

# Requirements Engineering in Global Teams – *can you make them effective and fun?*

Peter Cooke  
Global Enterprise Architect  
Ford Motor Company

# Outline

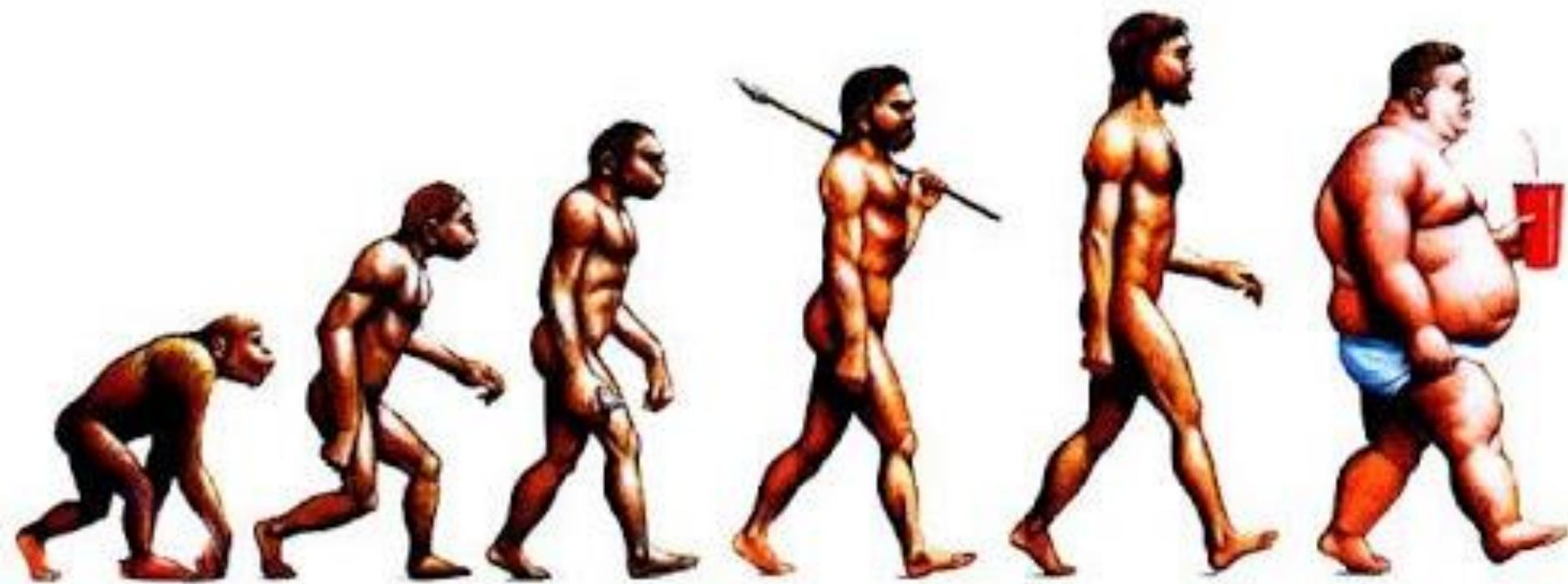
- ▶ The Evolution of Global IS development at Ford
- ▶ Current Problems with Global Requirements Engineering
- ▶ Looking for Solutions – 2012 Research Project
- ▶ Research Recommendations
- ▶ Current Trials
- ▶ Q&A

# Context

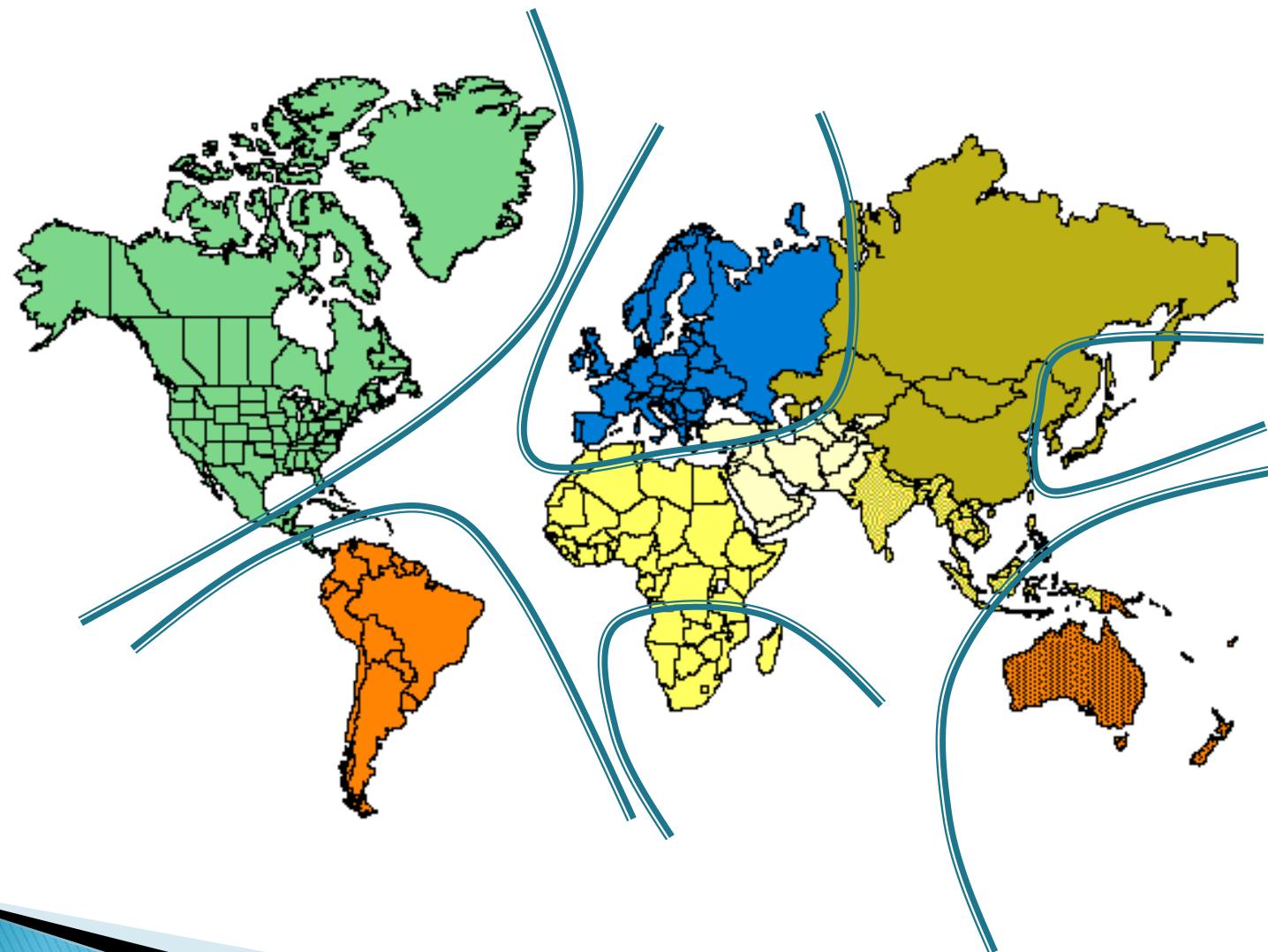


- ▶ < 1990s Ford run as a set of regional self-sustaining business units.
- ▶ 1990's European Strategy – extend market share through acquisition (Jaguar, Landrover, Volvo Cars) and then exploit economies of scale within the region.
- ▶ > 2008 **OneFord** Strategy. Sell other brands, Focus on Ford Blue Oval. Become a truly global company. “Design Once, build anywhere, sell anywhere”.
- ▶ **Significant increase in demand for global solutions with geographically distributed stakeholders.**

# The Evolution of Global IS Teams



# 1. The Age of “Just Don’t Try”



## 2. The Age of Foreign Service



# 3. The Age of the BIG workshop



# 4. The Age of the Travelling Rep.

Marcus from  
Ford of Europe



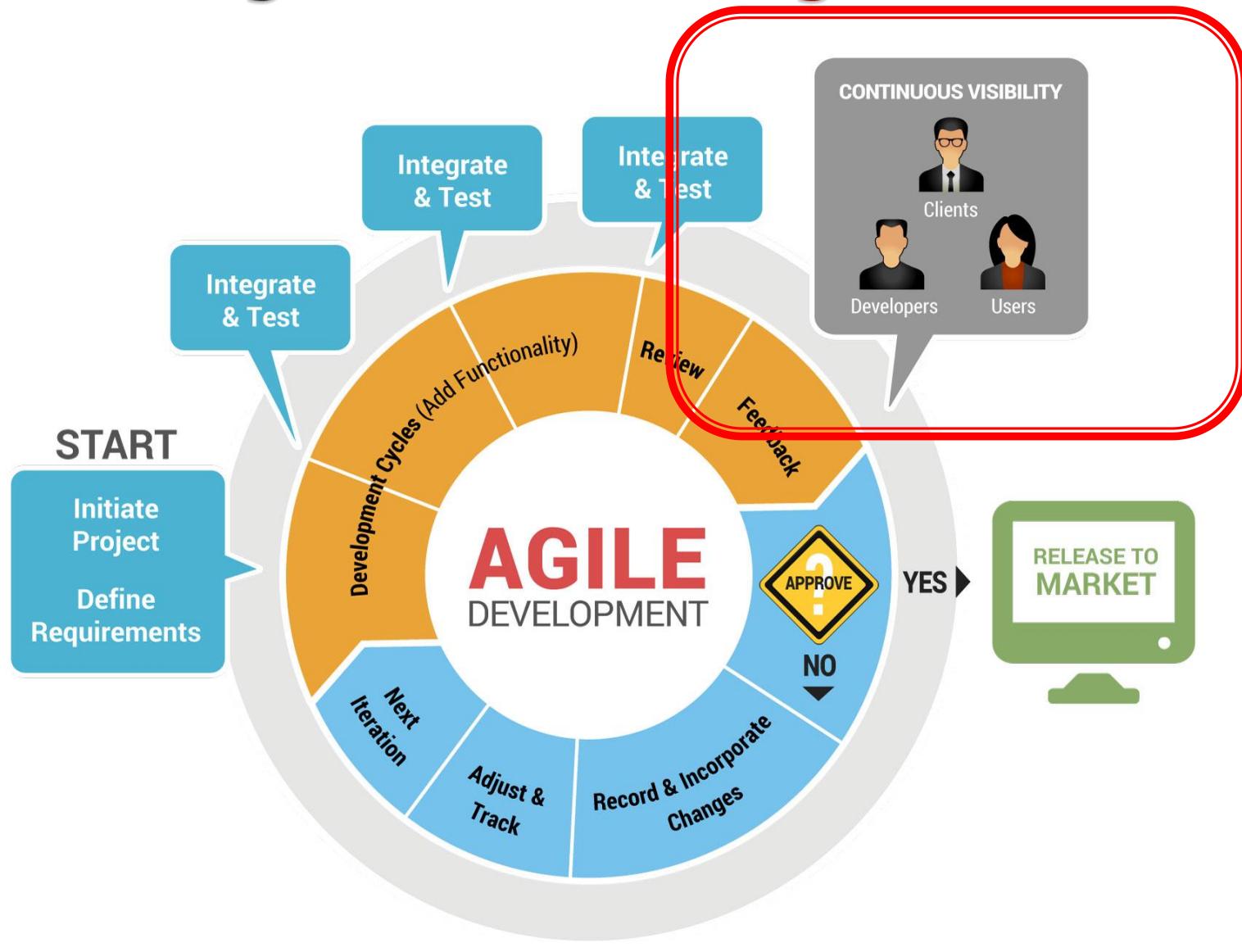
# 5. The Age of Virtual Teams?



