MPA 723
PROJECT MANAGEMENT

NATIONAL OPEN UNIVERSITY OF NIGERIA

COURSE GUIDE

MBA 723
INFORMATION TECHNOLOGY MANAGEMENT

Course Developer /Writer	Gerald C. Okereke Eco Communications Inc. Ikeja, Lagos
Course Editor	Mrs. E. A. Adegbola National Open University of Nigeria
Programme Leader	Dr. O. J. Onwe National Open University of Nigeria
Course Coordinator	Mrs. E. A. Adegbola National Open University of Nigeria

NATIONAL OPEN UNIVERSITY OF NIGERIA

National Open University of Nigeria
Headquarters
14/16 Ahmadu Bello Way
Victoria Island
Lagos

Abuja Office
No. 5 Dar es Salaam Street
Off Aminu Kano Crescent
Wuse II, Abuja
Nigeria

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

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Course Aim

This course is designed to acquaint business managers and information technology professionals with an understanding of how to manage information technology in business. The course explores how information technology functions can be organised, monitored and managed. It stresses the importance of customer and value for focus in business in the management of information technologies. It is designed to enhance managers' capabilities to deal with the challenges of information technology management.

Course Objectives

At the end of this course, the business managers and information technology professionals-to-be should be able to:

- explain what is information technology
- identify the basic components of information technology management
- name who heads the information technology department and who he/ she reports to
- explain the relationships between the information technology department (ITD) and end user
- discuss the major issues addressed by information systems planning
- demonstrate the importance of aligning information systems plans with business plans
- properly define and understand what is information technology architecture
- discuss the various changing phases in the development of information technology in organizations;
- explain the reasons for putting in place policies and guidelines in an organization
- discuss practical tips that aid you in planning, organizing and controlling a development project
- discuss how to promote teamwork in project development
- explain and define strategic information planning
- trace the evolution process of information technology
- explain the problems associated with software development
- explain the categories of software maintenance process
- discuss the tactical concerns in the production operation of IT organization
- explain the operational concerns in the production operation of IT organization
- discuss some of the key issues that are facing information technology management

- explain the outcomes of several surveys in information technology management
- identify the real challenges facing IT management
- work through a real life account of why information technology management failed in an organization
- identify the various reasons for failure of IT
- have a background knowledge of the State of Tennessee; and
- list the organizations that are involved in the IT process of State of Tennessee.

Study Units

The study units of this course are:

Module 1

Unit 1	Introduction to Information Technology Management
Unit 2	Managing Information Technology Department
Unit 3	Information Technology Planning
Unit 4	Information Technology Architecture
Unit 5	Managing Information Technology Functions

Module 2

Unit 1	Information Technology Management Principles, Policies and Guidelines;
Unit 2	Managing Application Development Projects
Unit 3	Strategic Information Technology Planning
Unit 4	Managing Change in Information Systems Technology
Unit 5	Developing and Managing Customer Expectations in Information Technology Management

Module 3

Unit 1	Information Technology Management Issues and Success Factors
Unit 2	Challenges of Information Technology Management
Unit 3	Failure of Information Technology Management; and
Unit 4	Information Systems Planning Process: A Case Study.

Course Materials

The major materials you will need for this course are:

1. Course guide
2. Study units
3. Relevant textbooks including the ones listed under each unit
4. Assignment file
5. Presentation schedule

Assignment File

An Assignment File and a marking scheme will be made available to you. In this file, you will find all the details of the work you must submit to your tutor for marking. The marks you obtain from these assignments will count towards the final mark you obtain for this course. Further information on assignments will be found in the assignment file itself and later in this Course Guide in the section on assessment.

Tutor-Marked Assignment

You will need to submit a specified number of the Tutor Marked Assignments (TMAs). Every unit in this course has a tutor marked assignment. You will be assessed on four of them but the best four (that is, the highest four of the fifteen marks) will be counted. The total marks for the best four (4) assignments will be 30% of your total work. Assignment questions for the unit in this course are counted in the Assignment File. When you have completed each assignment, send it, together with the TMA (tutor-marked assignment) form to your tutor. Make sure each assignment reaches your tutor on or before the deadline for submission. If, for any reason, you cannot complete your work on time, contact your tutor to discuss the possibility of an extension. Extension will not be granted after due date unless under exceptional circumstances.

Assessment

- The tutor marked assignments represents 30% of the marks obtainable; and
- Examination constitutes 70% of the marks obtainable.

Final Examination and Grading

The final examination of MB 723 will be of three hours' duration. All areas of the course will be examined. Find time to read the unit all over before your examination. The final examination will attract 70% of the total course grade. The examination will consist of questions which reflect the type of self-testing, practice exercises and tutor-marked assignments you have previously come across. All areas of the course will be assessed. You are advised to revise the entire course after studying the last unit before you sit for the examination. You will also find it useful to review your tutor-marked assignments and the comments of your tutor on them before the final examination.

Course Marking Scheme

The following table lays out how the actual course mark allocation is broken down.

Assessment	Marks
Assignments (Best three Assignments out of Four marked)	= t 30%
Final Examination	= 70%s
Total	= 100%

Presentation Schedule

The dates for submission of all assignments will be communicated to you. You will also be told the date for completing the study units and dates for examinations.

How to Get the Most from this Course

In distance learning the study units replace the university lecturer. This is one of the advantages of distance learning; you can read and work through specially designed study materials at your own pace, and at a time and place that suits you best. Think of it as reading the lecture instead of listening to a lecturer. In the same way that a lecturer might give you some reading to do, the study units tell you when to read your set books or other materials. Just as a lecturer might give you an in-class exercise, your study units provide exercises for you to do at appropriate points. Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next is a set of learning objectives. These objectives let you know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study. When you have finished the units you must go back and check whether you have achieved the objectives. If you make a habit of doing this, you will significantly improve your chances of passing the course. The main body of the unit guides you through the required reading from other sources. This will usually be either from your set books or from your course guides. The following is a practical strategy for working through the course. If you run into trouble, telephone your tutor. Remember that your tutor's job is to help you. When you need assistance, do not hesitate to call and ask your tutor to provide it. Follow the following advice carefully:

1. Read this Course Guide thoroughly, it is your first assignment.

2. Organize a study schedule. Refer to the 'Course Overview for more details. Note the time you are expected to spend each unit and how the assignments relate to the units. Whatever method you chose to use, you should decide on and write own dates for working on each unit.

3. Once you have created your own study schedule, do everything you can to stick to it. The major reason that students fail is that they get behind with their course work. If you get into difficulties with your schedule, please let your tutor know before it is too late for help.

4. Turn to Unit 1 and read the Introduction and the Objectives for the Unit.

5. Assemble the study materials. Information about what you need for a unit is given in the 'Overview' at the beginning of each unit. You will almost always need both the study unit you are working on and one of your set books on your desk at the same time.

6. Work through the unit. The content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the unit you will be instructed to read sections from your set books or other articles. Use the unit to guide your reading.

7. Review the objectives for each unit to inform that you have achieved them. If you feel unsure about any of the objectives, review the study material or consult your tutor.

8. When you are confident that you have achieved a unit's objectives, you can then start on the next unit. Proceed unit by unit through the course and try to pace your study so that you keep yourself on schedule.

9. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. Consult your tutor as soon as possible if you have any questions or problems.
10. After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit

objectives (listed at the beginning of each unit) and the Course Objectives (listed in the Course Guide).

11. Keep in touch with your study centre. Up-to-date course information will be continuously available there.

Facilitators/Tutors and Tutorials

There are 8 hours of tutorials provided in support of this course. You will be notified of the dates, times and location of these tutorials, together with the name and phone number of your tutor, as soon as you are allocated a tutorial group. Your tutor will mark and comment on your assignments, keep a close watch on your progress and on any difficulties you might encounter and provide assistance to you during the course. You must mail your tutor-marked assignments to your tutor well before the due date (at least two working days are required). They will be marked by your tutor and retuned to you as soon as possible.

Do not hesitate to contact your tutor by telephone, e-mail, or discussion board if you need help. The following might be circumstances in which you would find help necessary. Contact your tutor if:

- You do not understand any part of the study units or the assigned readings,
- You have difficulty with the self-tests exercises,
- You have a question or problem with assignment, with your tutor's comments on an assignment or with the grading of an assignment

You should try your best to attend the tutorials. This is the only chance to have face-to- face contact with your tutor and ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from course tutorials, prepare a question list before attending them. You will learn a lot from participating in discussions actively.

COURSE MAIN

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Headquarters
14/16 Ahmadu Bello Way
Victoria Island
Lagos

Abuja Office
No. 5 Dar es Salaam Street
Off Aminu Kano Crescent
Wuse II, Abuja
Nigeria

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

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MODULE 1

Unit 1 Introduction to Information Technology Management
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UNIT 1 INTRODUCTION TO INFORMATION TECHNOLOGY MANAGEMENT

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3.2 Comparison between Conventional and e-Business-Driven IT
3.3 Business/IT Planning
3.4 Managing the IT Function
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1.0 INTRODUCTION

The strategic and operational importance of information technology to business is no longer questioned. As the 21st century unfolds, many companies throughout the world are intent on transforming themselves into global business powerhouse via major investments in global e-commerce, and other IT initiatives. Therefore, there is real need for business managers and professionals to understand how to manage this vital organizational function. In this course, we will explore who the information system and technology can be organized and managed and stress the importance of a customer a business value focus for the management of information technologies. So whether you plan to be an entrepreneur and run your own business, a manager in a corporation, or a business professional, managing information systems and technologies will be one of your major responsibilities.

The case study of Chicago Board of Trade portrays a dramatic failure and rebound to success of the information technology functions. Earlier, the IT group was so ineffective and so poorly managed that it seemed powerless to stop the weekly trading-floor system crashes that were costing the organization millions of dollars in lost income. The IT infrastructure was ancient, unreliable, and undocumented. Project and budget control were lacking, return on investment of IT projects had never been done, and quality control was substandard. Morale was low, and IT lacked credibility with the business units.

Chief Information Officer (CIO) was hired to turn the IT function around, which he began to do quickly through proper management. For example, new computer systems and databases software were installed, a project management was established, RIO evaluation of IT projects were required, and IT managers were assigned work with business unit managers to assure that IT was supporting their business goals. Now through proper management, information technology is now completing new projects and the trading-floor system are processing a third more than transactions without any system failure.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain what is information technology
- identify the basic components of information technology management
- compare conventional method of managing an IT project with recent approaches
- explain how to manage IT functions
- discuss the functions of key IT officials and executives
- define and explain the key issue of information technology management.

3.0 MAIN CONTENT

3.1 Components of Information Technology Management

Information technology is an essential component of business success for companies today, but information technology is also a vital business source that must be properly developed.

How should information technology be managed? Figure 1.1 overleaf illustrates one popular approach to managing information technology in a large company. This managerial approach has three components:

- **Managing the Joint Development and Implementation of Business / IT Strategies:** Led by the Chief Executive Officer and Chief Information Officer, proposals are developed by business and IT managers and professionals for using IT to support the strategic business priorities of the company. This business / IT planning process align IT with strategic business goals / the process also includes evaluating the business goals. The process also includes: evaluating the business case for investing in the development and implementation of each proposed business / IT project.

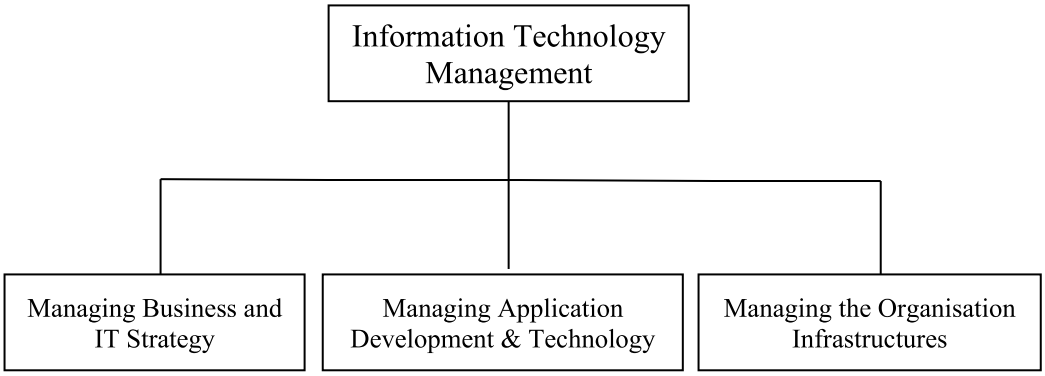


Figure 1.1: The major components of Information Technology Management

- **Managing the Development and Implementation of new Business / IT application and Technologies:** This is the primary responsibility of the Chief Information Officer and Chief Technology Officer. This area of management of IT involves managing the processes for information systems development and implementation, as well as responsibility for research into the strategic business uses of new information technologies.

- **Managing the IT Application and IT Infrastructures:** The Chief Information Officer and the IT manager share responsibility for managing the work of IT professionals who are typically organized into a variety of project teams and other organizational subunits. In addition, they are responsible for managing the IT infrastructure of hardware, software, databases, telecommunication networks and other IT resources which must be acquired, operated, monitored and maintained.

3.2 Comparison between Conventional and e-Business-Driven IT

In this section of the unit, we compare and contrast the conventional method of managing business and an e-Business-driven by IT. The figure 1.2 overleaf compares how Avnet Marshall's information technology management differs from conventional IT management. Notice that they use IT management illustrated in figure 1.1. For example, in technology management, Avnet Marshall uses a best-of-breed approach that supports business needs instead of enforcing a standardized and homogenous choice of hardware, software, database and networking technologies. In managing its IT organisation, Avnet Marshall hires information systems (IS) professionals who can integrate IT with business. These IS professionals are organized in workgroups around business / IT initiatives that focus on building IT-enabled business service for customers.

Figure 1.2: Comparing conventional and e-Business-driven IT management approaches

IT Management	Conventional Practices	Avnet Marshall's Business / IT Process
Technology Management	Approaches to IT infrastructures may sacrifice match with business needs for vendor homogeneity and technology platform choices	Best-of-breed approach to IT infrastructures in which effective match with business needs takes precedence over commitment to technology platform choices and vendor homogeneity.
Managing the IT Organisation	• Hire "best-by-position" who can bring specific IT expertise • Department organized around IT expertise with business liaisons and explicit delegation of tasks • IT problems have separable cost / value considerations. Funding typically allocated within constraints of yearly budget for IT function.	• Hire "best-of-breed" IS professionals who can flexibility integrate new IT and business competence • Evolving workgroups organized around emerging IT-intensive business initiatives with little explicit delegation of tasks • IT funding typically based on value proposition around business opportunity related to building services for customers. IT projects as inseparable part of business initiatives.

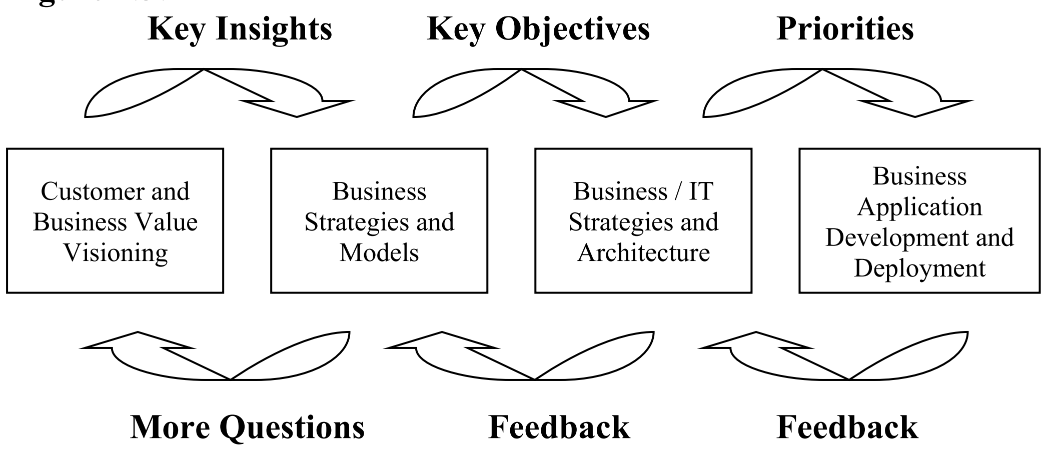
3.3 Business / IT Planning

Business / IT planning process, which focuses on discovering innovative approaches to satisfying a company's customer value and business value goals. This planning process leads to development of strategies and business model for new business applications, processes, products and services. Then, the company can develop IT strategies and an IT infrastructure that supports building and implementing their newly planned business applications.

Both the Chief Executive Officer and the Chief Information Officer of the company must manage the development of complementary business and IT strategies to meet its customer's value and business value vision. This ***co-adoption*** process is necessary because we have seen so often in this unit, information technologies are fast changing vital components in many strategic business initiatives. The business / IT planning process has three major components:

- **Strategy Development:** Developing business strategies that support a company's business vision. For example, use information technology to create innovative e-Business systems that focus on customer and business value.
- **Resource Management:** Developing strategic plans for managing or outsourcing a company's IT resources, including Information System personnel, hardware, software, database and network resources.
- **Technology Architecture:** Making IT choices that reflect information technology architecture designed to support a company's business / IT initiatives.

Figure 1.3:



Information Technology Architecture

The IT infrastructure that is created by the strategic business / IT process is a conceptual design, or blueprint that includes the following major components:

- *Technology Platform:* The Internet, intranets, extranets and other networks, computer systems, systems software and integrated enterprise application software provide a computing and communication infrastructure or platform that supports the strategic use of information technology from e-Business, e-Commerce and other business / IT applications.

- *Data Resources:* Many types of operational and specialised databases, including data warehouses and Internet / Intranet databases store and provide data and information for business process and decision support.

- *Application Architecture:* Business applications of information technology are designed as an integrated architecture or portfolio of enterprise systems that supports strategic business initiatives, as well as cross-functional business processes. For example, application architecture should include support for developing and maintaining the infrastructure supply, chain application and integrated resource planning as well as customer relationship management application.

- *IT Organisation:* The organizational structure of the information system functions within a company and the distribution of Information System specialists are designed to meet the changing strategies of a business. The form of the IT organisation depends on the management philosophy and business / IT strategies formulated during the strategic planning process.

Comparing Conventional and Avnet Marshall Business / IT Planning

In this section, we consider the Avnet Marshall's business / IT planning as compared to conventional business / IT planning. Avnet Marshall waves both business and IT strategic planning together ***co-adaptability*** under the guidance of the Chief Executive Officer and the Chief Information Officer, instead of developing IT strategy by just tracking and supporting business strategies. Avnet Marshall also locates IT application development projects within the business units that are involved in an e-Business initiative to form centres of business / IT expertise through the company. Finally, Avnet Marshall uses a prototyping application development process with rapid deployment of new business applications, instead of a traditional system development approach. This application development strategy trade the risk of implementing incomplete application with the benefits of gaining competitive advantages from early deployment of new e-Business services to employees, customers and other stakeholders, and of involving them in the 'fine-tuning' phase of application development.

Figure 1.4: Comparing business / IT strategic and application planning approaches

Conventional IT Planning	Avnet Marshall's Business / IT Planning
• **Strategic alignment:** IT strategy tracks specialized enterprise strategy	• **Strategic Improvisation:** IT strategy and enterprise business strategy co-adaptability unfold based on the clear guidance with a focus on customer value
• CEO endorses IT vision shaped through CIO	• CEO proactively shapes IT vision jointly with CIO as part of e-Business strategy
• IT application development projects financially organized as technological solutions to business issues.	• IT application development projects co-located with e-Business initiatives to form centres of IT-initiative business enterprise
• Phased application development based on learning from pilot project.	• Perpetual application development based on continuous learning from rapid deployment and prototyping with end user involvement.

3.4 Managing the IT Function

A radical shift is occurring in corporate computing. Think of it as the recentralization of management. It is a step back towards the 1970s, when a data processing manager could sit at a console and track all the technology assets of the corporation. Then come the 1980s and 1990s when departments got their own PCs and software, and client / server network sprang up all across companies.

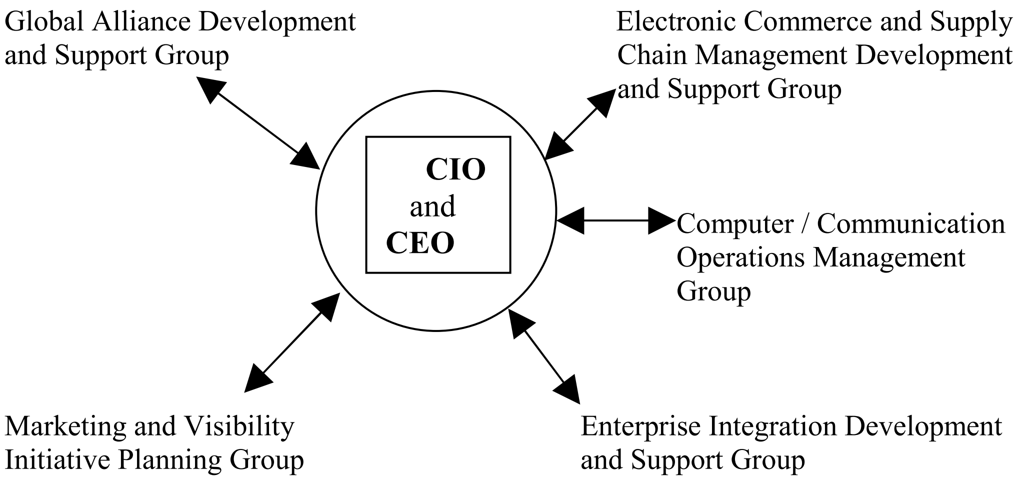
Three things have happened in the past few years. The Internet boom inspired business to connect all those networks; companies put on their intranet essential application without which their business could not function; and it becomes apparent that maintaining PCs on a network is very, very expensive. Such change creates an urgent need for centralization.

Organizing Information Technology

In the early years of computing, the development of large mainframe computers and telecommunications networks and terminals cause a **centralization** of computer hardware and software, databases and information specialists at the corporate level of organisations. Next, the development of minicomputers and microcomputers accelerated a **downsizing** trend, which prompted a move back to **decentralization** by many business firms. Distributed client / server networks at the corporate, department, workgroup and team levels came into being. This promoted a shift of database and information specialists to some departments, and the creation of information centres to support end-user and workgroup computing.

Later the trend is to establish more centralized control over the management of the IT resources of a company, while still serving the strategic needs of its business units, especially their e-Business and e-Commerce initiatives. This has resulted in the development of hybrid structure with both centralized and decentralized components. For example, the information technology functions at Avnet Marshall are organized into several business-focused development groups as well as operations management and planning groups.

Figure 1.5: The Organisational Components of the IT Functions as Avnet Marshall



Some organisations spin-off their information systems function into information systems (IS) **subsidiaries** that offer IS services to external organisations as well as to their parent company. Other companies create or spin-off their e-Commerce and Internet-related business units or IT groups into separate companies or business units. Other corporations **outsource**, that is, turn over all or some parts of their operations to outside contractors known as ***system integrators***. In addition, some companies are outsourcing software procurement and support to ***application service providers*** (ASPs), who provide and support business application and other software via the Internet and intranets to all of a company's employee workstations.

Application Development Management

Application development management involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance and system maintenance for all major business / IT development projects. Managing application development requires managing the activities of teams of system analysts, software developers and other information system and technology professionals working on a variety of information systems development projects. Thus, project management is a key management IT responsibility if business / IT projects are to be completed on time, within their budgets, as well as meeting their design objectives. In addition, some systems development groups have established ***development centres*** staffed with information technology professionals. Their role is to evaluate new application development tools and to help information systems specialists use them to improve their application development efforts.

3.5 Information Technology Operations Management

This concerned the user of hardware, software, network and personnel resources in the corporate or business unit ***data centres*** (computer centres) of an organisation. Operational activities that must be managed include computer systems operations, network management, production control and production support.

Most operations management activities are being automated by the use of software packages for computer system performance management. This ***system performance*** monitors the processing of computer jobs, help develop a planned schedule of computer operations that can optimize computer system performances and produce detailed statistics that are invaluable for effective planning and control of computing capacity. Such information evaluates computer system utilization, costs and performance. This evaluation provides information for capacity planning, production planning and control, and hardware / software acquisition planning. It is also used in quality assurance programmes, which stress quality of service to business end-users.

System performance monitors also supply information needed by ***checkback systems*** that allocate cost to users based on the information services rendered. All costs incurred are recorded, reported, allocated and charged back to specific end-user business units, rather than being lumped with other administrative service costs and treated as an overhead cost.

