 43) point out that "creating mutual understanding . . . require(s) group members (using computer-mediated communication) to transmit much more information than those working face to face." It is reasonable to expect that dispersed groups using such media will have to sacrifice speed if they must protect decision quality, and decision quality hinges on mutual knowledge of distributed information.

This discussion raises the following questions: When task-relevant information is distributed, do dispersed teams make poorer quality decisions because of failure to establish mutual knowledge? Do dispersed teams develop strategies to limit information-processing burdens and preserve decision quality? Must they accept reduced productivity or are there other options?

*Relationships.* The work of communication theorist Rolv Blakar and his colleagues provides a critical link

between the concept of mutual knowledge and the consequences for working relationships of failure to establish mutual knowledge. This stream of research investigates how family members react to communication difficulties caused by lack of mutual knowledge. Blakar calls the problem an absence of "shared social reality," however, its operationalization is consistent with lack of mutual knowledge (i.e., people who are engaged in communication have different information but do not realize this is the case). In the studies, pairs of family members are given maps of a city. One subject's map contains arrows that mark a route through the city. This subject is told to describe the route to his or her partner so that the partner can follow the route on his or her own map. Unbeknownst to the subjects, their maps differ in key respects, making it impossible for them to carry out the task successfully. Blakar and his associates were interested in when and how such problems are solved, allowing communication to be reestablished (Blakar 1973, 1984; Hultberg et al. 1980).

They concluded that it is essential that communication difficulties are "adequately attributed" by the participants. When an error or conflict in information exchange is detected, people make attributions concerning its cause. The research focuses on whether attributions concerning communication difficulties are personal or situational (Heider 1958) and constructive or nonconstructive for continued communication. Personal attributions associate the cause of the communication conflict with some characteristic or behavior of an individual. For example, participants in the study conducted by Hultberg et al. (1980) made personal attributions when they made statements such as "My explanation was not adequate" or "You give damned bad explanations!" They made situational attributions when they investigated the credibility of the maps they were using. Attributions were judged to be constructive if they facilitated inquiry and change to reduce the incidence of communication conflicts in the future. Attributions were nonconstructive if they were task irrelevant or destructive to cooperation, inquiry, and adaptation. The researchers suggested that situational as opposed to personal attributions tend to produce better resolution of conflicts because they focus participants on modifying the "contracts" that guide the communication process (Blakar 1984). If attributions are destructive, contracts concerning the communication process break down and people withdraw from cooperation.

This work has significant implications for the study of mutual knowledge in dispersed collaboration. It recognizes that communication failures are interpreted and that interpretations can vary. These interpretations can change people's perceptions of each other, their willingness to

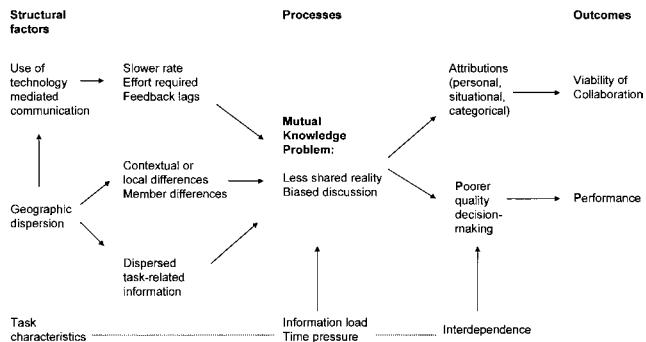
cooperate, and the ways in which they communicate and cooperate. The first part of this section suggests that dispersed collaborations are vulnerable to failures of mutual knowledge. Therefore, the way such failures are interpreted—i.e., attributed—could be critical for the long-term viability of dispersed collaboration.

Blakar and his collaborators focus on the distinction between personal and situational attributions. Applying these ideas to dispersed collaboration, we should consider how the dynamics of social categorization influence attributions and outcomes. As noted previously, Lea and Spears (1991, 1992, 1993) have observed that people using computer-mediated communication with remote others they do not know well rely heavily on social categorizations to guide their relationships. The social categorizations provide a basis for affiliation if participants share a significant social identity. However, they also can provide fodder for in-group/out-group dynamics if remote others are seen as belonging to social categories different and less attractive than oneself. This raises the question of whether or under what circumstances the attributions remote collaborators make concerning failures of mutual knowledge will be personal, categorical, or situational. It is not clear how these different types of attributions affect the viability of dispersed collaboration. Lea and Spears (1992) observe that people tend to overlook errors made by others with whom they share a significant social identity. On the other hand, collaborators might recategorize less generously remote others with whom they experience a communication failure. In addition, we can think of Blakar's "contracts" as norms: understandings within a group about what behaviors are and are not appropriate (Jackson 1965). Ideally, groups that experience communication failures will modify their norms to prevent future occurrences. However, if communication failures are blamed on individuals or subgroups, cooperative norms may break down.

This discussion presents the following questions: How are failures of mutual knowledge attributed in dispersed collaborations? Under what circumstances are attributions individual, categorical, or situational in nature, and with what consequences for future communication and collaboration?

Figure 1 summarizes the relationships discussed in this section. The discussion raises important questions about how mutual knowledge is established and its significance in dispersed collaboration. The existing literature provides a basis for expecting a number of problems with serious consequences. There is a need for close examination of the dynamics of actual dispersed collaborations to see if such problems do occur and how they manifest

**Figure 1 Likely Impact of Dispersion and Mediated Communication on Mutual Knowledge and on Collaborative Outcomes**



themselves. This suggests a fine-grained qualitative analysis of the communication and experiences of groups involved in such collaborations. This approach should illuminate the dynamics suggested by these theories and how they affect participants in ways other types of investigations would not.

## Method

The data were contained in an archival dataset that was created in the course of a collaborative project involving graduate business faculty and students located at nine universities on three continents. The project was intended to improve students' technical skills, give them experience in using technology to collaborate with remote partners, and expose them to the possibilities of electronic commerce. I gave my graduate students the option of participating in this project in lieu of the group project I usually assign in my Organizational Behavior course at George Mason University (GMU). Half my students decided to participate in the dispersed teams project. Each of them chose a partner within my class and these pairs were assigned randomly to a team with pairs from two other universities.

The six-member teams included pairs from two U.S. universities and one university located elsewhere. Non-U.S. partners were located in Canada (Université Laval, Memorial University of Newfoundland), Australia (Southern Cross University), and Portugal (Universidade do Minho). There were 45 teams in all, including 13 teams with GMU students. Only the data generated by the 13 teams that had GMU members are used in the analysis, yielding 13 cases. The students ranged in age from 23 to 48 years old, and all were graduate students taking business or management information systems courses. Because a number of foreign exchange students

participated, countries of origin included the United States, Canada, Colombia, Portugal, Germany, Ukraine, India, Thailand, Hong Kong, and Indonesia. All of the participants based in Australia were Asian exchange students.

The teams were given the assignment of (1) coming up with an idea for a business that would use the Internet in some way, (2) writing a business plan, and (3) creating a presentation for investors or an online storefront. The project spanned a seven-week period. Communication tools used by the teams included electronic mail, Internet-based "chat" tools, an Internet-based voting tool (Dennis et al. 1996), telephone, and fax. The project home page was a common point of reference for the teams. Home page material included detailed team assignments for each week, sample business plans, project evaluation criteria, and links to resources such as the voting tool, chat rooms, and information about electronic commerce. The teams were permitted to use whatever communication tools they found useful, including those that they found independently on the World Wide Web.

The nine faculty members whose students participated in the project communicated with each other through electronic mail, a faculty listserv, and occasional telephone calls. None of the faculty had met any of the others face-to-face. Thus, the faculty also was a dispersed team that collaborated for three months to manage a complex global social system. Despite efforts to make project requirements consistent across all nine universities, differences were discovered as the project unfolded. When any such difference was discovered, affected students were informed immediately and every effort was made to bring requirements into alignment.

## Data Sources

Data constituting the cases include 1,649 pieces of e-mail exchanged by members of the 13 teams, printouts of their online chats, team logs of their use of communication tools, 26 analysis papers written by project participants, and grades awarded independently to each team by two instructors. George Mason University students who participated in the project turned in copies of their e-mail on disk and on paper. On every team on which GMU students worked, there were two Texas Christian University (TCU) students, as well as two students from a university abroad. The TCU students turned in copies of their e-mail, and their professor sent copies to me. I compared the two sets of records and added to the master record newly discovered e-mails. This strategy was intended to identify all cross-site e-mails. As a result of the cross-check, there were only a handful of points in the team histories at which it was clear from the content of the

messages that an e-mail was missing, and I earmarked these points. The count of e-mail records by team ranged from 61 messages (Team 30) to 217 messages (Team 6).

Each team's communication log listed the team's online chats and use of other Web-based tools such as the voting tool. The number of chats held by teams or subsets of teams ranged from none (Teams 11, 18, and 26) to five (Teams 5, 21, and 39). The teams turned in copies of the texts of most of their chats. However, on some occasions they failed to make a printout so the text was not available for analysis. Descriptive information about each of the cases appears on the left side of Table 1.

GMU students wrote individual six-page analysis papers after the project ended. They were instructed to analyze one or two events in the life of their team that they considered to be significant, using e-mail and chat records as a resource. They were required to do their best to examine these events from the perspectives of the other team members as well as from their personal perspective.

To understand the experiences of the teams, I also drew on my experiences as a member of the geographically dispersed faculty team and my work with the students engaged in the project. In addition, several members of the faculty team wrote about their experiences and circulated these narratives. Finally, my colleague at TCU sent me copies of the grades she awarded to each of the 13 teams that included GMU students so that I would have two perspectives, hers and my own, on team performance.

Cursory review of the cases suggested that there had been a great deal of conflict in the teams. In seven of the 13 teams, conflict escalated to the point that hostile coalitions formed. In five of these teams, members at two sites began to complain about partners at the third site, refusing in some cases to send them pieces of the team's work or put their names on finished work. Two teams evidenced shifting coalitions among subgroups at the three sites. Close examination of episodes of conflict, frustration, or confusion in the teams seemed to be merited.

## Data Analysis

Data management and analysis procedures are summarized in Table 2. My objectives were to analyze episodes of conflict, frustration, or confusion in the teams, examine the significance and consequences of these episodes in the context of each case as a whole, and look for patterns across cases. I followed Eisenhardt's (1989) specifications for analysis of multiple case studies, with the addition of an embedded information-processing analysis of episodes of conflict, frustration, or confusion within cases (Yin 1994, Coulam and Smith 1985). Steps included (1)

putting the 13 cases into an accessible form without compromising their richness, (2) understanding each case on its own terms before attempting to generalize across cases (Eisenhardt 1989, Miles and Huberman 1994), (3) conducting an embedded information-processing analysis of episodes of conflict, frustration, or confusion, (4) creating and refining constructs that cut across cases, (5) identifying other variables of interest, (6) reviewing all cases to refine the definition of constructs and build evidence to measure or refute them, (7) integrating the constructs into a tentative model, and (8) reviewing all cases to refute or refine the model.

*Data Management.* I followed the process used by Gersick (1988) in her study of eight collocated project teams to gradually condense the voluminous case histories so they could be reviewed telescopically as well as microscopically. I wanted to make it possible to follow the flow of each case while preserving tight links to the original pieces of data. Each of the 13 teams' e-mail was read into AskSam, a text-management software program. Missing e-mail identified through the crosscheck with TCU was added to the files. Each piece of e-mail was assigned an identification number.

AskSam was used to create fields within which to annotate each piece of e-mail. In one such field, my research assistant summarized the literal content of the e-mail. This paralleled Gersick's literal summaries of the team meetings she studied. In another field, my research assistant recorded her interpretations of the activity in the team and the questions that came to her mind. She had been a member of one of the teams and recognized nuances of situations that a newcomer to the complex project probably would have failed to grasp. Her attention was directed primarily to the microscopic level—recording the literal content of each piece of e-mail—with secondary attention to the flow of events.

*Case Analysis.* I studied each case and recorded my observations in a field created for this purpose. Creation of the summaries made it possible for me to review entire cases quickly when I wished to, tracking the overall flow of events. In addition, counts of the number of e-mails each team exchanged during each day of the project were generated through the software and transformed into graphs of the team's communication activity—another perspective on the flow of the whole. I also examined the e-mail microscopically, comparing my impressions with the summaries and comments of my research assistant. I wanted to be sure that the summaries she prepared were sufficiently descriptive, so that I could rely on them when I wished to move quickly through the material. Using AskSam, one can double-click on the summary of a piece

**Table 1** Information by Case

Team	Non U.S. location	Number of Grades	Number of emails	Lack of contextual Chats*	Unevenly distributed information	Differences in salience of information	Relative speed of access of information	Meaning uncertain	Use of Technical problems	external information	Coalition activity
15	Australia	100; 95	156	4	C	U	r	q	T	E	some
26	Canada (Newfoundland)	86; 95**	65	0	C	U	s	q	q	E	none
11	Portugal	96; 86	159	0	C	U	S	R	Q	T	E much
30	Canada (Newfoundland)	93; 93	61	3		U	S	Q	t	e	none
17	Canada (Newfoundland)	90; 90	125	1	C	U	s	q	t	E	some
21	Portugal	90; 90	95	5	C	u	r	Q	T	E	none
1	Portugal	90; 81	85	1	c	U	q	T	e	some	
5	Australia	90; 74	156	5		U	R	Q	T	E	much
6	Portugal	86; 86	217	1		S	Q	T	E	none	
3	Canada (Quebec)	86; 86**	153	3	C	u	s	R	Q	T	e much
18	Canada (Quebec)	83; 83	105	0	C	U	s	r	q	t	E none
37	Canada (Newfoundland)	83; 83	130	2	C	U	s	r	q	T	e none
39	Canada (Quebec)	83; 83	142	5	c	U	s	r	q	T	E much

C, U, R, S, Q, and T = serious problems of this type in the team. c, u, r, s, q, and t = some problems of this type in the team.

E = frequent use of information from external sources in the team. e = some use of information from external sources in the team.

\* represents the number of chats involving at least two locations during which project work was conducted

\*\* number adjusted to reflect differences in grading criteria

of e-mail and be shown the full text. Thus, it was easy to move as I did between microscopic and telescopic views of the team's work. Like Gersick, I eventually condensed the summaries two more times: first into a timeline of key events and then into stages of team activity. I also tracked team behaviors and activities that are generally considered to be predictors of performance and viability: performance strategies, planning activities, leadership activities, roles, coalitions and conflicts, communication with or about outside stakeholders and authorities, and milestones in project development.

After studying a team's e-mail and recording my observations, I reviewed the analysis papers written by the two GMU members of the team. The papers gave me insight into their interpretations of the team's interaction, which I could compare with the e-mail and chat records, my own analysis, and the commentary of my research assistant.

*Information-Processing Analysis.* Information-processing analyses of collectives such as organizations and teams investigate two central questions: (1) how interactions

among members of a collective are influenced by individual information-processing characteristics and limitations, and (2) how structures and systems shape the interactions among individuals and the decisions and actions of the collective. Considerable attention is devoted to examining how individuals "perceive and interpret stimuli and how they remember, use and communicate information about a complex world" (Coulam and Smith 1985, p. 1). Accordingly, information-processing analysis is an appropriate method for investigating the establishment of mutual knowledge and failures of mutual knowledge. The typical medium for information-processing analyses is the case study because of the fine-grained evidence that is required (Coulam and Smith 1985).

I analyzed the exchange and processing of information leading up to, during, and after episodes of conflict, frustration, or confusion in the teams. From e-mail and chat records, I determined what information each team member did and did not have at the time a problem arose. This included activities such as establishing to whom e-mails

**Table 2 Data Analysis Procedures**

<b>Stages of Work and Key Observations</b>	<b>Activities</b>	<b>Purpose</b>
Data Manipulation	<p>Check completeness of e-mail records by comparing e-mail turned in by team members at ECU and SWU.</p> <p>Add to the master file any newly discovered e-mails.</p> <p>Import all e-mail into text management software program.</p> <p>Adjust time stamps to Eastern Standard Time so e-mail can be sequenced correctly and resequence.</p> <p>Assemble records and reports of team "chat" sessions.</p> <p>Research assistant writes a literal summary of each of the 1,649 pieces of e-mail and of each chat session. Focus on content of individual pieces rather than overall flow of events. Observations and questions noted in separate field.</p>	Gersick 1988: Begin process of gradually condensing voluminous transcripts of team activity into summaries of event sequences.
Data analysis	<p>Researcher studies each case, moving between summaries and actual text of e-mails. Observations and questions noted in separate field.</p> <p>Review and write summaries of analysis papers written by members of each team. Papers focused on one or two critical events in the life of the team.</p> <p>Triangulate researcher impressions with those recorded by participants and research assistant, and with e-mail records.</p>	Eisenhardt 1989:540; Miles and Huberman 1994: "Allow the unique patterns of each case to emerge" before attempting to generalize across cases."
Observation of high degree of conflict in teams and decision to examine episodes of frustration, conflict or confusion in depth.	Review all team cases and analysis papers to select episodes of frustration, conflict or confusion.	Get perspective on the meaning that participants made of the team's interactions.
Observation that there seem to be recurrent types of problems.	Trace development of each episode, attempting to determine what happened and how each team member saw it.	Develop a deep understanding of each individual case from multiple perspectives.
Observation that in these episodes, people frequently seemed to be working from different information.	Carefully identify exactly what e-mails and chat experiences the parties to an incident did and did not have at the time it occurred.	See whether there seem to be some generalizations across cases that could be explored.
Observation that there seem to be causal relationships between information exchange activities and failures, attributions about team members, and team coalition activity.	Create five constructs representing types of problems observed.	Eisenhardt 1989: Refine definition of constructs and build evidence that measures the construct in each case.
	Study all 13 cases again in depth to 1) challenge and refine the descriptions of types of problems, 2) document their frequency, 3) document the frequency of other variables of interest, and 4) look for other important types of problems not represented by the constructs.	Eisenhardt 1989: Verify that the emergent relationships between constructs fit with the evidence in each case.
	Integrate constructs into a tentative model, drawing on the cases and the relevant literature.	
	Study the 13 cases in their entirety a third time to challenge and refine this model.	

were and were not addressed, and whether the addresses were correct. I also compared accounts in the student analysis papers with the e-mail and chat records, noting points of divergence in content or tone. In a systematic way, I sought to understand the perspective of each member of a team as an episode unfolded on the basis of the information he or she had at the time and what he or she wrote in e-mail or chats.

**Cross-Case Analysis.** Across cases, I noticed recurring patterns in the development of problems. I studied these patterns inductively. I characterized individual incidents, grouped them, and adjusted the descriptions and groupings iteratively. Eventually, I characterized five types of problems: (1) failure to communicate and retain contextual information, (2) unevenly distributed information, (3) differences in the salience of information to individuals, (4) relative differences in speed of access to information, and (5) interpretation of the meaning of silence. I reviewed all the cases to refine or refute my descriptions of these problems and assess their frequency across cases and their seriousness within cases. I recorded the identification numbers of e-mails or chats in which I observed each type of problem. Then I reviewed the accumulated evidence in light of my knowledge of each team's case and judged whether each problem was (1) present and serious, (2) present but not serious, or (3) absent. The charting technique is an adaptation of techniques suggested by Miles and Huberman (1994) and used by Elsbach and Sutton (1992). I found I could integrate the five problems into a model that described how episodes typically unfolded and their consequences for teams. In another review of the cases, I sought to refine or refute this model.