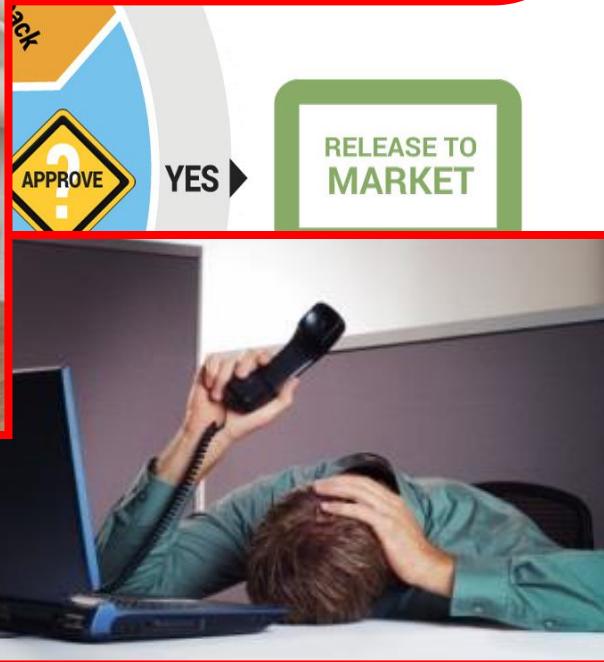
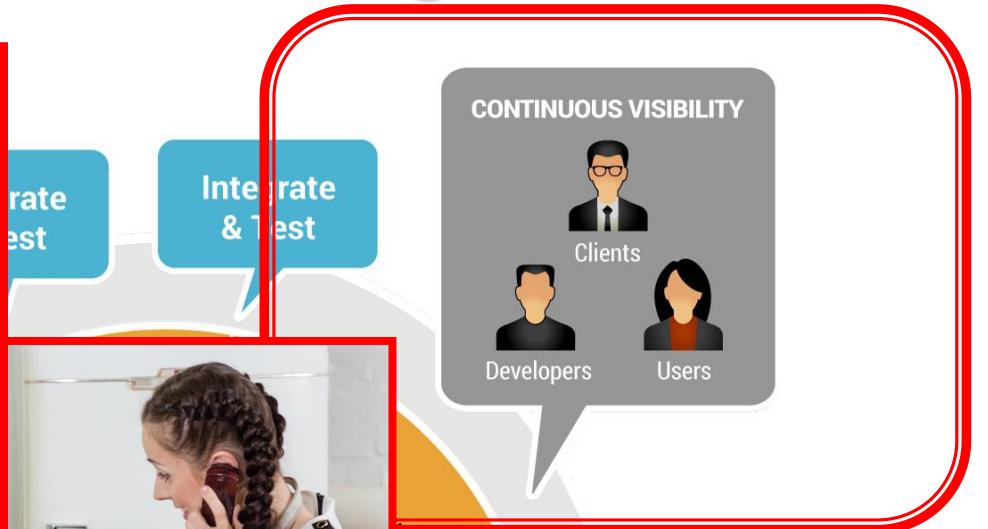
# 5. The Age of Virtual **Agile** Teams?



# 5. The Age of Virtual Agile Teams?

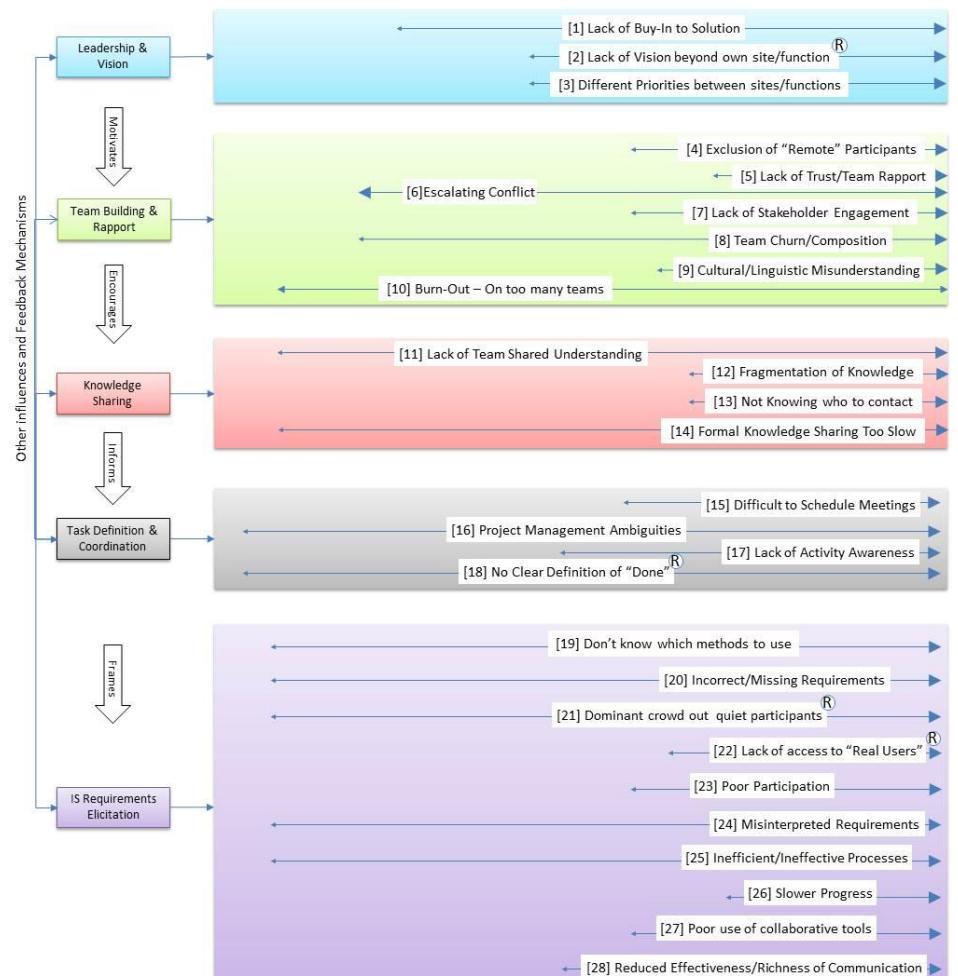


# 5. The Age of Global Agile Teams?

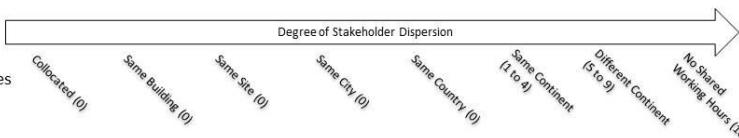




## Requirements Elicitation Problems mapped to Dispersion



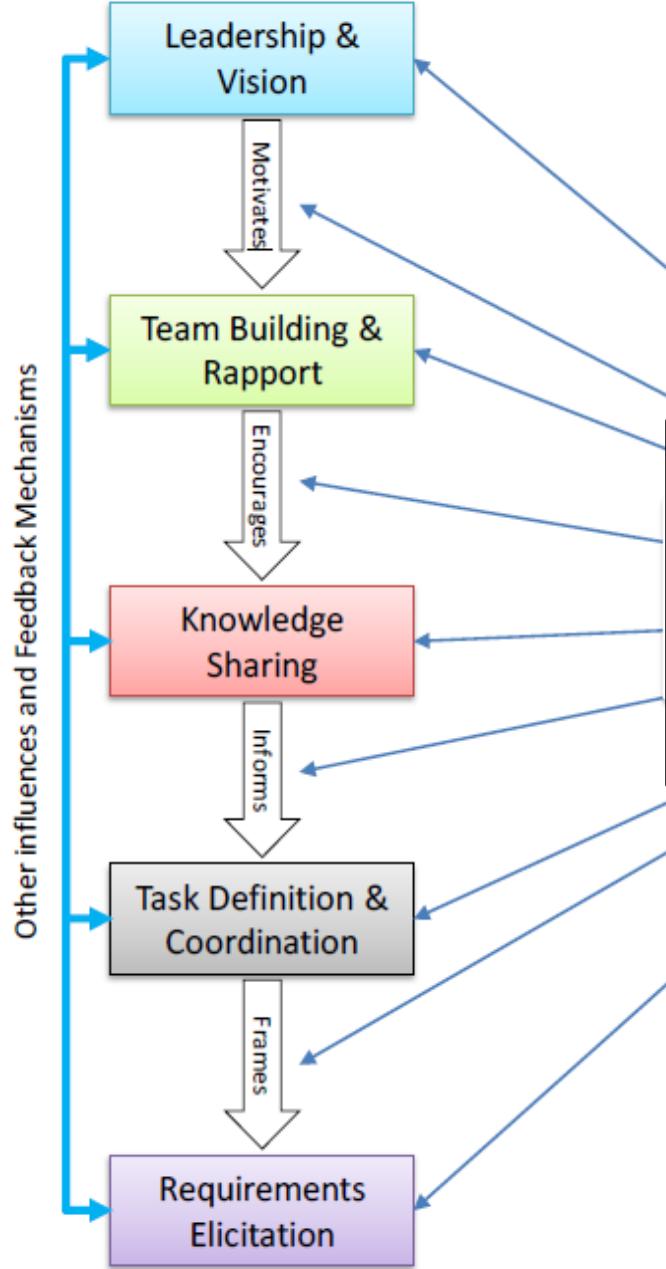
(n) = Time Zone Differences  
between Stakeholders



Key	Symbol
Range over which problem typically occurs	—
Frequency / Severity of Problem is Small(er)	→
Frequency / Severity of Problem is Large(r)	→
Problem only identified by Q'aire Respondents	R

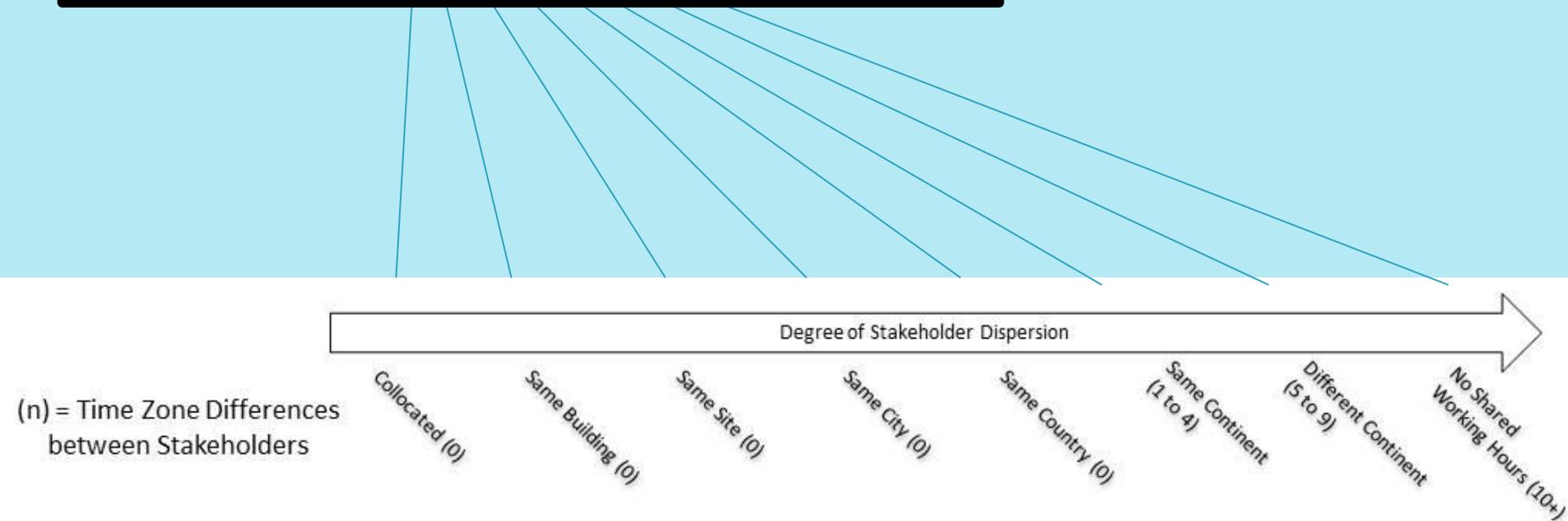
Vertical access based on Espinosa et al (2007). Extended to include Leadership and Vision. Horizontal access based on Siebdrat et al (2009). Extended to show assumed time zone difference as North-South dispersion has less impact than East-West (Espinosa Pickering 2006).

# Requirements Elicitation Problems mapped to Dispersion

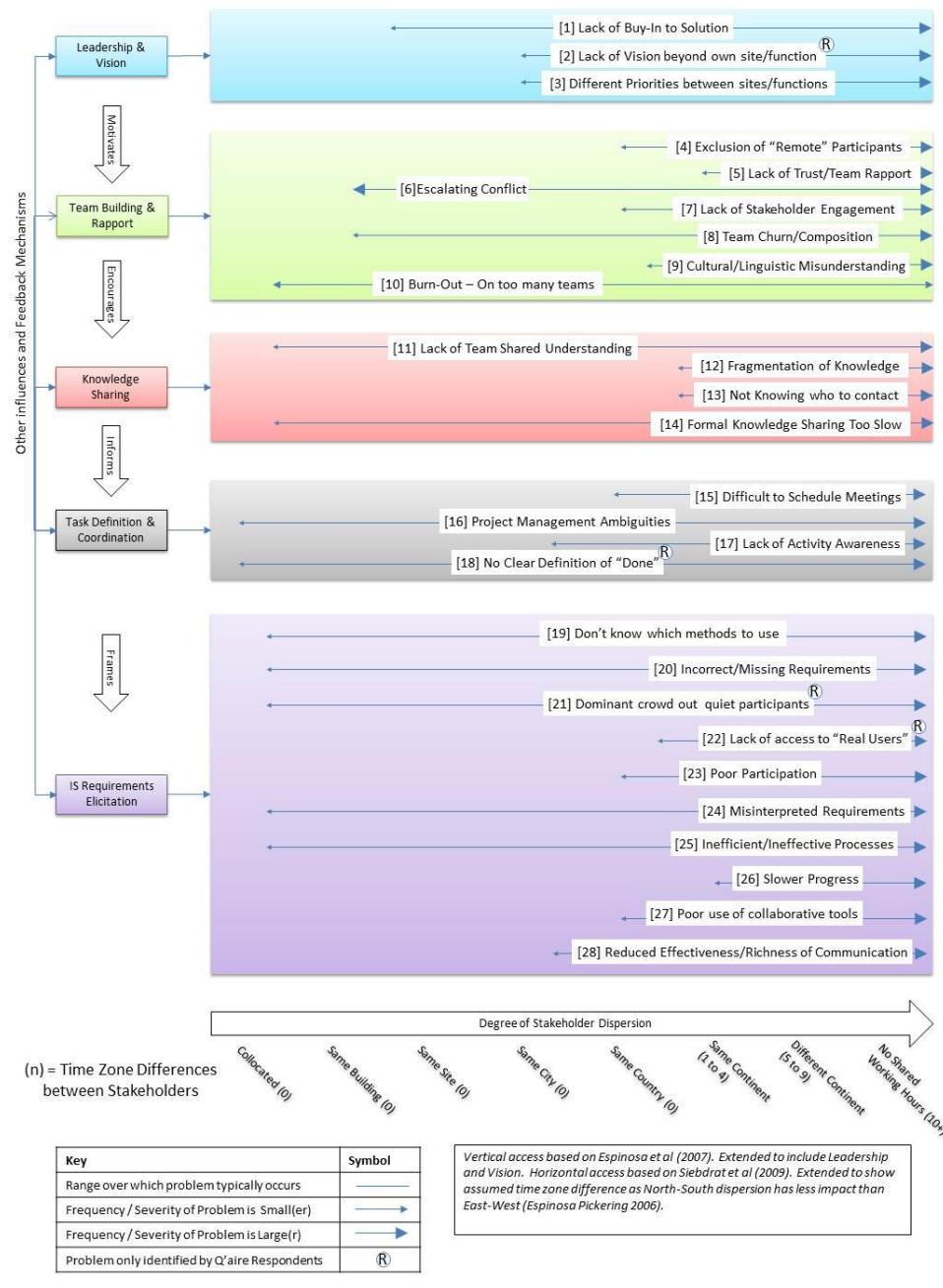


Information System Development  
doesn't happen in a vacuum...