Many performance monitors also feature ***process control*** capabilities. Such packages not only monitor but automatically control computer operations at large data centres. Some use built-in expert systems modules based on knowledge gleaned from experts in the operation of specific computer systems and operating systems. These performance monitors provide more efficient computer operations than human-operated systems. They also enable "light out" data centres at some companies, where computer systems are operated unattended, especially after normal business hours.

3.6 Human Resource Management for Information Technology

The success or failure of any information service organisation rests primarily on the quality of its people. Many computer using firms consider recruiting, training and retraining quality information technology personnel as one of the greatest challenges. Managing information services functions involves the management of managerial, technical and clerical personnel. One of the most important jobs of information services managers is to recruit qualified personnel and to develop, organize and direct the capabilities of existing personnel. Employees must be continually trained to keep up with the latest developments in a fast-moving and highly technical field. Employees' job performance must be continually evaluated and outstanding performance rewarded with salary increases or promotions. Salary and wage levels must be set, and career path must be designed so individuals can move to new jobs through promotion and transfer as they progress in seniority and expertise.

3.7 The CIO and Other IT Executives

The Chief Information Officer oversees all use of information technology in many companies and brings them into alignment with strategic business goals. Thus, all traditional computer services, internet technology, telecommunication network services and other information system technology support services are the responsibility of IT chief executive. Also, the CIO does not direct the day-to-day information services activities. Instead CIOs concentrate on business / IT strategy, they also work with the CEO and other top executives to develop strategic uses of information technology in electronic, business and commerce that help make the firm more competitive in the marketplace. Many companies have also filled the CIO position with executives from the business functions or units outside the IT field. Such CIOs emphasise that the chief role of information technology is to help the company meet its strategic business objectives.

3.8 Technology Management

The management of rapidly changing technology is important to an organisation. Changes in information technology like the rise of the PC, client / server networks and internet and intranets, have come swiftly and dramatically and are expected to continue into the future. Developments in information systems technology have had, and will continue to have, a major impact on the operations, costs, management work environment and competitive position of many organisations.

Thus, all information technologies must be managed as technology platform for integrating internally focused or externally facing-business applications. Such technologies include the internet, intranets and variety of electronic commerce and collaboration technologies as well as integrated software for customer relationship management, enterprise resource planning and supply chain management. In many companies, technology management is the primary responsibility of ***Chief Technology Officer*** (CTO) who is in charge of all information technology planning and deployment.

4.0 CONCLUSION

Information technology has come to stay as major driving force behind business successes in the world today. This trend has come with its attending challenges, which businesses will continue to contend with. The various components that need to make this a success, though sometimes complex, are being improved upon to enhance the relevance of information technology in business.

5.0 SUMMARY

The strategic and operational importance of information technology to business is no longer questioned. As the 21st Century unfolds, many companies through the world are intent on transforming themselves into global business powerhouse via major investments in global e-Commerce and other IT initiatives.

Information technology is an essential component of business success for companies today, but information technology is also a vital business source that must be properly developed.

Both the CEO and the CIO of a company must manage the development of complementary business and IT strategies to meet its customer's value and business value vision.

Avnet Marshall also locates IT application development projects within the business units that are involved in an e-Business initiative to form centres of business / IT expertise through the company.

A radical shift is occurring in corporate computing. In the early years of computing, the development of large mainframe computers and telecommunications networks and terminals cause a **centralization** of computer hardware and software, databases and information specialists at the corporate level of organisations.

Application development management involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance and system maintenance for all major business / IT development projects. Most operations management activities are being automated by the use of software packages for computer system performance management.

The success or failure of any information service organisation rests primarily on the quality of its people. The Chief Information Officer oversees all use of information technology in many companies and brings them into alignment with strategic business goals. The management of rapidly changing technology is important to an organisation.

6.0 TUTOR-MARKED ASSIGNMENT

1. Compare the conventional and Avnet Marshall's e-Business-driven IT management approaches.
2. Discuss the major components of IT planning as outlined in this unit.

7.0 REFERENCES/FURTHER READINGS

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UNIT 2 MANAGING INFORMATION TECHNOLOGY DEPARTMENT

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1.0 INTRODUCTION

Managing the information technology department (TD) is like managing any other organisational unit. The unique feature of ITD is that it operates as a service unit in a rapidly changing environment, thus making projections and planning difficult. The equipment purchased and maintained by the ITD is scattered all over the entire enterprise, adding to the complexity of ITD management. In this unit, we will discuss some issues; the first of which is describe the Chief Information Officer (CIO) and his or her relationship with other managers and executives. The second issue deals with internal structure of the ITD and how it interacts with end-users.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- identify who heads the information technology department and who he or she reports to
- discuss the relationships between the information technology department and end-users

- explain what an information centre (IC) is and its functions in an organisation
- identify who a Chief Information Officer (CIO), is his roles and challenges
- answer the question of the skills necessary for the success of a CIO
- state the organisational structure of an ITD.

3.0 MAIN CONTENT

3.1 Information Technology Department in the Organisation

The management of information technology resources is divided among the information technology department and end-users. The division of activities between the two parties depends on many factors, beginning with the amount and nature of duties involved in information resource management; and ending with outsourcing policies. Decisions about the roles of each party are made during the information technology planning and are discussed in this unit.

A major decision that must be made by senior management is where the ITD is to report. Partly for historical reasons, a common place to find the ITD is in the accounting and finance organisation. In such situations, the ITD normally report to the controller or the vice-president of finance. The ITD might also report to one of the following:

1. Vice-President of Administration
2. Senior Executive of an Operating Division
3. An Executive Vice-President
4. The Chief Executive Officer (CEO)

In the latter case, the Chief Information Officer usually carries the title of Vice-President of IT, Vice-President of Administrative Services or Vice-President of Information Resources. The four possibilities are marked and shown in figure 1.1.

The title of CIO and the position to which this person reports reflect, in many cases, the degree of support being shown by top management to the ITD. The reporting relationship of the ITD is very important that it reflects the focus of the department. If ITD reports to the accounting or finance area, there is often a tendency of emphasis on accounting or finance applications at the expense of those in the marketing, production and logistical areas. To be more effective, the ITD needs to take as broad a view as possible.

The name of the ITD is also important. Originally, it was Data Processing (DP) department, the name was changed to the Management Information System (MIS) department, then to Information Systems Department (ISD), later Information Technology Department (ITD).

Today, we find names such as Information Service Department, Corporate Technology Centre, and so on.

In very large organisations, the ITD is a division, or even an independent corporation (such as Bank of America and Boeing). The name depends on the IT role, its size, and so forth. When the information function is given the title of information resource management or information technology, the organisation often has the charter to do much more than just provide information services. In these instances, the department usually involves itself in strategic corporate planning.

The increased role and importance of IT and its management by both a centralized unit and end-users require careful understanding of the manner in which ITD is organized as well as the relationship between the ITD and end-users.

3.2 The IT Department and End-users

It is extremely important to have a good relationship between the ITD and end-users. Unfortunately, these relationships are not always optimal. The development of end-user computing and outsourcing was motivated, in part, by the poor service that end-users felt they received from the ITD. Conflicts occur for several reasons, ranging from the fact that priorities of the ITD may defer from those of the end-users to a simple lack of communication. Also, there are some fundamental differences between the personalities, cognitive styles, educational backgrounds and gender proportion of the end-users versus the ITD staff.

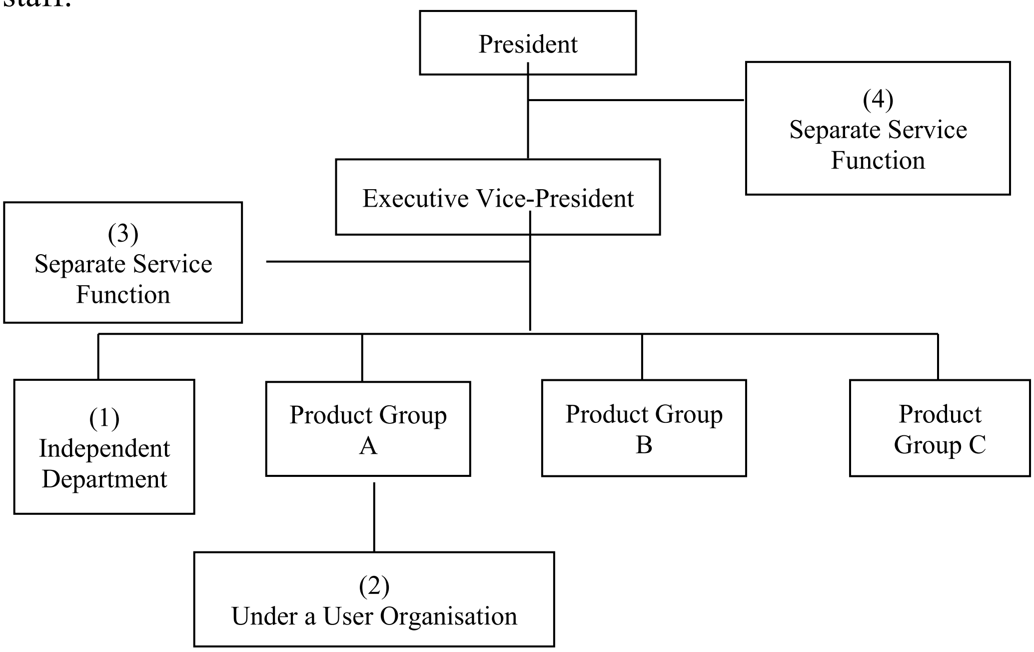


Figure 1.1: Four Alternative Locations for the ITD

Generally, IT organisation can take one of the following four approaches toward end-user computing:

1. **Let them sink or swim**. Don't do anything – let the end-users beware.
2. **Use the stick**. Establish policies and procedures to control end-users computing so those corporate risks are minimized.
3. **Use the carrot**. Create incentives to encourage certain end-user practices that reduce organisational risks.
4. **Offer support**. Develop services to aid end-users in their computing activities.

Each of these responses presents the IT executive with different opportunities for facilitation and coordination.

3.3 Fostering the ITD / End-user Relationship

The ITD is a service organisation that manages the IT infrastructure needed to carry out end-user applications, so a partnership between the ITD and the end-user is a must, as indicated by Wysocki and DeMichieli (1996). This is not an easy task since the ITD is basically a technical organisation that may not understand the business and the users. The users on the other hand, may not understand the information technologies. In order to foster the relationship between the two, organisations can employ several strategies. For example, the ITD of the Housing Development Board in Singapore uses the following strategies (per Tung andTurban, 1996):

- Introduce a special end-user support unit that coordinates quality assurance, data administration and office systems;
- Introduce an end-user training and development unit that is responsible for training and certification of IT software packages;
- Giving high priority and visibility to end-user computing;
- Training ITD employees to understand the business;
- Implementing a special conflict resolution team that quickly handles ITD / end-user conflicts;
- Recognizing the CIO as a member of the top executive management team;
- Empowering ITD employees to make decisions on-the-spot in order to minimise interferences and delays to end-users; and
- Developing a malfunction recovery plan for each end-user unit to minimise interferences with work when a system fails.

3.4 Information Centre

An interesting change in organisational structure related to computer technology is the introduction of the ***Information Centre (IC)***. The concept was conceived by IBM, Canada, as a response to increasing the number of end-user requests for new computer applications. This demand created a huge backlog in the IT department, and end-users have to wait several years to get their systems built. Today, the ICs concentrate on end-user support with PCs, client/server applications, and the Internet/intranet.

The IC is set up to help users get certain systems built quickly and provide tools that can be employed by users to build their own systems. The concept of IC furthermore suggests that the few people working as a team or as individuals in the centre should be especially oriented towards the users in their outlook. This attitude should be shown in the training provided by the staff at the centre and in the way the staff help users with any problems they might have. There can be one or several ICs in an organisation that report to the ITD and/or the end-user department (Fuller and Swanson, 1992).

The IC can also be used as a place to house a few professionals who can be available to build important user systems very quickly. The staff of the IC can construct systems like stand-alone decision support systems much more quickly than such systems can be built with traditional software and system development methods. Because of the impact of such systems and rapidity with which they can be made available, the ITD often gets a very good reputation in the user community.

Purpose and Activities:

The three main functions of IC are:

(1) Provide assistance to end-users in dealing with computing problems;
(2) Provide general technical assistance; and
(3) Provide general support activities.

The importance of ICs may diminish in the nearest future as users become more computer literate, end-user software development tools become more friendly, hardware becomes more reliable and intelligent diagnostic and training tools provide some of the services provided by ICs. Finally, management view of IC as cost centres whose benefits are intangible and difficult to justify.

Activities of Information Centres:

End-user Computing:

- Training and education
- Assisting in application development
- Assisting in the selection of intranet application
- Providing debugging assistance
- Identifying network requirements
- Consulting with the user to determine whether a particular application is appropriate for end-user development
- Providing a formal means for users' communication with management and with the traditional data processing staff
- Cooperating with database administrators to improve access to shared data resources
- Generating the catalog or library of existing applications for future use; and
- Assisting in Internet/intranet applications.

Technical Assistance:

- Directing security and control issues
- Providing guidance in the selection of hardware and software
- Helping in the selection and evaluation of application packages and other development tools
- Assisting in software installation and updates
- Assisting in using query and report languages and / or packages
- Assisting in the installation and use of communication devices
- Assisting in the installation and use of hardware; and
- Establishing database (or file) backups, recovery and archive guidelines.

General Support Services

- Providing clearing house functions for retrieving and disseminating information on relevant personal computing issues
- Establishing a hotline for interruption-driven user requests for information on software, hardware or application systems
- Chairing user group meetings on a regular and ad-hoc basis.

3.5 Chief Information Officer

The changing role of the ITD highlights the fact that CIO is becoming an important member of the organisation's management team.

3.5.1 The Role of the CIO

A survey conducted in 1992 showed that the prime role of the CIO is to align IT with business strategy (Table 1.1). The CIO roles are also supplemented by activities related to the Internet and electronic commerce.

Two recent roles of the CIO are decision-making about enterprise software and outsourcing:

- Software has a strong impact on the ITD as well as on the entire organisation. The evaluation, selection and implementation of software packages are a new role for the CIO.
- Outsourcing is also an important function related to the job of the CIO. Note that both outsourcing and software development reduces the IT staff and thus may diminish the importance of ITD.

Information Technology has become a strategic resource for many organisations. Coordinating these resources requires a strong IT leadership and ITD / end-user cooperation with the organisation. Therefore, the CIO – CEO relationship are critical for effective successful utilization of IT, especially in organisations that greatly depend on IT, where the CIO joins the top management “chief” group.

The Chief Information Officer is a member of the corporate executive committee, which has responsibility for strategic business planning and response; the most important committee in any organisation. Its members include the chief executive officer and the senior vice-presidents. The executive committee provides the top-level oversight ng he to in

Table 1.1: ***The Role of the CIO***

CIOs were asked to name their top priority in helping to improve their organisation’s efficiency and performance. The results are:

Roles	**Percentage**
• Align technology with the business strategy	24%
• Implement state-of-the-art solutions	12%
• Provide and improve information access	12%
• Enhance customer service	9%
• Create links within the organisation	7%
• Train and empower employees	7%
• Create links with external customers	6%
• Enhance current systems	4%
• Support business re-engineering	4%
• Act as change agent / catalyst	4%
• Educate business units about IT	3%
• Evaluate emerging technologies	3%
• Implement standard systems and architecture	3%
• Others	2%

Source: ***Kiely (1992), CIO Communications***

3.5.2 The Challenges of CIO

According to Statonis and Goldberge (1997) and McNurlin and Spague (1998), the major challenges facing CIOs are:

- Understanding the complexity inherent in doing business in a competitive global environment;
- Managing the accelerating pace of technological change;
- Understanding that IT may reshape organisations, which could become technology-driven;
- Realizing that often IT is the primary enabler for business solutions;
- Knowing the business sector in which your company is involved;
- Understanding your company's organisational structure and operating procedures;
- Using business not technological terms when communicating with corporate management;
- Gaining acceptance as member of the business management team;
- Establishing the credibility of the IT department;
- Increasing the technological maturity of IT and selling it; and
- Implementing IT architecture that will support the vision.

3.5.3 Skills for CIO

- Understanding the business;

- Maintaining technology competency;
- Understanding networking on a global scale;
- Facilitating change;
- Managing safety and security;
- Providing education to other executives;
- Understanding and setting industrial standards; and
- Balancing priorities.

The diversity of skills is evidenced in the high salaries of CIOs (up to $1,000,000 / year in large corporations) and the high turnover of CIOs. As technology becomes central to business, the CIO becomes a key mover in the ranks of upper management. For example, in large financial institutions executive committee meeting, modest request for additional budgets by the senior vice-president for finance and for marketing were turned down after hours of debate. But at the same meeting, the CIO's request for a ten-fold addition was approved in few minutes.

It is interesting to note that CEOs are acquiring IT skills. According to ***Infoworld*** (June 16, 1997) a company's best investment is a CEO that knows technology. If both the CIO and CEO have the necessary skills for the information age, their company has the potential to flourish.

Two factors stand out in those organisations that tend to be successful computer users; the high degree of support shown for the ITD by the organisation's senior management and the consequent image the ITD has in the organisation. Some of the actions CEOs can take are obvious, and others are subtler. Among the more obvious are:

1. Putting the IT Vice-President's office next to the CEO;
2. Supporting an executive training series in IT and attending the sessions in an uninterrupted manner; and
3. Elevating the head of ITD to the level of Vice-President reporting directly to the CEO.

Less obvious is that a CEO can use the organisational reward system to show support for IT budget commitment to the ITD plus the undertaking of a major ITD project affecting the entire organisation are other signs of support of IT.

3.6 The Organisational Structure of the IT Department

3.6.1 Managerial Efficiency versus User Service

IT department can be organized in many different ways. A major factor that determines the structure of the ITD is balancing the two conflicting goals: achieving efficiency of the ITD resources while providing a high level of service to the end-user.

The traditional ITD was composed of three major components: systems analysis, programming and operations. However, in today's internal business set up, IT structure includes several other components such as network, technological planning, decision support and the Internet and intranet. The first issue is how to organize the systems analyst and programmers who constitutes a major portion of the ITD.

From an efficiency point of view, an IT manager would probably prefer to structure the system development parts as an independent unit of the ITD. The beauty of this organisation is that it is very flexible. If new systems requirement comes along, it is easy to assign person from the analysts and programmer pool to do the job. The difficulty especially from a user perspective, is that the analyst and the programmers assigned to certain projects may have no experience with the problem or familiarity with the user's area. In addition, they are often unknown quantity, since they may not have worked with this user before.

To ease these problems, some organisations add special subunit called ***user liaison***. The people in this subunit, who should be experienced senior analysts, are responsible for working with user organisations to determine their information needs and with the analyst and programmers to meet these needs. One problem with the structure is that there is often confusion about the responsibilities and authority of the user liaison and those of the user or systems analysts.

Another structure that tries to balance managerial need and user requirements is a matrix organisation as shown in figure 1.2. In matrix organisation, there is a pool of programmers and a pool of analysts. These people report to a supervisor with a title such as manager of programming. In addition, there is a unit composed of project leaders who report to a supervisor with title such as manager of project development. This organisational form is very efficient, but it has the disadvantage that each analyst and programmer has two bosses because each reports to a project leader for project-related matters and to the manager of their functions for overall matters (broken lines). The functional manager evaluates performance with input from project leaders with whom an individual has worked. This system has high potential for difficulties when conflicts arise. For this reason, there is a trend towards an end-user-oriented structure and a virtual organisation.

3.6.2 End-User-Oriented Structure and the Virtual IT Organisation

An end-user-oriented structure could be prominent in future ITD. This is team-based organisation in which analysts, programmers and other IT professionals with diverse skills are grouped into teams, each to serve a particular user group. A team may not have all the skills it needs so it may bring in a "virtual" team member for specialised skills as needed (see figure 1.2). Such a structure is referred to as ***Virtual IT organisation***.

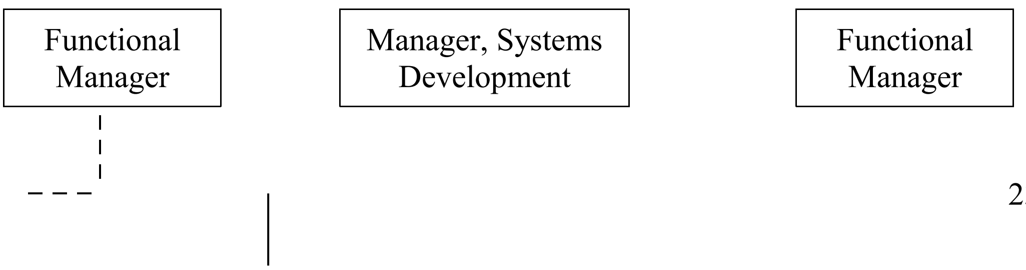
The team-based structure can be difficult to manage when slack resources exist in one team while another is overloaded. The shortcoming is balanced by the fact that over time, the systems development personnel become very familiar with the business function they are serving. Furthermore, by working together on many projects, team members form strong interpersonal relationship, which usually work well to ease communication and system implementation problems.

An alternative team-based structure is known as ***centres of excellence*** in which IT members are organized into team according to their technical expertise. Transforming IT organisations into centres of excellence is not simple and may fail if appropriate measures are not taken.

3.6.3 Centralization versus Decentralization

Computing equipment and IT activities are distributed among end-users throughout the organisation. The ITD is basically a centralized unit, but some of its activities such as systems development and maintenance can be decentralized. In a decentralized structure, some ITD employees are assigned to user department so that they are closer to local problems and get to know the business better. Decentralization of IT personnel is frequently combined with the decentralization of support resources.

The major advantages of centralization are ease of planning and control. Consolidation of financial and operating data for evaluation and reporting purposes, management of personnel and personnel changes, and the location of more and specialised people in one place allow flexibility and increased productivity. In contrast, in a decentralised structure, it is easier to control cost, since the IT employees are more empowered because they know better the end-user problems and response time is shorter.



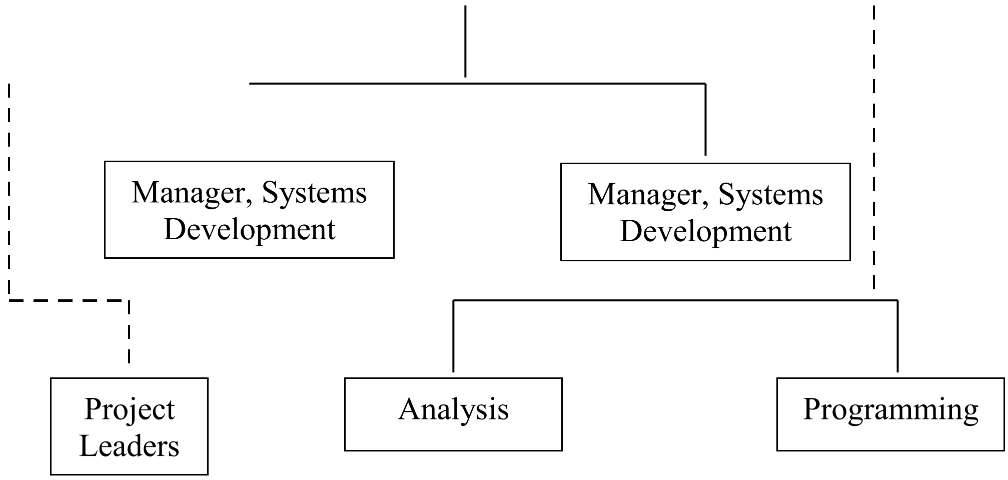


Figure 1.1: ***Information as organisation in form***

The virtual organisation can be arranged in several configurations as shown in figure 1.2 below:

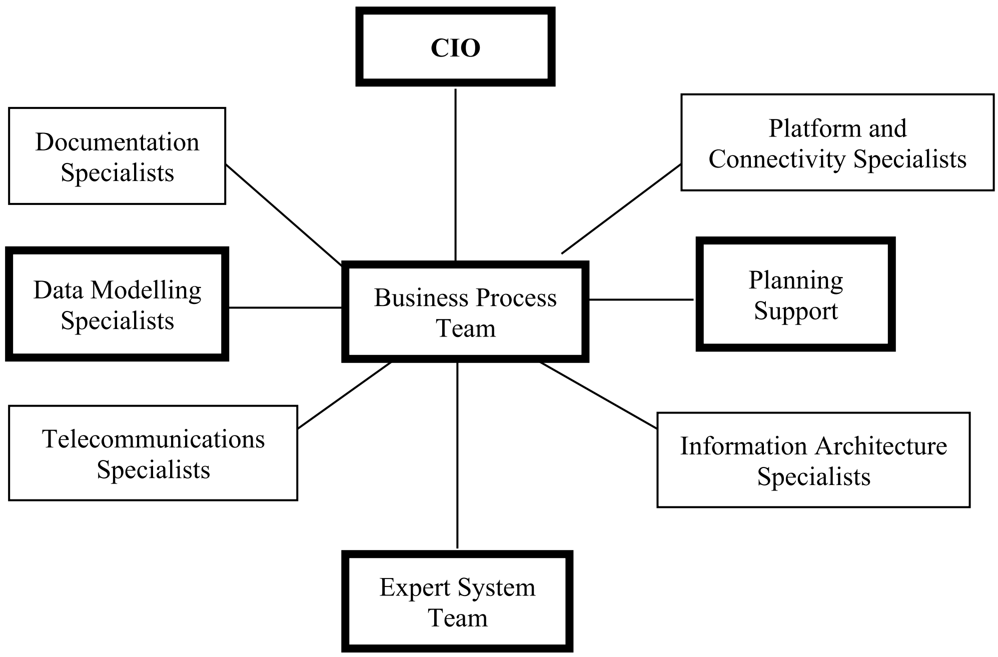


Figure 1.2: Model of business process team drawing from specified sources for virtual team members

3.7 The Virtual IT Organisation

Virtual IT organisations are emerging in several different forms, but generally, the central IT staff works with departmental IT (end-user computing) business managers, outside vendors and even corporate customers. This changes the nature and culture of the traditional IT hierarchical structure to more open, interactive structure (see Figure 1.3).