## Findings

This section reports findings at the episode, case, and cross-case levels of analysis. I describe the five types of problems observed, their frequency and severity across cases, and their association with team strategies and outcomes. I also present a model that summarizes the relationship of problems to each other and the processes observed across cases.

### Types of Problems

**Failure to Communicate and Retain Contextual Information.** Team members had difficulty gathering and remembering information about the contexts within which their distant partners worked. They also failed to communicate important information about their own context and constraints to their remote partners. The teams involved in the project, including the dispersed faculty team, sometimes failed to recognize differences across

sites in deadlines for deliverables, evaluation criteria, and the timing of spring break. Only belatedly did many teams come to understand competing time commitments that were affecting members' participation. Team members also sometimes assumed that the collocated partners were in closer touch with each other than they were.

For example, Team 26 experienced conflict over whether or not to schedule online "chat" sessions among team members. The GMU pair refused to schedule a session. According to a GMU partner, we "felt strongly that a phone call would be much more efficient." In his analysis paper, he interpreted the TCU partners' insistence on using the medium as follows: "Perhaps they did not realize how difficult it is to implement the necessary scheduling." What was not communicated in the team was the fact that using chat tools was part of the evaluation criteria at TCU but not at GMU. The TCU students were taking a management information systems course, while the GMU students were taking an organizational behavior course. Despite efforts to make requirements consistent, differences such as this one surfaced. The conflict stemmed from a difference in the *organizational contexts* of the GMU and TCU members, but to the end, the GMU partners saw it only as a *preference* on the part of the TCU partners. Important information about the organizational context and constraints was not communicated among dispersed team members.

In Teams 3, 6, 17, and 18, some team members disappeared during what turned out to be their spring break. One of Team 18's GMU partners believes that she sent her remote partners an e-mail that described GMU's upcoming spring break and stated that she and her collocated partner would be away for three days. When I studied the e-mail records, I could not find her message. At this point, the team had turned in its business plan, but faced an impending deadline for its presentation. After several days passed without e-mail from GMU, exasperated team members at TCU wrote to their partners at Université Laval in Canada: "I can't believe what I just heard. Is it true that Anna and George have spring break now???" Replied the Canadians, "Maybe they are out of town!" Team 3 had a similar experience when partners at Memorial University of Newfoundland who were responsible for assembling all parts of the business plan vanished without warning from the e-mail traffic for three days. Panicked team members at other schools eventually took over the task of their silent partners. The Canadian partners had not mentioned their upcoming break to their distant team members.

In Team 6, e-mail records show that a team member *did* warn the others about a trip during spring break; however, the information did not seem to register in the minds

of the remote partners. Requests from teammates for immediate action continued to arrive in her e-mail while she was away. It appears to be difficult for teammates to create a mental map of their distant partners' situation and to update that map when new information arrives.

At the outset, some students failed to send an initial e-mail message to their teammates for up to three weeks. Often, persons reported later that they were taking mid-term examinations or completing some other project. However, they failed to perceive the need to describe their situation to remote partners whose situations might be quite different. Relationships fared better when pre-occupied teammates laid out immediately the constraints under which they were operating.

Participants also seemed to exaggerate the completeness of communication in the collocated condition. This is yet another way of misjudging the context of remote partners. A GMU partner in Team 11 assumed that concerns she had expressed on the telephone to one partner at TCU would be conveyed to the other partner at TCU. Later the GMU partner wrote that she had *repeatedly* asked TCU to make a particular change in the team's home page, while one of the TCU teammates insisted that he had *never* heard this concern. One factor in this difference was the GMU partner's assumption about the ease and completeness of communication between the collocated TCU partners.

*Unevenly Distributed Information.* Unevenly distributed information also interfered with team-level collaboration and caused problems in relationships. Two causes were errors in e-mail addresses and failure to send copies of e-mail to all team members. Team members also may have thought they sent e-mail that in fact never went out or was undelivered. The bucket of information being passed among team members proved to be far leakier than they realized. Wildly different perspectives among team members were created because of differences in the information they received.

In two teams (Teams 37 and 11), partners located outside the United States were quick to initiate communication, yet this failed to become common knowledge in the team. On the contrary, the impression grew that these partners were absent or unwilling to communicate. Meanwhile, they wondered why their initial messages were ignored. In Team 37, a Canadian partner was the second person to check in. After introducing herself, she explained that her collocated teammate was away for a few days but would write shortly. She mistyped the address of one GMU partner, but typed the second GMU address correctly. However, neither GMU partner ever indicated having received her e-mail. E-mail records confirm that

at least one of the TCU partners received the e-mail, however this person did not correct the GMU partners when they complained that the Canadians had not been heard from. The dynamic created in the team concerning the Canadians teammates' tardiness persisted to the end, even though it was based on inaccurate information.

In Team 11, the Portuguese partners were the first to write to the group. Their message contained two incorrect e-mail addresses and two correct addresses. It was five days before one GMU team member discovered the message from Portugal in her e-mail. By that time, both GMU and TCU members had begun to worry and complain about what they thought had been silence from Portugal. The Portuguese probably were receiving mail from the United States but wondering why their greeting was being ignored. Moreover, there is no evidence that the GMU partner who found the e-mail from Portugal ever forwarded it to the rest of the team. The Portuguese operated on the assumption that the entire team had the information contained in the initial note, but in fact, only one or two United States members had it.

Impressions formed as a result of unevenly distributed information persisted in the face of correcting information. This is not surprising when one considers how difficult it is to trace all the ways in which a particular piece of information (in this case, erroneous information) has shaped one's feelings about another person. The history of Team 30 offers a striking illustration. The mailing list used by one of the GMU partners, Paul, had an error in it: It included one person who was a member of a different team and omitted one person (Don) who was a member of Paul's team. By the time the situation came to a head, Paul thought he had sent six e-mails to the entire team. He was receiving e-mail from his team member, Don, but did not realize that he was not sending mail to Don. The person who was receiving the e-mail in error never notified Paul. Eventually, Paul spent several hours investigating chat room sites and proposed one to the team. He was astonished when Don wrote within hours proposing a different chat room, assuming that the team would meet there, and ignoring Paul's message. In his analysis paper, Paul wrote that this indicated "resentment toward me for taking the initiative and making decisions."

Paul gave Don the benefit of the doubt by writing to check the e-mail address, but Don did not respond to this note, which offended Paul even more. But let us look at this from Don's point of view: Even though Paul has written six detailed e-mails to the team, Don has not received *any* of them. To Don, Paul is a deadbeat team member who now has finally sent a short note asking if he has Don's address right! Eventually, Paul removed the incorrect name from his mailing list and added Don's name,

but Paul did not change his understanding of the team or see how differently this exchange must have appeared to Don. Even though Paul figured out that he had Don's name and address wrong and offered to send Don all the early messages he had written, Paul still presented the exchange as a power struggle in his analysis paper. Paul still thought that Don deliberately ignored the work he had done.

In relationships conducted face-to-face, it is a challenging cognitive exercise to interpret a set of facts from the perspective of another person. It is far more difficult to determine how the information before the other party differs from one's own, and then see things from the other's perspective. Geographic dispersion makes these two activities more difficult because of undetected "Leaks in the bucket," because partners seem to have difficulty retaining information about remote locations, and because feedback processes are laborious. In addition, the data suggest that team members with complete or correct information may not speak up when erroneous conclusions are voiced in the team.

Problems stemming from unevenly distributed information were not limited to cases involving errors in addresses and undelivered mail. Sometimes people knew they were exchanging mail with only part of the team, but failed to understand how this affected the perspectives of team members who did not receive the mail, or how it affected the dynamics of the team as a whole. In Team 11, Lisa in Portugal suggested a focus for the team's project. Team members at GMU and TCU exchanged e-mail about Lisa's idea without copying her. They agreed that her idea was creative and interesting but too complex for the team's time frame. When the team voted electronically, Lisa's idea was not selected. From Lisa's perspective, her idea was met by silence. There was no discussion, praise, or criticism—just a vote. When team members began volunteering via e-mail to develop particular parts of the business plan, the Portuguese part of the team was silent. I suspect that the GMU and TCU members were more conscious of the silence from Portugal than their own silence in response to Lisa's idea. E-mail concerning Lisa's idea was exchanged. It just wasn't sent to Lisa.

It is not news that private conversations can create problems in a team. However, the dynamics and consequences of this behavior in dispersed teams are worth noting. Private exchanges of e-mail distort perceptions of the volume of activity in a team. This can confuse members' sense of pace and timing. Members who are receiving all the e-mail will perceive some members as active and others as relatively inactive. Those who are not receiving all the mail will perceive the energy level of the

team to be low and the pace to be slow. Accordingly, they may further reduce their pace, or berate members for inactivity because they do not know of their efforts. Analysis of the team histories suggests that these kinds of perceptions can be excruciatingly difficult to identify and change when a team is dispersed. Private "conversations" may create much more confusion for dispersed teams than face-to-face teams.

*Differences in the Salience of Information.* Teams also encountered problems that hinged on differences in the salience of information among team members. Writers tended to assume that what was salient to them would be salient to their readers. Scholars have observed that mediated communication often lacks cues to *meaning* such as facial expressions, body language, and tone of voice (Kiesler and Sproull 1992, Sproull and Kiesler 1986). However, these types of cues also signal the *salience* to the communicator of one piece of information relative to another. Dispersed team members were not successful in communicating to their partners what parts of their messages, or which messages, they considered most important. When an e-mail message addressed several topics, partners sometimes differed on which topics they found salient. For example, as described previously, a GMU partner who wanted a change made in the team home page raised the issue on the telephone with TCU Partner 1 and in a postscript to a four-paragraph e-mail to TCU Partner 2. The proposed change was the last of three issues addressed in the e-mail. TCU Partner 2 later insisted indignantly that he had never heard of the request. Clearly, the postscript had greater salience to the sender than to the receiver.

Differences in information salience were exacerbated by unwieldy feedback processes in the dispersed teams and the making of indirect requests. Analyzing a tense exchange in Team 6, a GMU member observed:

With so much information going back and forth, it was difficult for my teammates to absorb every detail . . . Because I couldn't "see" if the receiver was paying attention, I didn't know if my message had to be repeated. Yet it is time-consuming to let the sender know my perception of their message.

In other cases, writers did not use in their e-mail key words that they thought they had used. In Team 18, Anna wanted to clear up irritation that had resulted when she and George disappeared for three days during GMU's spring break. In her analysis paper, she wrote, "When everything was done, I thought it was time to clear our misunderstandings. I didn't want to brush things away. I sent an e-mail saying that we need to have a chat as there were some misunderstandings to be cleared." The chat never took place. One reason may be that Anna did not

actually use the words "clear our misunderstandings" in her e-mail. Instead, she wrote, "There seems to be a communications lapse between us. George and I thought that we probably need to discuss certain aspects from the home page. Is it possible to chat today? . . . This is important, so please let us know soon." It is unlikely that Anna's wish to resolve the issue of why she and George disappeared was clear to her dispersed teammates because she said that she wanted to "discuss certain aspects from the home page." Confusion due to indirect wording is not confined to computer-mediated communication, as Tannen (1994) has shown. But the characteristics of some of the communication technologies used by dispersed groups probably make it difficult for members to recognize the meaning and importance of indirect requests like this one.

In addition, there was a tendency to request feedback from the team indirectly, yet to expect quick responses from everyone. (Kiesler et al. 1984 predicted the latter.) "Every time I sent an e-mail requesting "any thoughts" from everyone, I expected to receive one from everyone. And when I didn't, I felt that those who didn't respond were not holding up their end of the bargain," reported a member of Team 5. A member of Team 17 observed, "People always said, 'Hope to hear from you soon.' Who then has responsibility for initiating communication?" A member of Team 11 recalled sending e-mail "into the abyss," and GMU-based members of Team 6 discussed the feedback problem among themselves, but never with other members of their team. In an analysis paper, one wrote:

We wanted acknowledgment of the time we spent on the deliverable as well as a feeling that we were on target. No one responded. We sent another e-mail saying that we hadn't heard from anyone. Finally, we heard from one group member, but even that message contained minimal information.

Clearly, the salience of the request for feedback was higher for senders than receivers. Thus, when electronic communication is voluminous, senders and receivers unwittingly may differ in what they find most salient and fail to fulfill their distant partners' expectations. This problem may be complicated by a tendency to state requests indirectly, yet expect quick responses from all members. In general, the level of feedback among members of a dispersed group is not likely to be as high as members would wish, and may not be sufficient to ensure shared understanding.

*Relative Differences in Speed of Access to Information.* Research has shown that teams using computer-mediated communication operate at a slower rate than teams meeting face-to-face (Lebie et al. 1996, Straus 1997, Straus

and McGrath 1994, Walther and Burgoon 1992). However, this study surfaced a second type of problem involving speed: relative differences among team members in speed of access to information. One manifestation of this problem stemmed from differences among team members in access to communications technology. Some members had 24-hour e-mail access while their partners had access only when at their university. If some members see e-mail only once a day or once every few days, this limits the interaction that is possible and slows the pace of the team. Observed a member of Team 3, "Some problems dragged on for days while the suspicions of group members intensified. In reality, the problem could have been as simple as someone not being able to get to the computer lab to check their messages."

A second manifestation seemed to stem from differences in the speed of electronic transmissions among parts of a team. This was exemplified by the relationship among members of Team 5, which included two members in Australia and four members in the United States, two of them in Virginia and two in Texas. The team held five online chats during which tensions between the members in the United States and Australia were evident. Near the end of the team's fifth chat, an American team member observed that the Australian members always seemed to be "25 minutes behind the discussion" and suggested that this could be an artifact of the speed of transmission between the continents. The team members at the two United States locations could carry on a relatively rapid exchange until being "interrupted" by team members in Australia who referred to subjects from which the others had moved on.

I was not able to verify this hypothesis through chat room transcripts or other means. However, the explanation proposed by the team member is credible. Telephone lines carried most of the Internet traffic between the United States and Australia and they frequently became overloaded, resulting in breakdowns and time lags. This would mean that parts of the team were communicating at different rates—one rate between the two sites in the United States and another rate between the United States and Australia. This is a recipe for frustration and irritation for all. If the members in Australia responded to messages the instant they received them, their responses still would appear in the chat room traffic well after the conversation between the United States partners had moved on because of time lags coming and going. Moreover, from the perspective of the Australian partners, a stream of unrelated comments by the United States partners would always follow their messages. It would appear that their comments were ignored.

Both types of problems concerning relative speed

tended to be invisible to team members. Instead, they were attributed to remote partners' lack of conscientiousness. In addition, recognizing the constraints on access to information was only of limited help to the teams. The fact remained that it was difficult for team members to work "in sync" with one another. Although the source of problems sometimes was identified, suspicions and impressions that had formed tended to persist.

*Interpreting the Meaning of Silence.* One of the biggest challenges team members faced was interpreting the meaning of their partners' silence. Over the course of the project, it became clear that silence had meant all of the following at one time or another: I agree. I strongly disagree. I am indifferent. I am out of town. I am having technical problems. I don't know how to address this sensitive issue. I am busy with other things. I did not notice your question. I did not realize that you wanted a response.

Partners often misinterpreted silence. One common problem was interpreting silence as consent when it stemmed from disagreement or inattention. For example, United States members of Team 11 misjudged the silence of their Portuguese partners after an electronic vote. The Americans interpreted the silence as consent, and then began to wonder. When they inquired, their Portuguese partners replied, "Yes we are still (here), but you had decided everything. Now you should tell us what you want . . . We don't know (anything) about (the business idea that was chosen)." Similarly, a GMU member of Team 6 informed her teammates that she would be away during spring break. "I asked if I needed to submit anything for the home page before I departed . . . When I didn't receive a response, I assumed everything was in order." After she had left, her teammates began to write terse e-mails, asking for the address of her personal home page, which they wished to link to the team home page.

Silence due to technical problems or faulty information sometimes was interpreted as intentional nonparticipation. A member of Team 21 became concerned when various team members "did not respond to most of the e-mails and kept missing chat room meetings." He interpreted this as his partners' "unwillingness to work." It eventually was discovered that the U.S. partners thought the time difference between themselves and their Portuguese partners was six hours, when it was five hours. Times for the synchronous "chats" among the partners were communicated in error, which meant that the Portuguese partners would arrive at the appointed hour and find no one there. This confusion persisted over the course of four chats and two weeks before it was ironed out.

In meetings conducted face-to-face, it can be difficult to interpret the meaning of team members' silence. However, geographic dispersion and reliance on communications technology add new dimensions of uncertainty and complicate efforts to resolve the uncertainty. A partner could be out of town or silenced by technical problems. There may be a tendency to fall silent rather than address sensitive issues because of the difficulty of communicating nuances when using less rich communications media. In particular, uncertainty about silence can make it difficult to know when a decision has been made in a geographically dispersed group.

Clearly, the 13 dispersed teams struggled with problems involving the distribution and interpretation of information. The problems were serious. They affected individual working relationships and the viability of teams as wholes. Relationship problems were created and magnified by flaws in information management. These problems were difficult to correct. Corrective feedback was scarce and slow, and it was laborious to modify impressions in the face of new information. Impressions persisted in the face of corrected information. Table 3 summarizes the five types of problems identified.

### **Frequency of Problems**

Table 1 displays the occurrence by team of each type of problem described above. The display includes indicators of team activity (the total number of e-mails logged, the number of online chats held, and communication with external sources of information), in-group/out-group dynamics (whether hostile coalitions formed), and performance (grades received). Also noted for each team is the occurrence and severity of technical problems such as the inability to access groupware, chat line, or e-mail servers when planned, the inability to transmit compatible files among team members, and the use of incorrect passwords or procedures. Table 4 summarizes the frequencies of occurrence and severity of each problem across all the teams. It shows that the most severe disruptions to teams' work were caused by uneven exchange of information and technical problems. These problems were serious in nine of the 13 teams. The most common problems across teams were difficulty interpreting the meaning of silence, uneven exchange of information, and technical problems. Difficulty interpreting the meaning of silence was "some problem" or "a serious problem" in all 13 teams. Uneven exchange of information and technical problems were "some problem" or "a serious problem" in 12 of the 13 teams.

### **Association with Strategies and Outcomes**

I looked for relationships between the incidence and severity of particular problems in teams and a measure of

**Table 3 Types of Information Problems**

Failure to communicate and retain contextual information

*Propositions:* It is difficult for dispersed collaborators to gather, retain, and update information about the contexts in which their distant partners work, particularly as the number of locations increases. Reciprocally, dispersed collaborators often fail to communicate important information about their own context, situation, and constraints to their remote partners.

Examples of such information include the length of the trip to the office, the quality, accessibility, and features of equipment, measurement processes and standards; local holidays and customary practices, pressure from local supervisors and coworkers, local history and interpretive schemas, competing responsibilities, and local emergencies.

Unevenly distributed information

*Propositions:* Dispersed collaborators fail more often than they realize to distribute the same information to all members. Causes include human and technological error, and selective distribution without awareness of all its consequences.