# Degrees of Stakeholder Dispersion



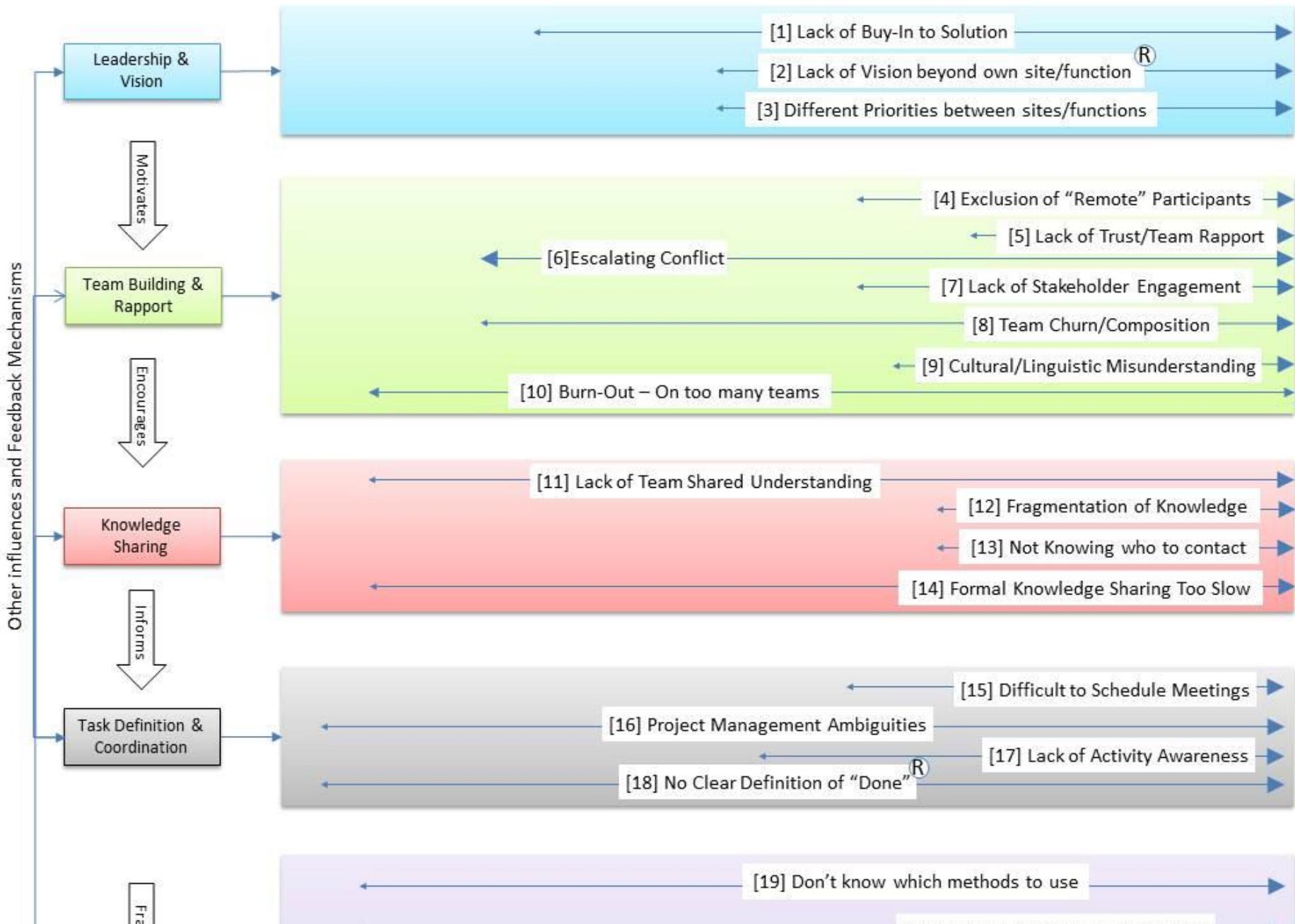
## Requirements Elicitation Problems mapped to Dispersion

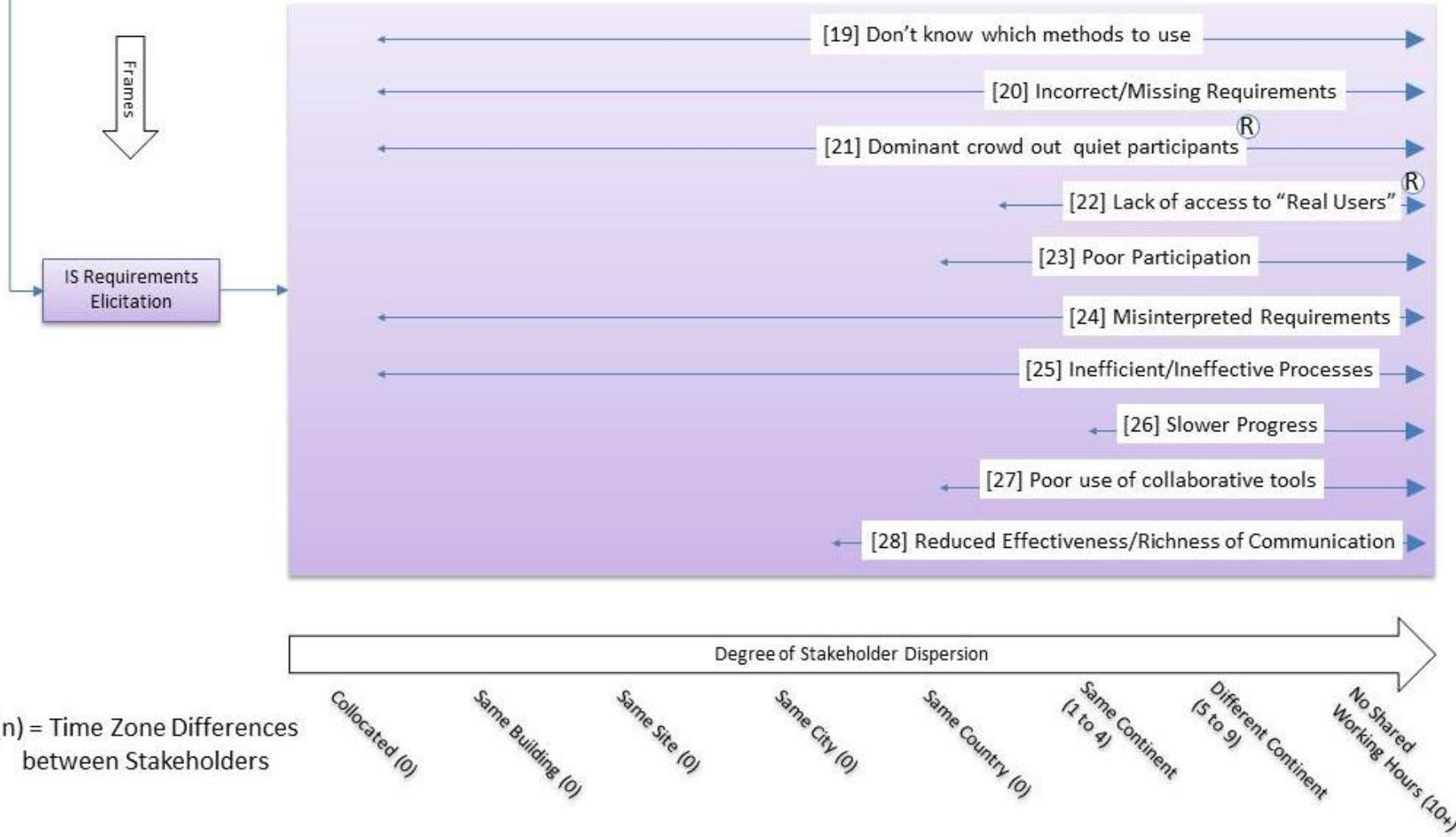


28 Error States Identified...

...and their severity increases with dispersion

# Requirements Elicitation Problems mapped to Dispersion

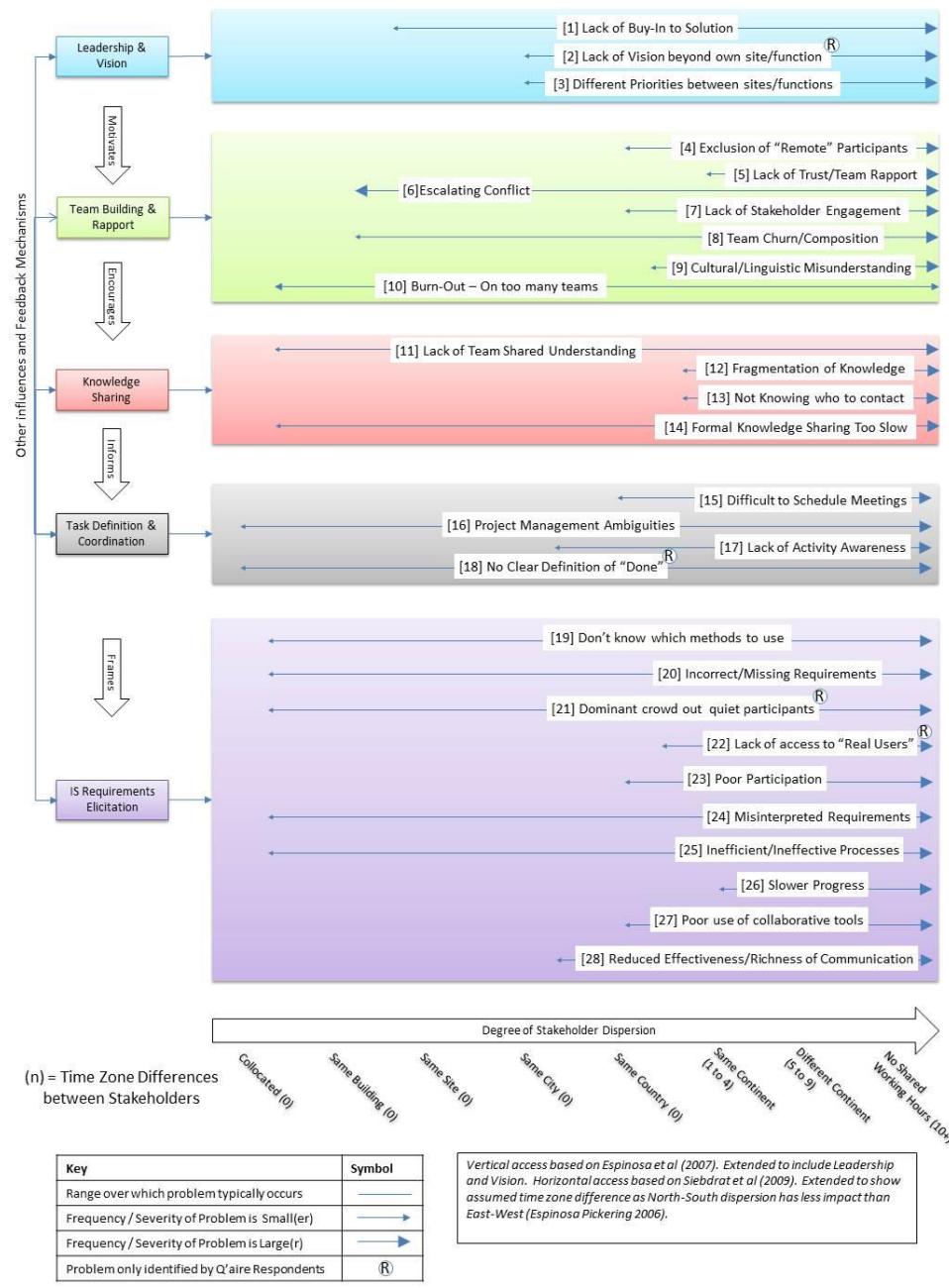




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## Requirements Elicitation Problems mapped to Dispersion



So may issues...  
...where to start?