Some characteristics of the new structure are:

- **IT personnel**, particularly those in application development, are incorporated into the business units, sometimes even reporting directly to the business manager.
- **The boundary of the Virtual IT organisation** does not end at the company's walls, vendors and customers may be part of the team as well.
- **The rest of the IT Virtual organisation** is coming to rely on what is left of central IT functions to develop an overall technical architecture that meets the needs of the entire organisation.
- **Central IT plays a prominent role as technology scouts** surveying the streams of new products and technologies for those most suitable for the company.

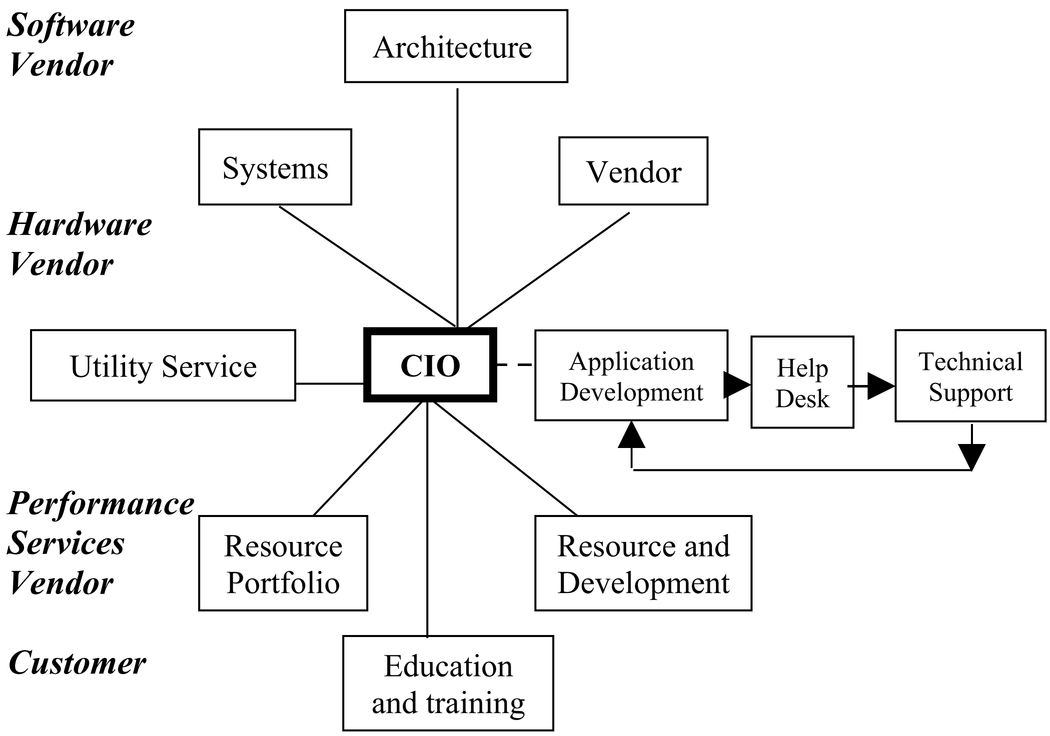


Figure 1.3: The Virtual IT Organisation (Source: Moad, 1994)

Centralised IT resources tend to be the best suited to the following situations.

4.0 CONCLUSION

An organisation that wants to benefit fully from the application of information technology in driving business must take into account the need to have a unit or department devoted to information technology. The success of this unit depends on how it is well-managed to fall in line with the corporate business plan. Adequate managerial skills need to be imparted to the information technology professional for them to flow with standard business process.

5.0 SUMMARY

Managing the information technology department (ITD) is like managing any other organisational unit. The unique feature of ITD is that it operates as a service unit in a rapidly changing environment, thus making projections and planning difficult.

The management of information technology resources is divided among the ITD and end-user. The division of activities between the two parties depends on many factors, beginning with the amount and nature of duties involved in information resource management and ending with outsourcing policies.

It is extremely important to have a good relationship between ITD and end-users. Unfortunately, these relationships are not always optimal.

The ITD is a service organisation that manages the IT infrastructure needed to carry on end-user applications, so a partnership between the ITD and the end-user is a must.

An increasing change in organisational structure related to computer technology is the introduction of the Information Centre (IC). The changing role of the ITD highlights the fact that CIO is becoming an important member of the organisation's management team. A survey conducted in 1992 found that the prime role of the CIO is to align IT with business strategy.

The Chief Information Officer is a member of the corporate executive committee which has responsibility for strategic business planning and response, the most important committee in any organisation.

IT department can be organized in many different ways. A major factor that determines the structure of ITD is balancing the two conflicting goals; achieving efficiency of the ITD resources while providing a high level of service to the end-user.

A end-user-oriented structure could be prominent in future ITD. This is team-based organisation in which analysts, programmers and other IT professionals with diverse skills are grouped into teams, each to serve a particular user group.

Computing equipment and IT activities are distributed among end-users throughout the organisation. The ITD is basically a centralised unit, but some of its activities such as systems development and maintenance can be decentralised.

Virtual IT organisations are emerging in several different forms, but generally, the central IT staff works with departmental IT (end-user computing) business managers, outside vendors, and even corporate customers.

6.0 TUTOR-MARKED ASSIGNMENT

1. Mention five (5) skills needed to enhance managerial performance of a Chief Information Officer (CIO).
2. Briefly discuss the major characteristics of a Virtual Organisation.

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UNIT 3 INFORMATION TECHNOLOGY PLANNING

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1.0 INTRODUCTION

It has been demonstrated by case studies of corporations such as TruServ that there is the need for formal IT strategic plan, especially for large corporations. The studies also demonstrate that there are different types of plans (e.g. tactical and strategic), and that the end-users must be involved in the planning as well as the CEO.

The issue of IT planning is very important for end-users for the following reasons:

(1) End-users do IT planning for their own units;
(2) End-users must participate in the corporate IT planning, therefore, they must understand the process; and
(3) Corporate IT planning determines how the IT infrastructure will look. The future of every unit in the organisations will be impacted by the infrastructure.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the major issues addressed by information systems planning
- demonstrate the importance of aligning information systems plans with business plans
- explain the four-stage model of information system planning
- describe several different methodologies for conducting strategic information systems planning.

3.0 MAIN CONTENT

3.1 Business Importance and Content

A survey of 301 IT executives conducted in October, 1997 by CIO Communications Inc. revealed that IT strategy is the number one concern for CIO. Strategic planning used to rank at the top of the list in late 1980's and early 1990's, and then it retreated to the middle of the list. Now it is back in style with an increased emphasis on aligning IT and business plan.

Why this renewed interest in formal strategic planning? According to Blodgett (1998), as the demands of an increasingly competitive workplace call for closer integration of IT goals and business mission, strategic plan for the whole enterprise becomes more important. This is what IT thinks, says John Braucksieker, corporate director of IT for the International Wire Group Inc. in St. Louis'. "We in IT were on this side and the business people were on the other side, afraid to show us to customers, and there was not much dialogue between the two groups".

"Now, a good IT plan has to keep in mind the internal customers as well as external customers and vendors, and IT have to work closely with the business side to make IT succeed in helping the company stay competitive, Braucksieker concluded". CIOs in the early 1990's were busy cutting costs and outsourcing, leaving no time for strategic planning, but now due to the business pressures; strategic planning is a must.

What is in a plan? Simply put, a strategic information system plan identifies a set of computer-based applications that will help the company reach its business goals. To create a plan that is truly strategic, the CIO and the CEO must work together. Strategic planning is a complex process based on relationship and communications. IT planning has similarities and differences compared to any business planning. For example, planning and forecasting is not the same thing.

Forecasting, which is part of planning predicts the future; while *Planning* is preparing for that future. Given the many changes that are occurring in today's business environment, forecasting is particularly difficult. But just because the future is very uncertain and forecasting it is a daunting task does not mean that IT planning can be deferred or neglected. Certain assumptions about the environment and about technology must be made, even if some of them may later prove to be wrong.

3.2 The Evolution of IT Planning

Initial efforts to establish planning and control systems for IT started in the late 1950's and early 1960's. During these early years, information technology resources went into developing new application and revising existing systems. Organisations adopted methodologies for developing systems, and installed project management systems to assist with planning new applications. These included the use of well-defined project phases, specified deliverables, formal user reviews and sign-off procedures. Efficient operation of completed system also became important with an emphasis on availability and reliability. The information technology department (ITD) implemented automated operations planning and scheduling systems.

These initial mechanisms addressed *operational* planning. As organisations became more sophisticated in their use of information systems, emphasis shifted to *managerial* planning or reduced allocation control. A manifestation of this shift was the organisation of the ITD into a corporate computing unit. A form of **chargeback** or **chargeout** (i.e. users pay for the computing and information services they use by charging the corporate IT expenditure) to the user was implemented in an attempt to shift accountability to IT expenditure users. Some questioned the effectiveness of chargeback as a cost control tool, but at least in theory, chargeback fosters greater user attention to benefit versus costs and results in more effective planning and utilization.

Collectively, these measures increased the amount of planning and process for identifying demand for information services were also developed. Typically, annual planning cycles were established to identify potentially beneficial IT services, to perform cost-benefit analysis and to subject the list of potential projects to resource allocation analysis. Often, the entire process was conducted by an IT *steering committee* composed of key managers representing major functional units within the organisation. The steering committee was created to oversee the ITD to ensure that adequate planning and control processes were present and to focus IT activities on long-range organisational objectives and goals. The steering committee reviewed the list of potential projects, approved the ones considered to be beneficial and assigned relative priorities. The approved projects were then mapped into a developmental schedule usually encompassing a one-to-three year time frame. This schedule became the basis for determining IT supports requirements; such as long-range hardware, software, personnel, facilities and financial requirements.

Some organisations extend this planning process by developing additional plans for longer time horizons. They have a long-range IT plan, sometimes referred to as ‘strategic’ IT plan (Ward Griffiths, 1996). This plan does not typically refer to specific projects; instead it sets the overall direction in terms of infrastructures and resource requirements for IT activities for five to ten years in the future. The next level is medium-term ‘master plan’ that identifies the **application portfolio**, a list of major approved IT projects that are consistent with the long-range plan. Some of these projects will take more than a year to complete and others will not start in the current year, it extends over several years. The third level is “tactical” plan with budgets and schedules for current year’s projects and activities. In reality, because of the rapid pace of change in technology and environment, short-term plans may include items not anticipated in other plans. All these projects would be from the *master plan*.

The planning process just described is currently practised by many organisations. Specifics of the IT planning process, of course, vary among organisations. For example, not all organisations have a high-level steering committee. Project priorities maybe determined by the IT director, by his or her superior, by company politics or even on a first-come first-served basis. Organisations with decentralised ITD often employ integrative mechanisms, such as formal review and consolidation meetings to determine their overall IT plan. In cases of strong divisional autonomy, no centralised planning may be attempted; rather, a process similar to that just described maybe utilized by each divisional IT group. Planning must be continuously monitored and adjusted if need be. Some organisations adjust their IT plan every six (6) months due to the rapid technological changes. Short and medium plans must also be reviewed periodically.

3.3 Issues in IT Planning

Improving the planning process for information technology and systems has long been one of the top concerns of ITD management. The Society of Information Management (SIM) found this to be the number one issue in surveys of senior IT / IS executive. Although the issue declined to number three in 1990 survey and 10 in the 1994 survey, IT planning still represents a challenging issue for IT / IS executives (Brancheau et.

al., 1996). As indicated earlier, planning was at the top of the list in different surveys in 1997.

Basic information systems planning addresses the following four general issues:

- aligning the IT plan with organisational business plan (Reich and Benbasat, 1996)
- designing an IT architecture of the organisation in such a way that users, applications and databases can be integrated and networked together
- efficiently allocating information systems development and operational resources among competing applications; and
- planning information systems projects so that they are completed on time and within budget to include the specified functionalities.

3.3.1 Aligning the IT Plan with Organisational Plan

The first task of IT planning is to identify information systems applications that fit the priorities established by the organisation. Surprisingly, organisational strategies and plans are often not available in written form or they may be formulated in terms that are not useful for information systems planning. Therefore, it is often difficult to ascertain the strategies and goals to which the information systems plan should be aligned. Nevertheless, without this alignment, the information system plan cannot get and keep long-term organisational support. If selecting and scheduling information system projects are based solely on proposals submitted by users, the project will reflect existing computer-use biases in the organisational managers' aggressiveness in submitting proposals and organisational power struggles, rather than the overall needs and priorities of the organisation. Figure 1.1 graphically illustrates the alignment of IS strategy, business strategy and IT strategy development.

3.3.2 Design of an Information Technology Architecture

The term information technology architecture or information architecture refers to the overall (high-level) structure of all information systems in an organisation. The structure consists of application for various managerial levels (operational control, management planning and control as well as strategic planning) and applications oriented to various functional-operational activities such as marketing, research and development, production and distribution. The information architecture also includes infrastructure (e.g. the databases, supporting software and networks needed to connect application together). Information architecture for an organisation should guide long-range development as well as allow for responsiveness to diverse short-range information system demands.

3.3.3 Allocation of Resources

Rational optimal allocation of information system resources among competing organisational units is difficult. This is especially true if the portfolio of potential application does not mesh with an overall organisational plan and if the functional or organisational unit requirements have not been integrated into a planning framework that establishes completeness and aggressiveness are used in place of rational allocation. This can result in a precarious political situation for ISD management.

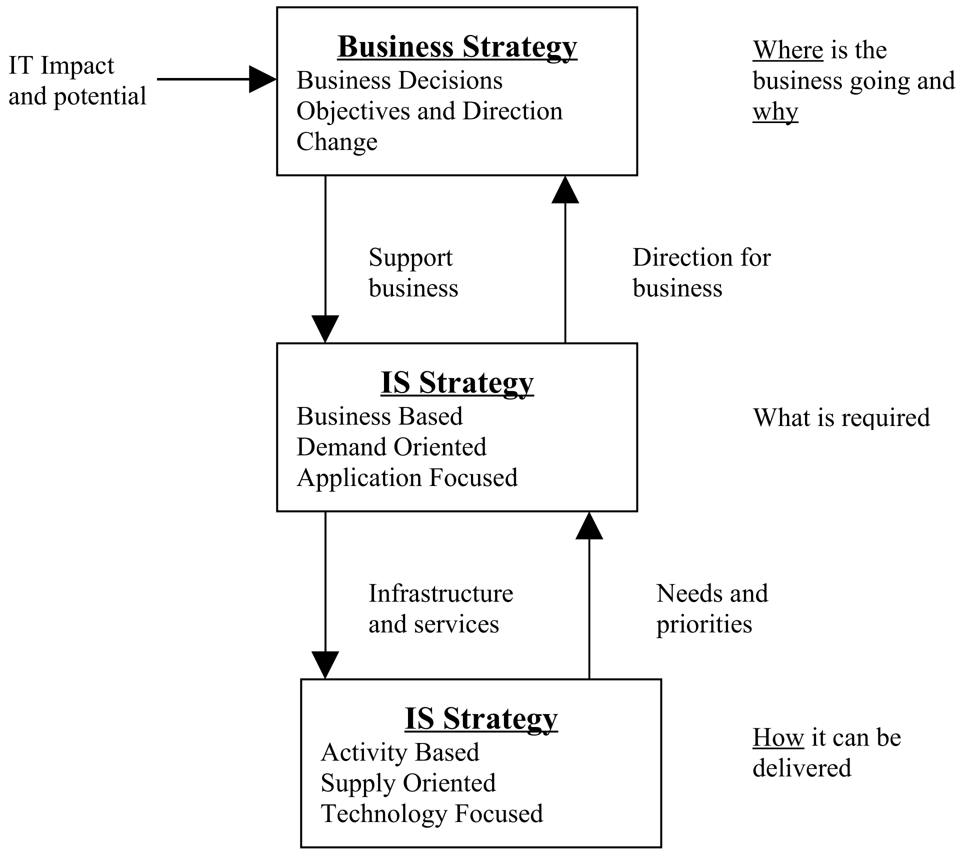


Figure 1.1: The Relationship between Business IS

3.3.4 Completion of Project on Time and within Budget

For information system and technology project applications to be completed on time or within budget, a common saying in the IT field is that projects often take twice as long and cost four times as much as originally planned. Consequently, organisational performance and ISD management's capability suffer. Project plans are seldom accurate as time and resource requirements are generally underestimated.

Often, under the pressure to finish a project on time and / or within budget, certain promised features are omitted. The reduction in functionality and/or quality frequently leads to user dissatisfactions with the resultant systems. Missing or inadequate features must be added in what is usually called "system maintenance". Better project planning could avoid or reduce the impact of such mishap.

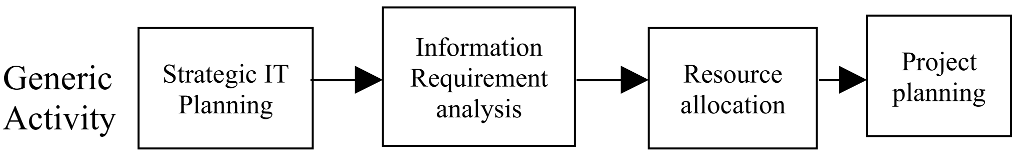
3.4 Problems with IT Planning

IT planning can be an expensive and time-consuming process. A study of five large-scale planning projects (Goodhue et. al., 1992) found that these projects involved 10 or more employees, on a half-time or full-time basis, for periods lasting from 10 weeks to a year. The estimated costs of these projects ranged from $450,000 to $1.9 million. A survey of 80 firms with formal IT planning projects (Lederer and Sethi, 1988) found that 53 percent were dissatisfied with their experiences in actually carrying out the plans they developed.

These research findings suggest that although IT planning is desirable, organisations should be careful not to devote an excessive amount of resources to these efforts. They should also beware of the pitfall of allowing IT planning to become an end in itself. To achieve the potential benefits of IT planning, organisations need to focus greater effort on actually implementing the plans they develop. This plan should be realistic and of high quality.

3.5 A Four-stage Model of IT Planning

Several models were developed to facilitate IT planning (e.g. see Ward and Griffiths, 1996). Of special interest is Wetherbe's (1993) four-stage model of planning, which is based on observation of planning efforts, promotional literature and analysis of various methodologies used in planning process. The model depicted in figure 1.2 consists of four major activities: strategic planning, requirement analysis, resource allocation and project planning. These activities correspond to the four general issues of IT planning.



Most organisations engage in each of the four stages, but their involvement tends to be sporadic and influenced by problems as they occur instead of reflecting a systematic, stage-by-stage process. If they use a formal planning method, it is important that the selection reflects what is most appropriate for each stage of IT planning, rather than the persuasive argument of consultants.

The four-stage model can be expanded to include major activities and outputs of the four stages as shown in figure 1.3 below. With additional details, the model comes from a high level of abstraction to a more concrete formulation of IT planning activities.

The four-stage planning model is the foundation for the development of an application portfolio of new information systems. There is also a relationship between the four-stage planning model and the various versions of systems development life-cycle (SDLC). The four-stage planning model identifies projects and general resource requirements necessary to achieve organisational objectives.

Major IT Planning	***Description***
Strategic IT Planning	Establish the relationship between the overall organisational plan and IT plan
Information requirements analysis	Identify broad organisational information, requirements to establish a strategic information, architecture that can be used to direct specific application development project
Resource allocation	Allocating both IT application development resources and operational resources
Project planning	Developing a plan that expresses schedules and resource requirement for specific information systems projects.

Table 1.1: ***IT Planning Stages***

3.6 Strategic Information Planning

The first stage of the IT planning model is ***strategic information planning*** (SIP). It includes several somewhat types of activities. On the one hand, it refers to identifying a set of new applications – a portfolio through which an organisation will conduct a business. These applications make it possible for the organisation to implement its business strategies in a competitive environment. This type of activity is evidenced in the case study sited in this unit.

On the other hand, SIP can also refer to a process of searching for strategic information systems (SIS) applications that enables organisations to develop a competitive advantage rather than just maintaining its position.

Another type of activity is planning for a specific project or a set of issues-related projects.

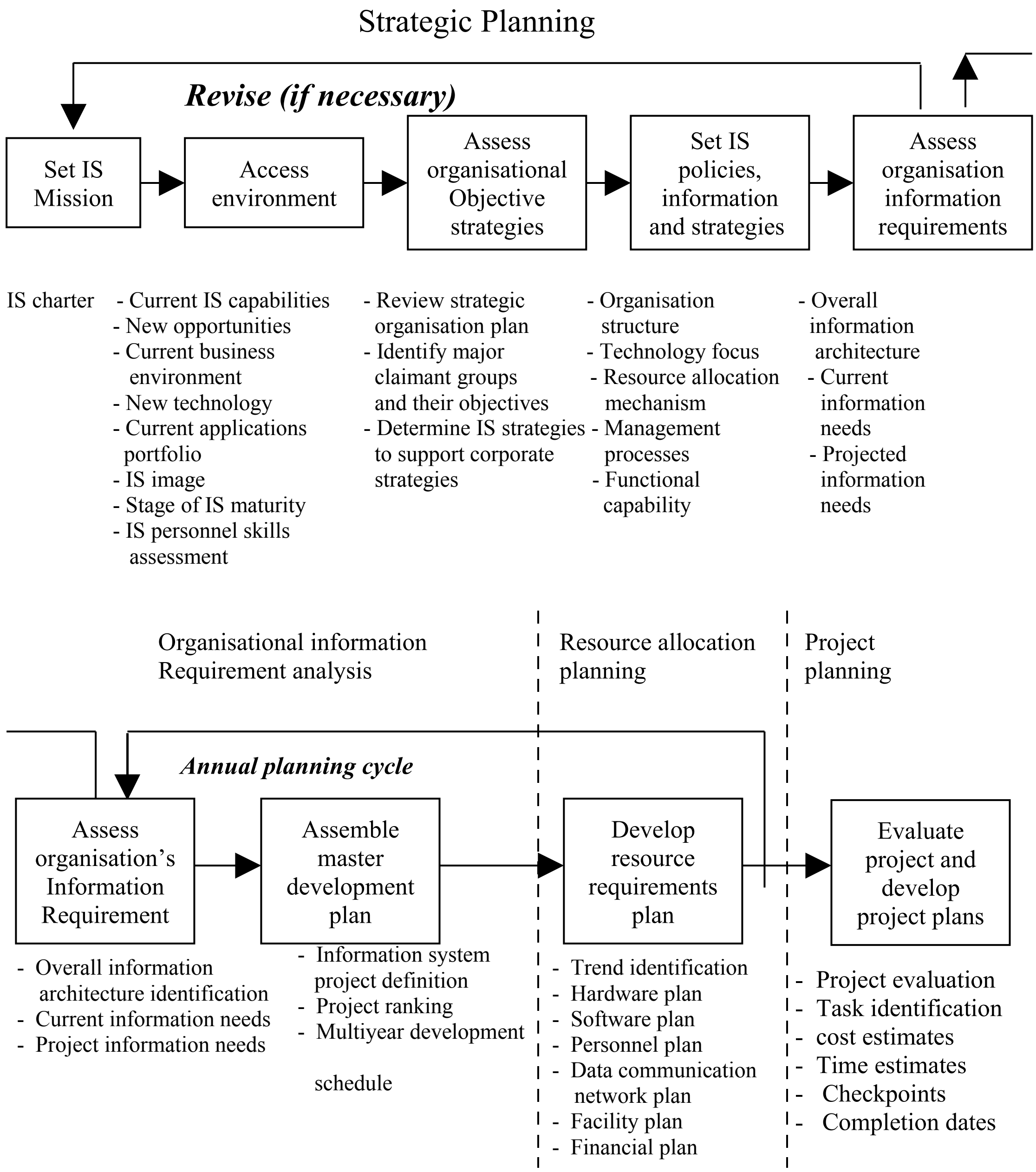


Figure 1.3: Major activities and outputs in the four stages of IT Planning

In either case, SIP must be aligned with overall organisational planning (Ward and Griffith, 1996). To accomplish the alignment, the organisation must do the following:

- Set the IT mission
- Assess the environment
- Assess existing systems availabilities and capabilities

- Assess organisational objectives and strategies
- Set IT objectives, strategies and policies
- Assess the potential impact of IT.