Uneven distribution of information results in team members having different perspectives because of the different information they have. Partners with complete or correct information may not speak up when erroneous conclusions are voiced in the team. Impressions created on the basis of unevenly distributed information often persist in the face of correcting information. Uneven distribution of information distorts perceptions of the volume of activity in a team, and confuses the team's pacing and timing.

Differences in the salience of information among members of a dispersed collaboration

*Propositions:* Dispersed collaborators tend to be less successful than collocated collaborators in communicating to their partners what parts of their messages, or which messages, they consider most important. They may assume that what is salient to them will be salient to remote partners. In particular, requests that are stated indirectly may be salient to the person making the request but not salient to the object of the request. While this problem is not unique to dispersed teams, it may be problematic for them because of restricted back-channel feedback and often slow feedback cycles.

Relative differences in speed of access to information

*Propositions:* Dispersed collaborations are susceptible to problems that stem from parts of a team communicating at different rates. Some members may be in frequent contact with one another while others are heard from less often. Causes include differences among parts of a team in the speed of electronic transmissions or in access to communications technology. This means that partners are not synchronized in terms of their access to information and their ability to detect and correct misunderstandings. The structural causes of these types of problems tend to be invisible to team members. Even when recognized, differences in communication rate pose problems for collaboration.

Interpretation of the meaning of silence

*Propositions:* Dispersed collaborators often are uncertain about or misinterpret the meaning of their remote partners' silence. Geographic dispersion and reliance on communications technology add new dimensions of uncertainty to the meaning of silence and complicate efforts to resolve the uncertainty. There may be a tendency to fall silent rather than address sensitive issues because of the difficulty of communicating nuances using the available media. Uncertainty about silence can make it difficult to know when a decision has been made in a geographically dispersed group.

**Table 4 Frequency of Problems Across Teams (in percentages)**

Extent of problem	Type of problem					
	Lack of contextual information	Unevenly distributed information	Differences in salience of information	Differences in speed of access	Meaning of silence uncertain	Technical problems
Serious problem	54	69	23	23	46	69
Some problem	23	23	46	38	54	23
Not a problem	23	8	31	38	0	8

performance (i.e., grades received), the incidence of hostile coalitions, and the number of e-mails and chats logged. I also looked to see whether teams could be grouped by their task and relationship management strategies. The data suggest four constellations: (1) good performance, task focus, moderate relationship demands, relatively low volume of communication, and low coalition activity; (2) good performance, high task and relationship demands, relatively high volume of communication, and high coalition activity; (3) weaker performance, relatively high volume of communication, many and diverse information problems, and high coalition activity; and (4) weaker performance, relationship focus, task secondary, relatively high volume of communication, and low coalition activity. There were no obvious direct relationships in this small sample between the incidence and severity of particular information problems and performance. Information problems seemed to be more damaging to relationships than to task performance. It also seemed to matter how members dealt with the information problems that occurred: the extent to which they extended the benefit of the doubt when remote partners did not behave as expected, and the extent to which they were able to identify aspects of the situation that helped explain behavior that was contrary to expectations.

Thus, teams with an average grade of 90% and above seem to constitute two types: those that exchanged relatively little e-mail and did not develop coalition activity, and those that exchanged more e-mail and developed coalition activity. Teams 26, 30, and 21 fit the first category and Teams 15, 11, and 17 fit the second. The three teams that earned a grade of 90 or above and avoided the development of hostile coalitions emphasized minimalism and closure in their work processes and tended to give remote partners the benefit of the doubt. In other words, they kept task and social demands relatively low. They exchanged some personal information at the outset, but otherwise tended to focus on the task at hand. The tone was businesslike but gracious. Through skill or luck, they agreed quickly on a viable idea for a business and then focused on implementing the idea. Giving remote partners the benefit of the doubt was important, as each of these teams did encounter significant information exchange problems early in their lives that easily could have escalated. However, members' interpretations of these events, attributions made about remote partners, and consequent behaviors did not accelerate the development of hostile relationships in the team. They struggled to maintain a gracious tone despite unanswered questions, seeming slights, and frustration.

For example, Team 26 exchanged only 65 messages,

less than half the number that many other teams exchanged. The average grade it received on its project was second highest among the thirteen teams studied. Individual introductions were brief and businesslike, but the tone of communication was gracious overall. One team member repeatedly modeled this behavior, while still taking a strong stand on a few issues. The team's communication is peppered with comments such as "Good ideas!," "Thanks for the vote of confidence," "Great pic," and "What a talented group!" The group encountered a serious challenge early on because of errors in e-mail addresses involving both the GMU and TCU partners. The upshot was that four of the six team members voted to accept a project idea that the two GMU members had never even received, while a project proposal from GMU bounced back undelivered from TCU. Both GMU members noted in their analysis papers that they were irritated by this event; however, one of them added, "I do understand why this occurred. An initial phase of confusion is to be expected in virtual teams that rely primarily on e-mail for communication." In other words, he made a situational rather than personal or categorical attribution. When new challenges involving differences in context, constraints, and ideas arose for the team, they were handled in sophisticated ways. Confronting disagreements over elements of the business plan, a team member in Canada wrote, "Greetings, friends. We seem to be at odds over what our company should be doing . . ."

In the other three teams that earned a grade of 90 or above (Teams 15, 11, and 17) some members were determined to turn in a quality product and managed to do so. However, life inside the team was turbulent. Attempts were made to extend the benefit of the doubt to remote partners; however, attributions grew harsh. For example, a member of Team 11 eventually wrote, "We got a cheap excuse (from the Portuguese partners) that I did not buy." Ultimately, partners at two of the three locations began planning to do the project as a group of four and discussed whether to withhold the names of the out-group members from the finished product. It may be that the approach to the task these teams took was relatively demanding, and it overwhelmed the team's social capacity and available communication media. For example, these teams debated longer on the kind of business they would design than did Teams 26, 30, and 17. When information problems occurred, they were difficult to resolve and did considerable damage.

The same problems and processes appeared in a more virulent form in Teams 5, 3, and 39, whose grades averaged below 90 percent and who had a relatively high volume of communication, frequent and diverse information problems, and fierce coalition activity. Almost all

of the teams with much coalition activity included students who were high achievers, judging from the quality of their work in my course overall. They may have demanded more from the dispersed mode of work and their remote partners than could be delivered. For example, Team 5 subjected ideas to intense scrutiny but struggled in the aftermath to maintain working relationships. Reflected a member of Team 3, "Our group lacked any real talent for offering compromises and moving on." Another member of Team 3 described the behavior of partners as "belligerent, lackadaisical, and indifferent." These groups seem to have become caught in destructive and self-reinforcing patterns of interaction to which dispersed teams are susceptible.

On the other hand, Teams 6 and 37 privileged harmony over quality. Team 6 is an outlier in that its e-mail volume was the highest of all the teams and its internal relationships appear to have been the most positive. Members of this team realized early on that uneven distribution of information among team members could be a problem and invested considerable effort in avoiding this situation. However, the team's work product was not graded as highly as that of some of the other teams. In analysis papers, members of both Teams 6 and 37 suggested that desire for harmony in the team had interfered with scrutiny of business ideas. Wrote a member of Team 37, "(We) felt we should go along with the other members' ideas . . . even though we did not agree with them . . . The whole team was never in conflict. Everyone was very polite."

### **Integrative Model**

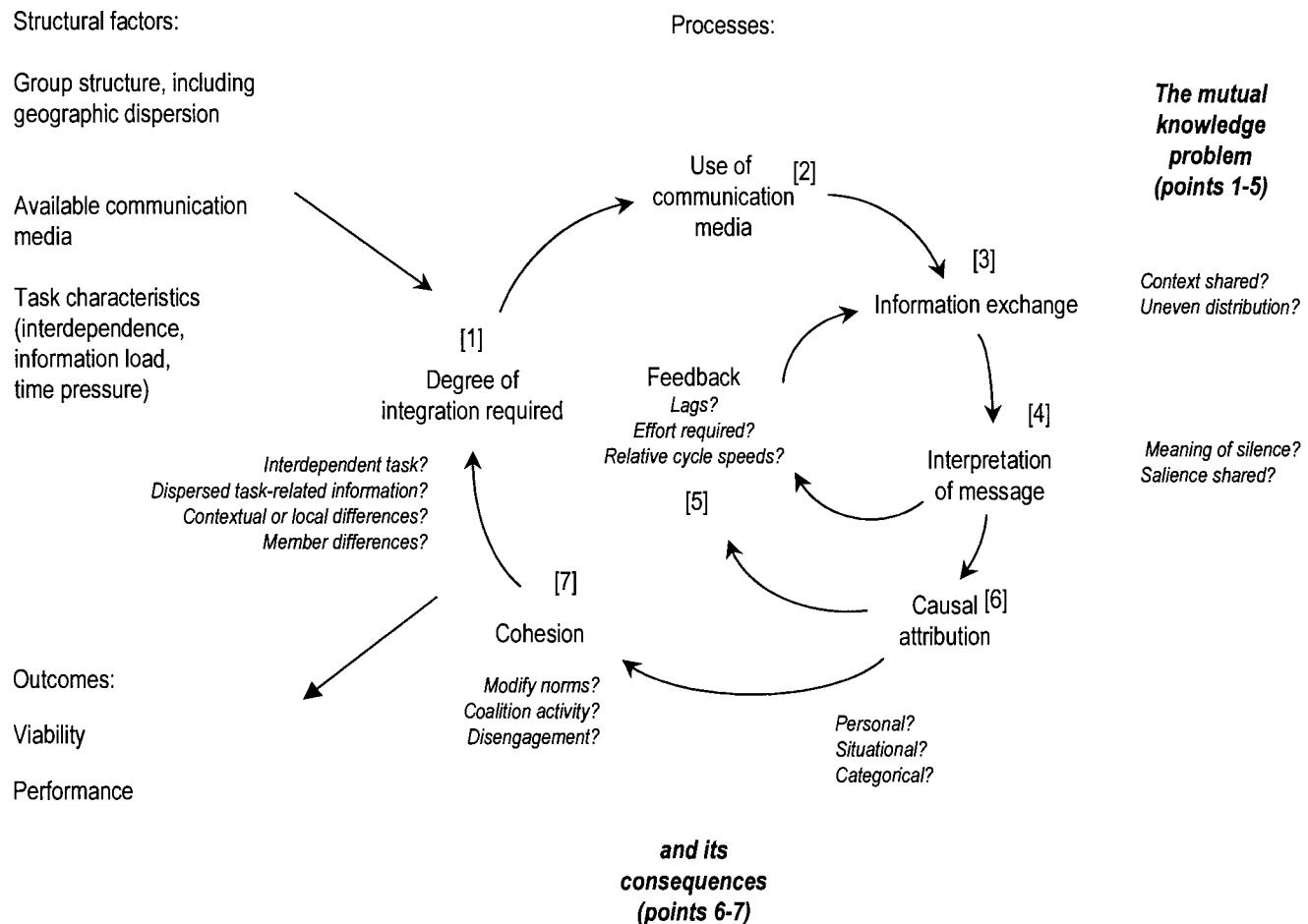
Figure 2 summarizes the processes I observed. It focuses on the challenges dispersed teams face in integrating individual member contributions and maintaining social integration in light of the mutual knowledge problem and its consequences. The task requirements, context, and composition of the group establish the degree of integration required for effective performance and how difficult to achieve this is likely to be (see Point [1] in Figure 2). For example, a complex task may require a high level of integration of individual expertise for success. However, achieving this integration will be more challenging if group members start from different social and practical realities—e.g., come from or live in different cultures, have different functional backgrounds, are working across organizational boundaries, or are widely dispersed geographically from one another. In addition, the characteristics of the available communication technologies, their appropriateness for the task at hand, and how the group uses these technologies (Point [2]) represent another set of enabling and constraining conditions (DeSanctis

and Poole 1994, Maznevski and Chudoba 2000, McLeod 1996).

Failure to exchange adequate information about context and failure to distribute the same information to all members of the team constitute two major pitfalls in information exchange (Point [3]) to which dispersed teams may be subject. It may also be difficult for team members to retain and update information about remote contexts provided by their distant teammates. As a consequence of these failures, group members are more likely to work from different definitions of the situation, which handicaps communication and collaboration. In addition, failure to share and retain up-to-date information about context contributes to communication breakdowns by limiting the ability of senders to frame communication in a decentered rather than self-centered way. Messages framed in a decentered or receiver-centered way have a better chance of being interpreted accurately (Point [4]) (Blakar 1985). The likelihood of tension is probably greater if group members' social and practical realities are quite different from the outset (Point [1]); however, subsequent aspects of interaction may add to the confusion. Human error in using technology and technical failures can create information distribution problems in an otherwise untroubled situation. However, once tensions have begun to develop, negative attributions have been made (Point [6]) and coalitions have formed (Point [7]), members may be more inclined to distribute information selectively among team members, and problems escalate.

Exchange of information is just one part of the communication process. Receivers must "decode" the symbols that constitute a message and interpret the meaning of the sender (Redding 1972, Rommetveit 1968). The contexts within which senders and receivers encode and interpret information are likely to differ when their geographic locations are distant, increasing the likelihood of misinterpretation. This problem is exacerbated by failure to exchange sufficient information about context. Two other possible pitfalls at this stage (Point [4]) of the process are the drawing of erroneous conclusions about remote partners' silence, and differences in the salience to sender and receiver of different parts of a message, leading to differing interpretations of the message.

The available information and how it is processed affects attributions (Point [6]). I propose that personal attributions are made about remote partners more often than collocated partners because more information is available about the local than the remote situation. The complexity of dispersed structures and processes also makes situational attribution difficult. Interpretations and attributions can be checked through feedback, however geographically dispersed groups face three challenges: time lags,

**Figure 2** The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration

the effort required to seek and give feedback when dispersed, and relative differences that may exist in feedback speeds among parts of the group (Point [5]). Slow feedback cycles (Point [5]) reduce corrective feedback and increase the likelihood of erroneous interpretations (Point [4]) and exaggerated attributions (Point [6]).

Finally, there may be a tendency to generalize such social perceptions, particularly negative ones, to the locational subgroup of which a person is a member, which sets in motion in-group/out-group dynamics (Point [7]) that are destructive to group cohesion. In some cases that I studied, collocated partners relied increasingly on each other, criticizing their remote partners among themselves and sometimes disengaging from the group's work. In other cases, subgroups in two locations exchanged critical e-mail about the third subgroup and refused to send them work products. Typically, an important piece of information was not sent, sent to the wrong place, or lost in transit (Point [3]), which affected the conclusions drawn

by all parties (Point [4]) and led to negative attributions to individuals and subgroups (Point [6]) and the disintegration of relationships (Point [7]). Sometimes, problems were mitigated when errors were caught in the course of a feedback cycle (Point [5]). However, there were instances in which this correction was so slow in coming that those involved were unable to trace and modify all the faulty conclusions they had drawn. The cycle depicted in Figure 2 can be self-reinforcing: The problems of information exchange, interpretation, and attribution described here, and their disintegrative effect on team relationships, add to the already substantial integration challenge confronted by a geographically dispersed group (Point [1]).

## Discussion

This paper proposes that a central problem of geographically dispersed collaboration is maintaining mutual

knowledge. Both physical dispersion of collaborators and frequent use of communications technology tend to negatively affect the means by which people establish mutual knowledge. I also suggest that failure to establish and maintain mutual knowledge can have serious consequences for the viability of dispersed collaboration. My empirical findings support and develop this theory. The five specific problems I identified inductively are manifestations of the mutual-knowledge problem that are especially likely under conditions of physical dispersion. I describe ways in which these problems interact, exacerbating factors, and typical consequences. While failure to establish and maintain mutual knowledge may be more likely and serious when collaborators are physically dispersed, the problems, processes, and consequences are probably not limited to dispersed collaboration. I offer grounded suggestions about how and when these dynamics might appear in collocated collaborations.

### **Failures of Information Exchange**

Two specific problems that came to light in this study concern failures of information exchange which result in dispersed partners having different information, but not knowing this is the case. Members of the teams I studied often failed to guess which of the many features of their context and situation differed from the contexts and situations of remote partners. They did not communicate critical local information. Second, team members failed far more often than they realized to distribute the same information to all members. Causes included human and technological error, and selective distribution without apparent awareness of all its consequences.

Identification of these failures of information exchange extends our understanding of both mutual knowledge and dispersed collaboration. One reason that geographic dispersion poses challenges to collaboration is that locations are likely to differ. Differences can include the length of the trip to the office; the quality, accessibility, and features of equipment; measurement processes and standards; local holidays and customary practices; pressure from local supervisors and coworkers; local history and interpretive schemas; competing responsibilities; and local emergencies. In addition, dispersed teams may be more likely than collocated teams to include members with different cultural backgrounds and organizational affiliations, which introduce still more contextual differences. People who wish to collaborate must discover and work across these differences.

However, my research suggests that dispersed collaborators are not skilled at discovering and communicating about such differences. In addition, when the information was mentioned in the teams I studied, remote partners

sometimes failed to note or remember it. This makes sense when we think of local information as a "hidden profile" (Stasser and Stewart 1992; Stasser et al. 1995; Stasser and Titus 1985, 1987). According to the principle of information sampling, uniquely held information is less likely than commonly held information to be mentioned in group discussions. If mentioned, it is less likely than commonly held information to be salient to group members. These problems are exacerbated by high information load (Stasser and Titus 1987) and use of text-based communication technologies (Hightower and Sayeed 1995, 1996; Hollingshead 1996). Thus, members of dispersed teams may have difficulty achieving mutual knowledge of important aspects of the situations and contexts in which partners function. In addition, the problem of unrecognized differences in context exacerbates other problems described below.

Unrecognized differences in context should be less of a problem for collocated teams than dispersed teams to the extent that collocated team members share context in common. Collocated teams also have more powerful ways of discovering differences, such as visual inspection and face-to-face communication. Future research should compare the mechanisms by which members of collocated and dispersed teams identify differences in situations, constraints, and assumptions. In addition, research should continue to examine how dispersed collaborators handle contextual information. It would be useful to identify conditions under which they are able to form mental maps of the situations of remote partners and update them as situations change. We may also wish to compare the ability of dispersed collaborators to detect differences in task-related information across locations relative to differences in context, including cultural context.

Communication across distance and via technology was shown in my study to be a particularly leaky process. Messages were addressed incorrectly, undelivered, or deliberately not sent to team members. People worked from different information far more often than they realized, and this caused serious problems in communication and relationships. Confusion and conflict was promulgated not just by different interpretations of the same information, but also by different interpretations of different information. I have shown that members often blamed each other for their frustrations.

This problem has implications for the development of trust in dispersed collaboration. Jarvenpaa and Leidner (1999) and Jarvenpaa et al. (1998) found that trust in dispersed teams was predicted most strongly during the early phases of team activity by perceptions of other members' "integrity," by which they mean "adherence to principles thought to make the trustee dependable and reliable" such

as demonstrated work ethic, fair dealings, and consistency" (Jarvenpaa et al. 1998, p. 31). The authors propose that trusting action and demonstrated reliability increase trust in dispersed teams. However, my work suggests that human and technical errors in information distribution may be common in dispersed collaboration, particularly during the early phases of activity. If these are interpreted as failures of personal reliability, they are likely to inhibit the development and maintenance of trust.