# Top Three Reported Problems

1. Difficulty in Scheduling Meetings
2. Difficulty in Building Shared Understanding / Mental Models
3. Late Identification of Incorrect or Missing Requirements

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1. Difficulty in Scheduling Meetings
2. Difficulty in Building Shared Understanding / Mental Models
3. Late Identification of Incorrect or Missing Requirements

EDT Eastern Daylight Time (USA, Canada) in use instead of EST	Detroit	London	Chennai
Tue, 04:00 PM <sup>dst</sup>	Tue, 04:00 PM <sup>dst</sup>	Tue, 08:00 PM	Wed, 01:30 AM
		Tue, 09:00 PM	Wed, 02:30 AM
		Tue, 10:00 PM	Wed, 03:30 AM
		Tue, 11:00 PM	Wed, 04:30 AM
		Wed, MIDNIGHT	Wed, 05:30 AM
		Wed, 01:00 AM	Wed, 06:30 AM
		Wed, 02:00 AM	Wed, 07:30 AM
		Wed, 03:00 AM	Wed, 08:30 AM
		Wed, 04:00 AM	Wed, 09:30 AM
		Wed, 05:00 AM	Wed, 10:30 AM
		Wed, 06:00 AM	Wed, 11:30 AM
		Wed, 07:00 AM	Wed, 12:30 PM
		Wed, 08:00 AM	Wed, 01:30 PM
		Wed, 09:00 AM	Wed, 02:30 PM
		Wed, 10:00 AM	Wed, 03:30 PM
		Wed, 11:00 AM	Wed, 04:30 PM
		Wed, NOON	Wed, 05:30 PM
		Wed, 01:00 PM	Wed, 06:30 PM
		Wed, 02:00 PM	Wed, 07:30 PM
		Wed, 03:00 PM	Wed, 08:30 PM
		Wed, 04:00 PM	Wed, 09:30 PM
		Wed, 05:00 PM	Wed, 10:30 PM
		Wed, 06:00 PM	Wed, 11:30 PM
		Wed, 07:00 PM	Thu, 12:30 AM
		Wed, 08:00 PM	Thu, 01:30 AM
		Wed, 09:00 PM	Thu, 02:30 AM
		Wed, 10:00 PM	Thu, 03:30 AM

Han et al (2011)

Maximize the use of asynchronous communication methods to reduce the demand for synchronous communications during shared working hours

Wed, 03:00 AM <sup>dst</sup>	Wed, 03:00 AM <sup>dst</sup>	Wed, 07:00 AM	Wed, 12:30 PM
Wed, 04:00 AM <sup>dst</sup>	Wed, 04:00 AM <sup>dst</sup>	Wed, 08:00 AM	Wed, 01:30 PM
Wed, 05:00 AM <sup>dst</sup>	Wed, 05:00 AM <sup>dst</sup>	Wed, 09:00 AM	Wed, 02:30 PM
Wed, 06:00 AM <sup>dst</sup>	Wed, 06:00 AM <sup>dst</sup>	Wed, 10:00 AM	Wed, 03:30 PM
Wed, 07:00 AM <sup>dst</sup>	Wed, 07:00 AM <sup>dst</sup>	Wed, 11:00 AM	Wed, 04:30 PM
Wed, 08:00 AM <sup>dst</sup>	Wed, 08:00 AM <sup>dst</sup>	Wed, NOON	Wed, 05:30 PM
Wed, 09:00 AM <sup>dst</sup>	Wed, 09:00 AM <sup>dst</sup>	Wed, 01:00 PM	Wed, 06:30 PM
Wed, 10:00 AM <sup>dst</sup>	Wed, 10:00 AM <sup>dst</sup>	Wed, 02:00 PM	Wed, 07:30 PM
Wed, 11:00 AM <sup>dst</sup>	Wed, 11:00 AM <sup>dst</sup>	Wed, 03:00 PM	Wed, 08:30 PM
Wed, NOON <sup>dst</sup>	Wed, NOON <sup>dst</sup>	Wed, 04:00 PM	Wed, 09:30 PM
Wed, 01:00 PM <sup>dst</sup>	Wed, 01:00 PM <sup>dst</sup>	Wed, 05:00 PM	Wed, 10:30 PM
Wed, 02:00 PM <sup>dst</sup>	Wed, 02:00 PM <sup>dst</sup>	Wed, 06:00 PM	Wed, 11:30 PM
Wed, 03:00 PM <sup>dst</sup>	Wed, 03:00 PM <sup>dst</sup>	Wed, 07:00 PM	Thu, 12:30 AM
Wed, 04:00 PM <sup>dst</sup>	Wed, 04:00 PM <sup>dst</sup>	Wed, 08:00 PM	Thu, 01:30 AM
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Han et al (2011)

Maximize the use of asynchronous communication methods to reduce the demand for synchronous communications during shared working hours

Workshops	Prototyping	Agile	Interviews
Participatory Design	Document reviews	Iterative Development	TOGAF
Questionnaires	Joint Application Development	Delphi	Use Cases
User Stories	Visual Modelling Techniques	Case Tools	-

Table 2.1 – Established RE Methodologies

But the majority of existing IS Methodologies appear to assume significant synchronous dialogue

# Top Three Reported Problems

1. Difficulty in Scheduling Meetings
2. Difficulty in Building Shared Understanding / Mental Models
3. Late Identification of Incorrect or Missing Requirements



Espinosa and Pickering (2006)

“The novelty of virtual collaborative working has progressively matured into a set of accepted norms”

- Audio Conferencing (1:1 and multiple participants)
- Email
- Email Attachments / Deliverables
- Shared Data Storage (eg Sharepoint)
- Presence Indicators and Instant Messaging (1:1 and multiple participants)
- Desktop/Application Sharing (eg Webex)
- and to a lesser extent:
  - Personal Webcams (eg Skype)
  - Shared Video / Audio (eg Youtube, Podcasts, Embedded Audio Narration)



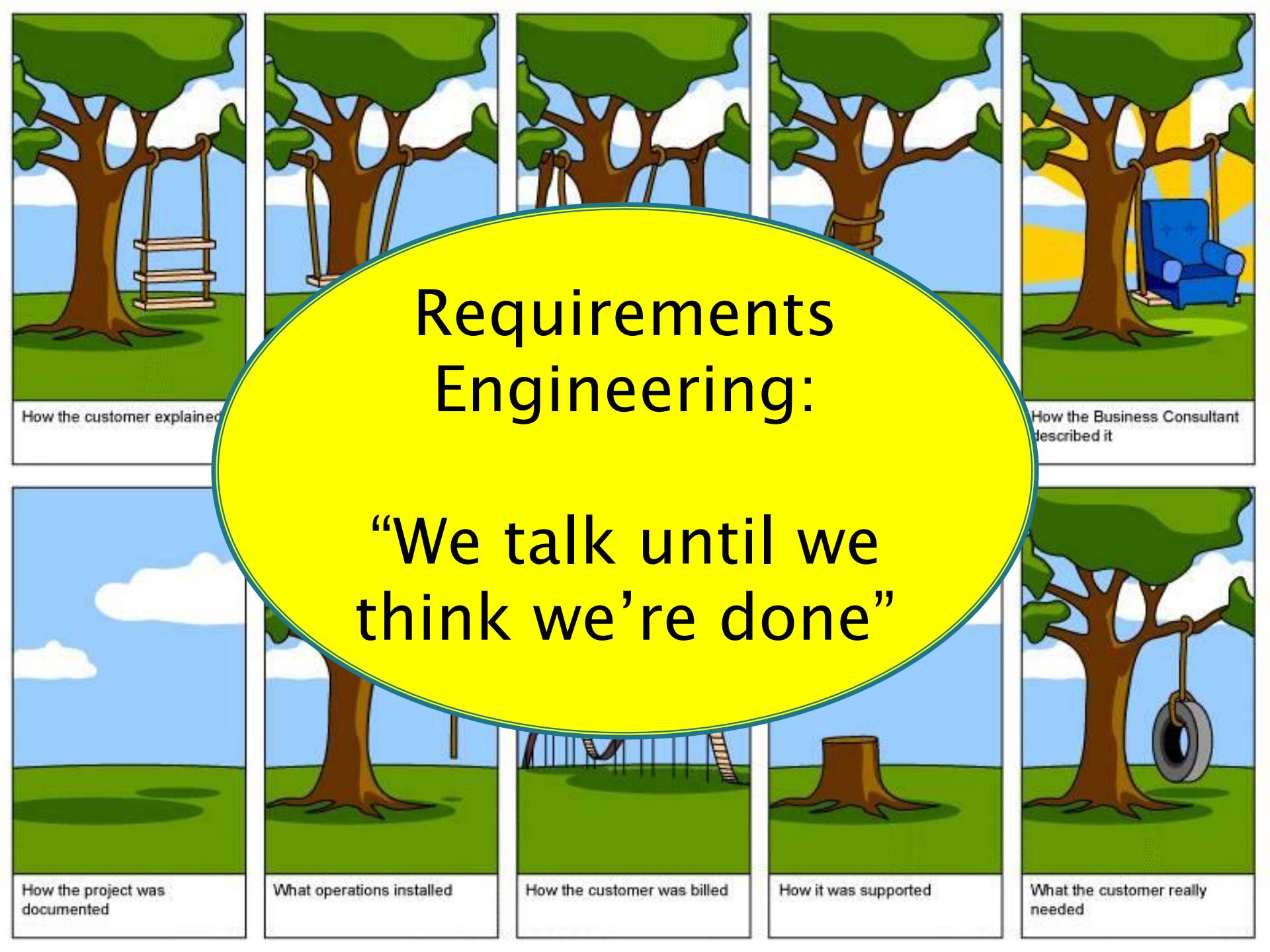
*Rather than look fondly back to the days of co-location...*

Is there an “opportunity to re-create – make something new and better – rather than trying to emulate face-to-face working practices?”

Townsend (1998)

# Top Three Reported Problems

1. Difficulty in Scheduling Meetings
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# Requirements Engineering:

“We talk until we  
think we’re done”