The output from the process should include the following:

(1) A new or revised IT charter and assessment of the state of the ISD
(2) An accurate evaluation of the strategic aspirations and directions of the organisation
(3) A statement of the objective, strategies and policies for the IT effort.

To carry out the above tasks, there exists several methodologies, the major ones are: Business Systems Planning, Nolan's Stages of IT Growth model, Ends / Means Analysis and Critical Success Factors (CSF).

3.7 Case Study: How TruServ Planned Its Information Technology

The Problem:

TruServ Corporation was created in 1997 by a merger of Cotter and Company and Servistar Corporation. TruServ is a $5 billion retail giant. A major problem was to merge the information systems of the two companies, a task which is planned for completion in 1999. To do so, Paul Lemerise, the CIO of TruServ will rely on a strategic IT plan rather than putting together blueprints.

The Solution:

Lemerise turned first to Ernest & Young, a major CPA / IT consultant with which he had worked before on external auditing. He created a planning team that included the consultants and executives from the two merging companies Lemerise did not include IT executives because he wanted strong input from the business side. He felt that he and the consultants knew enough about IT.

The team decided to include both short-term tactical plan and long-term strategic plan. The short-term plan was aimed at supporting the immediate needs of TruServ. It ensured that projects such as year 2000 compliance would be on tract. It also established a help desk. The long-term plans examined such issues such as use of the Internet and introducing intranet and electronic commerce.

The team examined the merger plans and business plans of the new corporations' interview were conducted with 30 top executives regarding business goals and technology wish lists. Of special importance was a long meeting with the CEO. Lemerise said during the interview, the CEO got very excited and stated that we should not think just about IT, but about the business.

Once the interviews were completed, Lemerise met with all the executives together in an attempt to get a consensus about the priorities of IT projects and the entire strategic plan. The formal IT strategic plan was completed in July, 1997. It included all major initiatives for three years, such as the move tone common retail system and delineating how the company will use the Internet and Intranet. The topics ranged from the use of radio-frequency (RF) technologies in the warehouses to electronic commerce.

The Result:

The plan will remain fluid; it will be re-evaluated and updated with new business goals every six months. The company decided not to plan for more than three years (anything beyond planning for three years often doesn't happen). The plan includes an ROI part with such intangible items as improving communication with customers.

4.0 CONCLUSION

Information technology planning constitutes an integral part of an information technology management. In fact, the success of the IT planning goes a long way to determine the success of any management process put in place. Truly "to fail to plan is to plan to fail". The planning model advocated is by no means exhaustive, but serves a basis in developing an information technology plan.

5.0 SUMMARY

It has been demonstrated by case studies of corporations such as TruServ, that there is the need for formal IT strategic plan, especially for large corporations.

A survey of 301 IT executives conducted in October, 1997 by CIO. Strategic planning used to rank at the top of the list in late 1980's and early 1990's, and then it retreated to the middle of the list. Initial efforts to establish planning and control systems for IT started in the late 1950's and early 1960's. During these early years, information technology resources went into developing new application and revising existing systems.

Some organisations extend this planning process by developing additional plans for longer time horizons. They have a long-range IT plan sometimes referred to as 'strategic' IT plan (Ward Griffiths, 1996). Improving the planning process for information technology and systems has long been one of the top concerns of ITD management.

The first task of IT planning is to identify information systems applications that fit the priorities established by the organisation. Surprisingly, organisational strategies and plans are often not available in written form, or they may be formulated in terms that are not useful or information systems planning.

IT planning can be expensive can be an expensive and time-consuming process. A study of five large-scale planning projects (Goodhue et. al. 1992) found that these projects involved 10 or more employees, on a half-time or full-time basis, for periods lasting from 10 weeks to a year. Several models were developed to facilitate IT planning (e.g. see Ward and Griffiths, 1996). Of special interest is Wetherbe's (1993) four-stage model of planning, which is based on observation of planning efforts, promotional literature and analysis of various methodologies used in planning process.

The first stage of the IT planning model is ***strategic information planning*** (SIP). It includes several somewhat types of activities. On the one hand, it refers to identifying a set of new applications – a portfolio through which an organisation will conduct a business. Lemerise turned first to Ernest & Young, a major CPA / IT consultant with which he had worked before on external auditing. He created a planning team that included the consultants and executives from the two merging companies.

6.0 TUTOR-MARKED ASSIGNMENT

1. List the four (4) basic issues addressed by information systems planning in this unit.
2. Briefly give descriptions of the major IT planning activities.

7.0 REFERENCES/FURTHER READINGS

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UNIT 4 INFORMATION TECHNOLOGY ARCHITECTURE

CONTENTS

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  3.2 How do you do an IT Architecture?
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1.0 INTRODUCTION

Information Technology (IT) Architecture is a blueprint that is developed, implemented, maintained and used to explain and guide how an organisation's IT and information management elements work together to efficiently accomplish the mission of the organisation. IT Architecture addresses the following views: business activities and processes, data sets and information flows, applications and software, and technology. A proper architecture is NOT limited to hardware and software issues. Having IT architecture with specific goals does not mean that an organisation must immediately change all of its systems, etc. Part of an IT architecture is a plan that addresses how the organisation will migrate to the new targets over time.

Why Should You Care?

Responding to the dictates of good management as well as legislative requirements, the Department of Commerce requires that each of its operating units develop and implement one or more IT architectures. An operating unit may have one IT architecture that covers all of its offices and business processes, or a number of IT architectures based on distinct business processes within the operating unit. Within NOAA, for example, the management of commercial fisheries could be considered one business process, while the issuance of nautical charts could be another. The Department may have a few basic requirements that all IT architectures must contain, but aside from those, the specific contents of the architecture are set up to the operating unit.

The best reasons for having IT architecture are the benefits it would bring to your organisation, and all DOC organisations who have implemented one have found it beneficial. Benefits have included the improved ability to share and efficiently process information, the ability to respond faster to changes in technology and business needs, and reductions in costs because of economies of scale and resource sharing. Oversight bodies, such as OMB and GAO, expect agencies to be developing and implementing architectures. Failure to develop and implement IT architecture will adversely affect the chances of getting funding for new IT projects or improvements to current systems, as well as hinder an organisation's ability to meet customer needs efficiently (e.g. moves to electronic commerce).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- properly define and explain what information technology architecture is
- identify the major components of IT architecture
- discuss the steps to be taken in putting in place IT architecture.

3.0 MAIN CONTENT

3.1 Components of IT Architecture

The IT architecture that is created by the strategic business / IT planning process is a conceptual blueprint that includes the following major components:

- **Teaching Platform**. The Internet, intranets, extranets and other networks, computer systems, systems software and integrated software application provide a computing and communication infrastructure, or platform that supports the strategic use of information technology for e-business, e-commerce and other business / IT applications.

- **Data Resources**. Many types of operational and specialised databases including data warehouses and Internet / intranet databases store and provide data and information for business processes and decision support.

- **Application Architecture**. Business applications of information technology are designed as an integrated architecture or portfolio of enterprise systems that support strategic business initiatives as well as cross-functional business process. For example, application architecture should include support for developing and maintaining the enterprise supply chain applications and integrated enterprise resource planning and customer relationship management applications.

- **IT Organisation**. The organisational structure of the IT functions within a company and distribution of IT / IS specialists are designed to meet the changing strategies of a business. The form of the IT organisation depends on the managerial philosophy and business / IT strategies formulated during the strategic planning process.

3.2 How Do You Do an IT Architecture?

There are risks involved in doing IT architecture. In larger organisations, it can become a time-consuming and potentially expensive task. To minimise the risks and maximize the benefits, you need to have a defined process to follow, understand that process well and make sure that the process fits your situation and needs. There is no one required process – you can find a number of different ones on the Web. They all have something in common. When doing IT architecture, you need to focus on ***the business activities*** (work) performed including performance measures, how they are organised and where they take place; ***the data sets*** and ***information flows*** needed to perform the activities; ***the applications and software*** needed to capture and manipulate the information sets; and the ***technology*** (hardware, network communications) needed to run the applications. The following pages present a seven-step process for dealing with these elements, a process that has been used successfully within the Department of Commerce. IT architecture must be documented and updated as needed. The level of detail can vary – some agency architecture documents approach the size of a small set of encyclopaedia, whereas others are much more compact.

3.3 The Seven Step Process

One Approach to Doing IT Architectures

Before you do anything else, you need a vision of what you are trying to accomplish and some specific objectives. The vision is a statement of where the organisation's IT environment and capabilities should be in the next three to five years. A key element is the issue of scope. Are you setting out to do an IT architecture for an organisation, a business operation within one organisation, or a business operation that involves multiple organisations? There are trade-offs in the scope chosen for IT architecture: A smaller scope allows the architecture to be tailored to very specific programmme needs and is easier to develop, while a broader scope realises greater benefits in operability; procurement and support cost savings and efficient information flows. You need to take resources into account when defining your objectives.

A question that may need to be asked is whether you should do a complete IT architecture, but in some cases, an aspect of the organisation or business process needs action immediately. You may need to concentrate on a single process rather than completing each step for the entire organisation. The objective, after all, is to improve the products and services provided to the public, not produce IT architecture for architecture's sake. A complete architecture should almost always improve the business process, but if slicing the job differently produces quicker benefits, then that should be considered.

Another step should be a set of IT architectural principles – statements of preferred direction or practice on how the organisation or process will use IT. These can help to provide a context for specific architectural decisions made later in the process and also help to make those decisions consistent. Some may seem so obvious that you first question why you should bother, but by documenting principles and keeping them as a visible part of the process, they are less likely to be overlooked.

There can be a wide variety of IT principles dealing with the basic IT architecture itself, the use of a common user interface, and the use of modular components for systems and so on. You should review some examples done by other offices to help you focus on what should be done. The DOC Enterprise IT Architecture Advisory Group has provided examples on its Home Page at http://secure.cio.noaa.gov/hpcc/docita/ or the group can make examples available to you upon request. When defining your vision, objectives and principles, you need to make sure that they are consistent with the goals of your Strategic Plan and Strategic IT Plan, as well as with the Departmental goal of achieving an electronic government.

3.3.1 Define your Vision, Objectives and Principles

Who and what are your IT Architectural efforts going to cover? What general IT Principles will guide your efforts?

The next step in the IT architecture process is to characterise your current status. This means that at a given time you should take a snapshot of your existing IT capabilities to determine its capabilities. The word "characterise" is used because it isn't usually necessary to identify and analyse everything IT or information-related in the organisation. You just need enough data to understand the basic situation you are in and the problems that exist, and to develop an idea of where you want to go. The scale of this task depends, of course, on the size and complexity of the organisation. It can vary from a relatively simple job to a complex and time-consuming one. It is essential to remember that IT architecture isn't just deciding on a computing platform, or an operating system etc. Your organisation exists to provide some product or service, and IT is a tool to do that. So the question is whether IT is being used in the most effective way to accomplish the organisation's programmme goals.

To determine that, you need to know a lot more than just the equipment and software you are using. If you don't know enough to evaluate whether the work processes should be re-engineered or not, then you don't know enough to do a complete IT architecture. The types of information you need can be placed into a number of categories. The following are just examples – different organisations choose different ways of characterizing their baseline, but these give an idea on one approach.

What work is performed? You must have a clear understanding of what work the organisation performs and where it is performed (anywhere from one small location to throughout the nation or even the world).

What information is needed for that work and by whom? You need to understand the basic flow of information, not just within your organisation; but also to and from outside customers or suppliers and what the information consists of; how that information is organised and whatever else is needed to give you a clear understanding of the information.

What applications are used to process that information? What software is used to process, analyse, move, etc. the needed information?

What types of file structures are used? What protocols are involved in transfers?

What technology is used to perform the work? Which IT hardware is currently used, including telecommunications and networking equipment? Many have found that besides taking the inventory of these things, it can be very helpful to interview key IT staff, end-users and managers; these are the people who usually know the most about what actually takes place, where problems may exist and where opportunities for improvements may exist. You need to compile all the information that you find and then organise the data into your baseline document.

3.3.2 Characterise your IT Baseline

How does your office do its business, what information technology is used, and how is it used?

While you may collect the information in categories like those above, by the end of the process you need to know how they all interrelate. What depends upon that? Once you have a good understanding of your current situation, you are ready to move to the next step. At this point in the process, you should know where you currently stand. Now you need to try to figure out where you would like to be (or need to be) in the future. How the workflow should ideally work? What generic types of applications and technology would be used? You are developing a model of the IT structure, not identifying the specific standards for products to be used (later you will create standards and guidelines that will be used by the organisation for the acquisition of the technology, applications and services, but those are not the Target Architecture itself). To do this step effectively, you must first understand the forces that are driving the need for change – the "drivers" in the business and technology areas.

Business Drivers are the ones telling you that you need to do business differently. Customers may be demanding better or different services. Organisations that you work with may want to change how you exchange data. The methods now being used to do business may not be cost-effective / efficient in the future. Or the drivers may be instructors from higher-level organisations or from laws. As part of the Federal Government set up, all agencies need to consider the impact of the Paperwork Elimination Act on their future IT Architecture. This law says that by October 31, 2003, the public must be given the option to transact business with the government by electronic means, and that means that agencies will need to have digital signature procedures in place. This is part of the larger push towards electronic commerce. Within the Department of Commerce, the goals in your Strategic Plan and of an electronic government are drivers that must be taken into account.

Technology Drivers are the ones that tell you that technology is giving or will give you options for doing things differently (and hopefully better). Many parts of the Department of Commerce, for instance, realised the potential of the Internet and started using it to provide products and services to the public long before any outside forces told them that they should do this. What other technologies out there can provide you with similar future opportunities? IT security is a particularly strong driver that should be addressed when developing all parts of the architecture.

By analyzing these drivers and your current baseline, you can start to define your future business and technology models – how you see the future business process working, the general technological tools needed to make that process effective and how those tools need to interrelate. You may then break down these models into more specific models dealing with specific areas (e.g., they could be data models, system models, infrastructure models) depending upon the complexity of the organisation or process involved. In the final analysis, you get down to identifying specific approaches the organisation should take in the future.

3.3.3 Create a Target Architecture

What do you want your IT Architecture to look like in the future?

The Target Architecture is the heart of the process. The four components (business activities including performance measures, data sets and information flows, applications and software and technology) of the IT Architecture need to be modelled separately.

Security and privacy considerations should be addressed throughout. The process consists of defining each set of architectural components and its key attributes. The desired capabilities of and relationships between components are then defined. The result is an organised set of definitions and models from which drawings can be made to reflect the different views of the architecture. Again, the relatively complexity of the situation will determine how detailed and extensive this effort and documentation needs to be. The four components are then synthesized into a comprehensive Target Architecture.

The Target Architecture should be looking five years ahead. Because it is a model that does not designate specific products, it can look this far into the future. New technology could lead to changes to specific standards for architecture every two or three years, but these changes would not normally affect the model of how the technology elements support the business. It is a good idea to develop an "evolvable" IT Architecture. Technology changes almost daily – you need a structure that can accommodate these changes as easily as possible. Some rules for evolvable systems architectures also apply to broader enterprise architectures: keep things modular, have well-defined boundaries between systems and components (crisp interfaces), use industry-standard interfaces, use open-systems standards, and use common mechanisms whenever possible. Planning for modular systems with clear boundaries allows you to change portions of the IT architecture without having to revise everything in the architecture, and also helps you see how changes in one part of the architecture may affect other elements. Depending upon the size and complexity of the organisation, all of this can produce a confusing quantity of data. There is no standard way to organise and display this data. You can look at examples of what others have done and choose the methods most useful for your particular situation and needs.

The gaps have to be identified for each component of the IT architecture. Where are the gaps large and where are they small? How difficult will it be to bridge those gaps? How much time, money, resistance from users, etc. may be involved? The nature of your organisation plays a great role in this analysis. A smaller centralised organisation or one where IT is controlled by one office will face different issues than a decentralised office with little or no central IT control.

3.3.4 Determine the Gaps between your Current and Target Architectures

What are the differences between your baseline and the architecture you want to achieve?

There may be gaps that are theoretically easy to solve – say a change with no complicated shift in technology and that will actually save money immediately – but that would face such fierce resistance by users that the organisation would decide that there is a large and difficult gap here, with difficult decisions as to whether and how to bridge that gap. Knowledge of all this is necessary to go to the next level – developing the game plan for migrating to the Target Architecture. You now know your baseline, your Target Architecture, the gaps between the two and the issues involved in bridging those gaps.
The next step is to plan for when and how you are going to actually do that bridging. Many factors are involved, including those that you looked at in the gap analysis. Are there "quick wins" where the

organisation can realise benefits right away and for a minimal cost and effort? Besides the immediate benefits, tehse can show doubters the value of an IT architecture. Or are the real problems ones that need immediate concentration on more major and longer-term tasks? Which actions depend upon other actions to be effective? In some cases, at least an informal cost-benefit analysis may be needed. There are no standard answers here, other than that you need to do the analysis and make a plan setting priorities for implementation. A timetable should also be created, recognising that the budget considerations can have a major impact on that schedule. In some cases, the hardest question may be who will do the work – who will be responsible for doing what, and how? A plan without assigned responsibilities rarely produces anything. So if a contractor develops an IT architectural document for you, and it is placed on a shelf, you probably wasted your money. The planned migration approach developed should be reflected in your Operational IT Plans.

A key tool for migration is something called a “Technical Reference Model”, or TRM. A TRM generically identifies the various software, hardware and interface services needed for the organisation or business operation. The TRM helps you to see how everything fits together, guides the acquisition of IT products and services, and helps provide a base for future architectural changes. It also serves as the basis for developing a Standard Profile, which identifies acceptable options within the IT architecture for filling the needs of the TRM’s services. These options are specific types of equipment, software products, protocols, etc. There may be a single standard for some elements and a range of acceptable options for others. It is important to be aware of situations where higher-level organisations or outside business needs may constrain your choices, such as where a higher organisation level has already defined a standard for something throughout the organisation. A Standard Profile should guide acquisition and development activities.

3.3.5 Develop a Migration Plan

How will you bridge the gaps between the baseline and the Target Architecture?

Another key part of the plan is identifying the processes to be used for implementation. A “governance” process needs to answer the following questions: How will we ensure that people planning and developing IT systems do so in a way consistent with the Target IT Architecture? How will we ensure that IT procurements are consistent with the Target IT Architecture (all procurements, not just major system procurements)? How will we determine if exceptions or changes to the IT Architecture are needed for a specific system or procurement? How will we track the implementation of the IT Architecture Migration Plan and the benefits / flaws of the IT Architecture? How will we keep the IT Architecture up-to-date, reflecting changes to the business, development in technology, etc? Operating unit CIOs are expected to include a governance plan as supporting documentation to their architecture submissions to the Department CIO.

Obviously, the steps leading up to this one will be of limited value if implementation never takes place. But what does "implementation" really mean? It does not necessarily mean that the organisation must immediately convert its IT and information systems to the Target Architecture. If the IT Architecture is guiding the procurement and development of technology and systems, then it is being implemented, even if it may take a number of years before the Target Architecture's goals are fully realised. As mentioned above in Step 5, a migration plan can identify priorities where the application of the organisation's available resources and time can produce the greatest benefits.

For implementation to take place, the architecture must be understood by all key players in the organisation. To be fully effective, the architecture cannot be a tool just used by some or all of the IT technical personnel. Top agency management and programme personnel need to be aware and supportive of the architecture. There needs to be integration with the programme planning and the budget processes. For instance, the agency should not propose projects for funding in the budget if they are inconsistent with the Architecture and the Migration Plan. The technical opportunities that maybe identified in the architectural efforts can point out ways to change the business process, to use technology to do things in a radically different way (rather than just upgrading equipment that once automated old methods of doing business without affecting the way the essential business was conducted). Conversely, other types of changes in business needs could lead to changes in the architecture. Business (programme) and architecture feedback is crucial to full and effective implementation.

3.3.6 Implement the Migration Plan and Architecture

Start implementing the plan to bridge the IT architectural gaps.

Technology is changing very quickly these days, and that trend does not appear likely to slow down or stop. Business needs and processes also change over time. So a Target Architecture, whether fully implemented or not, that addresses how IT and information will serve business needs must be periodically reviewed and updated to reflect those changes.

The review can affect any of the other six steps identified – important technology or business changes may require a new vision and new basic objectives. New technology may provide opportunities for a revised Target Architecture, and you may need to re-evaluate your baseline to allow you to identify the gaps that need to be spanned to reach that new target. If architectural documents remained unchanged, the chances are increasingly high over time that the organisation is not maximising the possible value of new technology and is restricting creativity. Ideally, at least annual updates should reflect changes in strategic plans and budget status. Since a good IT Architecture deals with interfaces with other organisations, you also need to stay aware of technological changes in those organisations and make sure that they are aware of changes that you may be planning to make. Another type of review that needs to be conducted is an assessment of the maturity level of an organisation's architecture programme. The Department of Commerce has established a self-assessment guide for this purpose and requires periodic reports on the results. These results should guide your efforts to improve your programme. The Federal CIO (CIO means "Chief Information Officer") has developed a conceptual framework for a Federal Enterprise Architecture. The following graphic comes from one of their publications. As you can see, some of the terms are different from the ones used above, but the basic approach is consistent.

3.3.7 Review and Update Regularly

An IT Architecture is a process, not a document.

4.0 CONCLUSION

Generally, the term information technology architecture refers to the overall high-level structure of all information systems in an organisation. The information technology infrastructure of an organisation should guide the long-range development as well as allow for responsiveness to diverse, short-range information systems demands.

5.0 SUMMARY

Information Technology (IT) Architecture is a blueprint that is developed, implemented, maintained and used to explain and guide how an organisation's IT and information management elements work together to efficiently accomplish the mission of the organisation. The best reasons for having an IT Architecture are the benefits it brings to your organisation.

The vision is a statement of where the organisation's IT environment and capabilities should be in the next three to five years. A key element is the issue of scope. Another step in the IT Architecture process is to characterise your current status. This means that at a given time, you take a snapshot of your existing IT capabilities. The word "characterise" is used because it is not usually necessary to identify and analyse everything IT or information-related in the organisation.

Business drivers are ones telling you that you need to do business differently. Customers maybe demanding better or different services. **Technology drivers** are the ones that tell you that technology is giving or will give you options for doing things differently (and hopefully better).

The Target Architecture is the heart of the process. The four components (business activities including performance measures, data sets and information flows, applications and software and technology) of the IT Architecture need to be modelled separately. There maybe gaps that are theoretically easy to solve – say a change with no complicated shift in technology and that will actually save money immediately; but that would face such fierce resistance by users that the organisation would decide that there is a large and difficult gap here, with difficult decisions as to whether and how to bridge that gap.

Another key part of the plan is identifying the processes to be used for implementation. A "governance" process needs to answer the following questions: how will we ensure that those planning and developing IT systems do so in a way consistent with the Target IT Architecture?

Technology is changing very quickly these days, and that trend does not appear likely to slow down or stop. Business needs and processes also change over time. So a Target Architecture, whether fully implemented or not, that addresses how IT and information will serve business needs must be periodically reviewed and updated to reflect those changes.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the major components of an IT Architecture.
2. Outline the steps to carrying out an IT Architecture Process.

7.0 REFERENCES/FURTHER READINGS

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UNIT 5 MANAGING INFORMATION TECHNOLOGY FUNCTIONS

CONTENTS

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1.0 INTRODUCTION

Although most organisations recognize the importance of information technology as a means for improving performance, successful implementation is far in-between and the experience with it in many organisations as a strategic business tool is often frustrating. This is true in both private and public sector organisations. There is abundant evidence from numerous surveys that many existing Management Information Systems (MIS), often using advanced computer equipment, have had relatively little success in providing management with the information it needs. The source of problems with IT in almost all of these organisations will typically revolve around five main areas:

(1) IT investments are unrelated to business strategy;
(2) Payoff from IT investments is inadequate;
(3) There is too much ‘technology for technology’s sake’;
(4) Relations between IT users and IT specialists are poor, and
(5) System designers do not consider users’ preferences and work habits.