### **Failures of Interpretation**

This study also identified three problems that disrupted shared interpretation of information in the dispersed teams: difficulty communicating and understanding the salience of information, differences in speed of access to information, and difficulty interpreting the meaning of silence. When problems of salience occurred, partners had the same information but attended to different parts of it and misunderstood each other as a result. While this problem is not unique to dispersed teams, it probably is exacerbated by the use of computer-mediated communication. The medium does not provide the paraverbal and verbal cues that people use in conversation to signal the importance of one piece of information relative to another. Furthermore, failure to communicate salience may be more costly in dispersed than collocated collaborations because of slow feedback channels and restricted back-channel feedback. Slow and effortful feedback limits detection and correction of misunderstandings. Kiesler and Sproull (1992, Sproull and Kiesler 1986) described how computer mediation restricts cues to the meaning of communication. I focus on the problem of signaling the importance of one piece of information relative to another and how this problem is manifested in dispersed collaboration and exacerbated by the other problems identified in this study.

The members of the dispersed teams I studied also had difficulty working together when the speed of feedback cycles differed among parts of the group. Some members were in frequent contact with rapid feedback cycles, while contact with others was limited and slower paced. These differences were caused by differences in access to communication technology and the distribution of members across distance and time. The teams were not synchronized in their access to information and ability to detect and correct misunderstandings, and so had a difficult time maintaining mutual knowledge.

This observation reveals a new side of the issue of rate in computer-mediated communication. Researchers have shown that the rate at which computer-mediated communication proceeds affects group productivity and the development of relationships (Straus 1997, Straus and

McGrath 1994, Walther 1992, Walther and Burgoon 1992). My finding calls attention to the consequences of parts of a group communicating at different rates. Future research should explore whether uneven feedback cycles within a group have a different impact than uniform feedback cycles. Uneven feedback cycles across parts of a group could be more destructive than a uniformly slow pace because subgroups grow out of sync with, and isolated from, the group. This could result in their becoming scapegoats. Ironically, feedback cycles may be slower and more uneven among parts of a group under just those conditions for which rapid cycles are most needed: when the contexts of senders and receivers differ substantially. For example, feedback cycles may be unpredictable when part of a team is traveling constantly or located in an area with a weak communications infrastructure.

Finally, I observed that team members often misinterpreted the meaning of their remote partners' silence. Physical dispersion and dependence on communications technology add sources of uncertainty about the meaning of silence beyond those experienced by groups that meet face-to-face. Partners may fall silent because they find it difficult and time-consuming to convey sensitive issues in text, or because of technical failures. They may be silent because they agree, because they disagree, or because they are physically absent. In the mutual knowledge literature, Brennan (1998) describes how lack of feedback (i.e., silence) leads to failures of grounding in conversations with and through computers. Without feedback, one does not know whether a computer is working, has completed the task, has malfunctioned, or is waiting for additional inputs. I broaden her point by showing how physical dispersion presents additional sources of uncertainty as to the meaning of partners' silence.

### **Consequences for Attribution**

The failures of information exchange and interpretation identified in this study have consequences for attribution processes. They illuminate two reasons why people are likely to make personal rather than situational attributions concerning remote partners. First, failure to share and remember information about remote situations and contexts, and uneven distribution of information, mean that remote partners often lack information to make situational attributions. According to the attribution literature, when people do not have situational information, they tend to make personal attributions, i.e., their explanations focus on the dispositions of individuals (Jones and Nisbett 1972, Nisbett et al. 1973).

The study also demonstrates the complexity of communicating and collaborating across distance and via

technology. Information about multiple locations must be gathered, integrated, and updated. Multiple possible explanations for unexpected behavior and silences must be weighed and investigated. Exchanges between subgroups must be reported to the whole. Feedback lags, which may be different for each location, must be taken into account. There is considerable evidence that when people work under heavy cognitive load, they become more likely to make personal rather than situational attributions (Gilbert and Hixon 1991, Gilbert and Osborne 1989, Gilbert et al. 1988).

Falling back on personal attributions because of a lack of information or information-processing limitations amounts to blaming individuals for problems that may have broader causes. This distracts partners from full diagnosis of problems and modification of practices to prevent reoccurrences. It also damages partners' opinions of each other. These points are consistent with the observations of Blakar (1984) and Hultberg et al. (1980) concerning the effects of personal versus situational and constructive versus nonconstructive attributions among the family members they studied.

Attribution processes among people who collaborate across distance and through the use of computer mediation merit additional attention. One of the contributions of this study is harnessing the power of the well developed literature concerning attribution to help understand the development of such relationships. Two information-based antecedents of attribution, situational information and cognitive load, are explored in this study. However, the attribution literature describes additional information-based antecedents of attribution, as well as a number of motivation-based antecedents. (See Kelley and Michaela 1980 for a summary.) This literature could help us understand how dispersed collaborators make sense of their complicated world.

Future research might also explore whether cognitive load is indeed higher in dispersed than collocated teams, and trace all its consequences. Two consequences are discussed in this paper: bias toward dispositional attribution and difficulty identifying uniquely held information. However, there could be other consequences over time, such as stress or burnout. In addition, the concept of cognitive load facilitates application of these findings to collocated teams: Members of collocated teams may be most likely to encounter the problems of mutual knowledge, and their consequences discussed here, when members are experiencing heavy cognitive load.

The data suggest that processes that began with failures of mutual knowledge and produced personal rather than situational attribution eventually led to the fracturing of some teams into in-groups and out-groups. There was a

tendency to generalize attributions, particularly negative ones, to others at the same location. Team members' analysis papers describe remote *subgroups* as "lackadaisical," "aggressive," and having an "inferiority complex." This is consistent with the work of Lea and Spears (1991, 1992, 1993) who suggest that people using computer-mediated communication tend to categorize remote others on the basis of meager cues. In a dispersed team, one salient basis for social categorization is location, e.g., the California group or the Portuguese group or the client-site group. According to the literatures concerning group identity and in-group/out-group conflict, such tendencies are exacerbated by weak team integration (Karakowsky and Siegel 1995, McDonald 1995) and the need for a target for displaced hostility (Brewer 1986). Frustration in search of an outlet may build up in dispersed collaborations because of the elusive problems of information exchange and interpretation described in this study, and other structural and technical challenges. Once in-group/out-group dynamics had arisen in the teams I studied, subgroups tended to withhold information from each other. This erodes mutual knowledge to a greater degree, and worsens problems. It also creates differing impressions among parts of a group of the group's timing and pace, impacting motivation and coordination.

Future research should explore the role of social categorization processes in dispersed work groups, including generalization on the basis of location. Dynamics involving subgroups should be investigated because dispersed teams in practice typically include collocated subgroups (Goodman and Wilson 1998, Leonard et al. 1998, Maznevski and Chudoba 2000, Mazchrzak et al. 2000, Snow et al. 1996).

### Association with Performance

There were no clear relationships between team performance and particular problems of information exchange and interpretation, or the general incidence of such problems. Failures of mutual knowledge were ubiquitous across the teams. Although it was possible to distinguish different team performance strategies, no one strategy was associated with high performance. However, performance strategies did seem to be associated with different *relational* outcomes in the teams. Future research should return to this issue with more sensitive task designs. In particular, designs should vary the distribution of task-related information across locations and the amount of interdependence required of team members. Using such tasks, relationships among team performance, performance strategies, and the failures of mutual knowledge identified in this study should be examined.

### Amplifying and Moderating Forces

Feedback lags seem to amplify the problems of information exchange and interpretation identified by this study. Krauss and Bricker (1966) demonstrate that feedback lags disrupt the ability of senders and receivers to establish common referents, a building block of mutual knowledge. In addition, this study suggests that feedback lags contribute to the exaggeration of negative attributions concerning remote partners and make it more difficult for dispersed collaborators to diagnose their situation.

Without feedback, deprived collaborators are left to speculate why their expectations have not been fulfilled and when feedback will come. In the absence of situational information, they are likely to make negative attributions concerning the dispositions of their remote partners. These attributions can grow more negative as waiting continues. Deprived collaborators also sometimes amplify their demands, triggering an exaggerated response from their remote partners. The situation is like that of the person who ultimately turns the hot water up too high in the shower because of time lags between turns of the faucet and response. One participant said as much: "Some problems dragged on for days *while the suspicions of group members intensified*. In reality, the problem could have been as simple as someone not being able to get to the computer lab to check their messages." The speed of feedback cycles may constitute a critical constraint for geographically dispersed groups.

In addition, feedback lags and dispersed information make it extremely difficult for people to get an overview of the structure and functioning of a dispersed system of relationships. Actions and reactions are difficult to interpret when disrupted by lags in feedback. Blaming is a common response when individuals do not grasp the structure and dynamics of complex systems of which they are a part (Bowen 1985, Senge 1990). In future research, systems dynamics theory (Sterman 1989) might contribute to our understanding of the impacts of distributed information and feedback lags on dispersed collaboration and computer-mediated communication.

In both dispersed and collocated collaboration, problems establishing and maintaining mutual knowledge are most likely to occur when there is a great deal of uniquely held task-related and contextual information and limited communication channels. Exacerbating factors can be expected to include heavy cognitive load, a complex interdependent task, tight time limits, and a complex team design—particularly one involving strong subgroup identities, which may reinforce local perspectives.

For situations in which these factors are operating,

practices that should moderate problems include methodically seeking out situational and uniquely held information, giving prompt feedback whenever possible, focusing on the overall structure and processes of the system of relationships rather than on individuals, reexamining group operating practices and norms, and extending the benefit of the doubt rather than engaging in the creation of out-groups. The overall effect of these practices is to direct attention to group-level diagnosis and learning.

### Limitations

The mode of generalization appropriate to case study research is analytic generalization—generalization to theory rather than statistical generalization (Yin 1994). Therefore, it is important to articulate how the teams studied here may be typical and atypical of geographically dispersed work groups. Geographically dispersed work groups take many different forms in practice (Goodman and Wilson 1998, Leonard et al. 1998, Maznevski and Chudoba 2000, Mazchrzak et al. 2000, Snow et al. 1996). The teams I studied probably are atypical in the limitations they faced around means of communication. Travel, videoconferencing, and telephone conferencing were not an option for them, and they were limited by personal expense in their use of the telephone. Occasional face-to-face meetings and more telephone contact might moderate the processes observed; however, there is reason to think that basic tendencies might be the same. Additional modes of contact could contribute to uneven exchange of information among parts of a team if used extensively by dyads or subgroups.

Several team design factors should also be noted: group identity and time frame (discussed in Walther 1997), interdependence, and composition. The local university-based subgroups of the teams studied probably had a considerably stronger basis for identity than the teams as wholes. While dispersed teams in practice are often composed of people from multiple organizations and subgroups with strong identities, the weak basis for team identity should be taken into account. Likewise, the teams' seven-week time frame is not unusual in business practice; however, its relative shortness and the teams' low expectation of future interaction should also be noted. As discussed previously, the team's level of interdependence could be characterized as moderate. They carried out a project that required research, creativity, and a range of skills with outcomes of significance for the members. The teams were composed of adult professionals representing a range of ages with moderate international and technical experience. We must continue to examine the forms that dispersed collaboration takes in practice and

take these structural factors into account in our research designs and theories.

Another limitation of the study is the use of one primary judge of the meaning of the data. Case study and multiple case study methodologists struggle with the issue of reliability, given the unwieldy form of the data and the time required to review it, and this study faces the same challenge. This work followed the recommended practice of preserving a case study database and case study protocol (Yin 1994) so that another researcher could review the process. Following Eisenhardt (1989), the protocol included two reviews of all the cases that were aimed at testing reliability, one after initial formulation of constructs and the second after formulation of the model to refine or refute emerging conclusions.

There are also some safeguards peculiar to this study. There was a clear standard as to what constituted the foundation of the data because every effort was made to develop complete e-mail histories of each team. Communication and the flow of events were preserved in a record that did not reflect the choices of a researcher. While I was the final judge of the meaning of this communication and these events, I did compare my impressions with those recorded separately by a research assistant and by 26 participants in the teams. When these impressions diverged, I could and did minutely examine the e-mail records to try to understand the divergence.

In addition, I provided numerous detailed examples in this report so that some assessment of the evidence can be made in lieu of a full review of the records. Gersick (1988) observes that the advantage of a single patient judge of meaning is that analysis is done consistently, yielding understanding of a whole event. However, this will always be one side of a trade-off in a study such as this one.

A third limitation is that this study did not compare the dispersed teams with collocated teams, so we cannot determine the extent to which the problems and processes described also occur in collocated collaborations. This issue must be explored empirically. However, I have taken care to describe when we might see these dynamics in collocated collaborations, and to provide grounded reasons why failure to establish and maintain mutual knowledge should be more likely and more serious in dispersed collaborations.

### Implications for Practice

While the conclusions offered here are tentative, designers and members of geographically dispersed teams may still be interested in the implications for practice. This work suggests that designers of dispersed teams should aggressively explore in advance potential differences in

situations and incentives that will affect team members. Goals, incentives, and situations should be aligned whenever possible. When they cannot be, these differences should be brought to all team members' attention.

Ideally, all members of a dispersed collaboration should be sent the same information. Beyond the content of the information, this provides each member with an accurate picture of the *pace* of activity in the collaboration, including any differences in pace among subgroups. In practice, however, the information load could be overwhelming. If there is a risk of overload, leaders and members of dispersed teams should communicate information that establishes or makes adjustments to the parameters of collaboration such as (1) the availability of members (including identification of holidays), and constraints on availability such as competing responsibilities; (2) the objectives of the collaboration and solution contexts; (3) local requirements, customs, processes, and constraints that bear on member availability, objectives, or solutions; (4) means of communication and norms, including back-up procedures; and (5) reports on the pace of activity overall and the pace in any subgroups.

Members of dispersed teams and people communicating via computer mediation should resist making assumptions about the situation and constraints of remote others. Instead, they should actively seek out such information. It is also important for individuals to monitor the tendency to leap to dispositional attributions about remote partners. Situational causes should be considered, even if information to support them is not immediately available. In addition, prompt feedback when possible helps everyone in a complex distributed system to correct inaccurate interpretations and attributions. Training in systems thinking may be useful for members of distributed work groups by helping them appreciate the structure, processes, and time lags of the system of which they are a part.

We have entered a new era of collaborative activity, one in which it is feasible for work groups to span time zones rather than yards or miles. There are many advantages to be gained through the use of such groups. However, their usefulness will be maximized if we understand characteristic dynamics sufficiently well, so that effective team designs can be developed and effective training can be offered. The literature on computer-mediated communication has led the way by exploring the nature of communication in such groups. However, it is argued here that not only the mode of communication but also the fact that these groups are complex distributed dynamic systems will affect processes, and outcomes. We know that people tend not to be sensitive to the structure, processes, and time lags of the systems of which they are

a part. However, successful collaboration in geographically dispersed work groups may hinge on members mastering these skills: grasping local realities and the big picture, establishing mutual knowledge, taking into account the dynamics of feedback processes, and understanding the processes linking distant but interdependent parts.

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# Ways to Build Collaborative Teams

Even the largest and most complex teams can work together effectively if the right conditions are in place.

**by Lynda Gratton and Tamara J. Erickson**

**W**HEN TACKLING A MAJOR INITIATIVE like an acquisition or an overhaul of IT systems, companies rely on large, diverse teams of highly educated specialists to get the job done. These teams often are convened quickly to meet an urgent need and work together virtually, collaborating online and sometimes over long distances.

Appointing such a team is frequently the only way to assemble the knowledge and breadth required to



pull off many of the complex tasks businesses face today. When the BBC covers the World Cup or the Olympics, for instance, it gathers a large team of researchers, writers, producers, cameramen, and technicians, many of whom have not met before the project. These specialists work together under the high pressure of a “no retake” environment, with just one chance to record the action. Similarly, when the central IT team at Marriott sets out to develop sophisticated systems to enhance guest experiences, it has to collaborate closely with independent hotel owners, customer-experience experts, global brand managers, and regional heads, each with his or her own agenda and needs.

Our recent research into team behavior at 15 multinational companies, however, reveals an interesting paradox: Although teams that are large, virtual, diverse, and composed of highly educated specialists are increasingly crucial with challenging projects, those same four characteristics make it hard for teams to get anything done. To put it another way, the qualities required for success are the same qualities that undermine success. Members of complex teams are less likely – *absent other influences* – to share knowledge freely, to learn from one another, to shift workloads flexibly to break

those conditions requires thoughtful, and sometimes significant, investments in the capacity for collaboration across the organization.

Working together virtually has a similar impact on teams. The majority of those we studied had members spread among multiple locations – in several cases, in as many as 13 sites around the globe. But as teams became more virtual, we saw, cooperation also declined, unless the company had taken measures to establish a collaborative culture.

As for diversity, the challenging tasks facing businesses today almost always require the input and expertise of people with disparate views and backgrounds to create cross-fertilization that sparks insight and innovation. But diversity also creates problems. Our research shows that team members collaborate more easily and naturally if they perceive themselves as being alike. The differences that inhibit collaboration include not only nationality but also age, educational level, and even tenure. Greater diversity also often means that team members are working with people that they know only superficially or have never met before – colleagues drawn from other divisions of the company, perhaps, or even from outside it. We have found that the higher

## We found that the greater the proportion of experts a team had, the more likely it was to disintegrate into nonproductive conflict or stalemate.

up unexpected bottlenecks, to help one another complete jobs and meet deadlines, and to share resources – in other words, to collaborate. They are less likely to say that they “sink or swim” together, want one another to succeed, or view their goals as compatible.

Consider the issue of size. Teams have grown considerably over the past ten years. New technologies help companies extend participation on a project to an ever greater number of people, allowing firms to tap into a wide body of knowledge and expertise. A decade or so ago, the common view was that true teams rarely had more than 20 members. Today, according to our research, many complex tasks involve teams of 100 or more. However, as the size of a team increases beyond 20 members, the tendency to collaborate naturally decreases, we have found. Under the right conditions, large teams can achieve high levels of cooperation, but creating

the proportion of strangers on the team and the greater the diversity of background and experience, the less likely the team members are to share knowledge or exhibit other collaborative behaviors.

In the same way, the higher the educational level of the team members is, the more challenging collaboration appears to be for them. We found that the greater the proportion of experts a team had, the more likely it was to disintegrate into nonproductive conflict or stalemate.

So how can executives strengthen an organization’s ability to perform complex collaborative tasks – to maximize the effectiveness of large, diverse teams, while minimizing the disadvantages posed by their structure and composition?

To answer that question we looked carefully at 55 large teams and identified those that demonstrated high levels

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# Collaboration Conundrums

Four traits that are crucial to teams – but also undermine them

## Large Size

Whereas a decade ago, teams rarely had more than 20 members, our findings show that their size has increased significantly, no doubt because of new technologies. Large teams are often formed to ensure the involvement of a wide stakeholder group, the coordination of a diverse set of activities, and the harnessing of multiple skills. As a consequence, many inevitably involve 100 people or more. However, our research shows that as the size of the team increases beyond 20 members, the level of natural cooperation among members of the team decreases.