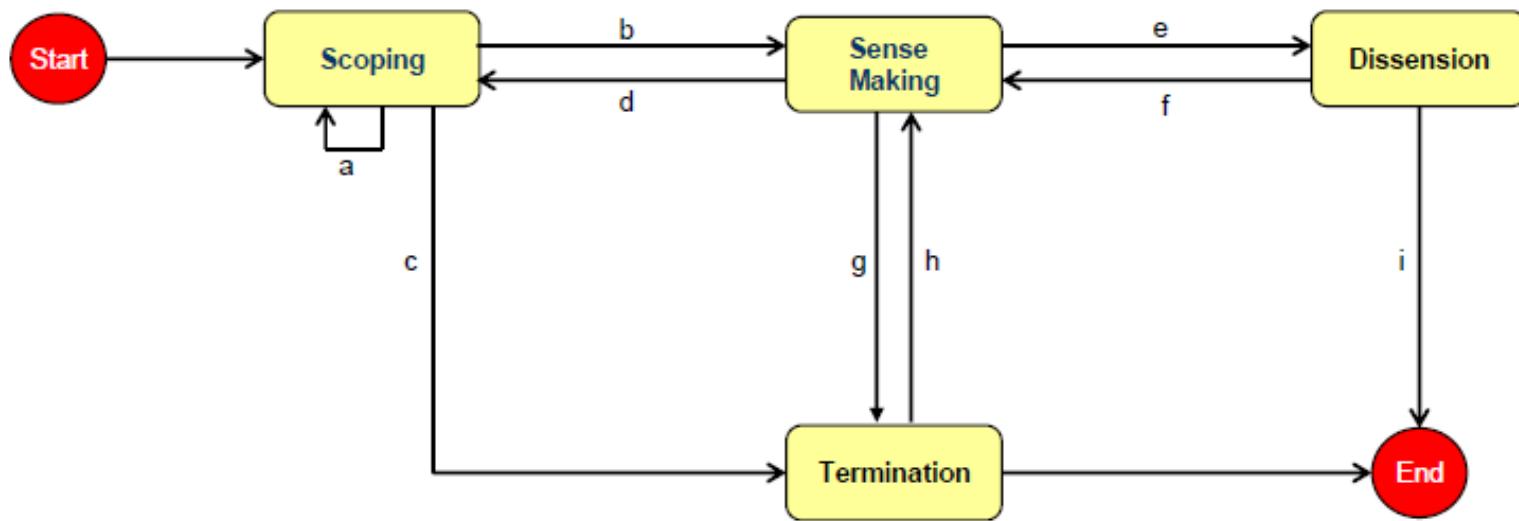
How the customer explained it

What operations installed

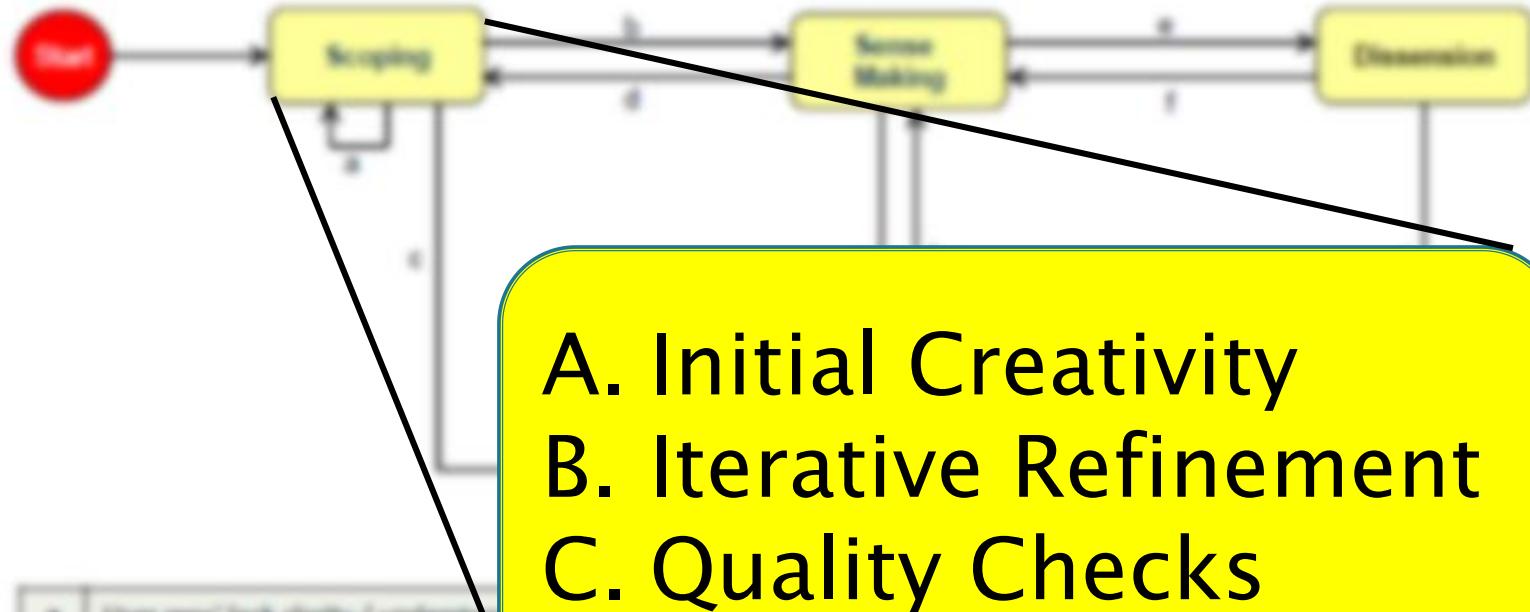
How the customer was billed

How it was supported

What the customer really needed



<b>a</b>	User reps' lack clarity / understanding
<b>b</b>	Logical progression, working norms established, growing trust
<b>c</b>	Simple requirement enables direct move to termination
<b>d</b>	Need to refine/change/clarify objectives. Impact analysis indicated need to change scope.
<b>e</b>	Disagreements about requirements arise; Interpersonal/Political issues arise
<b>f</b>	Disagreements resolved; Improved understanding enable returning to remaining unfinished business
<b>g</b>	Logical progression, shared mental model and agreements
<b>h</b>	Gaps are identified which require re-examination
<b>i</b>	Failure to resolve conflict; breakdown of trust



a	User reqs' lack clarity / undefined
b	Logical progression, working consensus
c	Simple requirement enables direct move to iteration
d	Need to refine/change/clarify objectives. Impact analysis indicated need to change scope.
e	Disagreements about requirements arise. Interpersonal/Political issues arise
f	Disagreements resolved; improved understanding enable returning to remaining unfinished business
g	Logical progression, shared mental model and agreements
h	Gaps are identified which require re-examination
i	Failure to resolve conflict; breakdown of trust

# Top Three Reported Problems

- ▶ Difficulty in Scheduling Meetings
- ▶ Difficulty in Building Shared Understanding / Mental Models
- ▶ Late Identification of Incorrect or Missing Requirements

## Summary so far

- The problems are real ...
- There's some existing ideas that might help solve some aspects of them
- But it is difficult to know which solutions to use or how to best combine them

# Internal Research 2012

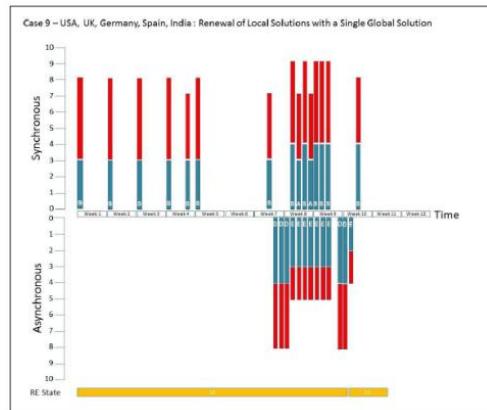
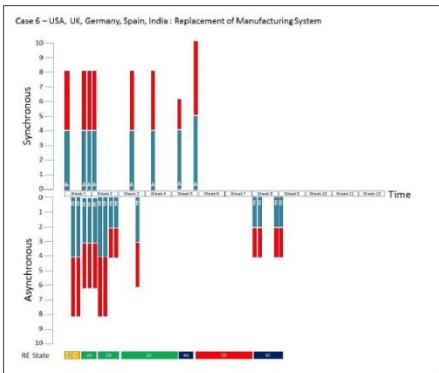


1. What methodologies and methods are currently being used?
2. Which are most efficient and effective?
3. What factors contribute to variation in their performance?
4. Is there a simple rule-of-thumb best split between synchronous and asynchronous working?
5. Does the choice of methods affect the overall start-to-end speed of the RE process – and why?

# Primary Research

29 global IS projects monitored for 10 weeks through a repeated set of interviews and data capture.

Every RE activity classified, rated and documented.



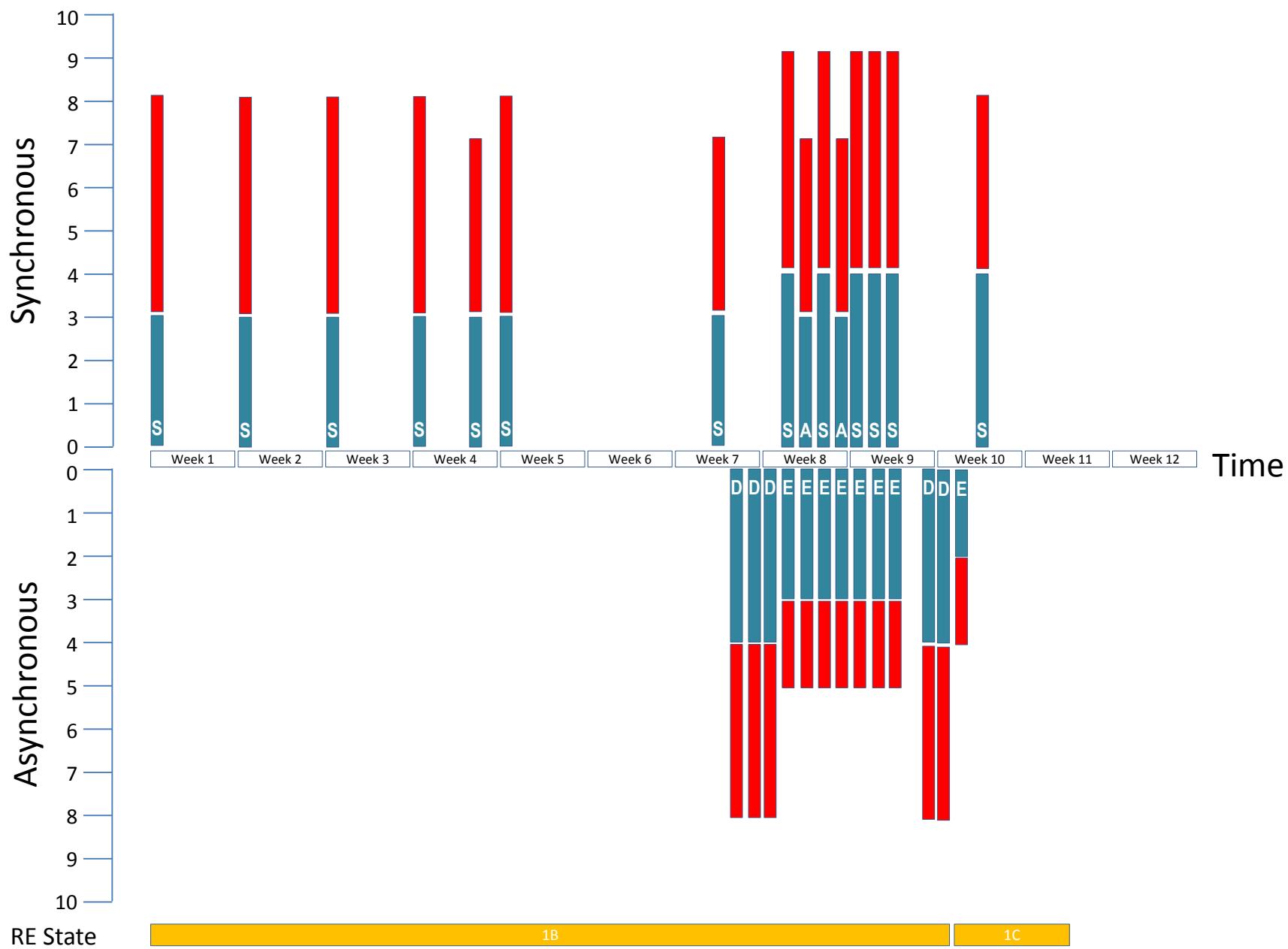
## Key to Activity

Effectiveness Rating (1-5)
Efficiency Rating (1-5)
S Audio Conference with Desktop Sharing
A Audio Conference
D Off-line Development of Deliverable
E Email Exchanges
V Video Conference with Desktop Sharing
P Personal Study
F Face-to-Face

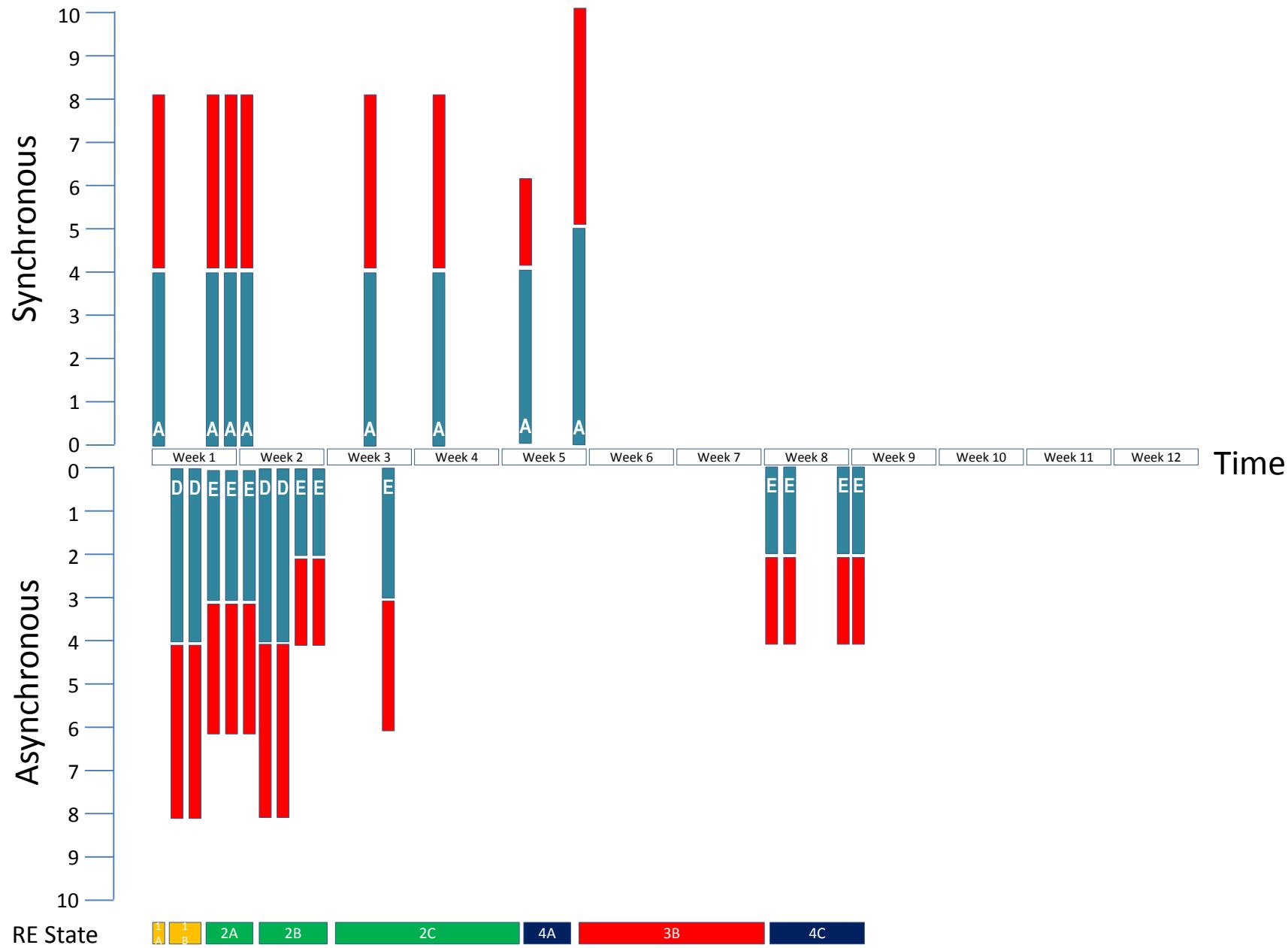
## Key to RE State

1A	Scoping - Initial Creativity
1B	Scoping - Clarification & Refinement
1C	Scoping – Quality Checks
2A	Sense Making – Initial Creativity
2B	Sense Making – Clarification & Refinement
2C	Sense Making – Quality Checks
3A	Dissension - Initial Creativity
3B	Dissension - Clarification & Refinement
3C	Dissension – Quality Checks
4A	Termination – Initial Creativity
4B	Termination – Clarification & Refinement
4C	Termination – Quality Checks