These problems are not new, neither are they confined to developing countries nor specific industrial sectors. Big, medium and small enterprises have spent millions on consulting fees trying to resolve the problems since the advent of information, with little to show for their money. The problem is now so entrenched that top executives are adopting extreme attitudes and deploying extreme policies in dealing with this problem. Some outsource as many IT activities as possible, often in the belief that outsiders can manage the function better.

Why is there such confusion? Because information technology is generally exalted as the panacea for all organisational inefficiencies, and hence the one-stop solution to poor performance. Information Technology broadly defined is about automating Information System (IS) – a system of human and technical components that accepts stores, processes outputs and transmits information. An information system may be based on any combination of human endeavours, paper-based methods and IT. It is getting this mix right in developing information systems that has proved to be a big headache to many managers. Many organisations elevate IT to the level of strategy; however, integrating IT with organisational strategic goals is only marginally easier than reaching the summit of Everest. It can be done, but it is difficult and the cost of failure is high.

To be successful, an MIS must be designed and operated with due regard to organisation and behavioural principles as well as technical factors. Management must be informed enough to make an effective contribution to system design and information specialists (system analysts, accountants, operations researchers and others) must become more aware of managerial functions and needs so that, jointly, a more effective MIS is developed. Organisations should back away from the immediate problems of cost. They should focus and reflect on how they are framing the underlying IT-management issues.

Too many top managers, especially in the public sector are intimidated by the task of managing information technology. They tiptoe around it, supposing that it needs special tools, special strategies and special mind-set. The truth of the mater is that, it does not. Technology should be managed, controlled like any other competitive weapon in a manager's arsenal. IT is just one competitive lever among many. Its purpose is simply to help the organisation achieve its operational goals.

Instead of spending much time trying, often fruitlessly, to develop an IT strategy that perfectly mirrors the organisation's business strategy, ***IT investment decisions should be based on simple and easily quantifiable performance improvement goals***. An organisation must identify its performance goals first and then choose the technology, whether old or new, that can help it achieve those goals. Most organisations, however, go for cutting-edge applications in the almost mystical belief that it would deliver improved performance, hence a competitive edge.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list and explain the various changing phases in the development of information technology in the organisation
- discuss the major factors working against managing information technology functions
- explain why we need to focus on performance improvement for an IT project
- answer the question on how managers can bring about organisational bonding
- explain how to manage information technology functions.

3.0 MAIN CONTENT

3.1 Changing Concepts in the application of Information Technology in Organisations

In the early 1980s up to the 1990s, many organisations, both private and public, discovered that they were developing information systems that did not support their business strategies. Development projects were often given priority according to technical criteria rather than business imperatives, and funding went to sponsored projects enjoying political backing, rather than projects with the most strategic importance. The solution to these problems at that time was seen in developing an IT strategy. IT vendors, consultants and academics invented and sold planning techniques that were aimed first at discovering an organisation's competitive strategy and second, at suggesting an Information Systems portfolio to support it. Strategic alignment would then be assured. Unfortunately, this goal of achieving 'strategic alignment' remained elusive. Business strategies and plans were rarely as expected; IT opportunities were poorly understood, the organisation's parts had different priorities; and the subsequent IT strategies that were eventually drawn up often seemed devoid of common sense

3.2 The Changing Concepts Matrix Issue

***How do you decide what** information **system your organisation needs**?*

- **Strategic alignment**
  Develop an IT strategy that aligns with your business strategy
- **Strategic instinct**
  Let the basic way you compete, especially your operational goal drive IT investments.

How do you know whether IT investments are worthwhile*?*

- **Value for money**
  Adapt capital-budgetting process to manage and evaluate IT investments
- **Performance improvement**
  Judge investments based on operational performance improvements.

When you are trying to improve your processes, how does *technology* ***fit into your thinking****?*

- Technology **solutions**
  Assume that technology offers the smartest, cheapest way to improve performance
- **Appropriate** technology
  Identify a performance goal and then select a technology that helps you achieve it in a way that supports the people doing the work.

How should IT users and IT specialists connect in your organisation*?*

- **IS user relations**
  Teach specialists about business goals and develop technically adept systems.
- **Organisational bonding**
  Encourage integration by rotating managers through the IT function, bring together specialists and users, and giving IT oversight to executives who also oversee other functions.

How can you design systems that improve organisational performance?

- **Systems design**
  Design the most technically elegant system possible and ask employees to adapt it.
- **Human design**
  Design the system to make use of the tacit and explicit knowledge that employees already possess.

Information technology seen in this context is, therefore, just a competitive lever that helps organisations reach their goals; it is not fundamentally different from quality, process re-engineering or performance improvement concepts. As bolder and better ideas emerge, they developed in a process of learning by doing, that is, by making strategy in small steps. Information technology should, therefore, be seen not as something out of the ordinary, special, different or problematic but as part of a fully integrated picture.

3.3 Focus on Performance Improvement

Appraising IT investments in organisations is not an easy task. Both cost and benefits seem to be confusing most of the time. Many organisations have introduced investment management processes akin to capital budgetting, hoping to legitimize IT projects and ensure management commitment to them. Such concerns about affordability and return on investment are neither irrational nor improper. After all, information technology should not be exempted from the pursuit of shareholder value, and in some organisations, the cost of IT is so high that it is, properly, a strategic question. However, the cumulative and pervasive value-for-money mind-set can be destructive. It can bias investments towards cost-saving automation projects and it can lead to dangerously late adoption of IT infrastructure improvements. It also carries an implicit message that IT is something to be exploited only when benefits are obvious and certain.

Assessing the viability of IT projects should not, therefore, be primarily on financial metrics, audits and investment appraisals; instead, since operational performance goals are the drivers for IT investments, the key indicator for appraisal should be performance improvement, not value for money. The fact that investment decisions are not financially based does not mean they are fuzzy; operational performance goals must be articulated with fine-grained specificity. IT investments can also support improvements in general operations and be easily justified by operational efficiency measures. In this regard, continuous improvement and incremental advances means that a lot of IT spending should come in small steps. However, major investments must still be driven by broad operational performance goals. Contrary to the impression given by some consultants and computer manufacturers, the mere fact of using IT does not of itself automatically bring benefits. If IT is misapplied or installed without sufficient analysis of the real management or organisational problems, then no benefits will be gained and money will be wasted. Automating inefficient methods does not produce benefits. The methods and systems must be right before any attempt is made to automate them and no IT system should be installed unless it is demonstrably better than the best manual method. The proper, planned use of IT can, of course, be highly beneficial but do not automatically accrue.

3.4 Adapting Appropriate Technology

Organisation executives often complain about 'technology for technology's sake'. This has been brought about as a result of many IT vendors and consultants in the market, emphasizing 'technology solution'. Most would-be customers want to know what problems or opportunities exist. The dynamics of the technology-solutions philosophy are very clear. Vendors need to create markets for new technologies. IT specialists want to try out the latest and greatest technology toys. Users cannot necessarily judge what is possible until they use a new technology, so they depend on the judgement of IT specialists. And sometimes, organisations are proud of adopting new technologies ahead of the rest of the world. That bias can lead to wonderful results as manifested in the growth of Internet and the World Wide Web. But it has its dark side too. Most executives can recall more than one system that was too advanced for the company needs, and other systems that were redesigned even when they were still perfectly inadequate.

Many organisations have found themselves adopting technology for other secondary reasons than productivity. The 'best practice' in contrast is adapting appropriate technology. Organisations should identify the tasks to be accomplished and desired levels of performance; then they select a technology that will help the organisation achieve that level in a way that suits the people doing the work. It must be emphasised that it is the operational goals that drive the choice of technology and not vice versa.

To create value from information, changes in decision behaviour must result and consequently there must be a decision focus to the MIS. This means that the MIS must be designed with due regard to the types of decision, how decisions are taken, how the decision maker relates to the organisation, the nature of the organisation, its environment and so on. Acceptance and understanding of this emphasis by both managers and information specialists is a primary requisite to effective MIS design. Managers and the MIS which supports them must distinguish between ***effectiveness*** and ***efficiency***. Thus, a system may be producing the wrong output efficiently and is an ineffective system. Good management concentrates on what must be done before considering how it should be done and the MIS should help them do this.

3.5 Fostering Organisational Bonding

Although in many cases IT function in organisations is relatively decentralised, users frequently perceive it as centralised. They think that IT specialists are remote and enjoy too much leverage in controlling the system. They also complain that IT programmers and analysts know nothing about the organisation's business. "By the time we induct the IT personnel into our business, they have left the company" observed one manager. The labels 'users' and 'specialist', while accurate, also help create two cultures. Creating hybrid managers – people who are knowledgeable about organisational business and IT, sounds appealing, but the hybrids soon discover they are stuck in a career cul-de-sac. There are four basic ways of going around this problem, namely:

- First, managers should spend sometime in the IT department as part of a job rotation scheme. This will provide managers with not only the technical know-how, but also the knowledge about how to get things done in IT; about who can help with what.

- Secondly, it is advisable to co-locate IT specialists with users during the project implementation period. Co-location improves communication and understanding between users and specialist, it is another way of encouraging bonding.
- Thirdly, IT managers should not be isolated to that one function alone, rather senior executives in-charge of IT should also be in-charge of one or two other functions usually finance and planning. Many conflicts can be avoided when senior managers have overlapping responsibilities; integration and bonding can occur quite naturally.

- Finally, organisations should utilize the vendors' expertise as much as possible and minimise the use of off-the-shelf packaged software. Instead they should work closely with a dedicated vendor to develop applications in-house. Care should, however, be taken to ensure that such long-term relationships do not constrain experimentation and adoption of radically new and diverse technologies. Bonding is important because the issues noted above are not structural in nature. They cannot be completely solved by setting up committees, creating new liaison roles or tinkering with the degree of centralization. The focus is on proximity, cross-training, shared understanding and relationships.

3.6 From System Design to Human Design

Traditional system development in organisations tended to focus more on business processes being supported or redesigned than on the people who will use the product. Perhaps as a result, people often find new systems difficult to use, counter-intuitive and even annoying. If asked, how much has IT systems increased job satisfaction? The most common observation would be that IT systems have de-skilled and routinized far more work than they have enriched. The point here is not that job enrichment should be the goal of IT development, but rather that specialists often leave no room in their systems for human judgement or understanding when they become overly focused on technological 'solutions'. Building a system should not be an end in itself, enhancing the contribution of people is the higher goal. That is why the concept of 'Human Design' is central in modern systems planning and development. Moreover, tact knowledge to knowledge that cannot be fully communicated with words and numbers, things that we do not know we know and those that we cannot easily explain, is very important. Information Technology is much suited to processing explicit knowledge. It is thus important to try to marry the two as much as possible for maximum gain. It is, therefore, advisable that the process of system design incorporates non-specialists.

3.7 Case Study: SCHULTZ CAREER SERVICES

Ralph Kinney, Information Technology Manager (ITM) and Pete Burrough, Assistant Information Technology Manager (AITM) of Schultz Career Services (SCS) collaborated their ideas regarding IT strategies the company should pursue to improve its competitive advantage.

There are two main concerns facing the company, namely:

- The first concern is the company's decentralised computer network, which does not enable users in different offices to easily share information.
- The second is the lack of training the system administrators have to effectively perform their responsibilities.

The goal of SCS is to achieve 45 million in sales in less than five years through sustained growth. The questions Kinney and Burrough asked themselves were how can they improve the IT department to help achieve these goals? Three areas that the owners are concerned with to sustain their growth are to increase their current business, build a new core business for the future and plant the seeds that may become potential business in the long-term. Due to the fact that the Graham Company, SCS's most rival competitor, has been trying to find out how SCS's strategists have been making them so much, there has been a great pressure on the company to ensure their competitive advantage.

After collecting input from the System Administrators (SA) in each office, Kinney and Burrough needed to analyze the problems and provide the best solution for the company; and to help support the company's mission.

Company Background:

Schultz Career Services is a job placement agency that specialises in placing candidates in electrical, electronic, mechanical, production, sales, communication and management positions with companies all over the US. Services are free to candidates looking for positions due to fees paid from the clients for having SCS find employees for them. Founded in January, 1991, SCS was started by Allen Betts, Michael Casey, Bob Withers and John Waters, who had met while working for another placement agency as career recruiters. Their success at this former company spurred interest in expanding the business and reworking the marketing strategies to become more candidate-friendly and to develop an operation, which would give the individual recruiters more control over their own destiny. The team made recommendations for change, but was met by strong resistance from management of the company. Even though many of the changes would have made the company more competitive and generated more revenue, management refused to listen or consider them as viable. At the point where the team was told that they were replaceable by management, a change had to occur; the team broke off on their own. A decision was made to leave the former company for somewhere better.

Schultz Career Services has always been national in scope, simultaneously beginning operations in San Francisco, Nashville and Houston. A Raleigh office was opened in 1993, along with a Chicago office in 1994. The corporation was incorporated in Houston, TX, on January 6, 1991, and remains the SCS headquarters office. Since then, others have been opened in Seattle, NYC, Hawaii, Virginia Beach and Orlando [see Exhibit 1]. The first innovation for SCS was the "candidate first" approach to recruiting applicants.

Their goal is to educate the applicant on industry and opportunity and encourage a decisive, well-informed choice before trying to present any type of interview. The second innovation was the mini-conference, which gave the clients the opportunity to bring in candidates which have previously been screened and are unfit for the position they are looking forward to fill, usually 10 – 15 candidates, to conduct interviews with them. Based on a first-hand "know the client in person" approach; the mini-conference gave clients a chance to have conferences on their job site at a date and time of their choosing. Once SCS got on their feet, they expanded this idea of the mini-conference to a national conference. This is a special, private event in which SCS interviews up to ten candidates a day in a private setting. At a national conference, SCS brings together typically about 50 companies and 60 – 90 candidates together. Each company interviews about 10 prescreened candidates. These candidates have been prescreened and qualified for the positions. SCS now holds over 50 conferences a year in thirteen cities. For the candidates, there is no cost other than travel expenses. For clients, fees are only incurred upon hiring, which they are at no obligation to pay. The other form of interview is Direct Interview. Clients are presented with only the right candidate per position. SCS arranges both telephone and on-site interviews based on direct matching of candidates to client openings.

Distributed Systems:

Schultz Career Services' need to codify information began when the company started in 1991. At the start of the company, the organisation lacked today's basic office technologies, such as networked computers, electronic databases and email. Instead, the founders of the organisation utilized outdated technologies such as stand-alone computers and maintained all office files in boxes or in personal briefcases. As time progressed, however, the need to manage this information more effectively increased. Office personnel were finding it difficult to share information or to find files in a timely manner and could not analyze the information the organisation maintained without having to spend large amounts of time sorting, sifting and organising printed documents. Between 1991 and 1995, SCS utilized only four computers, one for each founder of the company.

As the company grew in size the need to accommodate all employees of Schultz Career Services with a computer became essential. Therefore, each of the seven employees located at the Houston office was eventually provided with one computer. These computers were connected through a decentralised stand-alone client/server system. As a result, SCS personnel outside of the Houston office were not able to access data in the Houston network. Schultz Career Services' Chief Operations Officer did consider connecting all SCS facilities through a Wide Area Network (WAN). However, it was decided that a WAN would be too expensive for SCS to purchase and maintain. Each employee in every office had access to the Internet through a dedicated ISDN line through the office server. However, the organisation did not post company databases on the Web and the company currently does not have an Intranet. Therefore, the different SCS offices do not share databases with other offices within their company. Data is only shared within each office.

IT Function:

The Chief Operations Officer (COO), located at the corporate headquarters, exclusively determines all changes related to Schultz Career Services' Information Systems. However, all SCS offices are assigned a System Administrator (SA) who has the authority to request changes to the organisation's Information Technology to the Chief Operations Officer. Nonetheless, the COO currently makes all of the final decisions related to IT changes. Partner, Bob Withers stated: *"Deciding how many people would be involved in changing the technological needs of SCS was easy for the corporate office. The CEO and myself decided that all IT related decisions should be generated at the headquarters and disseminated to all of our offices. This way, we can better identify the needs and capabilities of each of our offices".*

The architecture of SCS's distributed computer system includes nine field offices and one corporate main office. Each office, which supports a decentralised stand-alone system, has one server and at least 12 workstations. However, the number of workstations required at each site is dependent on the number of employees working at that office. For example, at the New York City site, there are currently 12 workstations, while at the Nashville site, there are 15 workstations. Currently, there exists no automation between offices or the corporate headquarters since these offices are not connected through the network. The only way employees at SCS can share information is either through e-mailing, faxing or mailing hard copies of documents. "It's a daily function to send candidates' information to other offices. It takes time to retype all their information. If you get distracted, it could be easy to make a mistake entering the data," said Melissa Wilkenson, Account Representative Assistant at Orland.

(a) ***System Administration:***

The role of the System Administrator (SA) in SCS is considered an additional duty performed by the most senior member of each field office, regardless of capability and training. The role of the SA in each SCS office includes troubleshooting technical problems, notifying the IT Manager of the need to procure system related hardware and software, reporting to the Chief Operations Officer and requesting outsourcing of expertise.

All of SCS's system administrators are required to troubleshoot technical problems related to the computer system. As the SA of the New York City office, Gary Highwater stated: "*Everyone comes to me with any little problem they have with their computer. Usually, it's easy to fix like their email isn't working properly. Other times, it's something that I don't have any idea how to fix. I do what I can or I call Ralph or Pete."*

The system administrators are also responsible for identifying the need to purchase system related hardware and software and to notify the IT Manager of this need. However, the SA seldom identify the need to procure hardware or software because the IT Manager usually updates the IT system as needed. As Leonard Wolfe, SA of the Hawaii office stated: "*From my experience, Ralph usually sends us the software to install or upgrade. We have to keep him updated on how it's working for us and what would be helpful. That way, he knows what we need and what to improve upon*".

SCS requires all SAs to report directly to Michael Case, the Chief Operations Officer. It is the SA's responsibility to keep the COO informed of all system-related problems. As the SA of the Seattle office, Ronald Peterson stated: "*If something more than just a minor malfunction occurs within the office that I don't have the knowledge to fix, I call upon Pete or Ralph to guide me through the process. It's my position to inform them of any trouble we are experiencing so they can perform the necessary steps to overcome these difficulties and improve the systems to make us more efficient*". SCS are also responsible for requesting outsourcing expertise when the SA is not able to rectify system-related problems. All approval to outsource this expertise must be approved by the IT Manager, Ralph Kinney, before the SA can seek this help. Barbara Speck, the SA in the Virginia Beach office explains this process: "*If our IT managers can't help me with a problem by walking me through the steps or by going in on their own through PC anywhere, then they would authorize us to outsource for help. It's easier than having one of them fly here from Houston*".

One of the problems SCS has with delegating the SA task to key employees in SCS offices includes the lack of expertise by the employees. Each office lacks an IT department and is instead composed of functional employees that act strictly as office managers or employment recruiters. As a result, the SA responsibility falls on the individual in charge of each SCS office, whether or not this individual has the skills to perform SA tasks. Furthermore, SCS does not offer training to the SA. Therefore, it is not uncommon for employees of SCS to be responsible for SA tasks that they are not qualified to perform. Also, SA tasks are considered added responsibilities to the employee that is chosen to be the office's SA. In other words, that individual is not relieved of other office responsibilities. Instead, the SA is required to fulfill other requirements in addition to the SA duties.

(b) *System Requirements for the Offices:*

As directed by the Chief Operations Officer, all SCS offices utilize the same Operating System and system software. Currently, SCS is using Windows 95 as the operating system on a Windows NT platform. The organisation also purchased Microsoft Office 97 for all office word processing. Lastly, the company purchased a database software package from an outsourcing company called Telemagic. Specifically, this database was designed for SCS to collect information related to specific data pertaining to a client. This data includes: name, address, home and work phones, fax, email, date they are available to start work, position desired, location(s) they would like to work, salary desired, college(s) attended, when resume was received, date they were met with by a representative, and how they heard about SCS. The database also stores information on a candidate's specific work skills, which conference they should be invited to, and other personal information accumulated. There is also a screen that shows placement information such as the company that they have been placed with, location, hiring date, salary, and fee in which the company will pay SCS. These systems are loaded into the server of each of Schultz Career Services' offices located throughout the United States.

Regardless, however, of any attempt from Schultz Career Services' headquarters to influence each office to utilize information systems uniformly, one of the biggest challenges SCS faces is the lack of regularity of shared data between offices. Though each office utilizes the same type of database to store client information, each office configures these databases differently. This lack of conformity between the SCS offices is in part a result of the outsourcing database company, Telemagic, teaching employees how to manipulate the database software to store data differently. Allowing the software to be an open source database has allowed each SCS to create a unique database that stores data in different formats. As a result, the organisation is not able to automate the sharing of data. In fact, if a representative of SCS in the Houston office requests information from an SCS office in Baltimore, the data can be emailed to the office point of contact, however, the data cannot be exported into the Houston Telemagic database because the data fields are not the same. Therefore, the representative at the Houston office is required to manually update the company's database. Mandy Baker, Administrative Assistant in the Houston office said, "*Being able to transfer data directly from office to office would increase my efficiency. It would prevent me from having to enter each person's information manually. I'd have more time to accomplish other things*".

Final Thought:

Ralph Kinney and Pete Burroughs were convinced that the lack of SA training and the company's decentralised computer system were hindering the company's ability to be as efficient as the organisation should be. Both executives realised that all SA's needed minimal training and that the company's database needs to be standardized. However, after discussing this problem in detail, both wondered if these

IT solutions would be enough for the company to gain the competitive edge they were looking for.

4.0 CONCLUSION

IT is here to stay and its usage can only grow and not diminish in organisations. Seamless integration of the IT function with the rest of organisational functions is a great challenge facing organisations. Integration of IT with the organisation has to be from top to bottom and systemic, not structural. Thus, bridges will not collapse as long as there is on IT culture and another business culture, the principle of organisational bonding will make them strong and stable. System development must treat people as complements and even alternatives, not just as users.

The basic principles of strategic instinct, performance improvement, organisational bonding, appropriate technology and human design, if followed in system development would go a long way in alleviating some of the major problems experienced about IT in organisations. Above everything else, senior managers must regain the control of technology in their organisations and abandon the dangerous idea that IT requires special, technocratic skills to manage. It is emerging that, long time IT management traditions that have evolved over the last 40 years are in a way flawed and need to be reviewed. Powerful IT vendors, management consultants and specialist developed these ideas and profited from them. In the end, even those constituencies have begun to doubt their goals. It is time to radically rethink how to manage the IT function in organisations.

5.0 SUMMARY

Although most organisations recognise the importance of information technology as a tool for improving performance, successful implementation is far in-between and the experience with it in many organisations as a strategic business tool is often frustrating. In the early 1980’s up to the 1990’s, many organisations both private and public discovered that they were developing information systems that did not support their business strategies.

Appraising IT investments in organisations is not an easy task. Both cost and benefits seem to be confusing most of the time. Organisation executives often complain about ‘technology for technology’s sake’. This has been brought about as a result of many IT vendors and consultants in the market, emphasizing ‘technology solutions’.

Although in many cases, IT function in organisations is relatively decentralised; users frequently perceive it as centralised. They think that IT specialists are remote and enjoy too much leverage in controlling the system. Traditional system development in organisations tended to focus more on business processes being supported or redesigned than on the people who will use the product.

The SCS goal is to achieve 45 million in sales in less than five years through sustained growth. Schultz Career Services' need to codify information began when the company started in 1991. The Chief Operations Officer (COO), located at the corporate headquarters, exclusively determines all changes related to Schultz Career Services' information systems.

The role of the SA in SCS is considered an additional duty performed by the most senior member of each field office, regardless of capability and training. One of the problems SCS has with delegating the SA task to key employees in SCS offices includes the lack of SA expertise in the employees who work at each office. As directed by the COO, all SCS offices utilize the same operating system and system software.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss four ways to create strong organisational bond in IT project as discussed in this unit.
2. Mention the roles of System Administrator in the Schultz Career Services.