## Diversity

Often the challenging tasks facing today's businesses require the rapid assembly of people from multiple backgrounds and perspectives, many of whom have rarely, if ever, met. Their diverse knowledge and views can spark insight and innovation. However, our research shows that the higher the proportion of people who don't know anyone else on the team and the greater the diversity, the less likely the team members are to share knowledge.

## Virtual Participation

Today most complex collaborative teams have members who are working at a distance from one another. Again, the logic is that the assigned tasks require the insights and knowledge of people from many locations. Team members may be working in offices in the same city or strung across the world. Only 40% of the teams in our sample had members all in one place. Our research shows that as teams become more virtual, collaboration declines.

## High Education Levels

Complex collaborative teams often generate huge value by drawing on a variety of deeply specialized skills and knowledge to devise new solutions. Again, however, our research shows that the greater the proportion of highly educated specialists on a team, the more likely the team is to disintegrate into unproductive conflicts.

## Executive Support

At the most basic level, a team's success or failure at collaborating reflects the philosophy of top executives in the organization. Teams do well when executives invest in supporting social relationships, demonstrate collaborative behavior themselves, and create what we call a "gift culture" – one in which employees experience interactions with leaders and colleagues as something valuable and generously offered, a gift.

**Investing in signature relationship practices.** When we looked at complex collaborative teams that were performing in a productive and innovative manner, we found that in every case the company's top executives had invested significantly in building and maintaining social relationships throughout the organization. However, the way they did that varied widely. The most collaborative companies had what we call "signature" practices – practices that were memorable, difficult for others to replicate, and particularly well suited to their own business environment.

For example, when Royal Bank of Scotland's CEO, Fred Goodwin, invested £350 million to open a new headquarters building outside Edinburgh in 2005, one of his goals was to foster productive collaboration among employees. Built around an indoor atrium, the new structure allows more than 3,000 people from the firm to rub shoulders daily.

The headquarters is designed to improve communication, increase the exchange of ideas, and create a sense of community among employees. Many of the offices have an open layout and look over the atrium – a vast transparent space. The campus is set up like a small town, with retail shops, restaurants, jogging tracks and cycling trails, spaces for picnics and barbecues – even a leisure club complete with swimming pool, gym, dance studios, tennis courts, and football pitches. The idea is that with a private "Main Street" running through the headquarters, employees will remain on the campus throughout the day – and be out of their offices mingling with colleagues for at least a portion of it.

To ensure that non-headquarters staff members feel they are a part of the action, Goodwin also commissioned an adjoining business school, where employees from other locations meet and learn. The visitors are encouraged to spend time on the headquarters campus and at forums designed to give employees opportunities to build relationships.

Indeed, the RBS teams we studied had very strong social relationships, a solid basis for collaborative activity that allowed them to accomplish tasks quickly. Take the Group Business Improvement (GBI) teams, which work on 30-, 60-, or 90-day projects ranging from back-office fixes to IT updates and are made up of people from across RBS's many businesses, including insurance, retail banking, and private

of collaborative behavior despite their complexity. Put differently, they succeeded both because of and despite their composition. Using a range of statistical analyses, we considered how more than 100 factors, such as the design of the task and the company culture, might contribute to collaboration, manifested, for example, in a willingness to share knowledge and workloads. Out of the 100-plus factors, we were able to isolate eight practices that correlated with success – that is, that appeared to help teams overcome substantially the difficulties that were posed by size, long-distance communication, diversity, and specialization. We then interviewed the teams that were very strong in these practices, to find out how they did it. In this article we'll walk through the practices. They fall into four general categories – executive support, HR practices, the strength of the team leader, and the structure of the team itself.

banking in Europe and the United States. When RBS bought NatWest and migrated the new acquisition's technology platform to RBS's, the speed and success of the GBI teams confounded many market analysts.

BP has made another sort of signature investment. Because its employees are located all over the world, with relatively few at headquarters, the company aims to build social networks by moving employees across functions, businesses, and countries as part of their career development. When BP integrates an acquisition (it has grown by buying numerous smaller oil companies), the leadership development committee deliberately rotates employees from the acquired firm through positions across the corporation. Though the easier and cheaper call would be to leave the executives in their own units – where, after all, they know the business – BP instead trains them to take on new roles. As a consequence any senior team today is likely to be made up of people from multiple heritages. Changing roles frequently – it would not be uncommon for a senior leader at BP to have worked in four businesses and three geographic locations over the past decade – forces executives to become very good at meeting new people and building relationships with them.

**Modeling collaborative behavior.** In companies with many thousands of employees, relatively few have the opportunity to observe the behavior of the senior team on a day-to-day basis. Nonetheless, we found that the perceived behavior of senior executives plays a significant role in determining how cooperative teams are prepared to be.

Executives at Standard Chartered Bank are exceptionally good role models when it comes to cooperation, a strength that many attribute to the firm's global trading heritage. The Chartered Bank received its remit from Queen Victoria in 1853. The bank's traditional business was in cotton from Bombay (now Mumbai), indigo and tea from Calcutta, rice from Burma, sugar from Java, tobacco from Sumatra, hemp from Manila, and silk from Yokohama. The Standard Bank was founded in the Cape Province of South Africa in 1863 and was prominent in financing the development of the diamond fields and later gold mines. Standard Chartered was formed in 1969 through a merger of the two banks, and today the firm has 57 operating groups in 57 countries, with no home market.

It's widely accepted at Standard Chartered that members of the general management committee will frequently serve as substitutes for one another. The executives all know and understand the entire business and can fill in for each other easily on almost any task, whether it's leading a regional celebration, representing the company at a key external event, or kicking off an internal dialogue with employees.

While the behavior of the executive team is crucial to supporting a culture of collaboration, the challenge is to make executives' behavior visible. At Standard Chartered the senior team travels extensively; the norm is to travel even

## Eight Factors That Lead to Success

### 1 Investing in signature relationship practices.

Executives can encourage collaborative behavior by making highly visible investments – in facilities with open floor plans to foster communication, for example – that demonstrate their commitment to collaboration.

### 2 Modeling collaborative behavior.

At companies where the senior executives demonstrate highly collaborative behavior themselves, teams collaborate well.

### 3 Creating a "gift culture."

Mentoring and coaching – especially on an informal basis – help people build the networks they need to work across corporate boundaries.

### 4 Ensuring the requisite skills.

Human resources departments that teach employees how to build relationships, communicate well, and resolve conflicts creatively can have a major impact on team collaboration.

### 5 Supporting a strong sense of community.

When people feel a sense of community, they are more comfortable reaching out to others and more likely to share knowledge.

### 6 Assigning team leaders that are both task- and relationship-oriented.

The debate has traditionally focused on whether a task or a relationship orientation creates better leadership, but in fact both are key to successfully leading a team. Typically, leaning more heavily on a task orientation at the outset of a project and shifting toward a relationship orientation once the work is in full swing works best.

### 7 Building on heritage relationships.

When too many team members are strangers, people may be reluctant to share knowledge. The best practice is to put at least a few people who know one another on the team.

### 8 Understanding role clarity and task ambiguity.

Cooperation increases when the roles of individual team members are sharply defined yet the team is given latitude on how to achieve the task.

for relatively brief meetings. This investment in face-to-face interaction creates many opportunities for people across the company to see the top executives in action. Internal communication is frequent and open, and, maybe most telling, every site around the world is filled with photos of groups of executives – country and functional leaders – working together.

The senior team's collaborative nature trickles down throughout the organization. Employees quickly learn that the best way to get things done is through informal networks. For example, when a major program was recently launched to introduce a new customer-facing technology, the team responsible had an almost uncanny ability to understand who the key stakeholders at each branch bank were and how best to approach them. The team members' first-name acquaintance with people across the company brought a sense of dynamism to their interactions.

**Creating a "gift culture."** A third important role for executives is to ensure that mentoring and coaching become embedded in their own routine behavior – and throughout the company. We looked at both formal mentoring processes, with clear roles and responsibilities, and less formal processes, where mentoring was integrated into everyday activities. It turned out that while both types were important, the latter was more likely to increase collaborative behavior. Daily coaching helps establish a cooperative "gift culture" in place of a more transactional "tit-for-tat culture."

At Nokia informal mentoring begins as soon as someone steps into a new job. Typically, within a few days, the employee's manager will sit down and list all the people in the organization, no matter in what location, it would be useful for the employee to meet. This is a deeply ingrained cultural norm, which probably originated when Nokia was a smaller and simpler organization. The manager sits with the newcomer, just as her manager sat with her when she joined, and reviews what topics the newcomer should discuss with each person on the list and why establishing a relationship with him or her is important. It is then standard for the newcomer to actively set up meetings with the people on the list, even when it means traveling to other



locations. The gift of time – in the form of hours spent on coaching and building networks – is seen as crucial to the collaborative culture at Nokia.

### Focused HR Practices

So what about human resources? Is collaboration solely in the hands of the executive team? In our study we looked at the impact of a wide variety of HR practices, including selection, performance management, promotion, rewards, and training, as well as formally sponsored coaching and mentoring programs.

We found some surprises: for example, that the type of reward system – whether based on team or individual achievement, or tied explicitly to collaborative behavior or not – had no discernible effect on complex teams' productivity and innovation. Although most formal HR programs appeared to have limited impact, we found that two practices did improve team performance: training in skills related to collaborative behavior, and support for informal community building. Where collaboration was strong, the HR team had typically made a significant investment in one or both of those practices – often in ways that uniquely represented the company's culture and business strategy.

**Ensuring the requisite skills.** Many of the factors that support collaboration relate to what we call the "container" of collaboration – the underlying culture and habits of the company or team. However, we found that some teams had a collaborative culture but were not skilled in the practice of collaboration itself. They were encouraged to cooperate,

they wanted to cooperate, but they didn't know how to work together very well in teams.

Our study showed that a number of skills were crucial: appreciating others, being able to engage in purposeful conversations, productively and creatively resolving conflicts, and program management. By training employees in those areas, a company's human resources or corporate learning department can make an important difference in team performance.

In the research, PricewaterhouseCoopers emerged as having one of the strongest capabilities in productive collaboration. With responsibility for developing 140,000 employees

The ABN Amro teams rated the company's support for informal communities very positively. The firm makes the technology needed for long-distance collaboration readily available to groups of individuals with shared interests – for instance, in specific technologies or markets – who hold frequent web conferences and communicate actively online. The company also encourages employees that travel to a new location to arrange meetings with as many people as possible. As projects are completed, working groups disband but employees maintain networks of connections. These practices serve to build a strong community over time – one that sets the stage for success with future projects.

## The most productive, innovative teams were led by people who were *both* task- and relationship-oriented. What's more, these leaders changed their style during the project.

in nearly 150 countries, PwC's training includes modules that address teamwork, emotional intelligence, networking, holding difficult conversations, coaching, corporate social responsibility, and communicating the firm's strategy and shared values. PwC also teaches employees how to influence others effectively and build healthy partnerships.

A number of other successful teams in our sample came from organizations that had a commitment to teaching employees relationship skills. Lehman Brothers' flagship program for its client-facing staff, for instance, is its training in selling and relationship management. The program is not about sales techniques but, rather, focuses on how Lehman values its clients and makes sure that every client has access to all the resources the firm has to offer. It is essentially a course on strategies for building collaborative partnerships with customers, emphasizing the importance of trust-based personal relationships.

**Supporting a sense of community.** While a communal spirit can develop spontaneously, we discovered that HR can also play a critical role in cultivating it, by sponsoring group events and activities such as women's networks, cooking weekends, and tennis coaching, or creating policies and practices that encourage them.

At ABN Amro we studied effective change-management teams within the company's enterprise services function. These informal groups were responsible for projects associated with the implementation of new technology throughout the bank; one team, for instance, was charged with expanding online banking services. To succeed, the teams needed the involvement and expertise of different parts of the organization.

Committed investment in informal networks is also a central plank of the HR strategy at Marriott. Despite its size and global reach, Marriott remains a family business, and the chairman, Bill Marriott, makes a point of communicating that idea regularly to employees. He still tells stories of counting sticky nickels at night as a child – proceeds from the root-beer stand founded in downtown Washington, DC, by his mother and father.

Many of the firm's HR investments reinforce a friendly, family-like culture. Almost every communication reflects an element of staff appreciation. A range of "pop-up" events – spontaneous activities – create a sense of fun and community. For example, the cafeteria might roll back to the 1950s, hold a twist dance contest, and in doing so, recognize the anniversary of the company's first hotel opening. Bill Marriott's birthday might be celebrated with parties throughout the company, serving as an occasion to emphasize the firm's culture and values. The chairman recently began his own blog, which is popular with employees, in which he discusses everything from Marriott's efforts to become greener, to his favorite family vacation spots – themes intended to reinforce the idea that the company is a community.

### The Right Team Leaders

In the groups that had high levels of collaborative behavior, the team leaders clearly made a significant difference. The question in our minds was how they actually achieved this. The answer, we saw, lay in their flexibility as managers.

**Assigning leaders who are both task- and relationship-oriented.** There has been much debate among both academ-

ics and senior managers about the most appropriate style for leading teams. Some people have suggested that relationship-oriented leadership is most appropriate in complex teams, since people are more likely to share knowledge in an environment of trust and goodwill. Others have argued that a task orientation – the ability to make objectives clear, to create a shared awareness of the dimensions of the task, and to provide monitoring and feedback – is most important.

In the 55 teams we studied, we found that the truth lay somewhere in between. The most productive, innovative teams were typically led by people who were *both* task- and relationship-oriented. What's more, these leaders changed their style during the project. Specifically, at the early stages they exhibited task-oriented leadership: They made the goal clear, engaged in debates about commitments, and clarified the responsibilities of individual team members. However, at a certain point in the development of the project they switched to a relationship orientation. This shift often took place once team members had nailed down the goals and their accountabilities and when the initial tensions around sharing knowledge had begun to emerge. An emphasis throughout a project on one style at the expense of the other inevitably hindered the long-term performance of the team, we found.

Producing ambidextrous team leaders – those with both relationship and task skills – is a core goal of team-leadership development at Marriott. The company's performance-review process emphasizes growth in both kinds of skills. As evidence of their relationship skills, managers are asked to describe their peer network and cite examples of specific ways that network helped them succeed. They also must provide examples of how they've used relationship building to get things done. The development plans that follow these conversations explicitly map out how the managers can improve specific elements of their social relationships and networks. Such a plan might include, for instance, having lunch regularly with people from a particular community of interest.

To improve their task leadership, many people in the teams at Marriott participated in project-management certification programs, taking refresher courses to maintain

their skills over time. Evidence of both kinds of capabilities becomes a significant criterion on which people are selected for key leadership roles at the company.

## Team Formation and Structure

The final set of lessons for developing and managing complex teams has to do with the makeup and structure of the teams themselves.

**Building on heritage relationships.** Given how important trust is to successful collaboration, forming teams that capitalize on preexisting, or “heritage,” relationships, increases the chances of a project's success. Our research shows that new teams, particularly those with a high proportion of members who were strangers at the time of formation, find it more difficult to collaborate than those with established relationships.

Newly formed teams are forced to invest significant time and effort in building trusting relationships. However, when some team members already know and trust one another, they can become nodes, which over time evolve into networks. Looking closely at our data, we discovered that when 20% to 40% of the team members were already well connected to one another, the team had strong collaboration right from the start.

It helps, of course, if the company leadership has taken other measures to cultivate networks that cross boundaries. The orientation process at Nokia ensures that a large number of people on any team know one another, increasing the odds that even in a company of more than 100,000 people, someone on a companywide team knows someone else and can make introductions.

Nokia has also developed an organizational architecture designed to make good use of heritage relationships. When it needs to transfer skills across business functions or units, Nokia moves entire small teams intact instead of reshuffling individual people into new positions. If, for example, the company needs to bring together a group of market and technology experts to address a new customer need, the group formed would be composed of small pods of

## How Complex Is the Collaborative Task?

Not all highly collaborative tasks are complex. In assembling and managing a team, consider the project you need to assign and whether the following statements apply:

- The task is unlikely to be accomplished successfully using only the skills within the team.
- The task must be addressed by a new group formed specifically for this purpose.
- The task requires collective input from highly specialized individuals.
- The task requires collective input and agreement from more than 20 people.
- The members of the team working on the task are in more than two locations.
- The success of the task is highly dependent on understanding preferences or needs of individuals outside the group.
- The outcome of the task will be influenced by events that are highly uncertain and difficult to predict.
- The task must be completed under extreme time pressure.

If more than two of these statements are true, the task requires complex collaboration.

colleagues from each area. This ensures that key heritage relationships continue to strengthen over time, even as the organization redirects its resources to meet market needs. Because the entire company has one common platform for logistics, HR, finance, and other transactions, teams can switch in and out of businesses and geographies without learning new systems.

## The Research

Our work is based on a major research initiative conducted jointly by the Concours Institute (a member of BSG Alliance) and the Cooperative Research Project of London Business School, with funding from the Advanced Institute for Management and 15 corporate sponsors. The initiative was created as a way to explore the practicalities of collaborative work in contemporary organizations.

We sent surveys to 2,420 people, including members of 55 teams. A total of 1,543 people replied, a response rate of 64%. Separate surveys were administered to group members, to group leaders, to the executives who evaluated teams, and to HR leaders at the companies involved. The tasks performed by the teams included new-product development, process reengineering, and identifying new solutions to business problems. The companies involved included four telecommunication companies, seven financial services or consulting firms, two media companies, a hospitality firm, and one oil company. The size of the teams ranged from four to 183 people, with an average of 44.

Our objective was to study the levers that executives could pull to improve team performance and innovation in collaborative tasks. We examined scores of possible factors, including the following:

### **The general culture of the company.**

We designed a wide range of survey questions to measure the extent to which the firm had a cooperative culture and to uncover employees' attitudes toward knowledge sharing.

### **Human resources practices and processes.**

We studied the way staffing took place and the process by which people were promoted. We examined the extent and type of training, how reward systems were configured, and the extent to which mentoring and coaching took place.

### **Socialization and network-building practices.**

We looked at how often people within the team participated in informal socialization, and the type of interaction that was most common. We also asked numerous questions about the extent to which team members were active in informal communities.

**The design of the task.** We asked team members and team leaders about the task itself. Our interest here was in how they perceived the purpose of the task, how complex it was, the extent to which the task required

members of the team to be interdependent, and the extent to which the task required them to engage in boundary-spanning activities with people outside the team.

### **The leadership of the team.**

We studied the perceptions team members had of their leaders' style and how the leaders described their own style. In particular, we were interested in the extent to which the leaders practiced relationship-oriented and task-oriented skills and set cooperative or competitive goals.

### **The behavior of the senior executives.**

We asked team members and team leaders about their perceptions of the senior executives of their business unit. We focused in particular on whether team members described them as cooperative or competitive.

In total we considered more than 100 factors. Using a range of statistical analyses, we were able to identify eight that correlated with the successful performance of teams handling complex collaborative tasks. (See the sidebar "Eight Factors That Lead to Success.")