## Case 9 – USA, UK, Germany, Spain, India : Renewal of Local Solutions with a Single Global Solution



## Case 6 – USA, UK, Germany, Spain, India : Replacement of Manufacturing System





# Q1 Methodologies Used?

Very little evidence of any methodology used

“we just do it”

# Q1 Methods Used?

## Widely Used

- ▶ E-mail Dialogue
- ▶ Deliverables (via Sharepoint or email)
- ▶ Audio
- ▶ Audio + Webex

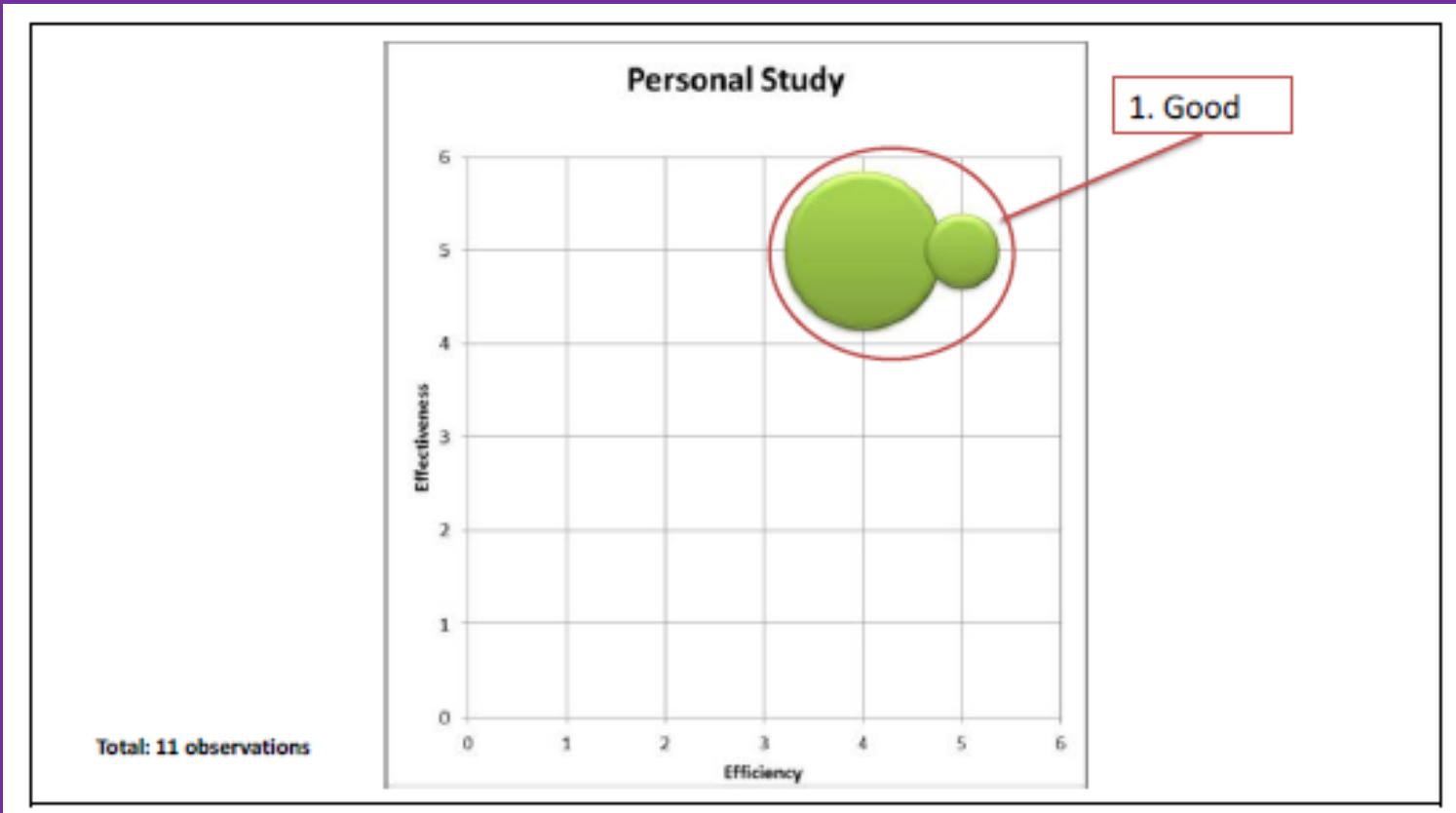
## Rarely Used

- ▶ Video Conferencing
- ▶ Travel → Face2Face
- ▶ Personal Study
- ▶ Audio + Webex + Video

## Not Used

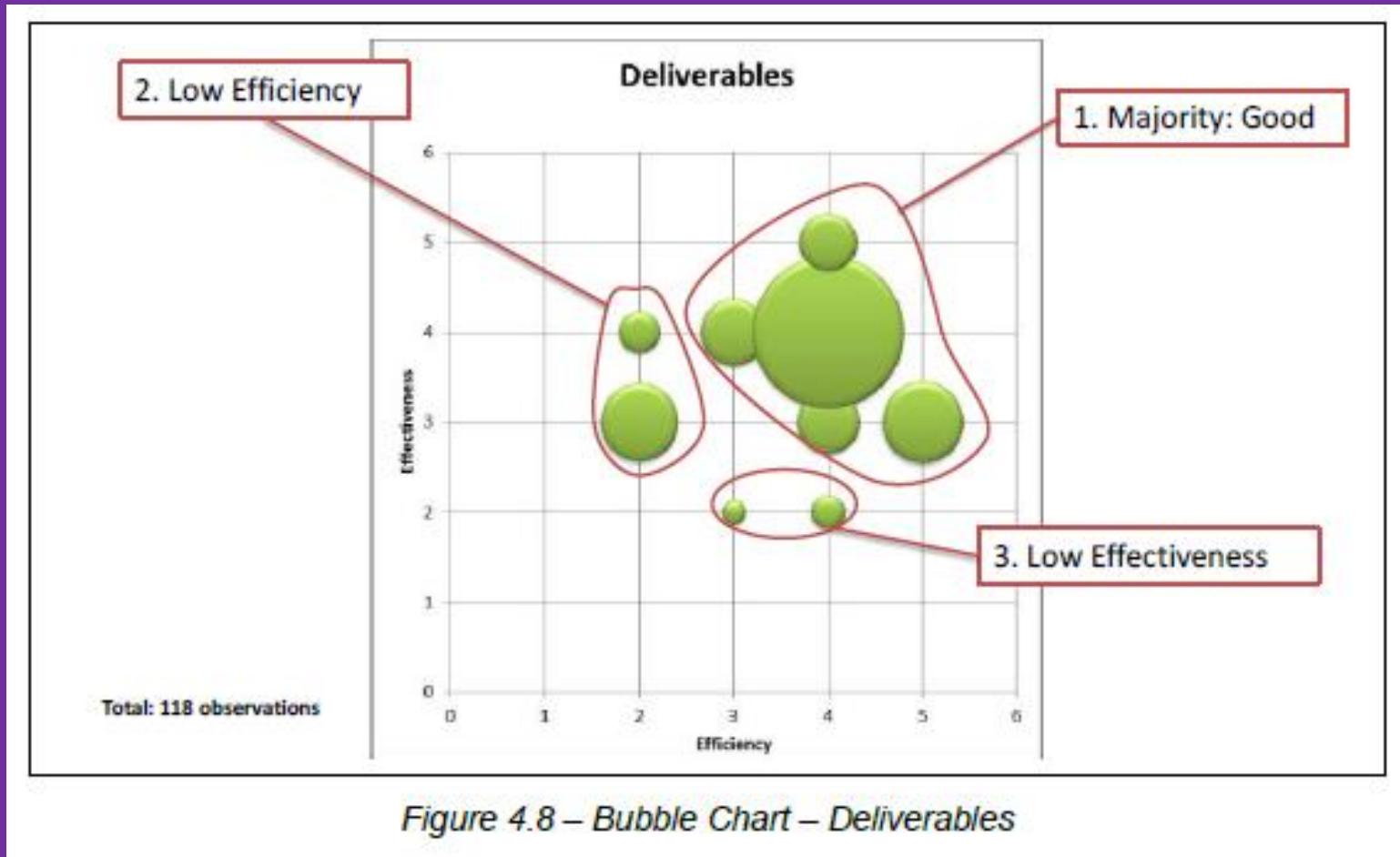
- ▶ 1:1 Webcams
- ▶ Embedded audio
- ▶ Posted Video
- ▶ Discussion Boards
- ▶ Instant Messaging