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MODULE 2

Unit 1 Information Technology Management Principles, Policies and Guidelines
Unit 2 Managing Application Development Projects
Unit 3 Strategic Information Technology Planning
Unit 4 Managing Change in Information Systems Technology
Unit 5 Developing and Managing Customer Expectations In Information Technology Management

UNIT 1 INFORMATION TECHNOLOGY MANAGEMENT PRINCIPLES, POLICIES AND GUIDELINES

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1.0 INTRODUCTION

Applicability: The policy and guidelines apply to all missions critical to administrative computing systems involved in the creation, updating, processing, reporting, distribution, archiving and other uses of administrative information at the American University of Beirut and its Medical Centre.

The guidelines are independent of the system architecture and apply to web-base systems, client / server applications, and server centric applications whether developed in-house, acquired from external vendors or a result of extensions to existing or purchased applications. The guidelines apply to all administrative applications that deal with students, patients, financial, administrative, or other business information that is an integral part of running the business of the University and the Medical Centre. They apply to any process or application that affects more than one person's job responsibilities.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain background knowledge of the case organisation
- explain the reasons for putting in place policies and guidelines in an organisation
- state the responsibilities of owners of systems / projects
- state the responsibilities of the major partners in any project
- list some criteria to follow in investments.

3.0 MAIN CONTENT

3.1 Background

American University of Beirut (AUB) is briskly replacing its legacy of administrative computing systems and computerizing new business areas and processes in compliance with market best practice and leading information systems architecture based on the principles of open standard, web enabled and/or client / server systems and technologies. The deployment of the new administrative computing systems at the University started in 1998 coinciding with major changes in the management organisation, mainly at the executive level.

The concurrent changes and the accompanied change management initiatives did not address in a perceptive manner the impending information technology management principles, institution-wide processes and information systems ownership, interoperability, inter-process dependencies, shortest path optimization, systems' audit and security, common standards, documentation, quality control and quality assurance, etc. The new administrative computing architecture is expected to sustain and support the University and Medical Centre information technology needs for at least ten years. This is a large-scale change that will fundamentally affect the way the University does its business for many years to come.

3.2 Policy

AUB academic and administrative policies and procedures, processes and supporting information technology are designed to enhance productivity, reduce costs and enable efficient and effective workflows.

Every institution-wide process has a designated ***process sponsor / owner*** who is responsible for ensuring the fitness of that process to the business needs of its customers. Every administrative computing system, supporting an institution-wide mission critical process or a departmental centric process, has a designated ***functional sponsor / owner*** who is responsible for ensuring the fitness of that system to the processes it supports. Every administrative computing system, supporting an institution-wide mission critical process or based on the sponsor / owner request a departmental centric process, has a designated ***IT coordinator*** who is responsible for ensuring that the system is consistent with AUB-adopted administrative computing system design, implementation and management standards and procedures; being request for proposal (RFP), request for development (RFD), project management, design and implementation documentation, process and system audit and security, data object definition and custodianship, data backup and retention, interoperability and integration, unique identification, application source escrow assurance and quality. Accountability is assigned for every administrative data object. Roles and responsibilities of data custodians, data maintainers and data users are clearly defined to ensure the quality, security, accessibility and preservation of AUB administrative data.

3.3 Guidelines

Responsibility: The owner of an administrative system is responsible for the definition of the scope of the project, development of a project plan, assignment of responsibilities and management of the project. An administrative system owner who does not use the services of the Computing and Networking Services for design, development or maintenance of an administrative system must assume both the system owner and the system developer responsibilities. Operators of distributed computing systems, remote network servers, or small stand alone systems must satisfy all the responsibilities of administrative system owner, developer, user and operator in succession, on an ongoing basis. Computing and Networking Services will designate an IT coordinator to monitor the quality control of any and all institution-wide mission critical administrative system.

(a) Process Sponsor / Owner Responsibilities

- Define and document the process workflow;
- Ensure that the process fit the business requirements and functionality;
- Ensure that the process is optimal and delivers quality service to its customers;
- Ensure adequate data object accountability;
- Ensure adequate data collection and validation from the source;
- Ensure that data custodians, data maintainers and data users are clearly assigned, adequately trained and explicitly clear about their roles and responsibilities;
- Define the functions, procedures, reports and audit requirements of the administrative system;
- Ensure the request for proposals (RFP) or request for development (RFD) and the proposed designs meet the system requirements;
- Ensure adequate controls, audit trails, security, backup, recovery and restart procedures are included in the design;
- Ensure an adequate test plan is prepared and also monitor the testing and review of the system during development and / or configuration;
- Define and ensure compliance with system acceptance criteria;
- Formally accept the system as complete and ready for production.

(b) System Owner Responsibilities

- Define the functions, procedures, reports and audit requirements of the administrative system
- Ensure the request for proposals (RFP) or request for development (RFD) and the proposed designs meet the system requirements
- Ensure adequate controls, audit trails, security, backup, recovery and restart procedures are included in the design;
- Ensure an adequate test plan is prepared and also monitor the testing and review of the system during development and/or configuration
- Define and ensure compliance with system acceptance criteria. Formally accept the system as complete and ready for production
- Ensure an adequate training plan is prepared and delivered to the system users
- Ensure the design and development of the system meet all appropriate functional standards

- Provide for the completeness and accuracy of all required users and system documentation for the system
- Authorize system implementation and all programme changes
- Manage, control and review access to the system and its data. Maintain and review data security and integrity
- Manage and control user access to the system. Monitor and review user access logs.
- Define, approve and manage user access permission and authority levels
- Designate a system operator or administrator responsible for day-to-day decisions regarding the operation of the system.

(c) IT Coordinator Responsibilities

- Review and recommend changes to the functions, procedures, reports and audit requirements of the administrative system
- Ensure that the appropriate hardware and software environment is selected for the development and operation of the system
- Review, recommend changes and ensure the request for proposals (RFP) or request for development (RFD) and the proposed designs meet AUB standards
- Review, recommend changes and ensure that adequate controls, audit trails, security, backup, recovery and restart procedures are included in the design
- Review, recommend changes to the test plan and monitor the testing and review of the system during development and/or configuration
- Define and ensure compliance with system acceptance criteria. Formally accept the system as complete and ready for production
- Ensure the design and development of the system meet all appropriate technical standards
- Review the system documentation for completeness and accuracy
- Define and ensure compliance with the system installation procedures. Define and monitor procedures for modifying the system. Authorize all programme changes
- Review and approve data security and integrity. Review and approve data sharing procedures in order to ensure the integrity of interfacing systems
- Define and manage quality control and quality assurance procedures for data backup and system security.

(d) System Developer / Integrator Responsibilities

- Develop and / or integrate the application to the satisfaction of the administrative system owner, translating the system requirements into design requirements;
- Create a design that provides for functionality and ease of use, or select a product that meets system owner requirements;
- Design, code, install, test and deploy the application in compliance with all appropriate standards;
- Implement the most effective methods of satisfying the control and audit requirements established by the system owner, or resulting from design decisions;
- Implement the most appropriate methods of meeting the system security standards.

(e) System User Responsibilities

- Comply with user procedures and security requirements as established by the administrative system owner;
- Comply with all control requirements specified by the administrative system owner.

(f) System Operator Responsibilities

- Create a secure operating environment that promotes efficient use, including appropriate procedures to protect and recover data and a secure physical environment;
- Protect against, monitor for, and detect unauthorized access to the system or data files and report to the appropriate security officer.

3.4 Investment Criteria

Evaluation and approval of information system investments is based on a business case and full-cost analyses, including the costs of managing and maintaining technology investments throughout their expected useful lives. Investments in new information technologies are made to improve or sustain business practices or management decision-making in support of the University's mission and vision. They are cost-effective for the University as a whole, and consistent with the adopted technology standards.

3.5 Information Availability

University administrative data is sufficiently accessible, comprehensive, timely, accurate and flexible to accommodate the information and reporting needs of faculty, doctors, staff and students. It is made available to all with a legitimate need, consistent with AUB's responsibility to preserve and protect data privacy. To ensure cross-system interoperability and consistency, reference data and other shared data is made available to individuals and applications from single, authorized source databases that utilize consistent data definitions and business rules. The technical infrastructure provides students, faculty, doctors and students with convenient access to institutional and global computing and information resources and facilitates interaction and collaboration among individuals and groups.

3.6 Data Collection and Administration

University systems collect information electronically and directly from the information source, and deliver it electronically and directly to those who need it. Intermediaries are added to the process only if they increase the value to the information being transmitted. University administrative data is collected and validated once, and is re-validated only when transformed. AUB follows institution-wide data administration policies and practices to ensure data coordination, integration and integrity across systems.

3.7 Infrastructure and Core Services

AUBnet and CNS data centres technical infrastructure is optimized to support both web and client / server data capture and data access. The infrastructure provides a common set of core services that supports efficient implementation, operation and management of applications in a distributed and collaborative computing environment. Core infrastructure services are provided to support access and interoperability between administrative computing systems. The infrastructure is accompanied by adequate support services to provide reliability, availability and serviceability to meet AUB business and information needs.

3.8 Standards

AUB technical infrastructure conforms to a set of open system standards and supports a limited number of hardware, software and networking choices. AUB continually evaluates new technologies, standards and products that have the potential to further enable AUB's academic mission lower costs or improve overall productivity.

3.9 Application Design and Implementation

Applications are designed and implemented to be easily adaptable to multiple and changing business and technology needs. Applications are designed and implemented so that data collected and maintained by them may be used for multiple purposes, including operations, planning and decision making. Application interface designs conform to an AUB user interface standard that ensures consistency of appearance and behaviour across applications and platforms.

3.10 Consequence of Non-Compliance

Non-compliance with this policy could severely impact on the operation of the institution by exposing the university to permanent loss of university data leading to loss of financial records, students' records, patients' records, research materials and/or university research funds. It may also expose the individual or the university to legal action.

4.0 CONCLUSION

The case history of American University of Beirut (AUB) goes to demonstrate the key roles that policies, regulations and guidelines play in the implementation of an information management technology project. The laid down rules clearly formalizes structures to follow for smooth operations in an organisation.

5.0 SUMMARY

This policy and guidelines apply to all critical administrative computing systems involved in the creation, updating, processing, reporting, distribution, archiving and other uses of administrative information. AUB academic and administrative policies and procedures, processes and supporting information technology are designed to enhance productivity, reduce costs and enable efficient and effective workflows. The owner of an administrative system is responsible for the definition of the scope of the project, development of a project plan, assignment of responsibilities and management of the project.

Evaluation and approval of information system investments is based on a business case and full-cost analyses, including the costs of managing and maintaining technology investments throughout their expected useful lives. University administrative data is sufficiently accessible, comprehensive, timely, accurate and flexible to accommodate the information and reporting needs of faculty, doctors, staff and students. University systems collect information electronically and directly from the information source, and deliver it electronically and directly to those who need it.

AUBnet and CNS data centres technical infrastructure is optimized to support both web and client / server data capture and data access. AUB technical infrastructure conforms to a set of open system standards and supports a limited number of hardware, software and networking choices. Applications are designed and implemented to be easily adaptable to multiple and changing business and technology needs. Non-compliance with this policy could severely impact the operation of the institution by exposing the university to permanent loss of university data leading to loss of financial records, students' records, patients' records, research materials and / or university research funds.

6.0 TUTOR-MARKED ASSIGNMENT

1. Mention ten (10) responsibilities of process sponsors / owners in the guidelines of AUB.
2. List five (5) responsibilities of an IT coordinator in AUB.

7.0 REFERENCES/FURTHER READINGS

CNS-P-ADM-APPS (2003). Information Technology Management: Principles, Policies and Guidelines.

U.S. Department of State for Foreign Affairs Manual Volume 5 – Information Management 5 FAM 820 page 1 of 4.

UNIT 2 MANAGING APLICATION DEVELOPMENT PROJECTS

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1.0 INTRODUCTION

Application development management involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance and system maintenance for all major business / IT development projects. Managing application development requires managing the activities of teams of system analysts, software developers and other information system and technology professionals working on a variety of information systems development projects. Thus, project management is a key management IT responsibility if business / IT projects are to be completed on time, within their budgets, as well as meeting their desired objectives. In addition, some systems development groups have established development centres staffed with information technology professionals. Their role is to evaluate new application development tools and to help information systems specialists use them to improve their application development efforts.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list and explain practical tips that aid you in planning, organising and controlling a development project

- discuss how to promote teamwork in project development
- explain why business focus has to be maintained
- describe the tips to aid in building a solid infrastructures for a project
- distinguish whether your project sponsor is committed to your project or not.

3.0 MAIN CONTENT

3.1 Recognise Need for strong Project Management

Project management is "real work". It is not a spare-time activity. Surveys of failed software projects continue to point to poor project management as a major cause:

- "Bad project management remains a major problem". Computing Canada, 97.12.22
- "Most common reason (for project failure) is poor project planning".

To be successful, any project needs strong project management addressing the functions of planning, organising, leading and controlling.

(1) Planning

Make sure you know right from the start of your project the priority ranking for the three things you must manage: scope, schedule, and cost. "All three are critical" is not an acceptable answer. The way these are ranked makes a big difference to how you run your project: make decisions, structure the work, resolve issues, etc. Ensure the team includes people who have strong project management skills either through staffing or providing project management training.

If you plan well, ***believe in what the plan tells you,*** especially with respect to resources required. You may not like the message it conveys, but it is the most realistic assessment you have of what is required to get the job done. Don't ignore.

Define, implement and identify issue resolution process. Project progress can be significantly held up and deadline missed because there is no clear understanding of how to get issues resolved. Define a process which identifies the information required, when and how issues will be addressed (e.g. weekly meeting), and who will be involved. As well, define an escalation process; who will the team go to if they cannot resolve the issue.

If the project is high risk, consider planning for outside project reviews to assess the health of the project along the way.

(2) Organising

Get started early. As soon as the project and project manager are identified, begin getting the team and infrastructure in place. This includes not only identifying team members, but arranging for their participation, including technical, business and vendor resources. Particularly in today's climate with the information system resource shortage we face, it may take considerable time to find the resources required.

Other tasks to consider are arranging for office space, especially if you're assembling a large team or one consisting of a large number of external staff. Order hardware, software, office equipment and furniture. Arrange for network connections and telephone line hook-ups. These items frequently have long lead times. You will significantly improve your ability to meet the deadline at the back-end by getting your team in place and productive quickly right at the outset.

To be successful, critical, high risk or time-constrained projects must have a strong core of dedicated, full-time members. The core team must comprise representatives from information system, the business and the vendor, if applicable. This is a serious effort and must be treated as such. For other projects, a part-time team can work only if managed closely with strong leadership to keep the team members focused and making progress.

(3) Leading

Pay attention to the progress of all key factors: budget, schedule, work effort, deliverables and quality. Compare the actual status of each of these factors against where the plan said they should be as of this date.

Track work effort and compare it to the estimate on a task-by-task basis. This will provide a check to ensure the scheduled completion date is reasonable. It also will allow you to assess the accuracy of your estimates for that type of task, and for all tasks, in general. With this information, you can re-estimate your project if you determine your estimates are consistently too high or too low.

Monitor weekly. Look not only for current problems but potential problems which might be developing while you still have time to take action to head them off.

Stick to milestone dates and other deadlines; particularly in time-constrained projects, interim deadlines are critical and should be treated as such. If not, tasks closer to the implementation date get squeezed, resulting in lower quality, higher risk and greater strain on the team.

(4) Controlling

Inadequate scope control is a significant cause behind projects that are considered failures or are cancelled.

Unlike package implementations where scope can generally be controlled more easily (unless extensive modifications are being made), scope control for custom development projects is one of the biggest challenges. Unless rigorous scope control processes are implemented and followed from the outset, custom development projects can easily grow out of control.

According to Alberta '95 Survey, conducted by Adrian Ilincuta and Dr. Francis Hartman of the University of Calgary, requirements and scope represent the fourth highest risk factor that impacts on the success of software projects. This survey also quotes Capers Jones, Computerworld 1993, who identifies that 80% of all software projects are at risk of creeping user requirements. No other risk factor impacts on a higher percentage of projects.

Tips:

- Define a reasonable scope at the outset to ensure the necessary business benefits are achieved, and then manage this scope closely throughout the project. Define a formal change control process that includes who can submit a change request; what information must be provided; what the review process will be (when and by whom); and who has authority for approving change requests. A tip to avoid frivolous changes: ensure the information required from the person making the request includes *Benefits* and the requestor's *Supervisor / Manager's Approval*.

- Ensure all team members have a clear understanding of what the project scope includes and excludes. All team members will need to watch for changes to ensure they are identified and processed appropriately.

- Allow time in the original plan for *analysis* of change requests. Be aware, however, that even just the analysis of change requests can overwhelm the team. Be prepared to request a moratorium on change requests from the Steering Committee.

- Build sometime for changes into the plan; recognising that some change is inevitable. On average, scope creep typically occurs at a rate of 1% per month; for example, if the system has 1,000 requirements, the project will identify 10 new requirements each month (Edward Yourdon, Real World Project Management, 1998). Note, however, this rate can vary widely, depending upon the project. If change requests are approved beyond what you included in the baseline plan, then change the baseline.

- Beware of "small changes" that "could be easily slipped in". All changes should follow the same change approval process; otherwise, a precedent is set which becomes difficult to manage. As well, not all "small changes" are, in fact, small; the full impact of a change may be underestimated.

- Beware of the weight of multiple change requests. The team and the organisation can grow weary if the system under-development is continually being "enhanced" and, as a result, never gets delivered.

3.2 Promote Teamwork

Teamwork is a key success factor for any type of project and can be viewed from different perspectives. One important perspective that can impact the success of a project is the "sense of team" established throughout the project.

A strong "team" can accomplish unrealistic objectives. A "we-they" attitude for any reason on a project team can undermine this effort. A team approach to the project is critical. That means teamwork between the clients and the systems people at all levels. The client, project manager, or sponsor and the systems project manager must be working together, in the same direction. They must demonstrate a united front to their team and to the outside world.

This same concept extends up and down the project organisation – between users and systems staff, employees and consultants, vendor staff and other team members, management and staff. All must work together. A "we-they" attitude will lead to finger-pointing and looking for excuses instead of looking for answers.

Tips:

- Focus attention on building and maintaining the team. Spend the time upfront to plan events that allow team members to get to know one another; for example, project kick-off, weekly team meetings, informal social activities (lunches / drinks / dinners), and milestones celebrations. This should include ALL team members – systems, business, and vendor.

- Make every effort to co-locate the team. This promotes greater communication, which leads to greater understanding.

- Allow plenty of time for team members to communicate and review not only issues, but the activities they're working on. This will help to promote understanding and integration of project tasks and identify possible discrepancies early enough.

- Define and communicate the business objectives for the project clearly so that all have the same vision of what they're trying to accomplish.

- Pick "volunteers" over "forced labour" wherever possible, even if this means using a less experienced resource. Attitude counts for a lot.

- Promote the importance of strong teamwork within your team. Allow time at weekly status meetings to deal with team-related issues. Encourage your project leaders to spend time coaching their team members.

- Plan for recognition. Include not only the project team but supporting business and technical groups.

3.3 Maintain Business Plan

A project which has no valid business objective is a project doomed to failure. Recent studies indicate that approximately 50% of information system projects deliver no business value to the organisation. (The Squandered Computer, Paul Strassmann, The Information Economics Press, 1997). Regardless of what project you're doing, you and your team must always remember WHY you're doing it. And the WHY must have a business focus. With few exceptions, organisations are not in the business of information processing. Systems projects are not an end in themselves; we implement new systems solely to support the business. Sometimes, it's easy to lose sight of that fact, especially for people who are dedicated to the craft of systems, and we end up with technical projects looking for a solution.

Tips:

- Define and communicate the business objectives behind the project to every team member, such that each individual can easily explain them to the most senior executive of the company.

- Keep the business objectives in front of the team and be sure that the actions of the team support those objectives.

- Differentiate between "features" and "benefits". Features describe what the project will deliver; while benefits describe why it is being done.

- Manage the business case throughout the project. Continually revisit it to ensure that a valid business case does, indeed, exist. Projects are forever getting challenged by various stakeholders and the project manager needs to define the project. Conversely, conditions will sometimes change which reduce the benefit of a project, or increase its cost. We must also be prepared to recommend that a project should not continue.

It is also important to manage the business case beyond the end of the project to ensure it comes through. Assign accountability to (a) business leader(s) to realise the benefits after the system has been implemented.

3.4 Cultivate Strong Business Commitment

The lack of top management involvement and support is one of the top three reasons for project failure. While top management support can go a long way to helping get the project completed, long-term success is also dependent on commitment and ownership from all stakeholder business areas. This is the clients' system. Both the systems people and the clients must understand that from the outset. Therefore, it is not just client participation in the project, but client accountability. Unlike package implementations where, for the most part, the business practices are defined by the software, custom development is often a 'green field' or redesign of an existing software system. Therefore, getting the top talent from the business areas is an essential ingredient to defining the innovative solutions that will meet the company's current and future needs.

Tips:

- The project sponsor must be firmly behind you; if not, you either need to increase your selling efforts or consider shelving the project. Some techniques for cultivating a supportive sponsor are:

- focus on the business benefits vs. the technology
- explain the sponsor's role (this role may be new to him/her)
- understand how the new system will impact the sponsor, and
- coach the sponsor; tell him/her how the business can help make the project a success.

Note: If your project sponsor is not interested in getting into the details or understanding status on at least a bi-weekly basis, question how committed he/she is to getting the project done.

- Use the Steering Committee to your advantage. Have one! Pick representatives carefully; they should be influential, have credibility in the organisation, and support the project. Describe clearly what the business can do to help. Actively engage it to assist in finding project resources, selling to the organisation, resolving project issues and clearing roadblocks etc.
- Assign the most knowledgeable / valuable business resource(s) to assist with requirements definition, design, procedures development, testing, training etc. This is the person everyone goes to when they need help or assistance with issues in the business area. If it doesn't hurt the business to "lose" this person, you probably don't have the right person!
- Job appraisals for each team member should include the results of his/her participation on the project.
- Get full-time commitment to the project. If you try to do it with part-time resources, you're setting yourself up for failure. The normal job will compete and try to consume up to 100% of the person's time. Back fill current duties with other staff or contract personnel.

3.5 Address Organisational Impact

Projects bring change. Change cannot be implemented successfully by focusing only on the end product. To be successful, the business environment in which the end product will be used must also be addressed. The culture of the organisation needs to be taken into account. What impact will the new system have on current jobs, will jobs be eliminated? Will new responsibilities be required and will power shift in the organisation?

Tips:

- Projects are more than the technical stuff! Successful projects recognise the need for organisation impact management and incorporate it into the project plan. Activities to include are:

  - organisational assessment (readiness for change / competencies)
  - business process analysis, design and implementation
  - skills development needs analysis, design and delivery
  - organisational analysis and design (including performance measures)
  - ongoing performance measurement.

- The greater the geographic area impacted, the greater the effort. Ensure staff outside the head office are involved. Set up a working committee of field office personnel or better yet, add people from the field offices to the core team. As well, start the communication early, meet with them, understand their concerns and target your communications on addressing their concerns.

- Staff this function with people who have this expertise – it isn't as easy as it looks! Look for people with skills and/or formal training in psychology, organisational design, business process reengineering, and adult learning.

- Integrate these team members with the rest of the team and integrate their tasks with the rest of the project. Organisational impact management isn't just the responsibility of the "change management team members". In fact, it's everyone's responsibility.

- Given that everyone is responsible for organisational impact management, be sure to provide coaching or guidance to all team members about its content and importance.

3.6 Tailor Your Approach

Custom application development typically requires much more focus on the development processes than installing a software package. The approach must be tailored for each particular project depending on the specifics of the business and technical environment.

Tips:

- Implement best practices that have evolved and been refined in previous projects. When best practices are not available, strongly consider acquiring and following an industrial-strength, proven methodology. In essence, you are acquiring industry-level "best practices" that you can adopt and evolve.

- A methodology is especially recommended when:

- best practices have not been captured historically
- previous projects have not been especially successful
- the team includes many junior people
- using a new approach for the first time (i.e. OO, RAD, etc.)
- the project is high risk or critical.

- Bring the methodology vendor out onto the limb with you. Take advantage of the vendor's "quick start" programmes. Use experienced mentors / coaches to walk you through the first couple of projects from start to finish; get people who have used that methodology to successfully deliver projects.

- Everyone is familiar with the shelves full of dusty methodology binders. Do not attempt to follow every step in every binder. Methodologies' tainted reputation is often the result of inappropriate implementation rather than inherent flaws in the methods themselves. Use the coach to "walk you through the minefield" by determining which deliverables, steps and processes are appropriate for your specific project. Customize and "prune" where necessary.

- Be very cautious about growing your own methodology – you're really just reinventing the wheel. By the time you're done, you'll probably spend close to the price you would have paid to buy one initially.