One important caveat about heritage relationships: If not skillfully managed, too many of them can actually disrupt collaboration. When a significant number of people within the team know one another, they tend to form strong subgroups – whether by function, geography, or anything else they have in common. When that happens, the probability of conflict among the subgroups, which we call fault lines, increases.

### **Understanding role clarity and task ambiguity.**

Which is more important to promoting collaboration: a clearly defined approach toward achieving the goal, or clearly specified roles for individual team members? The common assumption is that carefully spelling out the approach is essential, but leaving the roles of individuals within the team vague will encourage people to share ideas and contribute in multiple dimensions.

Our research shows that the opposite is true: Collaboration improves when the roles of individual team members are clearly defined and well understood – when individuals feel that they can do a significant portion of their work independently. Without such clarity, team members are likely to waste too much energy negotiating roles or protecting turf, rather than focus on the task. In addition, team members are more likely to want to collaborate if the path to achieving the team's goal is left somewhat ambiguous. If a team perceives the task as one that requires creativity, where the approach is not yet well known or predefined, its members are more likely to invest time and energy in collaboration.

At the BBC we studied the teams responsible for the radio and television broadcasts of the 2006 Proms (a two-month-long musical celebration), the team that televised the 2006 World Cup, and a team responsible for daytime television news. These teams were large – 133 people worked on the Proms, 66 on the World Cup, and 72 on the news – and included members with a wide range of skills and from many disciplines. One would imagine, therefore, that there was a strong possibility of confusion among team members.

To the contrary, we found that the BBC's teams scored among the highest in our sample with regard to the clarity with which members viewed their own roles and the roles of others. Every team was composed of specialists who had deep expertise in their

given function, and each person had a clearly defined role. There was little overlap between the responsibilities of the sound technician and the camera operator, and so on. Yet the tasks the BBC teams tackle are, by their very nature, uncertain, particularly when they involve breaking news. The trick the BBC has pulled off has been to clarify team members' individual roles with so much precision that it keeps friction to a minimum.

The successful teams we studied at Reuters worked out of far-flung locations, and often the team members didn't speak a common language. (The primary languages were Russian, Chinese, Thai, and English.) These teams, largely composed of software programmers, were responsible for the rapid development of highly complex technical software and network products. Many of the programmers sat at their desks for 12 hours straight developing code, speaking with no one. Ironically, these teams judged cooperative behavior to be high among their members. That may be because each individual was given autonomy over one discrete piece of the project. The rapid pace and demanding project timelines encouraged individual members to work independently to get the job done, but each person's work had to be shaped with an eye toward the overall team goal.

...

Strengthening your organization's capacity for collaboration requires a combination of long-term investments – in building relationships and trust, in developing a culture in which senior leaders are role models of cooperation – and smart near-term decisions about the ways teams are formed, roles are defined, and challenges and tasks are articulated. Practices and structures that may have worked well with simple teams of people who were all in one location and knew one another are likely to lead to failure when teams grow more complex.

Most of the factors that impede collaboration today would have impeded collaboration at any time in history. Yesterday's teams, however, didn't require the same amount of members, diversity, long-distance cooperation, or expertise that teams now need to solve global business challenges. So the models for teams need to be realigned with the demands of the current business environment. Through careful attention to the factors we've described in this article, companies can assemble the breadth of expertise needed to solve complex business problems – without inducing the destructive behaviors that can accompany it. □

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"One of my private demons – I hired Louis to wrestle it for me."

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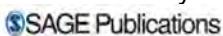
## **Team-based Research: Notes from the Field**

Diana R. Garland, Mary Katherine O'Connor, Terry A. Wolfer and F. Ellen Netting  
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ARTICLE

## Team-based Research

### Notes from the Field

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### ABSTRACT

This article reviews the literature on research using teams, including interdisciplinary teams, teams that span universities and are geographically distant, and teams using qualitative and mixed methods. It reports experiences of two multi-year, externally funded, multiple-university research teams that used both qualitative and quantitative methods. It concludes with suggestions for others undertaking team-based research.

### KEY WORDS:

interdisciplinary  
teams

mixed methods

team research

How teams of researchers across universities and disciplines collaborate among themselves and the dynamics that occur in this teamwork experience has been a neglected topic of study (Tripp-Reimer et al., 1994). Our experience with two projects that each involved university collaborators across the time zones of the continental USA and in both private and public institutions leads us to recognize that team-based research creates significant methodological and management challenges not inherent in individually based research. This article shares lessons we learned from these projects in an effort to establish the feasibility of such research and help others build upon our experiences. Amid the challenges, we acknowledge the advantages of team research, which include the group's capacity to collaboratively tackle complex areas of study and to learn from one another in the process.

## BENEFITS AND CHALLENGES OF USING RESEARCH TEAMS

Regardless of methods used, researchers work with others in formulating research questions, collecting data, and interpreting findings (e.g. Darlington and Scott, 2002; Davidson and Tolich, 1999). Colleagues and collaborators often are sought out informally as resources for multiple perspectives in the research process. In large-scale, funded studies in which diverse perspectives and multiple geographical sites are involved, this collaboration becomes formalized in the work of a team.

A team, in contrast to other small groups, pursues a collective task (Bradley, 1982; Ilgen et al., 1993). The collaboration required to pursue this collective task does not occur spontaneously; it requires the intentional creation of a culture of teamwork (Bronstein, 2003). For example, influenced by a tradition of qualitative research, Strauss enacted a team approach for doing action research that involved a group of six researchers, including social scientists, graduate students, and other professionals (Strauss and Corbin, 1998). Lessor (2001) describes the use of this model in an action-research project studying the introduction of global education in public schools. The team individually gathered data and then, in team meetings, analyzed their findings and developed grounded theory. Understanding team process is critically important and, thus, more and more researchers are writing about their experiences as collaborators in team projects (e.g. Armstrong and Cole, 1995; Bantz, 1993; Bradley, 1982; Crow et al., 1992; Del Monte, 2000; Galinsky et al., 1993; Hackman, 1990; Tripp-Reimer et al., 1994). They reveal many benefits and challenges in the process.

## BENEFITS TO TEAMWORK

Many projects require a variety of expertise that may go beyond the capacity of one person or reach for diverse perspectives, such as bringing together persons

with different life experiences and methodological skills. Integrating earlier investigator field research efforts, Douglas (1976) developed the team field research model. There is some specialization of tasks in this model; for example, researchers may interview or observe different and potentially conflicting groups within a setting, a task that one researcher could not do and still develop the needed trust of informants. From a nursing context, Beyea and Nicoll (1998) underscore not only a difference in tasks but also in the expertise team members bring to the research, suggesting that it is helpful to have individuals with dissimilar backgrounds who can bring new expertise to the team (Beyea and Nicoll, 1998; Cohen et al., 1991) and who fill different niches in the project (Erickson and Stull, 1998). Using a research team militates against premature convergence on conclusions, providing critics who can recognize problems as the project unfolds (Ilgen, 1999).

Interaction between researchers from different disciplines potentially can lead to greater creativity and insight in tackling complex problems that do not fall neatly within disciplinary boundaries or fit conventional methods. Researchers on interdisciplinary teams tend to be hybrid scholars who are 'border crossers', working at the edges of two or more disciplines (Bruhn, 2000). Teams often work together over time and projects, so that these processes are important beyond the productivity of a particular project.

## CHALLENGES TO TEAMWORK

Creating a team with diverse perspectives and skills also generates challenges. Brewer (1995) warns that dynamics such as in-group loyalties, inter-group rivalries, and negative stereotypes and distrust often impede coordination on diverse teams. In terms of professional and disciplinary norms, professional and organizational turf protection, role competition, and role confusion may impede collaboration (Graham and Barter, 1999). There can be conflict over status, leadership, and perceived levels of commitment as well as the more expected conflict over methods. These processes vary with team composition, whether they are equal in status (all academics at the same rank) or differential in status (professor and students), whether they come from the same discipline or differing disciplines, and whether they are members of the same or different institutions (Del Monte, 2000). Particularly challenging is interdisciplinary team research, involving members from different disciplines selected to bring needed and diverse professional perspectives to the research question (Taylor, 1986).

On an interpersonal basis, teams can be fragile; 'personal slights or professional criticisms, real or imagined, may fester and eventually become open sores' (Erickson and Stull, 1998: 28). Team research involves all the dynamics of groups, including the development of roles, leadership, norms, cohesiveness, and balance between task and social dimensions (Del Monte, 2000). Open

communication about these dynamics, as with most human enterprises, can significantly influence research processes and outcomes (Del Monte, 2000; Galinsky et al., 1993). A particularly difficult area is conversational norms such as whether one waits (politely) for another to stop speaking or interrupts. Violated norms can sabotage clear communication and team participation (Bantz, 1993).

Norms are even more likely to be violated in team projects that extend across time and space. Armstrong and Cole (1995) report that misunderstandings and escalating conflicts emerged as two problems in their long-distance collaborative research. Distant members were excluded from informal conversations and decision making. Messages were interpreted differently in different contexts, sometimes fueling ongoing conflicts. Conflicts went unidentified longer and escalated further before flaring suddenly, because distance blocked the corrective feedback provided by informal encounters. In conference calls, it was easy for the group in the room to talk over distant members, who ended up silently listening (Armstrong and Cole, 1995). The use of qualitative methodology brings additional team challenges because of the dependence on the researcher/observer as the primary research instrument. The significance of processes of communication, trust, and conflict management are therefore heightened.

More than many other professionals, social workers are used to working in teams, both with other social workers and with colleagues from other disciplines (Bronstein, 2003). Skills for working on teams are drawn from group work and include contracting, monitoring of group process, dealing with conflict, and understanding inter-professional differences (Abramson, 1990). Although it seems obvious, it is easy to overlook the ways that group process affects the capacity of a research team to do its work, and there is very little guidance for conducting team-based qualitative research beyond Erickson and Stull's (1998) guidelines for team ethnography. Therefore, we share the lessons we have learned in conducting two large, multi-site qualitative studies.

## **DESCRIPTION OF PROJECTS**

The authors were members of two three-year externally funded team-based research projects. The primary investigator (PI), who is also lead author of this article, is the only overlapping team member of the two projects. Both projects employed mixed qualitative and quantitative research methods. Project 1 began 18 months before Project 2, providing opportunity to implement learning about team research from the first to the second project – and, in some cases, unintentionally to repeat the same mistakes and successes before gaining some understanding of the challenges of team research.

Lilly Endowment, Inc. funded Project 1, entitled 'Service and Faith: The Impact on Christian Faith and Congregational Life of Organized Community Caring' (S&F). It involved seven social work researchers from four universities

– Calvin College (Michigan), University of South Carolina, Baylor University (Texas), and Whittier College (Southern California). The project was designed to help social workers to engage volunteers and their congregations in community service programs. It assumed that social workers need to understand religiously oriented motivations of volunteers. The first phase of the project included surveys of 35 congregations from the four regions surrounding the universities, and follow-up surveys with congregants actively involved as community service volunteers (Hugen et al., forthcoming). The second phase of Project 1 involved in-depth qualitative interviews with congregational leaders and community volunteers from the congregations. In contrast to the quantitative surveys, the qualitative interviews with congregational leaders, volunteers, and volunteer families took a highly inductive approach. The team continued working together through analysis of the qualitative interviews. This included open coding and memoing of transcripts by individual team members (Strauss and Corbin, 1998), coordinated and refined through weekly telephone conference calls and integration of the evolving coding framework. These team processes continued until increasingly deep and complex axial coding made it necessary to differentiate the analytic tasks by topic. Team members continued to exchange and review each other's work.

Pew Charitable Trusts funded Project 2, with the goal of identifying what faith-based organizations (FBOs) are doing well – and not so well – in addressing problems of urban poverty. This project included collaborating researchers from social work, business, and sociology representing Baylor University, University of Pittsburgh, Virginia Commonwealth University, and the Center for Religion and Civic Culture at the University of Southern California. This project reversed Project 1's order of quantitative and qualitative methods, starting with qualitative interviews in a purposive sample of 16 organizations having programs considered models in four urban communities geographically accessible to the four universities. For each program, face-to-face interviews using a semi-structured questionnaire were conducted with stakeholders who represented program leaders, service providers, service recipients, program funders, and board members. Attending to the emergent nature of grounded theory, semi-structured interview guides were adjusted after each phase of data collection and analysis to reflect new understandings gained in the previous phase. The analysis emerging from the grounded theory process became the foundation for the development of an extensive national survey that was disseminated to every FBO and congregation that could be located by multiple methods in 13 nationally representative cities. Finally, the research team conducted a second round of qualitative interviews with promising programs in each of the 13 cities to which the quantitative survey was sent.

In both projects, the research team's ongoing collaboration contributed to the review of literature and to instrument development, coordinated survey

and interview implementation, training team members in the grounded theory methods chosen for the projects, and enriching data analysis and writing. Each project took a different methodological design approach: Project 1 took a complementary approach where both methods were combined to provide for different perspectives; Project 2 took an antecedent approach using qualitative work to identify issues, followed by quantitative testing of those issues (Lancy, 1993).

## TEAM FORMATION AND CONTRACTING

The complexity of the multi-method research designs of both projects required highly and diversely skilled research teams knowledgeable about and committed to increasing knowledge about congregations and FBOs. The Project 1 team was entirely composed of social work professors bringing a diversity of research skills, some quantitative and some qualitative, and some with knowledge about social work with congregations. Because Project 2 examined effective organizational and business practices of FBOs, it included team members from business and sociology who had studied effective organizational practices as well as social work researchers with expertise in quantitative and qualitative methodologies. Some team members had less research experience but brought extensive knowledge of work with FBOs. In short, the teams were composed with an eye to bringing the needed skills for the tasks at hand (Graham and Barter, 1999). For the most part, team members received compensation in the form of contractual agreements. Most universities reduced teaching loads to allow time to participate in the projects.

Contracts and time lines may be well constructed in the beginning, but cannot protect the project from unforeseen circumstances. One year into Project 1, one of the seven team members (the Associate Director and the lead quantitative researcher) had to withdraw from the project for medical reasons. The team discussed possible courses of action – to replace the team member, or to distribute the work among the remaining members. It appeared that bringing another member up to speed, particularly someone who could step into a leadership role, seemed daunting, and so the team chose instead to distribute the workload among the remaining six researchers. As a consequence, an already demanding project became an even heavier responsibility on team members. Perhaps the most difficult loss was that, as Associate Director, the lost member had been charged with managing the team's processes. Those responsibilities subsequently fell to the PI, who was not able to secure additional time resources for this responsibility. These experiences threatened to send the team spiraling into feelings of failure (Hackman, 1990). Fortunately, the commitment to one another and to the project itself allowed the team to right itself and continue working, although we returned to feelings of discouragement more than once. Perhaps one of the most significant contributing factors to the team's

ability to right itself was the content of this project. Interviewing church leaders and volunteers provided opportunity for research team members to connect their research with their own personal faith commitments and to sense that their research would make a significant contribution to the faith communities being studied.

Another time challenge presented during the contractual phase of Project 1 was that some team members did not have the option of reduced workloads in order to participate in the project. Instead, because they were so motivated to participate, they chose to take on the project as an overload. Although the teams worked hard at considerable sacrifice, sometimes the project simply had to be second in priority to academic or family responsibilities, creating a slower pace and missed deadlines.

As a consequence of these early experiences in Project 1, Project 2 was designed somewhat differently. Because it is a much larger project, it was created with a much more distributed administrative structure. There are three Associate Directors for this project, one for each of the 'wings' of the project (quantitative and qualitative) and one for the publications. The emphasis on publications demanded this administrative attention because the project was designed to feed multiple practice-oriented publications to a website for faith-based organizations as well as to produce reports in more traditional academic publication channels. The PI's responsibilities were almost exclusively those of coordination among the facets of the project, maintaining budgetary oversight, and relating to external constituencies.

Graham and Barter (1999) present conditions necessary for a collaborative relationship: recognition of interdependence, a shared perception of stakeholders' legitimacy, the power to commit resources to the task and the ability to influence others to do the same, and an understanding that collaboration is a dynamic relationship that will change over time. Graham and Barter's (1999) observations about successful collaborative practice resonates with our experience: the projects were so complex that everyone recognized their interdependence. The generous grants made it possible to commit the resources needed to do the task and opened the doors of collaborating universities to share their faculties with us in this project. Yet, even with buyouts, faculty members have many commitments that compete for their time and these projects were very time-intensive. There were minor accountability problems, due in part to the distributed nature of the projects. A PI can lean on colleagues in the same department and perhaps on colleagues in other departments in the same university, particularly a PI who has some position power in the university – e.g., a full professor working with junior colleagues or a department chair. But position power has much less influence on the work and priorities of colleagues in other institutions. When deadlines were missed, the PI is left only with personal power and, ultimately, the threat of withdrawing the contract.

Project 1 encountered some problems relating to accountability. These appear to have been initiated by that early loss of one team member. About halfway through the project, it became clear that the project was much larger and required much more work than anyone had initially imagined, even had the entire team remained intact. Consequently, the team had to fight not to become discouraged, and to find ways to redefine project boundaries. Part of redefining those boundaries was setting new deadlines. And missing those deadlines became all too common. Project 2 did not experience problems with accountability to deadlines to the same extent, although, like Project 1, the project was much more ambitious and the load much heavier than initially imagined. Because the administrative team remained intact and managed the daily work much more closely, each with reduced teaching loads in order to accommodate these responsibilities, missed deadlines had more to do with unexpected delays caused by external factors (e.g. Institutional Review Board delays) than by team members not completing assigned work by stated deadlines.

There certainly were moments – and seasons – of conflict on both teams. But both projects were composed of persons who came to know and like one another. Project 1 was composed of persons linked professionally to the PI, and most members of that group had experienced years of friendship prior to the project, serving on professional boards and informally socializing at national conferences. Knowing and liking one another gave a real boost to the project, requiring less time to focus on group formation, although integrating members of a network into a group did require some attention. Trust is important in any research project, and it is fundamental in qualitative research.

Project 2 did not begin with the initial network of relationships that characterized Project 1, but almost everyone knew someone on the administrative team. The major challenge of Project 2 was its interdisciplinary composition. Not only did we bring different languages and disciplines but also different methodological skills, both quantitative and qualitative. Given the high level of commitment of the team to the project, every research team member wanted to be and was involved to a greater or lesser degree in both wings of the project, requiring steep learning curves for everyone in developing new skills. For example, members of our team who had never done qualitative research worked side-by-side with others who had written textbooks on the subject.

What the literature and previous experience did not prepare us for were the implications of subcontracting with universities for the involvement of their faculty members in a project housed in another university – and the differences between a subcontract and a grant. For example, the policy of the lead university in both of these projects was not to pass on proportions of the budget for indirect costs to other universities, and at least one of the universities in both projects demanded it, almost demolishing the partnership before it was

formed. Another university did not allow a reduction in teaching load for participation in a research subcontract with another university, resulting in a Project 1 team member taking on the project as 'overtime'. Yet another university had a union for its graduate students, resulting in far higher costs for their participation than students from other universities and, subsequently, a significant disparity between either the work expectations or the financial reimbursement from one institution to another. Finally, universities differ on the costs of releasing a faculty member for participation in a research project. At issue was the determination if the cost was the proportion of the faculty members' salary being released (e.g., 25 percent of salary for a 25 percent reduction in teaching) or the cost of hiring an adjunct faculty member to replace the faculty member in the classroom. Negotiating all of these matters created significant delays in finalizing subcontracts and launching the project.