# Q2/3 - Asynch. Personal Study

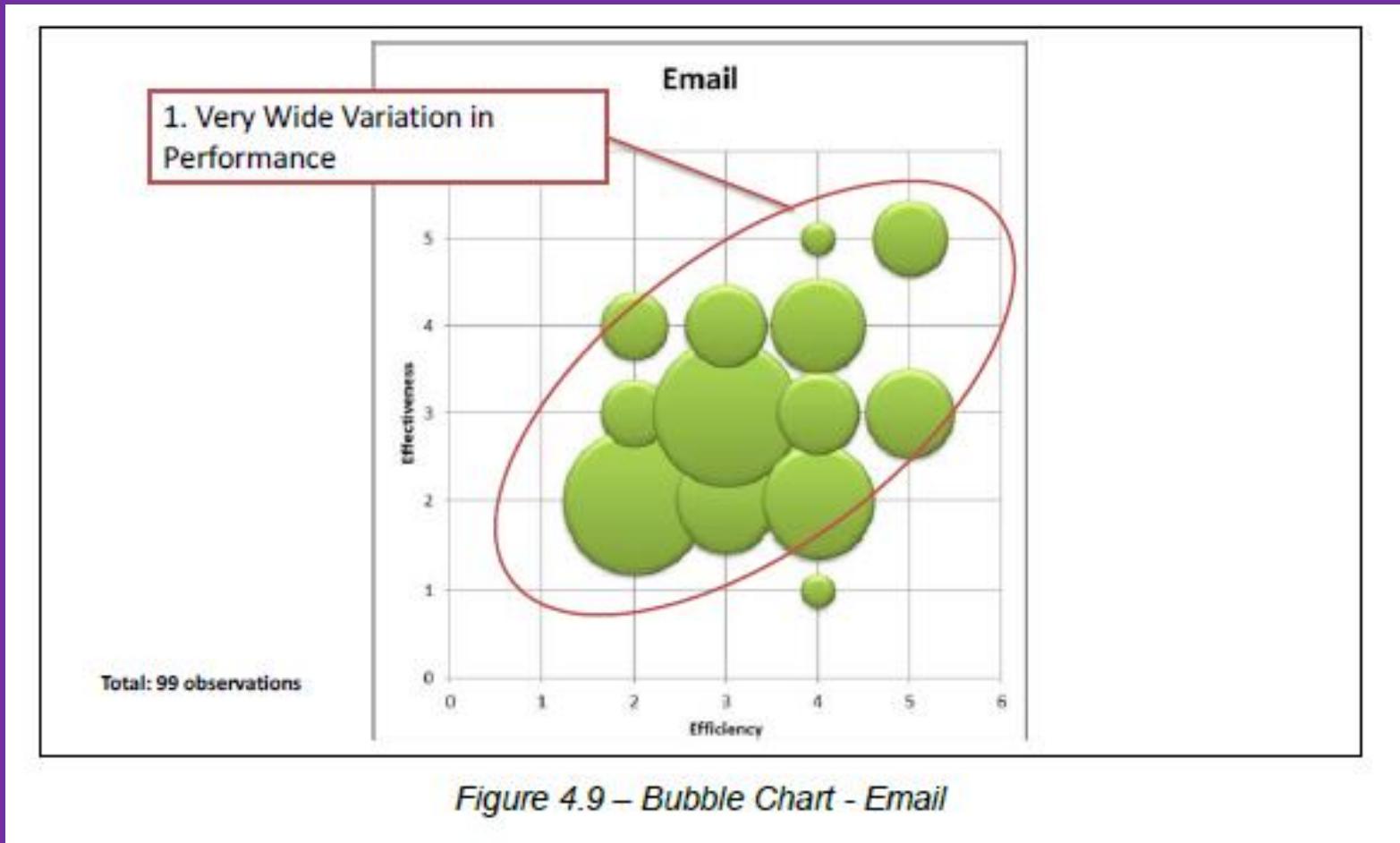


*Figure 4.7 – Bubble Chart – Personal Study*

# Q2/3 - Asynchronous Deliverables



# Q2/3 - Asynchronous E-mail



# Q2/3 - Synchronous Audio Only

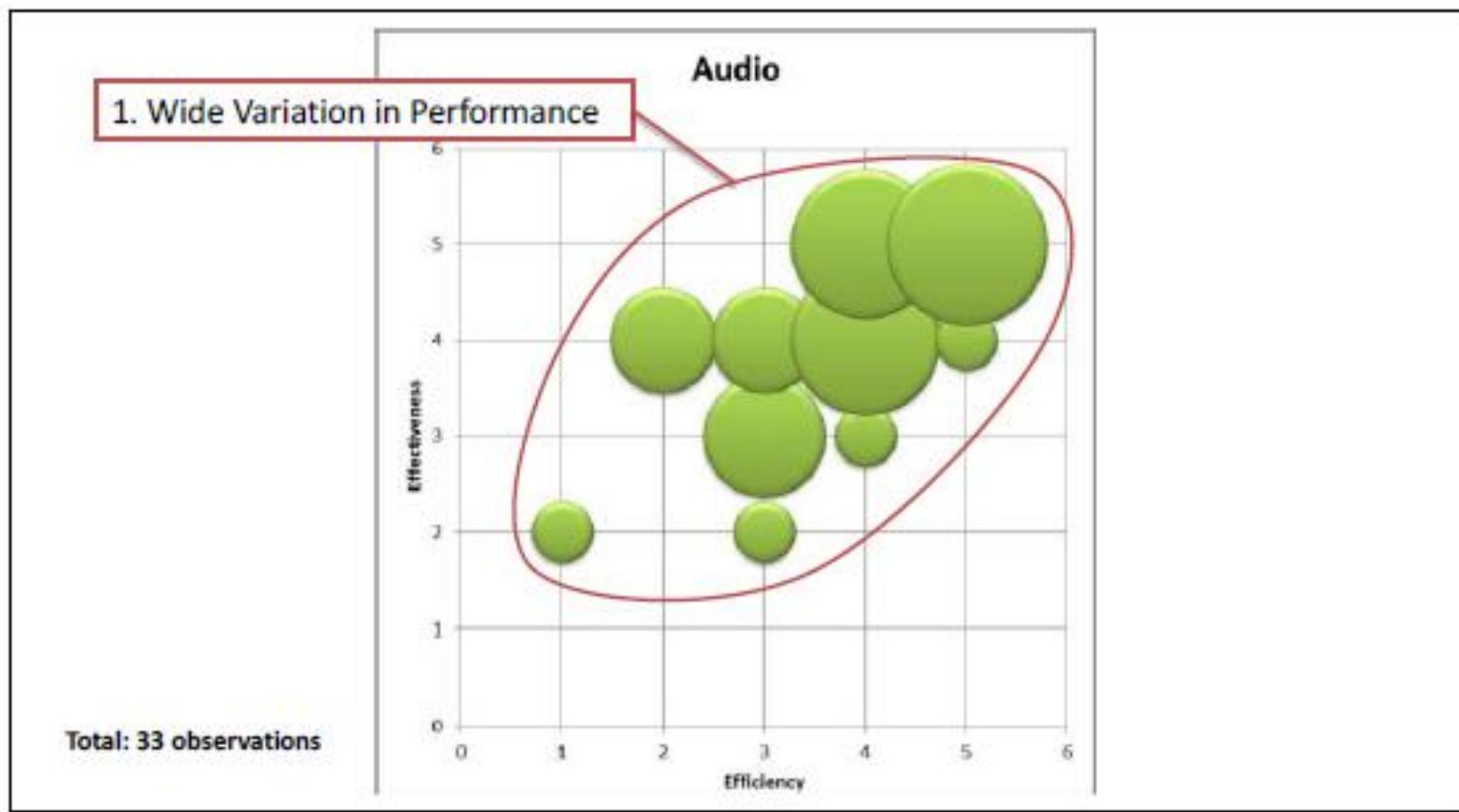


Figure 4.10 Bubble Chart – Audio Conferencing

# Q2/3 - Synchronous Audio+Webex

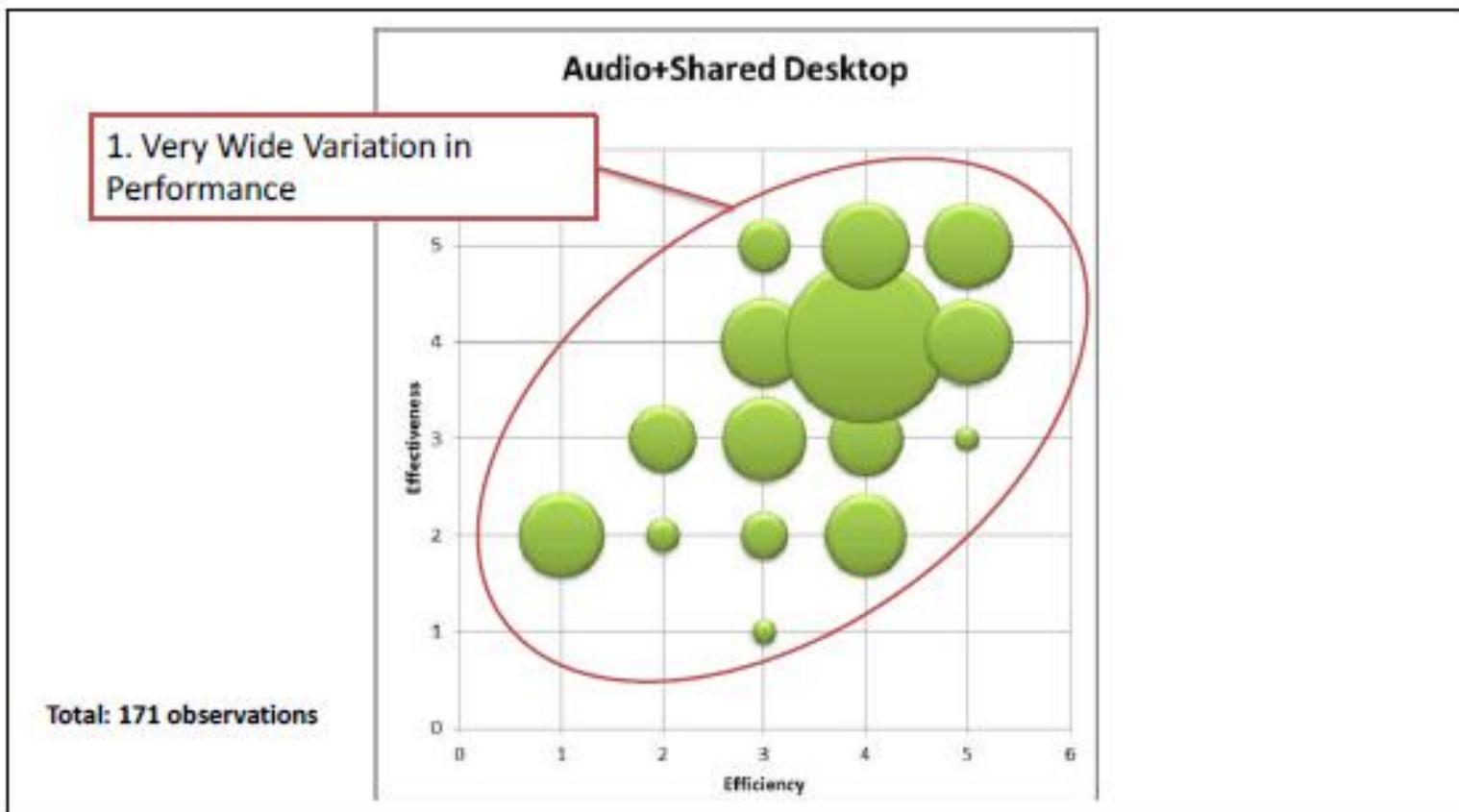
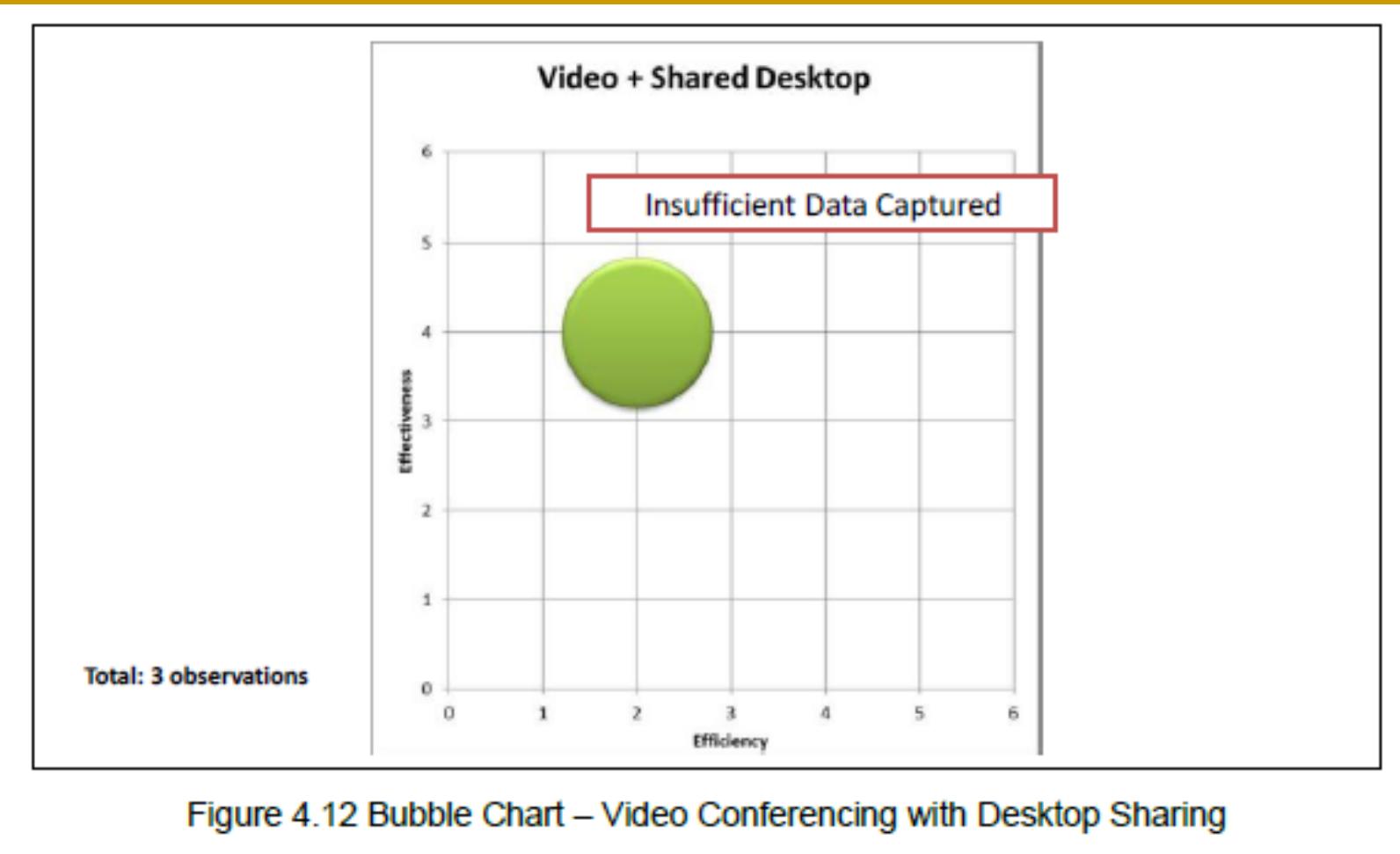