- Demonstrate Intelligence and Wisdom – "Intelligence is learning from your mistakes; Wisdom is learning from the mistakes of others". When starting a project, consider learning from the previous projects in that environment. At the end of your project, conduct a brainstorming session with your team to identify what went well and what could have been done better. Consider all aspects of the project, including process, deliverables, client relationships, scope control, etc. You may want to use an external facilitator. Ensure that everyone understands this is not a fault-finding or finger-pointing session. Publish results and share them with future projects.

3.7 Deliver Quality

The business will quickly forget the project was 'on-time and on-budget' if the quality of the system does not meet expectations. One of the best long-term indicators for a successful project is a quality system.

Tips:

- Quality is built-in from the beginning by adopting high quality processes (as described in "Tailor Your Approach"), and by properly capturing business requirements. Ensure that you're communicating your understanding of requirements back to the clients in a form that makes sense to them. Suggestions: data flow diagrams, input-process-output diagrams, brief text descriptions, etc.

- Quality is monitored along the way. Project management and deliverables reviews will gain you 80% of the bang for the QA buck. Review the first or second output of each programmer to identify any problems early. These can be one-on-one with a peer, or in a formal meeting setting.

- Quality is confirmed when work is completed – TEST! TEST! TEST!

    - Thorough testing is mandatory for any kind of technical development. At a minimum: test each development unit, system test (includes technical component integration and ensuring that business requirements are met); and user acceptance test. System and user testing should also test the business processes, procedures, user manuals, etc. Define exactly what is included in each test.

    - Incentive must not be purely on quantity of programmer output; there must be emphasis on quality of output. This especially applies to vendors of application software packages. Why torture your customers by making them do your testing for you?

    - Unit and technical system testing can be highly manual and expensive, and it may still be impossible to test every possible set of conditions manually. Where feasible, consider automated testing tools or utilities.

3.8 Quality of Converted Data

- Data conversion can be trickier in a custom development situation because you don't have an application vendor walking in with pre-built conversion routines. There are many "gotchas" here:

    - One-time conversion of master and historic data to new database formats often takes longer than scheduled and costs more than budgeted. Don't underestimate time to perform data cleanup, and fix data anomalies.

- If pressed for time, consider converting recent history first and then moving back into history. It may be possible to go live on your new system if at least the last few months of data are available, and you continue converting older data after going into production.

3.9 Solid Technical Infrastructure

Don't underestimate the implications of selecting appropriate technical architectures and tools. A major source of grief on custom development projects is when the technology lets you down. This was not a big issue in the mainframe days – there were limited vendors and established standards. Now, we are trying to integrate many components which are constantly evolving: servers, middle-ware, different operating systems, front-end tools, DBMS', etc and all from different vendors.

Tips:

- Proceed with caution if there is any uncertainty regarding the architecture and infrastructure you'll be delivering your system on. Ensure there is a process in place for selecting technology products, and that those responsible for making these decisions commit to a specific deadline. If it's a new environment, consider conducting some early prototyping or proof-of-concept activities to confirm its feasibility.

- Ensure that all components will fit and work together as intended; you'd be surprised how often a particular version of a tool may not work on a particular version of a hardware platform, operating system release, or DBMS version, etc.

- Verify that performance will meet client expectations. Ensure the environment is scalable enough for anticipated future requirements.
- Determine if there are telecommunications network considerations – i.e. performance, overloading, available bandwidth, etc.

- Make best efforts to ensure external vendors can deliver: they are not over extended in terms of resources and other client commitments; they understand the complexity of your requirements; and they are financially stable. Monitor and track their progress on an ongoing basis.

- When using a new tool or programmers are not experienced in a particular development language, get an expert for a short period (pay big bucks if necessary) to build decent templates or shells that the team can clone. Build one sample programme of each type that will be required. Don't bother with extra steps that does not add much value like stripping working code down to generic shells, etc.

- When performance, response time, throughput, etc., are critical to the application's success, do not scrimp on the testing hardware environment. It may be very valuable to have a test environment configured very similar to the ultimate production platform so that performance timings are relatively accurate and users can be confident that performance will be acceptable.

- Be sure to manage and secure source code and documents, whether using automated tools or manual procedures. You do not want an incident on your project where someone accidentally deletes a major part of the system source code when cleaning up file directories.

- Establish simple, clear procedures for promotion of code from the development environments into testing and on to production. Establish the role of change or configuration coordinator to be the expert and control this area.

3.10 Provide Leadership

People, communications and leadership skills are as critical to project managers as technical skills are to developers. Those skills will allow you to work with people, address conflicts and maintain a positive attitude and morale on your team. If you prefer getting intimate with technology and do not really like dealing with people, you may want to reconsider your ambitions of project management. Communication and people skills can be learned if there is a desire to acquire them.

Tips:

- Training – the marketplace is full of formal training and reference material in this area. Examples include Dale Carnegie's book "How to Win Friends and Influence People" and the Carnegie courses, Stephen Covey's "7 Habits …." Books and seminars, and in-house courses at large companies.

- MBWA (Management by Walking Around) – visit team members and ask lots of open-ended questions. You can't afford to wait until the next weekly status meeting to find out how things are going. A team member may not realise that their current challenge may actually impact another part of the project, so they may not have gone out of their way to bring it to your attention right away.

- The Golden Rule – treat everyone right. No matter how good a project manager you are, sooner or later, you or someone on your team will screw up. If you're a jerk, they will relish the opportunity to "nail you to the wall". If you're respected, everyone will pitch in to help out and correct the problem. In public, a good leader takes responsibility for things that go wrong, and gives the team credit for everything that went well.

- Your Attitude – if your project goes through any difficult times, it is your positive attitude that will keep the team going. When the going gets tough and things look bleak, remember that "nobody said it would be easy". They probably wouldn't opportunities to really make a difference – don't let them get you down.

- When Someone is not Working Out – proper leadership means making the tough decisions when necessary. If a team member isn't working out, don't torture everyone involved with drawn out corrective procedures; they often don't achieve the desired result. This may sound harsh, but "amputate the cancerous limb when necessary". If a person is not a good fit, they may be just as unhappy being there as you are with their performance. Nudging them out of their comfort zone can motivate them to get work that is a better fit for their particular skills and abilities. The sports world is rife with examples where poor performers became stars after being traded.

- Decision Making – don't make "knee-jerk" decisions based on frustration or emotion, and don't "waffle" with decisions once they are made. Follow the process appropriate for the decision that is required, communicate that decision and move forward. Changing your mind on hasty, ill-thought-out decisions causes frustration and uncertainty on the team.

4.0 CONCLUSION

Managing an application development project requires skills that cut across professions. That is, information technology skills alone will not be enough to successfully drive a management development project to conclusion. It thus means that all who are involved in managing application development projects should be diversified in the development, acquisition and application of skills to achieve optimal results.

5.0 SUMMARY

Application development management involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance and system maintenance for all major business / IT development projects. Teamwork is a key success factor for any type of project and can be viewed from different perspectives. One important perspective that can impact the success of a project is the "sense of team" established throughout the project. A project which is struck without a valid business objective is a project doomed to failure. The lack of top management involvement and support is one of the top three reasons for project failure.

Projects bring change. Change cannot be implemented successfully by focusing only on the end product. Custom application development typically requires much more focus on the development processes than installing a software package. The business will quickly forget the project was 'on-time and on-budget' if the quality of the system doesn't meet expectations. Data diversion can be trickier in a custom development situation because you don't have an application vendor walking in with pre-built conversion routines. Don't underestimate the implications of selecting appropriate technical architectures and tools. A major source of grief on custom development projects is when the technology lets you down.

People, communications and leadership skills are as critical to project managers as technical skills are to developers. The marketplace is full of formal training and reference material in this area. Examples include Dale Carnegie's book *How to Win Friends and Influence People* and the Carnegie courses, Stephen Covey's "7 Habits …" books and seminars and in-house courses at large companies.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss some of the tips for scope control in project management.
2. Mention five (5) ways you can develop a strong leadership for an IT project.

7.0 REFERENCES/FURTHER READINGS

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UNIT 3 STRATEGIC INFORMATION TECHNOLOGY PLANNING

CONTENTS

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1.0 INTRODUCTION

For a long time, relationship between information system functions and corporate strategy was not of much interest to Top Management of firms. Information systems were thought to be synonymous with corporate data processing and treated as some backroom operations in support of day-to-day mundane tasks (Rockart, 1979). in the 1980's and 1990's, however, there has been a growing realization of the need to make information systems of strategic importance to an organisation. Consequently, strategic information systems planning (SISP) is a critical issue. In many industry surveys, improved SISP is often mentioned as the most serious challenge facing IS managers (Pavri and Ang, 1995; Beath and Orlikowski, 1994; Martin, 1993; Porter and Miller, 1985). Planning for information systems, as for any other system, begins with the identification of needs. In order to be effective, development of any type of computer-based system should be a response to need – whether at the transaction processing level or at the more complex information and support systems levels. Such planning for information systems is much like strategic planning in management. Objectives, priorities and authorization for information systems projects need to be formalized. The systems development plan should identify specific projects slated for the future, priorities for each project and for resources, general procedures and constraints for each application area. The plan must be specific enough to enable understanding of each application and to know where it stands in the order of development. Also, the plan should be flexible so that priorities can be adjusted if necessary. King (1995), in his recent article, has argued that strategic capability architecture – a flexible and continuously improving infrastructure of organisational capabilities – is the primary basis for a company's sustainable competitive advantage. He has emphasised the need for continuously updating and improving the strategic capabilities architecture.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define strategic information planning
- discuss the evolution process of information technology
- state some of the characteristics of strategic information system planning
- discuss the types of methods used in strategic information planning, and the differences between them.

3.0 MAIN CONTENT

3.1 The Perspective of Strategic Information Systems Planning

In order to put the planning for strategic information systems in perspective, the evolution of information systems according to the three-era model of John Ward, et al. (1990) is pertinent. According to this model, there are three distinct, albeit overlapping eras of information systems, dating back to the 1960's. The relationship over time of the three eras of information systems is shown in table 1:

ERA	CHARACTERISTICS
1960's Data Processing (DP)	Stand alone computers, remove from users cost reduction function
1970's and 1980's Management Information Systems (MIS)	Distributed process, interconnected, regulated by management service, supporting the business, user-driven
1980's and 1990's Strategic Information Systems (SIS)	Networked, integrated systems, available and supportive to users, relate to business strategy, enable the business to be business-driven

Table 1: The Three Era Model of IS [Adapted from Ward (1990)]

Applications in the overall Data Processing (DP), Management Information systems (MIS) and Strategic Information Systems (SIS) areas need to be planned and managed according to their existing and future contribution to the business. Traditional portfolio models consider the relationship of systems to each other and the tasks being performed rather than the relationship with business success. A portfolio model derived from McFarlan (1984) considers the contribution of IS / IT to the business now and in the future based on its industry impact. Based on this model, applications are divided into four categories, as shown here:

Strategic

Applications which are critical for future success. Examples: computer-integrated manufacturing, links to suppliers, etc.

Turnaround

Applications which may be of future strategic importance. Examples: electronic data interchange with wholesalers, electronic mail, etc.

Factory

Applications which are critical to sustaining existing business. Examples: employee database, maintenance scheduling, etc.

Support

Applications which improve management and performance, but are not critical to the business. Examples: time recording, payroll, etc.
Some characteristics of strategic IS planning are:

- Main task: strategic / competitive advantage, linkage to business strategy.
- Key objective: pursuing opportunities, integrating IS and business strategies
- Direction from: executives / senior management and users, coalition of users / management and information systems.
- Main approach: entrepreneurial (user innovation), multiple (bottom-up development, top down analysis, etc.) at the same time.

Strategic Information Systems Planning in the present SIS era is not an easy task because such a process is deeply embedded in business processes. These systems need to cater for the strategic demands of organisations, i.e. serving the business goals and creating competitive advantage as well as meeting their data processing and MIS needs. The key point here is that organisations have to plan for information systems not merely as tools for cutting costs but as means to adding value. The magnitude of this change in perspective of IS / IT's role in organisations is highlighted in a Business Week article, 'The Technology Payoff' (Business Week, June 4, 1993).

According to this article, throughout the 1980's US businesses invested a staggering US$1 trillion in the information technology. This huge investment did not result in a commensurate productivity gain as overall national productivity rose at a 1% annual rate compared with nearly 5% in Japan. Using the information technology merely to automate routine tasks without altering the business processes is identified as the cause of the above productivity paradox. As IT is used to support breakthrough ideas in business processes, essentially supporting direct value adding activities instead of merely cost saving, it has resulted in major productivity gains. In 1992, productivity rose nearly 3% and the corporate profits went up sharply. According to an MIT study quoted in the above article, the return on investment in information systems averaged 54% for manufacturing and 68% for all businesses surveyed.

This impact of information technology on redefining, reengineering businesses is likely to continue and it is expected that information technology will play increasingly important roles in future. For example, Pant, et al. (1994) point outs that the emerging vision of virtual corporations will become a reality only if it is rooted in new visionary information technology. It is information technology alone which will carve multiple 'virtual corporations' simultaneously out of the same physical resources and adapt them without having to change the actual organisations. Thus, it is obvious that information technology has indeed come a long way in the SIS era, offering unprecedented possibilities, which, if not cashed on, would turn into unprecedented risks. As Keen (1993) has morbidly but realistically pointed out that organisations not planning for strategic information systems may fail to spot the business implications of competitors' use of information technology until it is too late for them to react. In situations like this, when information technology changes the basics of competition in an industry, 50% of the companies in that industry disappear within ten years.

3.2 Strategic Information Systems Planning Methodologies

The task of strategic information systems planning is difficult and often time organisations do not know how to do it. Strategic information systems planning is a major change for organisations, from planning for information systems based on users' demands to those based on business strategy. Also, strategic information systems planning change the planning characteristics in major ways. For example, the time horizon for planning changes from 1 year to 3 years or more and development plans are driven by current and future business needs rather than incremental user needs. Increase in the time horizon is a factor which results in poor response from the top management to the strategic information systems planning process as it is difficult to hold their attention for such a long period. Other questions associated with strategic information systems planning are related to the scope of the planning study, the focus of the planning exercise – corporate organisation vs. strategic business unit, number of studies and their sequence, choosing a strategic information systems planning methodology or developing one if none is suitable, targets of planning process and deliverables. Because of the complexity of the strategic information systems planning process and uniqueness of each organisation, there is no one best way to tackle it. Vitale, et al. (1986) classifies SISP methodologies into two categories: ***impact*** and ***alignment***. Impact methodologies help create and justify new uses of IT, while the methodologies help category align IS objectives with organisational goals. Two view of SISP Methodologies:

(a) Impact Methodologies

1. Value Chain Analysis: The concept of value chain is considered at length by Michael Porter (1984). According to him, ‘every firm is a collection of activities that are performed to design, produce, market, deliver and support its product. All these activities can be represented using a ‘value chain’. Porter goes on to explain that information technology is one of the major support activities for the value chain. “Information systems technology is particularly pervasive in the value chain, since every value activity creates and uses information. The recent, rapid technological change in information systems is having a profound impact on competition and competitive advantage because of the pervasive role of information in the value chain. Change in the way office functions can be performed is one of the most important types of technological trends occurring today for many firms, though few are devoting substantial resources to it. A firm that can discover a better technology for performing an activity than its competitors thus gains competitive advantage” (Porter, 1985). A typical value chain is summarised thus:

Primary Activities

- Inbound logistics
- Operations
- Outbound logistics
- Marketing and sales
- Service

Support Activities

- Firm infrastructure
- Human resources management
- Technology development
- Procurement

Once the value chain is charted, executives can rank order the steps in importance to determine which departments are central to the strategic objectives of the organisation. Also, executives can then consider the interfaces between primary functions along the chain of production, and between support activities and all of the primary functions. This helps in identifying critical points of inter-departmental collaboration. Thus, value chain analysis:

(a) is a form of business activity analysis which decomposes an enterprise into its parts. Information systems are derived from this analysis.
(b) helps in devising information systems which increase the overall profit available to a firm.
(c) helps in identifying the potential for mutual business advantages of component businesses, in the same or related industries, available from information interchange.
(d) concentrates on value-adding business activities and is independent of organisational structure.

Strengths

The main strength of value chain analysis is that it concentrates on direct value adding activities of a firm and thus pitches information systems right into the realm of value adding rather than cost cutting.

Weaknesses

Although a very useful and intuitively appealing, value chain analysis suffers from a few weaknesses, namely:

(a) it only provides a higher level information model for a firm and fails to address the developmental and implementation issues;
(b) because of its focus on internal operations instead of data, it fails to define a data structure for the firm;
(c) the basic concept of a value chain is difficult to apply to non-manufacturing organisations where the product is not tangible and there are no obvious raw materials;
(d) it does not provide an automated support for carrying out analysis.

Value chain analysis, therefore, needs to be used in conjunction with some other methodology which addresses the development and implementation issues and defines a data structure.

2. Critical Success Factor Analysis: Critical success factors analysis can be considered to be both an impact as well as an alignment methodology. Critical Success Factor (CSF) in the context of SISP are used for interpreting more clearly the objectives, tactics and operational activities in terms of key information needs of an organisation and its managers and strengths and weaknesses of the organisation's existing systems. Rockart (1979) defines critical success factors as being 'for any business the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organisation'. As shown in figure 3, CSF's can exist at a number of levels. They represent the few key areas where things must go right for the business to flourish.

   Consequently, critical success factors are areas of activity that should receive constant and careful attention from management. Rockart originally developed the CSF approach as a means to understanding the information needs of CEOs. The approach has subsequently been applied to the enterprise as a whole and has been extended into a broader planning methodology. It has been made the basis of many consulting practices and has achieved major results where it has been used well. CSF's can exist at a number of levels, i.e. industry, organisational, business unit, or manager's. CSF's at a lower level are derived from those at the preceding higher level. The CSF approach introduces information technology into the initial stages of the planning process and helps provide a realistic assessment of the IT's contribution to the organisation.

Strengths

CSF analysis provides a very powerful method for concentrating on key information requirements of an organisation, a business unit, or of a manager. This allows the management to concentrate resources on developing information systems around these requirements. Also, CSF analysis is easy to perform and can be carried out with few resources.

Weaknesses

(a) although a useful and widely used technique, CSF analysis, by itself is not enough to perform comprehensive SISP, it does not define a data architecture or provides automated support for analysis;

(b) to be of value, the CSF analysis should be easily and directly related back to the objectives of the business unit under review. It has been the experience of the people using this technique that generally it loses its value when used below the third level in an organisational hierarchy (Ward, 1990, p. 164);

(c) CSF's focused primarily on management control and thus tend to be internally focused and analytical rather than creative (Ibid);

(d) CSF's partly reflect a particular executive's management style. Use of CSFs as an aid in identifying systems, with the associated long lead-times for developing these systems, may lead to giving an executive information that s/he does not regard as important (Ibid.);

(e) CSF's do not draw attention to the value-added aspect of information systems. While CSF analysis facilitates identification of information systems which meet the key information needs of an organisation / business unit, the value derived from these systems is not assessed.

(b) Alignment Methodologies

1. *Business Systems Planning (BSP)*

This methodology, developed by IBM, combines top down planning with bottom up implementation. The methodology focuses on business processes which in turn are derived from an organisation's business mission, objectives and goals. Business processes are analysed to determine data needs and, then, data classes. Similar data classes are combined to develop databases. The final BSP plan describes an overall information systems architecture as well as installation schedule of individual systems. Steps in a BSP study are:

- Reduce and organise interview data
- Gain top management commitment
- Prepare for the study
- Conduct the kickoff meeting
- Define the business processes
- Define the data classes
- Analyse current business and systems relationships
- Interview leading executives
- Define an information architecture
- Determine architectural priorities
- Develop recommendations and an action plan
- Review the Information System Management

- Report results

Barlow (1990) and Ledrer and Sethi (1988) have discussed weaknesses of BSP Strengths:

Strengths

Because BSP combines a top down business analysis approach with a bottom up implementation strategy, it represents an integrated methodology. In its top down strategy, BSP is similar to CSF method in that it develops an overall understanding of business plans and supporting IS needs through joint discussions. IBM being the vendor of this methodology, it has the advantage of being better known to the top management than other methodologies.

Weaknesses

(a) BSP requires a firm commitment from the top management and their substantial involvement;
(b) it requires a high degree of IT experience within the BSP planning team;
(c) there is a problem of bridging the gap between top down planning and bottom up implementation;
(d) it does not incorporate a software design methodology;
(e) major weakness of BSP is the considerable time and effort required for its successful implementation.

2. *Strategic Systems Planning (SSP)*

Also known as PRO planner and developed by Robert Holland, this methodology is similar to BSP. A business functional model is defined by analyzing major functional areas of a business. A data architectural is derived from the business function model by combining information requirements into generic data entities and subject databases. New systems and their implementation schedules are derived from this architecture. This architecture is then used to identify new systems and their implementation schedule. Although steps in the SSP procedure are similar to those in the BSP, a major difference between SSP and BSP is that SSP's automated handling of the data collected during the SISP process. Software produces reports in a wide range of formats and with various levels of detail. Affinity reports show the frequencies of accesses to data and clustering reports give guidance for database design. Users are guided through menus for online data collection and maintenance. The software also provides a data dictionary interface for sharing SSP data with an existing data dictionary or other automated design tools. Steps in the SSP procedure are shown in figure 5. In addition to SSP, Holland System's Corporation also offers two other methodologies – one for guiding the information system architecture and another for developing data structures for modules from the SISP study. The strengths and weaknesses of BSP apply to SSP as well.

- Define new systems and their implementation schedule
- Analyze major functional areas
- Develop a business functional model
- Determine information requirements
- Combine information requirements into generic data entities and subject databases
- Derive IS architecture.

3. *Information Engineering (IE)*

This methodology was developed by James Martin (1982) and provides techniques for building enterprise, data and process models. These models combine to form a comprehensive knowledge base which is used to create and maintain information systems. Basic philosophy underlying this technique is the use of structured techniques in all the tasks relating to planning, analysis, design and construction of enterprise wide information systems. Such structured techniques are expected to result in well integrated information systems. IE relies on information systems for an enterprise. The system has three sides which represent the organisation's data, the activities of the organisation carried out using the data and the technology that is employed in implementing information systems. IE views all three aspects of information systems from a high-level, management oriented perspective at the top to a fully detailed implementation at the bottom. The pyramid describes the four levels of activities, namely: strategy, analysis, systems design and construction that involve data, activities and technology.

In addition to information engineering, Martin advocates the use of critical success factors. A major difference between IE and other methodologies is the automated tools provided by IE to link its output to subsequent systems development efforts, and this is the major strength of this methodology. Major weaknesses of IE have been identified as difficulty in security top management commitment, difficulty in finding the team leader meeting criteria, too much user involvement and that the planning exercise takes long time.

4. *Method / 1:*

Method / 1 (Arthur Andersen and Co., 1982) is a layered approach for SISP. The top layer is the methodology itself, the middle layer of techniques supports the methodology and a bottom layer of tools supports the techniques. Techniques supported by this methodology include data flow diagramming, matrix analysis, functional decomposition, focus groups and Delphi studies. Andersen Consulting's CASE tool set FOUNATION includes computer programs that support Method / 1. This methodology has five distinct objectives (Lederer and Gardiner, 1992):

- To identify the organisation's information needs;
- To find new opportunities for using information to achieve competitive advantage;
- To define an overall IT strategy satisfying the organisation's IT objectives;
- To define data, applications, technology and organisational requirements for supporting the overall IT strategy;
- To define the activities needed to meet the above requirements and thereby implement the overall IT strategy.