## TEAM LEADERSHIP/MANAGEMENT

Differences in university policies continued to create unexpected challenges. Each university had an Institutional Review Board (IRB) whose responsibility it was to insure that the well-being of research subjects was protected, and we learned that each system functions differently. Some were simply concerned for protecting human subjects, and others were heavily involved in critiquing the research methodology. Some institutions involved in Project 1 made the assumption that, since the grant was the responsibility of another university, and that university's IRB had approved the project, they did not need to review the project at all, or that an expedited review was sufficient. By contrast, in one institution in Project 2, a detailed review process took more than six months, significantly delaying the start of one arm of the research team. Other institutional differences emerged that created unexpected complications. These include what can be expected of student research assistants, everyday working policies such as travel and reimbursement, norms of working, and distribution of faculty workload. The experience a project director has in one institution may thus be surprisingly inadequate in predicting the time line and processes of a multi-institutional project.

Centralizing tasks also created some challenges. For example, we quickly learned in the first project that, in order to maintain standardization for the database, all transcriptions needed to be done by transcriptionists trained for the project. Therefore, we created a pool of transcriptionists at the host institution. Team members copied their interview tapes to insure against loss and then mailed the copy to the transcription pool at Baylor University, located in Central Texas. The Texas transcriptionists typed interviews from Virginia, South Carolina, Michigan, California, and Pennsylvania, involving a variety of cultural and ethnic groups in each site. Accents, slang, and life experiences vary dramatically within

and certainly across sites. For that reason, researchers needed to read transcripts for accuracy as well as for the work of coding.

Maintenance of team performance as the research proceeded (Abramson, 1990) was handled differently in the two projects. In Project 1, the PI served this function. Although she was involved in only minor ways in the surveying phase, she conducted qualitative interviews and participated in analyzing the survey data and in the two-year process of primary and axial coding of interviews. She chaired both face-to-face and telephone conference meetings. Researchers in Project 1 considered breaking into teams, one to focus on the quantitative study and the other on the qualitative study, but for a variety of reasons – commitment to the project, appreciation of the camaraderie that had developed, and perhaps even anxiety about missing out on something important – we agreed to continue working as a whole. We revisited this decision several times over the following three years during times of conflict but continued to work as a whole. Differences slowed the processes, created frustrations, but also made our work more rigorous.

The more complex Project 2 demanded a more complex approach to maintaining team performance. Initially, because of the high level of motivation the team had to the project, like Project 1, every researcher wanted to participate in both the qualitative and quantitative branches of the project, and the two Associate Directors responsible for these worked in tandem with the team. Over time, however, as the complexity and load of the work increased, the team divided into two sub-teams, each led by the Associate Director who had responsibility for that branch of the project. The Administrative Team – these two Associate Directors along with the Associate Director for publications, two staff persons, and the PI met on a weekly basis to provide project oversight. All were located at the host institution, making for a tightly woven administrative structure that kept this challenging project moving, fitting the model of ‘coordinative leadership’ described by Taylor (1986).

Team building continued throughout the life of both projects. Phone conference calls supported the ‘temporal rhythm’ (Hackman, 1990) through which the work was accomplished and that also reminded us of deadlines. Nevertheless, it was the periodic retreats where there were few distractions by other work responsibilities and opportunity not only to give sustained attention to the work but also to socialize and eat together and establish relationships that will last beyond the project that moved both projects forward leap by leap. These retreats included two-day sessions at various locations, sometimes in an airport hotel accessible to the team and sometimes in a retreat setting. At other times, retreats were a one-day meeting prior to or following a professional conference most or all of the team planned to attend. Often, the team planned a professional presentation at these conferences and the grant funding paid travel expenses, an important perk during a time of constrained university budgets.

Face-to-face meetings were important not just in the formative phase but throughout the life of each project. Early retreats for both projects focused on developing and agreeing upon research tools and interview protocols, and training in methodologies and qualitative analysis software. Later retreats gave opportunity to tackle the knotty problems of these projects such as gaining access to congregations or FBOs, increasing the return rates on surveys, and agreeing on sticky methodological issues, data analysis, and authorship of the first products of the projects.

The geographic distance of partners in both projects created significant challenges. Simply finding a time for phone conference calls that would fit coast-to-coast time zones and seven or nine teaching schedules took an Excel spreadsheet to negotiate. Also, different universities and partners of different faith traditions work on different schedules, beginning and ending semesters or quarters at quite different times and celebrating different holidays. Different norms existed for such matters as answering email, with some researchers answering within minutes or hours, and with others taking days before checking email. For both projects, the lead team at Baylor University tried with varying success not to manage things in casual hallway conversations without keeping other partners in the loop. Our experience confirmed Armstrong and Cole's (1995) assertion that distance blocks the corrective feedback provided by chance or informal encounters.

Finally, both teams discussed during the formative phase the potentially contentious topic of publication authorship. We followed several writers' advice about the importance of developing clear guidelines about authorship in the formative phase of the project (Bradley, 1982; Cohen et al., 1991; Tripp-Reimer et al., 1994). A written agreement was developed for both teams – and subsequently changed. The dynamic nature of each team brought both teams to the decision that the major publications providing overview of the project would contain names of all the primary partners in the project. Other publications would be authored only by those actually contributing to the writing of the product (as this article indicates), with review by the rest of the team in the case of Project 1, and by a publication committee in the case of Project 2.

## THE CHALLENGES OF QUALITATIVE RESEARCH TEAMS

Up to this point, the challenges of these two projects would have been present whatever the methodology. The significantly greater challenges of qualitative team research became clear in both of these projects, as the qualitative branches of both contrasted with the quantitative branches. For example, Tripp-Reimer et al.'s (1994) premise that the team must be very intentional about keeping the PI in contact with the field context and the data was born out particularly in Project 1. The PI needed to be involved 'on the ground' in the interviews in

order to understand what was being learned; that was not the case with the surveys, where the findings virtually spoke for themselves. Consequently, the PI conducted some interviews and read and coded every transcript in the project. Because of the size of Project 2, the PI did not participate in the qualitative interviewing or coding of transcripts and indeed experienced a sense of disconnection from the heart of the project. This loss makes it more difficult for the PI to be a spokesperson for Project 2.

In both projects, we learned the hard way that 'grounded theory' has different connotations for different researchers, including those who teach it and do it (e.g., Anastas, 2004; Charmaz, 1990, 2000; Denzin and Lincoln, 1994; Glaser, 1978, 1992; Glaser and Strauss, 1967; Rodwell, 1998; Strauss and Corbin, 1998). Project 1 was intent on using qualitative methods to search for meaning and provide thick description to the concepts emerging from the analysis of the transcripts. In contrast, Project 2 used an emergent and grounded qualitative process to produce a theory that could be tested in the subsequent quantitative survey. These decisions have been at the base of much struggle with the research designs and the subsequent data analysis. For both projects, discussion continued, and resolution was never really achieved to everyone's satisfaction, about the relationship between quantitative and qualitative methods in each design. Throughout both projects, the collaboration provided significant support and accountability for team members. But at the same time, the team approach meant that delays in one region slowed work elsewhere.

Having researchers coming from very different research perspectives (both traditional positivist and more non-traditional interpretivist), the simple decision to use qualitative or quantitative methods, and to aim at thick description or theory-to-be-tested, was never totally satisfied in either project. On both teams, many of the qualitative researchers wished for a more interpretive process, while the quantitative researchers were consistently pushing for greater control of the subjectivity and emergence. Experienced researchers clashed over the meaning of 'axial coding' and how to learn it and do it (Strauss and Corbin, 1998; Wolfer, 1998). Time in retreats to establish working procedures and methodological processes was essential; this kind of work needs to be done face-to-face, not on the phone.

A key issue in qualitative team research is the choice of supportive technology. The teams considered several software programs but, based on the apparent capacity and flexibility of Atlas.ti, both projects selected it as the best available tool compatible with the assumptions of grounded theory. In hindsight, we understand that some key team members were drawn to Atlas.ti because it supported our individual approaches to grounded theory analysis. But at the outset, we did not realize that shared language glossed important differences between us, nor did we appreciate that Atlas.ti could not resolve them for us. As we learned, the program's considerable flexibility required that we reach

agreements about how to conduct grounded theory analysis and how to do it together. Furthermore, given the teams' lengthy engagement in qualitative analysis, the specific tensions and ambiguities related to grounded theory and the use of Atlas.ti surfaced latent tensions within our methodologically diverse teams. Some, more quantitatively oriented team members felt especially frustrated and concerned by these differences regarding qualitative analysis.

Working with a team, in both cases, took far more time than we initially anticipated. Several of us have thought quietly that if we could just take this database off and code it on our own, we would have finished the project a year sooner. When the end of the original time commitment to Project 1 came and went and the work was not complete, we labored on, some more able or willing to keep at the work than others. Nevertheless, we do think our work demonstrates that the team approach or 'investigator triangulation' (Denzin and Lincoln, 1994) brings increased validity to qualitative data analysis. We may have been able to finish much sooner working alone, but having six or nine sets of eyes on the data, and having to convince colleagues in a consensual process that one's open and axial codes have merit, provided a rigor unparalleled in individual work. In addition, the coding protocol required to organize and document our collaborative analysis provides an excellent audit trail for these projects.

## LESSONS LEARNED

In terms of team formation, management and leadership, and actual performance we learned a great deal. We offer the following as lessons to consider in large research team efforts, involving multiple sites.

- Make a reduction in other responsibilities a prerequisite to participation, if at all possible. Without this reduction, team members may be so motivated initially that they commit themselves to what may become an unmanageable workload as the project develops.
- Commit more resources than you think could possibly be necessary, to the extent they are available, to an administrative infrastructure that keeps the project coordinated and frees the team to do the research. It may be just as important to garner consultation on designing this aspect of the project as it is the research design and methodology.
- Discuss and agree on roles and norms for the work in the formative phase of the project. Document these expectations for accountability in a written contract. Renegotiate that contract as the parameters of the project change (as they will).
- Obtain the necessary financial support for the project, including not only travel to research sites but also team meetings and retreats, and salaries not only for researchers but also for support staff. In budgeting for the project, include opportunity for informal socializing interspersed with the work to encourage the development of professional friendships that can withstand the frustrations of partnering on a demanding project.

- Determine what the university policies of partners on subcontracts, indirect costs, involvement of graduate students and student workers, IRB, travel, and workload reduction. Expect legal council involvement, particularly when indirect costs are low as is usually the case in foundation funding. Determine the impact these policies may have and plan accordingly, for such issues as establishing timelines for submissions to each IRB in order to maintain the project's timeline.
- Recognize that the administrative structure with which you begin is likely to change over time as the demands of the project or the team's memberships and relationships change.
- If the methodology is mixed (e.g. quantitative and qualitative), the team may initially be so motivated to the project that they determine to participate as a whole group in both dimensions of the project. This will require extra time in recognition of learning curves and in dealing with resistance and misperceptions; therefore, be open to revisiting this decision as the project unfolds, weighing the needs of the project as well as the needs of individual members.
- Plan face-to-face meetings at least quarterly.
- Develop a written policy for authorship of all publications from the project, reviewing those of other projects and recognizing that the policy will need to be reviewed periodically.
- Because of the challenge of a diversity of calendars and commitments, set regular times for conference calls at least three months and retreats at least six months in advance.
- Even if the motivation is high for a project, be sure that team members also have the requisite skills, disposition, and time available to do qualitative data analysis as conceptualized in the project. Unfortunately, it is assumed that quantitative methods require knowledge and skills but not always recognized that qualitative research also requires knowledge, skills and significant discipline.
- Qualitative team research requires far more time than individual research, not less. Allow enough time for that work, and then double your estimate to account for working as a team.
- Find a data management technology which adequately supports team qualitative research that includes functions such as the ability to merge the work of multiple analysts.
- Even in large projects, find ways for the PI to stay involved 'on the ground' with the data gathering and analysis

## SUMMARY

Through the stress and tension, both projects moved on because of the individual commitment of each team member. Many of our team members have taught research and group work skills, but we found that putting them together created new challenges and opportunities. We now believe that these projects were far more extensive because they were tackled by a group rather than one or two researchers working together with assistants. We also trust our findings

more than we would have trusted our individual work, because we have grown to trust one another's skills and one another's commitments to these projects.

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The HBR Interview | **J. Richard Hackman**

# Why Teams DON'T Work

A leading organizational psychologist explains the five critical conditions that make the difference between success and failure.

**Interview by Diane Coutu**

**OVER THE PAST COUPLE OF DECADES,** a cult has grown up around teams. Even in a society as fiercely independent as America, teams are considered almost sacrosanct. The belief that working in teams makes us more creative and productive is so widespread that when faced with a challenging new task, leaders are quick to assume that teams are the best way to get the job done.

Not so fast, says J. Richard Hackman, the Edgar Pierce Professor of Social and Organizational Psychology at Harvard University and a leading expert on teams. Hackman has spent a career exploring – and questioning – the wisdom of teams. To learn from his insights,

HBR senior editor Diane Coutu interviewed Hackman in his Harvard office. In the course of their discussion, he revealed just how bad people often are at teamwork. Most of the time, his research shows, team members don't even agree on what the team is supposed to be doing. Getting agreement is the leader's job, and she must be willing to take great personal and professional risks to set the team's direction. And if the leader isn't disciplined about managing who is on the team and how it is set up, the odds are slim that a team will do a good job.

What follows is an edited version of that conversation.

**You begin your book *Leading Teams* with a pop quiz: When people work together to build a house, will the job probably (a) get done faster, (b) take longer to finish, or (c) not get done?**

That multiple choice question actually appeared on a standardized fourth-grade test in Ohio, and the obvious "answer," of course, is supposed to be *a* – the work gets done faster. I love that anecdote because it illustrates how early we're told that teamwork is good.

People tend to think that teams are the democratic – and the efficient – way to get things done. I have no question that when you have a team, the possibility exists that it will generate magic, producing something extraordinary, a collective creation of previously unimagined quality or beauty. But don't count on it. Research consistently shows that teams underperform, despite all the extra resources they have. That's because problems with coordination and motivation typically chip away at the benefits of collaboration. And even when you have a strong and cohesive team, it's often in competition with other teams, and that dynamic can also get in the way of real progress. So you have two strikes against you right from the start, which is one reason why having a team is often worse than having no team at all.

## IDEA IN BRIEF

- » Teams are often seen as safe places where people can be highly creative and productive. However, research consistently shows that teams underperform their great potential.
- » Teams need to be set up carefully to ensure that they have a compelling direction. Small teams whose members stay together for long periods of time perform best.
- » Perversely, organizations with the best human resource departments sometimes have less effective teams. That's because HR tends to focus on improving individual rather than team behavior.
- » Leading a team requires enormous courage because authority is always involved, which arouses great anxiety in the team. Great team leaders often encounter resistance so intense it can put their jobs at risk.

**You've said that for a team to be successful, it needs to be real.**

**What does that mean?**

At the very least, it means that teams have to be bounded. It may seem silly to say this, but if you're going to lead a team, you ought to first make sure that you know who's on it. In our recent book *Senior Leadership Teams*, Ruth Wageman, Debra Nunes, James Burruss, and I collected and analyzed data on more than 120 top teams around the world. Not surprisingly, we found that almost every senior team we studied thought that it had set unambiguous boundaries. Yet when we asked members to describe their team, fewer than 10% agreed about who was on it. And these were teams of senior executives!

Often the CEO is responsible for the fuzziness of team boundaries. Fearful of seeming exclusionary – or, on the other end of the spectrum, determined to put people on the team for purely political reasons – the chief executive frequently creates a dysfunctional team. In truth, putting together a team involves some ruthless decisions about membership; not everyone who wants to be on the team should be included, and some individuals should be forced off.

We worked with a large financial services firm where the CFO wasn't allowed on the executive committee because he was clearly a team destroyer. He was disinclined toward teamwork, he was unwilling to work at finding collective solutions, and every team he was on got into trouble. The CEO invited the CFO to stay in his role because he was a truly able executive, but he was not allowed on the senior executive team. Although there were some bruised feelings at first, in the end the CFO was much happier because he didn't have to be in "boring" team meetings, and the team functioned much better without him. The arrangement worked because the CEO communicated extensively with the CFO both before and after every executive committee meeting. And in the CFO's absence, the committee could become a real team.

**I have no question** that a team can generate magic. But don't count on it.



### You also say that a team needs a compelling direction. How does it get one?

There is no one right way to set a direction; the responsibility can fall to the team leader or to someone in the organization outside the team or even to the team itself in the case of partnerships or boards of directors. But however it's done, setting a direction is emotionally demanding because it always involves the exercise of authority, and that inevitably arouses angst and ambivalence – for both the person exercising it and the people on the receiving end. Leaders who are emotionally mature are willing and able to move toward anxiety-inspiring situations as they establish a clear, challenging team direction. But in doing so, a leader sometimes encounters resistance so intense that it can place his or her job at risk.

That point was dramatically brought home to me a few years ago by a participant in an executive seminar I was teaching. I'd been talking about how leaders who set direction successfully are unafraid to assume personal responsibility for the mission of the team. I mentioned John F. Kennedy and Martin Luther King, Jr., and I got carried away and said that people who read the New Testament knew that Jesus did not convene little team meetings to decide the goals of the ministry. One of the executives in the class interrupted me and said, "Are you aware that you've just talked about two assassinations and a crucifixion?"

### What are some common fallacies about teams?

People generally think that teams that work together harmoniously are better and more productive than teams that don't. But in a study we conducted on symphonies, we actually found that grumpy orchestras played together slightly

better than orchestras in which all the musicians were really quite happy.

That's because the cause-and-effect is the reverse of what most people believe: When we're productive and we've done something good together (and are recognized for it), we feel satisfied, not the other way around. In other words, the mood of the orchestra members after a performance says more about how well they did than the mood beforehand.

Another fallacy is that bigger teams are better than small ones because they have more resources to draw upon. A colleague and I once did some research showing that as a team gets bigger, the number of links that need to be managed among members goes up at an accelerating, almost exponential rate. It's managing the links between members that gets teams into trouble. My rule of thumb is no double digits. In my courses, I never allow teams of more than six students. Big teams usually wind up just wasting everybody's time. That's why having a huge senior leadership team – say, one that includes all the CEO's direct reports – may be worse than having no team at all.

Perhaps the most common misperception about teams, though, is that at some point team members become so comfortable and familiar with one another that they start accepting one another's foibles, and as a result performance falls off. Except for one special type of team, I have not been able to find a shred of evidence to support that premise. There is a study that shows that R&D teams do need an influx of new talent to maintain creativity and freshness – but only at the rate of one person every three to four years. The problem almost always is not that a team gets stale but, rather, that it doesn't have the chance to settle in.

### **So newness is a liability?**

Absolutely. The research confirming that is incontrovertible. Consider crews flying commercial airplanes. The National Transportation Safety Board found that 73% of the incidents in its database occurred on a crew's first day of flying together, before people had the chance to learn through experience how best to operate as a team – and 44% of those took place on a crew's very first flight. Also, a NASA study found that fatigued crews who had a history of working together made about half as many errors as crews composed of rested pilots who had not flown together before.