Figure 4.11 Bubble Chart – Audio Conferencing with Desktop Sharing

# Q2/3 - Synch. Audio+Webex+Video



# Q2/3 - Synch. Travel → Face2Face



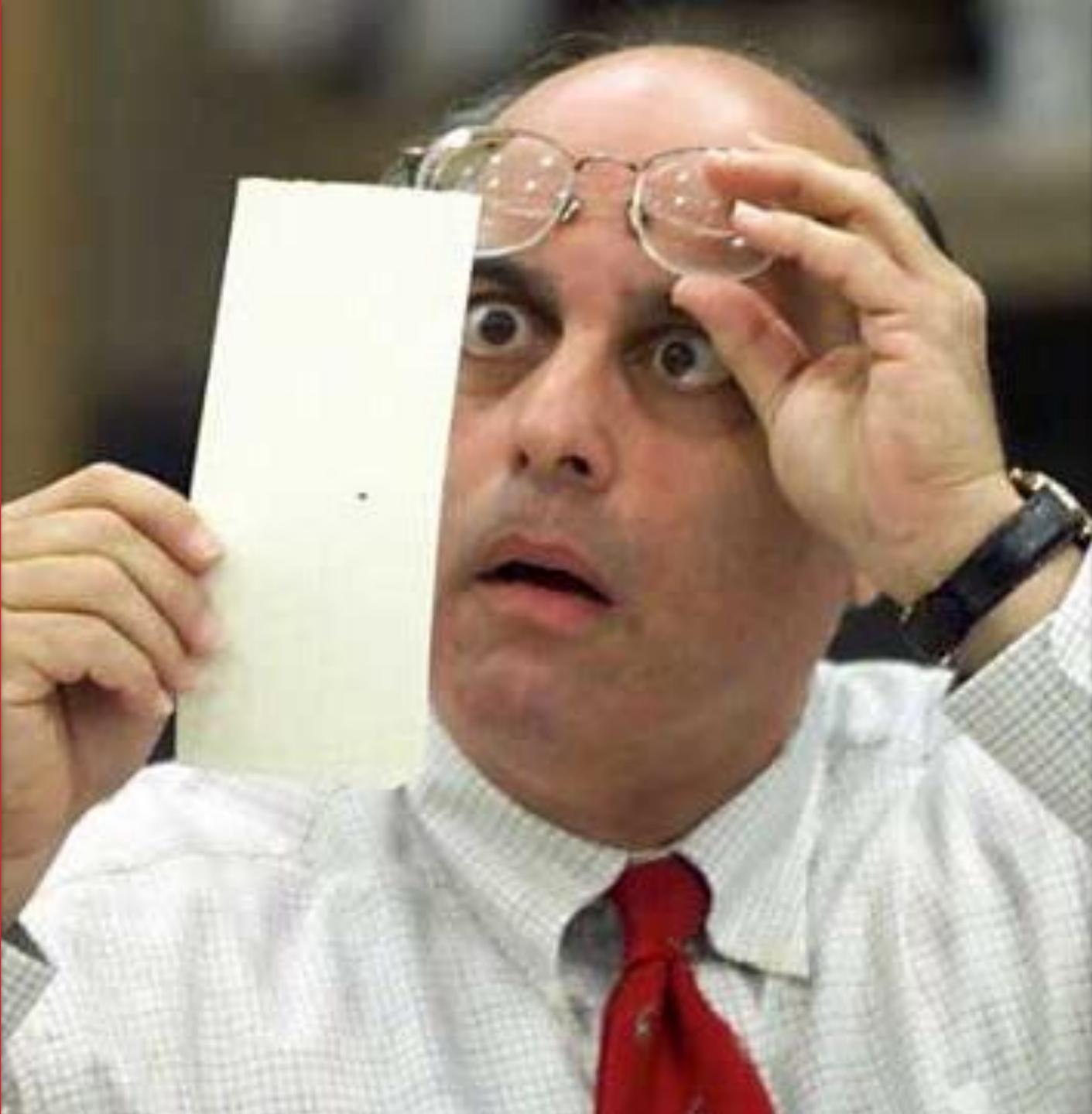
Figure 4.13 Bubble Chart – Face-to-Face

Q4

Is there a simple  
rule-of-thumb  
best split between  
synchronous  
and  
asynchronous  
working?

No...or if there is  
I didn't find it.

Let's look again...



What about the speed of RE?

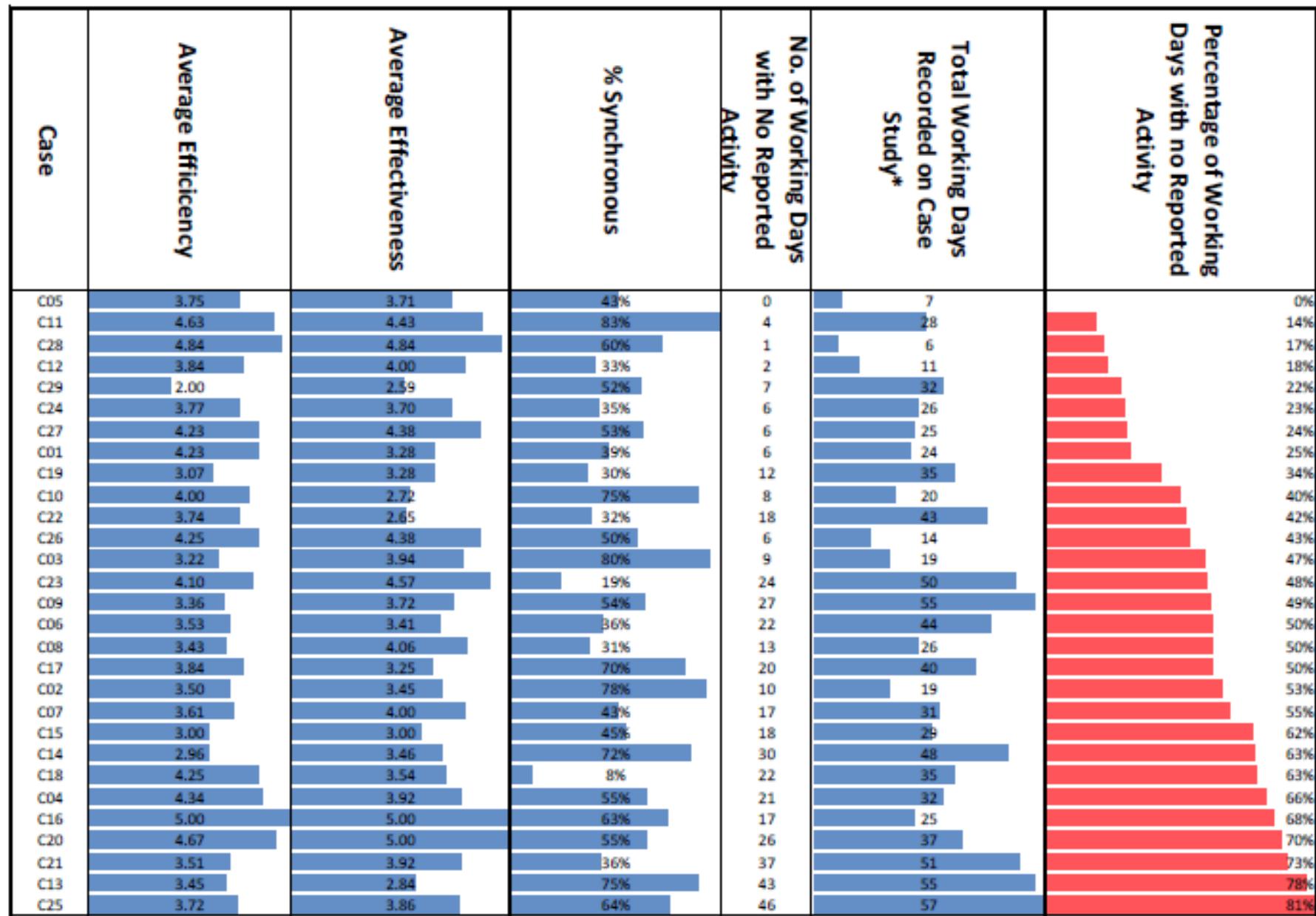


Figure 4.15 – Percentage of Working Days with no RE activities

		Organization	Management & Planning		Variety of Meeting Formats		Meeting Activities	Observed Reasons for increased elapsed time for RE Process			Delays caused by waiting for management availability for reviews/approvals	
Case	Percentage of Working Days with no Reported Activity	Team Size	Focus on planning "big events" (e.g workshops)	Forward planning beyond next meeting (e.g Weekly Review Meetings)	Who determined the working practices?	Total Group Meetings	Sub-Group / Regional Meetings	Meetings Focussed on Deliverables created offline	Delays caused by waiting for next meeting slot	Delays caused by waiting for next scheduled meeting	Delays caused by slow response to "big event"	
C05	0%	6	Author	No	No	Yes	Yes	Yes	No	No	No	No
C11	14%	6	Author	No	No	Yes	Yes	Yes	Yes	No	No	No
C28	17%	5	Author	No	No	Yes	Yes	Yes	Yes	No	No	No
C12	18%	6	Author	No	No	Yes	Yes	Yes	No	Yes	No	No
C29	22%	8	Manager	Yes	No	No	No	Yes	No	No	Yes	No
C24	23%	6	Author	No	No	Yes	Yes	Yes	Yes	Yes	No	No
C27	24%	8	Author	No	No	Yes	Yes	Yes	Yes	No	Yes	No
C01	25%	6	Author	No	No	Yes	Yes	Yes	Yes	No	Yes	No
C19	34%	8	Author	No	No	Yes	No	Yes	Yes	No	No	Yes
C10	40%	6	Author	No	No	No	No	Yes	No	Yes	No	No
C22	42%	12	Manager	Yes	No	No	No	Yes	No	No	Yes	No
C26	43%	10	No Plan	No	No	Yes	Yes	Yes	Yes	No	No	Yes
C03	47%	4	No Plan	No	No	Yes	Yes	Yes	No	Yes	No	No
C23	48%	10	Manager	Yes	No	No	No	Yes	No	No	Yes	No
C09	49%	25	Manager	Yes	No	No	No	Yes	No	No	Yes	No
C06	50%	8	Author	No	No	Yes	No	No	Yes	No	No	Yes
C08	50%	5	No Plan	No	No	Yes	Yes	Yes	Yes	No	No	Yes
C17	50%	20	Manager	Yes	No	Yes	Yes	Yes	No	No	Yes	No
C02	53%	10	Manager	Yes	No	No	No	Yes	Mix	No	Yes	No
C07	55%	10	Author	Yes	No	No	No	Yes	Mix	No	Yes	No
C15	62%	5	Author	Yes	No	No	No	Yes	Mix	No	Yes	No
C14	63%	10	Author	Yes	No	Yes	Yes	Yes	No	No	No	Yes
C18	63%	5	Author	No	No	No	No	No	-	No	No	Yes
C04	66%	12	Manager	Yes	Yes	No	No	Yes	No	No	Yes	No
C16	68%	8	Manager	Yes	No	No	No	Yes	Yes	No	Yes	No
C20	70%	8	Manager	Yes	No	No	No	Yes	Yes	No	Yes	No
C21	73%	25	Author	Yes	No	No	No	Yes	Yes	No	Yes	No
C13	78%	15	Manager	No	No	No	No	Yes	No	No	No	No
C25	81%	10	Manager	Yes	Yes	No	No	Yes	No	No	Yes	Yes

Figure 4.16 – Summary of Factors that may impact speed of RE

		Organization	Management & Planning			Variety of Meeting Formats			Meeting Activities	Observed Reasons for increased elapsed time for RE Process						
	Percent		Who drives	Format	Tool	Ref	Su		Mac	Delay	Def	Delay	Def	Delay	Def	Delay
C20	40%		8 Manager	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No
C21	73%		25 Author	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No
C13	78%		15 Manager	No	No	No	No	Yes	No	No	No	No	No	No	No	No
C25	81%		10 Manager	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	No	No	No

## Key Observations

1. Even large teams can be speedy
2. Empowered analysts can work faster when not constrained by a management-imposed “weekly meeting” mind-set.
3. Using a variety of methods tends to result in faster progress.
4. Doing the majority of work “off-line” appears to be best.
5. Teams that focus on “big workshops” go slowest.
6. Reliance on unstructured communication (eg email) can cause delays.

C20	40%		8 Manager	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No
C21	73%		25 Author	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No
C13	78%		15 Manager	No	No	No	No	Yes	No	No	No	No	No	No	No	No
C25	81%		10 Manager	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	No	No	No

Figure 4.16 – Summary of Factors that may impact speed of RE



# Recommendation #1

Design an RE methodology upfront to suit the situation

- Define the set of deliverables for exiting each STATE of the process
- Define the set of quality thresholds
- Define the set of appropriate methods FOR EACH STATE
- Consider time-boxing so that you can schedule management reviews and approvals ahead of time.

# Recommendation #2

## Establish Appropriate Working Norms

- Empower team members to self-manage communications and plans
- Encourage openness, adhoc meetings, 1:1 calls, IM chats.
- Set expectations on availability, flexi-working, and acceptable e-mail and off-line review response times.
- Set the expectation that every hour or every day matters – down days are bad.

# Recommendation #3

## Use Appropriate RE methods including “rich media”

- Improve the way you perform audio+webex → better facilitation, use methods that encourage interaction and involvement by all.
- Frequently use web cams for 1:1s to build trust and rapport.
- Try embedding audio narration into written materials → reduce pressure on “presenting materials” during meetings.
- Blend synchronous and asynchronous → think how to use all working hours.

# Current Trials

- ▶ Shared desktop used as “virtual whiteboard” in every meeting – with “active facilitation” – everyone attends from their own PC.
- ▶ Personal Webcams – especially for 1:1s – primarily to build trust and rapport.
- ▶ Canned Videos/Narrations of key presentations.
- ▶ Virtual Workshops based around a daily cycle of global and regional breakout sessions.

# ...6. The Age of Effective Global Agile?

- Rich Dialogue
- Appropriate use of Synch/Asynch Methods
- Rapport and Trust
- Empowerment and Creativity
- Successful IS and IT solutions



Rather than look fondly back to the days of co-location...

Is there an “opportunity to **re-create** – make something new and better – rather than trying to emulate face-to-face working practices?”

Townsend (1998)

# Requirements Engineering in Global Teams – *can you make them effective and fun?*

Peter Cooke  
Global Enterprise Architect  
Ford Motor Company

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