### **So why don't airlines stick to the same crews?**

Because it isn't efficient from a financial perspective. Financially, you get the most from your capital equipment and labor by treating each airplane and each pilot as an individual unit and then using an algorithm to maximize their utilization. That means that pilots often have to dash up and down the concourses just as passengers do, and sometimes you'll have a pilot who will fly two or three different aircraft with two or

What if we looked at the thing backwards or turned it inside out?" That's when people say, "Oh, no, no, no, that's ridiculous," and so the discussion about what's ridiculous comes up. Unlike the CFO I mentioned before, who derailed the team by shutting down discussions, the deviant opens up more ideas, and that gets you a lot more originality. In our research, we've looked carefully at both teams that produced something original and those that were merely average, where nothing really sparkled. It turned out that the teams with deviants outperformed teams without them. In many cases, deviant thinking is a source of great innovation.

I would add, though, that often the deviant veers from the norm at great personal cost. Deviants are the individuals who are willing to say the thing that nobody else is willing to articulate. The deviant raises people's level of anxiety, which is a brave thing to do. When the boat is floating with the current, it really is extraordinarily courageous for somebody to stand up and say, "We've got to pause and probably change direction." Nobody on the team wants to hear that, which is precisely why many team leaders crack down on deviants and try to

## **Every team needs a deviant, someone who says, "Why are we even doing this at all?"**

three different crews in the course of a single day – which is not so wise if you look at the research. I once asked an operations researcher of an airline to estimate how long it would take, if he and I were assigned to work together on a trip, before we could expect to work together again. He calculated that it would be 5.6 years. Clearly, this is not good from a passenger point of view.

The counterexample, by the way, is the Strategic Air Command, or SAC, which would have delivered nuclear bombs had that become necessary during the Cold War years. SAC teams performed better than any other flight crews that we studied. They trained together as a crew, and they became superb at working together because they had to. When you're working together in real time and there can be no mistakes, then you keep your teams together for years and years rather than constantly change their composition.

### **If teams need to stay together to achieve the best performance, how do you prevent them from becoming complacent?**

This is where what I call a deviant comes in. Every team needs a deviant, someone who can help the team by challenging the tendency to want too much homogeneity, which can stifle creativity and learning. Deviants are the ones who stand back and say, "Well, wait a minute, why are we even doing this at all?"

get them to stop asking difficult questions, maybe even knock them off the team. And yet it's when you lose the deviant that the team can become mediocre.

### **What makes a team effective, and how can a team's leader make it perform better?**

A good team will satisfy its internal or external clients, become stronger as a unit as time passes, and foster the learning and growth of its individual members. But even the best leader on the planet can't make a team do well. All anyone can do is increase the likelihood that a team will be great by putting into place five conditions. (See the sidebar "How to Build a Team.") And the leader still will have no guarantees that she will create a magical team. Teams create their own realities and control their own destinies to a greater extent, and far sooner in their existence, than most team leaders realize.

In 1990 I edited a collection of essays by colleagues who had studied teams performing diverse tasks in 27 organizations – everything from a children's theater company to a mental-health-treatment team to a beer-sales-and-delivery team. In those studies, we found that the things that happen the first time a group meets strongly affect how the group operates throughout its entire life. Indeed, the first few minutes of the start of any social system are the most important because they establish not only where the group is going but

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I once asked Christopher Hogwood, the distinguished conductor for many years of the Handel and Haydn Society in Boston, how important the first rehearsal was when he served as an orchestra's guest conductor. "What do you mean, the first *rehearsal*?" he asked. "All I have is the first few minutes." He went on to explain that there's nothing he pays greater attention to than the way he starts the first rehearsal. That's because he knows that the orchestra members will make a very quick assessment about whether or not they're going to make great music together, or whether he is just going to get in their way.

I do think there is one thing leaders such as Hogwood and others can do to improve the chances that a team will become something special, and that is to embrace their own quirkiness. You shouldn't try to lead like Jeff Bezos, because you are not Jeff Bezos. Each leader brings to the task his or her own strengths and weaknesses. Exploit the daylights out of the stuff you're great at, and get help in the areas where you're not so good. Don't try to ape any leadership model or team, because there's no one right style for leading a team. There are many different ways to create the conditions for effectiveness, sustain them, and help teams take full advantage of them. The best team leaders are like jazz players, improvising constantly as they go along.

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Of course, Obama is taking a risk by hiring so many strong and contentious personalities. He will inevitably have to spend a lot of time and energy serving as referee. This is what happened with Franklin Roosevelt, who also brought strong-minded figures into his government. One difference with Obama, however, is that FDR temperamentally loved the infighting. He liked to pit people against one another, believing that competition evoked the best performance from everyone. At times FDR actually enjoyed making his underlings suffer. I don't think Obama does.

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Johnson's team – Undersecretary of State George Ball, who strongly opposed the Vietnam War. Johnson would cite Ball when people complained that he surrounded himself with yes-men, but in fact Ball had little influence when LBJ met with top officials on Vietnam. Everyone in the group knew that Johnson didn't take Ball's antiwar arguments very seriously. If you really want dissenting views, better to use the Roosevelt-Obama model, where they can come from almost any member of the team – and not just from one designated rabble-rouser.

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This decision has the historical echo of John Kennedy's near-reappointment in 1961 of Dwight Eisenhower's defense secretary, who coincidentally was named Thomas Gates. Like Obama, Kennedy was a young president with little national security background and thought it might reassure people to have the previous defense secretary stay on at the Pentagon. Like Obama, JFK also suspected that a number of things might go wrong with national security during his first year as president. He felt that Americans might be less likely to blame the Democratic president if a Republican secretary of defense was there at his side. In the end Kennedy did not have the stomach for the risk of keeping a Republican appointee at the Pentagon. Obama did.

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things that face-to-face groups could never have generated. But nirvana never materialized; virtual teams need the basic conditions for effectiveness to be in place just as much as face-to-face teams, if not more so. That said, we are seeing that we can make do with much less face-to-face contact than we ever thought possible. Today's technology, for example, lets you have a chat window open during a web conference so you can type in the word "hand" to signal that you want to talk next. People don't need to see your face to know that you want to speak up. But even well-structured virtual teams need to have a launch meeting with everyone present, a midpoint check-in that's face-to-face, and a live debriefing. I don't think for a minute that we're going to have effective online teams if we don't know who's on the team or what the main work of the team really is, and so far that's still a problem with virtual teams.

#### **Given the difficulty of making teams work, should we be rethinking their importance in organizations?**

Perhaps. Many people act as if being a team player is the ultimate measure of one's worth, which it clearly is not. There are many things individuals can do better on their own, and they should not be penalized for it. Go back for a moment to that fourth-grade question about working together to build a house. The answer probably is that teamwork really does take longer or that the house may not get built at all. There are many cases where collaboration, particularly in truly creative

endeavors, is a hindrance rather than a help. The challenge for a leader, then, is to find a balance between individual autonomy and collective action. Either extreme is bad, though we are generally more aware of the downside of individualism in organizations, and we forget that teams can be just as destructive by being so strong and controlling that individual voices and contributions and learning are lost.

In one management team we studied, for example, being a team player was so strongly valued that individuals self-censored their contributions for fear of disrupting team harmony. The team, in a spirit of cooperation and goodwill, embarked on a course of action that was bound to fail – for reasons that some members sensed but did not mention as the plans were being laid. One wonders if the crisis in the financial world today would be quite so catastrophic if more people had spoken out in their team meetings about what they knew to be wrongful practices. But again that brings us back to the hazards of courage. You'd like to think that people who do the courageous right thing and speak out will get their reward on earth as well as in heaven. But you don't always get your reward here on earth. While it's true that not being on a team can put your career on hold, being a real and committed team player – whether as a team leader, a deviant, or just a regular member who speaks the truth – can be dangerous business indeed. □

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The HBR Interview | **J. Richard Hackman**

# Why Teams DON'T Work

A leading organizational psychologist explains the five critical conditions that make the difference between success and failure.

**Interview by Diane Coutu**

**OVER THE PAST COUPLE OF DECADES,** a cult has grown up around teams. Even in a society as fiercely independent as America, teams are considered almost sacrosanct. The belief that working in teams makes us more creative and productive is so widespread that when faced with a challenging new task, leaders are quick to assume that teams are the best way to get the job done.

Not so fast, says J. Richard Hackman, the Edgar Pierce Professor of Social and Organizational Psychology at Harvard University and a leading expert on teams. Hackman has spent a career exploring – and questioning – the wisdom of teams. To learn from his insights,

HBR senior editor Diane Coutu interviewed Hackman in his Harvard office. In the course of their discussion, he revealed just how bad people often are at teamwork. Most of the time, his research shows, team members don't even agree on what the team is supposed to be doing. Getting agreement is the leader's job, and she must be willing to take great personal and professional risks to set the team's direction. And if the leader isn't disciplined about managing who is on the team and how it is set up, the odds are slim that a team will do a good job.

What follows is an edited version of that conversation.

**You begin your book *Leading Teams* with a pop quiz: When people work together to build a house, will the job probably (a) get done faster, (b) take longer to finish, or (c) not get done?**

That multiple choice question actually appeared on a standardized fourth-grade test in Ohio, and the obvious "answer," of course, is supposed to be *a* – the work gets done faster. I love that anecdote because it illustrates how early we're told that teamwork is good.

People tend to think that teams are the democratic – and the efficient – way to get things done. I have no question that when you have a team, the possibility exists that it will generate magic, producing something extraordinary, a collective creation of previously unimagined quality or beauty. But don't count on it. Research consistently shows that teams underperform, despite all the extra resources they have. That's because problems with coordination and motivation typically chip away at the benefits of collaboration. And even when you have a strong and cohesive team, it's often in competition with other teams, and that dynamic can also get in the way of real progress. So you have two strikes against you right from the start, which is one reason why having a team is often worse than having no team at all.

## IDEA IN BRIEF

- » Teams are often seen as safe places where people can be highly creative and productive. However, research consistently shows that teams underperform their great potential.
- » Teams need to be set up carefully to ensure that they have a compelling direction. Small teams whose members stay together for long periods of time perform best.
- » Perversely, organizations with the best human resource departments sometimes have less effective teams. That's because HR tends to focus on improving individual rather than team behavior.
- » Leading a team requires enormous courage because authority is always involved, which arouses great anxiety in the team. Great team leaders often encounter resistance so intense it can put their jobs at risk.

**You've said that for a team to be successful, it needs to be real.**

**What does that mean?**

At the very least, it means that teams have to be bounded. It may seem silly to say this, but if you're going to lead a team, you ought to first make sure that you know who's on it. In our recent book *Senior Leadership Teams*, Ruth Wageman, Debra Nunes, James Burruss, and I collected and analyzed data on more than 120 top teams around the world. Not surprisingly, we found that almost every senior team we studied thought that it had set unambiguous boundaries. Yet when we asked members to describe their team, fewer than 10% agreed about who was on it. And these were teams of senior executives!

Often the CEO is responsible for the fuzziness of team boundaries. Fearful of seeming exclusionary – or, on the other end of the spectrum, determined to put people on the team for purely political reasons – the chief executive frequently creates a dysfunctional team. In truth, putting together a team involves some ruthless decisions about membership; not everyone who wants to be on the team should be included, and some individuals should be forced off.

We worked with a large financial services firm where the CFO wasn't allowed on the executive committee because he was clearly a team destroyer. He was disinclined toward teamwork, he was unwilling to work at finding collective solutions, and every team he was on got into trouble. The CEO invited the CFO to stay in his role because he was a truly able executive, but he was not allowed on the senior executive team. Although there were some bruised feelings at first, in the end the CFO was much happier because he didn't have to be in "boring" team meetings, and the team functioned much better without him. The arrangement worked because the CEO communicated extensively with the CFO both before and after every executive committee meeting. And in the CFO's absence, the committee could become a real team.

**I have no question** that a team can generate magic. But don't count on it.



### You also say that a team needs a compelling direction. How does it get one?

There is no one right way to set a direction; the responsibility can fall to the team leader or to someone in the organization outside the team or even to the team itself in the case of partnerships or boards of directors. But however it's done, setting a direction is emotionally demanding because it always involves the exercise of authority, and that inevitably arouses angst and ambivalence – for both the person exercising it and the people on the receiving end. Leaders who are emotionally mature are willing and able to move toward anxiety-inspiring situations as they establish a clear, challenging team direction. But in doing so, a leader sometimes encounters resistance so intense that it can place his or her job at risk.

That point was dramatically brought home to me a few years ago by a participant in an executive seminar I was teaching. I'd been talking about how leaders who set direction successfully are unafraid to assume personal responsibility for the mission of the team. I mentioned John F. Kennedy and Martin Luther King, Jr., and I got carried away and said that people who read the New Testament knew that Jesus did not convene little team meetings to decide the goals of the ministry. One of the executives in the class interrupted me and said, "Are you aware that you've just talked about two assassinations and a crucifixion?"

### What are some common fallacies about teams?

People generally think that teams that work together harmoniously are better and more productive than teams that don't. But in a study we conducted on symphonies, we actually found that grumpy orchestras played together slightly

better than orchestras in which all the musicians were really quite happy.

That's because the cause-and-effect is the reverse of what most people believe: When we're productive and we've done something good together (and are recognized for it), we feel satisfied, not the other way around. In other words, the mood of the orchestra members after a performance says more about how well they did than the mood beforehand.

Another fallacy is that bigger teams are better than small ones because they have more resources to draw upon. A colleague and I once did some research showing that as a team gets bigger, the number of links that need to be managed among members goes up at an accelerating, almost exponential rate. It's managing the links between members that gets teams into trouble. My rule of thumb is no double digits. In my courses, I never allow teams of more than six students. Big teams usually wind up just wasting everybody's time. That's why having a huge senior leadership team – say, one that includes all the CEO's direct reports – may be worse than having no team at all.

Perhaps the most common misperception about teams, though, is that at some point team members become so comfortable and familiar with one another that they start accepting one another's foibles, and as a result performance falls off. Except for one special type of team, I have not been able to find a shred of evidence to support that premise. There is a study that shows that R&D teams do need an influx of new talent to maintain creativity and freshness – but only at the rate of one person every three to four years. The problem almost always is not that a team gets stale but, rather, that it doesn't have the chance to settle in.

**So newness is a liability?**

Absolutely. The research confirming that is incontrovertible. Consider crews flying commercial airplanes. The National Transportation Safety Board found that 73% of the incidents in its database occurred on a crew's first day of flying together, before people had the chance to learn through experience how best to operate as a team – and 44% of those took place on a crew's very first flight. Also, a NASA study found that fatigued crews who had a history of working together made about half as many errors as crews composed of rested pilots who had not flown together before.

**So why don't airlines stick to the same crews?**

Because it isn't efficient from a financial perspective. Financially, you get the most from your capital equipment and labor by treating each airplane and each pilot as an individual unit and then using an algorithm to maximize their utilization. That means that pilots often have to dash up and down the concourses just as passengers do, and sometimes you'll have a pilot who will fly two or three different aircraft with two or

What if we looked at the thing backwards or turned it inside out?" That's when people say, "Oh, no, no, no, that's ridiculous," and so the discussion about what's ridiculous comes up. Unlike the CFO I mentioned before, who derailed the team by shutting down discussions, the deviant opens up more ideas, and that gets you a lot more originality. In our research, we've looked carefully at both teams that produced something original and those that were merely average, where nothing really sparkled. It turned out that the teams with deviants outperformed teams without them. In many cases, deviant thinking is a source of great innovation.

I would add, though, that often the deviant veers from the norm at great personal cost. Deviants are the individuals who are willing to say the thing that nobody else is willing to articulate. The deviant raises people's level of anxiety, which is a brave thing to do. When the boat is floating with the current, it really is extraordinarily courageous for somebody to stand up and say, "We've got to pause and probably change direction." Nobody on the team wants to hear that, which is precisely why many team leaders crack down on deviants and try to

## Every team needs a deviant, someone who says, "Why are we even doing this at all?"

three different crews in the course of a single day – which is not so wise if you look at the research. I once asked an operations researcher of an airline to estimate how long it would take, if he and I were assigned to work together on a trip, before we could expect to work together again. He calculated that it would be 5.6 years. Clearly, this is not good from a passenger point of view.

The counterexample, by the way, is the Strategic Air Command, or SAC, which would have delivered nuclear bombs had that become necessary during the Cold War years. SAC teams performed better than any other flight crews that we studied. They trained together as a crew, and they became superb at working together because they had to. When you're working together in real time and there can be no mistakes, then you keep your teams together for years and years rather than constantly change their composition.

**If teams need to stay together to achieve the best performance, how do you prevent them from becoming complacent?**

This is where what I call a deviant comes in. Every team needs a deviant, someone who can help the team by challenging the tendency to want too much homogeneity, which can stifle creativity and learning. Deviants are the ones who stand back and say, "Well, wait a minute, why are we even doing this at all?"

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**Michael Beschloss** has written nine books about presidential leadership, most recently *Presidential Courage* (Simon & Schuster, 2007).

things that face-to-face groups could never have generated. But nirvana never materialized; virtual teams need the basic conditions for effectiveness to be in place just as much as face-to-face teams, if not more so. That said, we are seeing that we can make do with much less face-to-face contact than we ever thought possible. Today's technology, for example, lets you have a chat window open during a web conference so you can type in the word "hand" to signal that you want to talk next. People don't need to see your face to know that you want to speak up. But even well-structured virtual teams need to have a launch meeting with everyone present, a midpoint check-in that's face-to-face, and a live debriefing. I don't think for a minute that we're going to have effective online teams if we don't know who's on the team or what the main work of the team really is, and so far that's still a problem with virtual teams.

#### **Given the difficulty of making teams work, should we be rethinking their importance in organizations?**

Perhaps. Many people act as if being a team player is the ultimate measure of one's worth, which it clearly is not. There are many things individuals can do better on their own, and they should not be penalized for it. Go back for a moment to that fourth-grade question about working together to build a house. The answer probably is that teamwork really does take longer or that the house may not get built at all. There are many cases where collaboration, particularly in truly creative

endeavors, is a hindrance rather than a help. The challenge for a leader, then, is to find a balance between individual autonomy and collective action. Either extreme is bad, though we are generally more aware of the downside of individualism in organizations, and we forget that teams can be just as destructive by being so strong and controlling that individual voices and contributions and learning are lost.

In one management team we studied, for example, being a team player was so strongly valued that individuals self-censored their contributions for fear of disrupting team harmony. The team, in a spirit of cooperation and goodwill, embarked on a course of action that was bound to fail – for reasons that some members sensed but did not mention as the plans were being laid. One wonders if the crisis in the financial world today would be quite so catastrophic if more people had spoken out in their team meetings about what they knew to be wrongful practices. But again that brings us back to the hazards of courage. You'd like to think that people who do the courageous right thing and speak out will get their reward on earth as well as in heaven. But you don't always get your reward here on earth. While it's true that not being on a team can put your career on hold, being a real and committed team player – whether as a team leader, a deviant, or just a regular member who speaks the truth – can be dangerous business indeed. □

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