This methodology incorporates the value chain analysis in its approach towards business and competitive assessment. The ten work segments of Method / 1, their actions and products are:

1. ***Work Segment:*** Scope, Definition and Organisation

Actions

- Determine key planning issues
- Determine project scope
- Organise project team
- Obtain management commitment
- Definition of key planning issues
- Definition of project scope
- Schedule of key management checkpoints

Actions

- Proposal letter

2. ***Work Segment:*** Business and Competitive Assessment

Actions

- Study business and competitive environment
- Identify competitive opportunities
- Define strategic information needs

Products

- Opportunities to use information competitively
- Definition of priority-setting criteria

3. ***Work Segment:*** Present State Assessment

Actions

- Document present systems
- Assess effectiveness of information services
- Review functional operations
- Assess present operations
- Evaluate competitive IT position
- Evaluation of organisation's IT position

Product

- Description of present and planned application characteristics
- Assessment of present operations, architecture and capacity

4. ***Work Segment:*** Information Technology Opportunities

Actions

- Analyse IT trends
- Determine information needs
- Define major IT objectives
- Identify opportunities for improvement

Products

- Summary of needs of each major functional department
- Description of opportunities for improvement
- Summary of IT objectives and trends

5. ***Work Segment:*** Information Technology Strategies

Actions

- Develop high-level IT strategies
- Define conceptual architecture of required information systems
- Identify high-priority projects IT strategies

Products

- Description of high-priority projects

6. ***Work Segment:*** Organisation Plan

Actions:

- Develop change management approach
- Develop human resources plan

Products

- Organisation plan

7. ***Work Segment:*** Data and Applications

Actions

- Plan, define data and application
- Define data and maintenance approaches
- Develop data and application plan

Products

- Data and application plan

8. ***Work Segment:*** Technology Plan

Actions

- Develop technical architecture
- Develop technology plan

Products

- Technology plan

9. ***Work Segment:*** Information Action Plan

Actions

- Develop migration plan
- Prepare information action plan

Products

- Information action plan

10. ***Work Segment:*** Product Definition and Planning

Actions

- Initiate project definition
- Define requirements
- Develop a conceptual design
- Obtain management advisory committee approval

Products

- Project definition report

3.2 Key Issues in SISP Methodologies

Lederer and Sethi (1988) surveyed 80 organisations to examine the problems faced by information systems managers when they attempt to implement one of three alignment methodologies, BSP, SSP or IE. Barlow (1990) has also examined the SISP methodologies and has provided some insights into their structure and implementation problems. Bergeron et al. (1991) examined the issue of application of two 'impact' methodologies, Porter's Value Chain Analysis and Wiseman's Strategic Thrust Methodology. These studies and the insights developed by us form the basis of this section, which provides a critique of the existing methodologies. The detailed list of problems in implementing SISP methodologies has been classified by Lederer and Sethi as resource, planning process, or output-related problem associated with the three methodologies.

According to this survey, the most severe problem identified by IS managers is the failure to secure top management commitment for carrying out the final plan. The second most severe problem identified is the requirement for substantial further analysis after the completion of the IS plan. Both these problems are related to the output of the planning process. Besides these top two, six of the next top eight problems are related to the resources required to carryout the strategic information systems planning (success of the plan depends on the team leader, difficulty in finding the team leader meeting the criteria specified in the study, methodology lacking computer support, planning exercise taking long time, etc). Among the top ten problems encountered while meeting the criteria specified in the study, methodology lacking(or, even while implementing an in-house methodology), three are common:

difficulty in obtaining top management commitment for implementing the outputs, the requirement of substantial further analysis and difficulty in finding a good team leader. The results of this survey suggest that IS planners are not particularly satisfied with their methodologies. If the objective of the SISP exercise is to align IS objectives with business goals, then detailed, lengthy and complex SISP may be of limited value. Where the objective is to use IT to impact a business strategy, these methodologies may not generate useful ideas for that purpose. Bergeron et al. (1990), however, point out that the value chain analysis and Wiseman's strategic methodologies do help in achieving that purpose. Barlow (1990) suggests that rather than clarity to the IS planning process, salient points which emerge from this and the preceding sections are:

- Although strategic information systems planning are a major concern, most organisations find it difficult to undertake it. Besides their lack of experience with SISP, absence of a comprehensive, structured, easy to use methodology may also be a main reason for it. It is possible that the advances in Information Technology and their applicability in organisations has outpaced all formal technologies evolved in the 1970's and 1980''s or evolved in 1990's as marginally modified versions of the earlier methodologies, which were largely dominated by IBM's Business Systems Planning.

- Further, as pointed out by Barlow (1990) also, the overall success of an integrated business / technology architecture depends upon the organisational structure, the level of IT experience within the company and the availability of information resources. Since these factors differ between firms, there may not be a single best way to view IT planning.

- A comprehensive methodology for SISP will need to incorporate both the 'impact' and the 'align' views. Method / 1 incorporate Value Chain Analysis. IE supports Critical Success Factors Analysis. Even BSP is now incorporating CSFs.

- Since it is difficult to find a team leader who meets the criteria specified in SISP methodologies, it is proposed that detailed guidelines on how to perform a SISP study by way of an automated tool will help. Such a tool will make the task more structured and less leader-critical. Some such tools for strategic business planning have been developed by the Search Technology, Inc. and are reported in Rouse and Howard (1993).

4.0 CONCLUSION

Information-based enterprises must be planned in an integrated way whereby all stages of the life cycle are engaged to bring about agility, quality and productivity. This integration is similar in nature to the integration of product life cycle for an enterprise. The existing methodologies, however, tend to support information planning as an island separated from the wealth of the enterprise's information resources. A needed new approach would tap into these resources which capture and characterise the enterprise to allow for integration of the planning stage with information systems development stages and support a shortened and adaptive cycle.

5.0 SUMMARY

- For a long time, relationship between information system functions and corporate strategy was not of much interest to Top Management of forms. Information systems were thought to be synonymous with corporate data processing and treated as some backroom operations in support of day-to-day mundane tasks.
- In order to put the planning for strategic information systems in perspective, the evolution of information systems according to the three-era model of John Ward, et al. (1990) is pertinent.
- Applications in the overall Data Processing (DP), Management Information Systems (MIS) and Strategic Information Systems (SIS) area need to be planned and managed according to their existing and future contribution to business.
- The task of strategic information systems planning is difficult and often time organisations do not know how to do it. The concept of value chain is considered at length by Michael Porter (1984). According to him, 'every firm is a collection of activities that are performed to design, produce, market, deliver and support its products. Critical success factors analysis can be considered to be both in impact as well as an alignment methodology.
- CSF analysis provides a very powerful method for concentrating on key information requirements of an organisation, a business unit, or of a manager. This allows the management to concentrate resources on developing information systems around these requirements.
- The BSP methodology developed by IBM, combines top down planning with bottom up implementation. The methodology focuses on business processes, which in turn are derived from an organisation's business mission, objectives and goals.
- The SSP also known as PRO planner and developed by Robert Holland is a methodology that is similar to BSP. A business functional model is defined by analyzing major functional areas of a business.

- The IE methodology was developed by James Martin (1982) and provides techniques for building enterprise, data and process models. These models combine to form a comprehensive knowledge base which is used to create and maintain information systems.
- Method / 1 (Arthur Andersen and Co., 1982) is a layered approach for SISP. The top layer is the methodology itself, the middle layer of techniques supports the methodology, and a bottom layer of tools supports the techniques.
- Lederer and Sethi (1988) surveyed 80 organisations to examine the problems faced by information systems managers when they attempt to implement one of the three alignment methodologies, BSP, SSP or IE. Although strategic information systems planning are a major concern, most organisations find it difficult to undertake it. Besides, their lack of experience with SISP, absence of a comprehensive, structured, easy to use methodology may also be a main reason for it. All the generic tasks associated with SISP are performed at the top level and the information flows at that level are diagrammed.
- It is also hypothesized that the above model will provide an organisation a third alternative to develop applications based on either a comprehensive systems development life cycle or rapid prototyping.

6.0 TUTOR-MARKED ASSIGNMENT

1. List 10 (ten) characteristics of the major eras in information technology development.
2. Discuss the strengths and weaknesses of Critical Success Factor.

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UNIT 4 MANAGING CHANGE IN INFORMATION SYSTEMS TECHNOLOGY

CONTENTS

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1.0 INTRODUCTION

The dominant activity of the large-scale software industry is the production of changes to application systems. Most changes are due to enhancements in functionality (Lientz et al. 1978). People do not know in advance or are not able to accurately express all the desired functionality of (say) a large information system. Only experience from using the system in an operational environment will enable the needs and requirements to be properly formulated. The requirements assessment will continuously change during maintenance and new requirements may be as demanding as those that directed the initial construction (Lientz & Swanson, 1981). Other causes of change are: accommodation to new environments and error corrections (Swanson, 1976; Lientz et al. 1978). Some kinds of change may require extensive consequential change in the rest of the application, e.g. changes to data definitions (Marche, 1993; Sjoberg 1993a). figures describing the maintenance proportion of the total lifetime expenditure on a software system vary between 50% and 90% (Zelkowitz, 1978; Putnam, 1982; Chikofsky & Cross, 1990). Application systems live longer and grow in size and complexity; it is likely that this trend will continue (Pfleeger, 1987).

The often unexpected and confusing situations that may occur due to changing conditions and new insight during the information systems construction and maintenance process (Lientz and Swanson, 1981;

Bjerknes, 1992) may in turn lead to new user requirements. Many factors may influence change in user requirements: change in market, workforce, skills, economy, legislation, etc. The diversity and possibly conflicting interests among users, problems in programmer-user communication, programmer effectiveness, etc. may complicate the change process. Another crucial factor in system maintenance is the suitability of the underlying technology in coping with changes. Due to rigid structure in existing systems and inadequate methods and tools for change management, implementing necessary changes consequent on new user requirements are often impossible within reasonable costs. Information systems should be designed and implemented with change in mind, and the organisation should be planned for change (Brooks, 1975). It may difficult to persuade software builders and managers to plan for change since it requires some extra effort during initial construction which may hinder meeting short-term budget and time goals. The short-term thinking discourages designing for maintenance even though it is an investment that wills more than payoff in the long-run. The prevalent assumption of stability in current teaching and practice, data modelling, database scheme construction, etc. must be breached. New and improved methods and tools for implementing change are required. Tools providing software documentation are one example. Most documentation is notoriously poor and virtually always obsolete. The only reliable, up-to-date program information may be the source code itself or information that is automatically generated from the source code. This paper presents a recording tool that automatically generates and maintains information needed for change and consequential change propagation.

2.0 OBJECTIVES

This unit is using software development to demonstrate change process in information technology management. Therefore, at the end of this unit, you should be able to:

- identify the problems associated with software development
- explain the categories of software maintenance process
- discuss process of developing a software
- identify and explain tools used for developing a software
- discuss the result of studies carried out to determine the effectiveness of software development process.

3.0 MAIN CONTENT

3.1 The Problem of Change and Software Maintenance

The term ***software maintenance*** denotes all changes to the software of an information system after its first installation in its operational environment. Since software systems do not physically wear out or break (although a physical copy on any medium may deteriorate), software maintenance differs from general maintenance in that the former is not concerned with rectification to an earlier state. Software does not change on its own, but is changed by people (or possibly by other software such as tools) to adapt to changed requirements, to improve performance, to correct errors, etc. The maintenance activities have been divided into the following categories (Swanson, 1976):

- *Corrective maintenance* (detecting and correcting errors – routine debugging)
- *Adaptive maintenance* (accommodation of changes to the environment – including hardware and system software)
- *Perfective maintenance* (user requested enhancements, improved documentation and enhanced performance).

It has been reported that the respective categories count for 17%, 18% and 60% of the total maintenance activities (Lientz et al. 1978). Within the third category, two-thirds were user requested enhancements. This shows that the majority of changes are not due to errors or other causes that one might believe could be prevented by better requirements, analysis, design and implementation techniques. For example, one might argue that the software changes could be reduced by more use of prototyping techniques (Budde et al. 1992). Prototyping may be useful during initial construction and may enable end-users to express their needs and requirements more accurately in areas such as screen design and certain aspects of system behaviour. However, since new requirements, changing environments, bug-fixing, etc. are encountered after the system has become operational, it is the operational system itself, which has to be changed. The challenge is thus to build large, long-lived, data-intensive systems that can be incrementally modified in compliance with changing user needs. So, reducing the extent of perfective change is not necessarily desirable. It is usual for people carrying out tasks to recognise improved methods and opportunities. Information systems, for example, are therefore most likely to support people well if they facilitate change, and allocating resources to at least perfective change should be regarded as valuable.

The problem of change is closely related to scale. A whole class of problems only shows up when a system becomes long-lived (typically involving persistent data) and grows in size, complexity and diversity (variability). This is confirmed by studies showing that software maintenance costs are significantly affected by age, size (Lientz and Swanson, 1981) and complexity (Banker et. al. 1993). Methods, tools and programming languages are also the subject of new and changed requirements in order to cope with increase in scale. For example, they must support ***incremental*** design, construction and commissioning.

3.2 The Software Development and Maintenance Process

The classical model for describing the software development process is the so-called *waterfall model* (Royce, 1970). This analysis-design-implementation-testing model of the software development life cycle, however, does not comply with the way systems are built in the real world. Obvious inadequacies are the lack of recognition of the importance of system changes and its description of systems development as a sequential process. Some of the deficiencies are encompassed in the "spiral model" (Boehm, 1988) which adds the notion of risk analysis and allows for iteration of the development tasks. The problem of software maintenance is not explicitly addressed by any of these models, though it is common to extend the classical model with a separate maintenance phase after testing.

In practice, however, the phases of development are repeated during maintenance. New requirements must be determined, the existing software application needs redesigned (Braa et al. 1992) and re-coding, new tests must be undertaken, etc. This does not mean that the software development and software maintenance life cycles follow the exactly same pattern; at a detailed level, the stages and the relative effort applied to the stages may differ (Chapin, 1988). Nevertheless, to satisfy new user requirements, we need methods and tools for managing various kinds of software change – independent of whether they occur during initial construction or after the software application has become operational.

3.2 Change Propagation

It is deceptively easy to change software (simple editing). Software is therefore changed much more frequently than tangible products. However, it is not easy to make *consistent* changes; it is easy to cause a mutation, but very hard to generate a viable one, particularly if multiple copies have been shipped, etc. A change in one place may have unintended effects elsewhere; even minor local changes can have global impact. Included in the consequences are new errors (the ripple effect). One study found that more than 50% of all errors were due to previous changes (Collofello & Buck, 1987). The challenge is to ensure that all consequential changes are dealt with correctly by propagation throughout the system and that no unnecessary changes occur, perturbing working practices and operational software.

The issue of change propagation will be illustrated by an example (Figure 1). Many information systems are centred around a database. User requested enhancements in the functionality of such a system may typically require change in the kind of information provided by the database, which is described by a data model. (The "□" in the figure should be read "may imply"). A change to a data model must normally be propagated to the database schema. Changes to database schemata (schema evolution) may in turn have new user requirements change to data model change to db schema change to db data change to application programs serious impact on other parts of the schema, on extensional data (user data stored in the database) and on application programmes (including interfaces for data entry, queries, report generation, etc).

At present, schema modifications are often dealt with in an *ad hoc* way. The necessary data conversions and program modifications may be expensive due to factors such as a requirement to shutdown the system, programmer effort, machine resources, etc. However, research on schema evolution is emerging (Barnejee et al. 1987; Skarra & Zdonik, 1987; Lernere & Habermann, 1990; Monk & Sommerville, 1993). Work on quantifying the extent and form of schema evolution will be described in Section 4.

3.4 Change Management at the Project Management Level

Project management is an activity at the overall software life cycle level and involves tasks like scheduling, team management and resource allocation (people, programming languages, tools, operating systems, hardware etc). The administration of changes at this level is an important part of project management and is commonly referred to as ***change management*** (Humphrey, 1990) or ***change control*** (Ferraby, 1991). The change process is formalized in that all change requests are evaluated with respect to the need for the change, the impact of the change on the project and system, schedule of necessary activities, etc. During the implementation of a change, information is recorded about who did what, when, what is the status, what remains, etc. IBM's Information / Management product is an example of a tool providing support for such change management (IBM, 1992). The Change Management facility helps you coordinate the various tasks your organisation performs to make and test changes in your data processing environment. You can enter data about changes made to any area of your organisation's operations: to software and hardware components of the operating system or to procedures, publications and facilities.

Change management tools at this level are thus support systems that record information and produce corresponding reports.

3.4.1 Change Management at the Implementation Level

Developing the software of large and long-lived information systems is a complex and time consuming task. Methods and tools should assist in managing this complexity and increase the efficiency and reliability of the development. It is crucial that the software engineers and programmers find it worthwhile to learn and apply the methods and tools. They should not hinder normal working practice, but software builders must understand that they have to invest in setting up and preserving structure if they want an easier maintenance future. The following activities should be supported:

- Predicting change consequences (impact analysis)
- Propagating necessary consequential changes
- Detecting inconsistencies after change or preventing them
- Detecting and recording change (necessary for recompilation, etc).

A sophisticated maintenance tool should also support activities such as ***reverse engineering*** (Bachman, 1988) and ***automatic documentation***. There is a significant amount of "legacy systems" (Brodie, 1992) which will still be operational for many years to come. In order to satisfy new requirements, such code is continuously being modified causing deterioration of its structure (Lehman & Belady, 1985). One approach to help solve this problem is reverse engineering which is to generate an abstract version of a concrete program and then re-implement the abstract version. Typically, COBOL programs are being re-implemented in COBOL itself or in a more up-to-date programming language (Griswold & Notkin, 1992).

A severe problem in the software application industry is obsolete or missing documentation. The major reason for this is that documentation is normally not updated in accordance with modifications to the software. For some sorts of documentation, this problem may be alleviated by tools that provide automatic documentation based on static analysis of source code. Such tools may typically generate call graphs, control and data flow charts, cross-reference information, metrics reports, etc.

3.5 Software Maintenance Tools

Tools for managing change in information systems can broadly be divided into those supporting project management and those supporting implementation. Tools in the latter category are oriented towards technical issues, and they should, as far as possible, extract all the information they need automatically. One example of such a tool is the ***Thesaurus tool***.

3.6 The Thesaurus Tool

The Thesaurus tool was built by the author to support software maintenance at the implementation level (Sjoberge et al. 1993; Sjoberg et al. 1994a). The term ***Thesaurus*** generally denotes "a 'treasury' or 'storehouse' of knowledge, as a dictionary, encyclopaedia, or the like" (Oxford, 1961). (The term is not used in the more popular meaning denoting a dictionary of synonyms). In this context, the "knowledge" is information about names and identifiers such as where they are defined and used, what kinds they are, in which contexts they occur, etc. The information captures ***all*** the software written in ***all*** the languages of an application. Information about extensional data in a database is also included. The Thesaurus is a meta-database that focuses on names which are central to system builders' thinking and thus influence the way software is organised. Meaningful names are important for problem-solving, understanding of semantic structure and retention (Barnard et al., 1982; Weiser & Shneiderman, 1987; Anand, 1988). The choice of names for identifiers is crucial for the readability of programs and is particularly important when trying to administer and manage change. The meanings attached to names are relatively stable when dealing with concepts at an abstract level (even though the detailed semantics and interpretation may vary between people and between contexts). This contrasts with all changes in physical software implementations. Therefore, there is potential for tools that help manage the evolution while preserving the use of names. A focus on names may encourage people to be more conscious of what the names are supposed to refer to, though the semantic relation between names and what they refer to is a classical, largely unresolved problem (Nelson, 1992). Choosing names carefully would also prevent name ambiguity. The comprehensiveness of the thesaurus is in contrast to most commercially available tools which focus either on the source code only (source code analysers) or on database-specific information (data dictionaries). A few data dictionary tools also include source code information, but relationships between names and identifiers in the software written in the various languages are not recorded automatically. All the contents of the thesaurus are automatically maintained. The whole application system is analysed, and the thesaurus updated regularly, at times specified by the user, for example, daily at 02.00. A fully analysis and update can also be initiated at any time.

The author has built two Thesaurus tools. The HMS Thesaurus tool was developed for a health management system (HMS) in an industrial (C, C

++, X Window System and relational database) environment (Sjoberge, 1993a). Another Thesaurus tool was thereafter built in the research context of the strongly typed, persistent programming language between database systems and programming languages (Atkinson, 1978); a uniform model for representations and operations on persistent and transient data is provided). Some of the features of the thesaurus tools are:

- structure and dependency visualization;
- impact analysis, and
- automatic build management, including smart recompilation. (In large application systems, recompilations represent a significant part of the maintenance costs and may thus be a hindrance for required system evolution).

Moreover, well-structured software is a requirement for easy maintenance in the future (Lehman and Belady, 1985; Gibson & Senn, 1989). To ensure correctness and prevent deteriorating structure, a set of application independent constraints to which each suite of application software should adhere, have been defined (Sjoberge, 1993b). Another thesaurus-based tool automatically verifies these constraints.

When introducing a tool that automatically checks the quality of software, one should ask: Who should use the tool? How should the working process be organised to benefit as much as possible from the tool? How should the project management motivate and encourage active use of the tool? It is particularly important that inexperienced and immature programmers find bugs and inconsistencies by themselves before the software is released. The only purpose of the tool should be to improve the quality of the software; a negative attitude may be created if it is felt that the tool is used for individual monitoring purposes, e.g. by the project management.

The present tools focus on the implementation phase (initial construction and maintenance). There is a tradeoff between automation and to what extent also other phases of the life cycle can be supported. If design structures, data model specifications, etc. become more well-structured, thesauri may extend their scope of information and form a basis for tools supporting other phases of the life cycle as well.

3.7 Change Statistics

In order to more accurately identify the requirements of methods and tools for change management, relevant information about the extent and kind of change should be provided. For example, Lehman has proposed five "laws" concerning software evolution (Lehman and Belady, 1985), which are based on long experience and quantitative studies of several systems, mostly operating systems. The first two are as follow:

- A programme must continuously undergo change in order to reflect change in its environment. If not, the program will become less and less useful.
- As a large programme is continuously changed, its complexity increases, which reflects deteriorating structure, unless work is done to maintain or reduce it.

Changes to data models and database schemata are a kind of change that is particularly in the direction of quantifying such change, the HMS thesaurus tool (Section 3.3) was instructed to collect change measurements in a large health management system over a period of 18 months, both during initial construction and after the system became operational (Sjoberg, 1993). The results were:

- 140% increase in the number of relations
- 270% increase in the number of relations
- Every relation was changed
- More additions than deletions, but still a significant number of deletions.

The extent of schema evolution and the considerable consequential changes to code confirm the need for supporting tools.

Another study reports the evolution of the data models in seven traditional applications: "Sales and payments", "Property inventory", etc. (Marche, 1993). Approximately 60% of the entity attributes changes during the period investigation (6 to 80 months depending on the application).

The studies of Marche and the author are the only examples of data model or database schema evolution measurements found in the literature. In spite of the changes reported these studies, it is often claimed that there is less need for change in traditional systems since they are simpler and their functionality and behaviour better understood (Banerjee, et al. 1987). However, it could also be the case that the traditional systems are so rigid, and the consequences of change so extensive that due to lack of appropriate methods and tools, user requested change is simply rejected. An example is the Norwegian census database – a CODASYL network database containing 5 gigabytes of data about 5 million persons. In spite of changed user needs, the schema has not been changed during the last decade due to extreme costs – typically measured in units of person-years; any (minor) schema change would imply database reorganization and application code modification, the needed work amounting to at least half a person per year per minor schema change (Gloerson, 1993). To acquire more general knowledge about the extent and form of change, applications systems in various application domains should be measured. One may then be able to identify properties related to change consequences that are independent of application domain, data model and implemented system.

3.8 Automatic Measurement Collection

It may be impractical to collect change data manually in a large, real-world application system. There are two reasons for automating the process:

- ***Reliability:*** In large systems with frequent changes, manual collection is error-prone.
- ***Economy:*** It is very hard to persuade people on a project to spend time and effort on keeping tract of the change history.

The latter is one major reason for the lack of measurements in this area. Automating the process requires simple detection of change. For example, it may be hard for a tool to distinguish between a rename and a deletion followed by an addition. Moreover, it is often semantically difficult to tell what kind of change has occurred. For example, assuming a type Person has been renamed to Patient and at the same time had several attributes removed and added. Has Person been changed, or has Person been removed and a new type Patient been created? The more sophisticated categories of change we create, the harder is automation.

In the health management study reported in the previous section, the automatic change data collection was made complicated by the significant change also to other parts of the system structure and to the development environments. Due to changes to directory structures and file naming conventions, changes to the support software (e.g. operating system, DBMS, version control systems), etc. Tools collecting change statistics need to be subjected to the same change control mechanisms as the rest of the system understudy. Completely automated collection of change data seems thus impossible. Therefore, in order to collect reliable measurements of a real-world system, the application development people on the site must have the time and interest in cooperating with the experiment. One problem is to convince them that the data collection is worth the investment.

4.0 CONCLUSION

Adapting large, long-lived information systems to their changing circumstances and requirements, remedying errors and improving existing functions are the technologically most challenging issues for software engineers responsible for the implementation of such systems. Methods and tools for systems development should have an inherent understanding of the nature of evolution in large information systems; hence, they should provide adequate means for managing change, including necessary consequential change.

Identifying what is interesting to measure and carrying out experiments yielding reliable results are non-trivial tasks. For example, many human properties that are crucial for change management in large-scale information systems (people's efficiency, skill in management, ability to communicate, etc.) are difficult to measure. We are certain, however that much more than is the case at present could and should be measured within the fields of information systems and software engineering.

5.0 SUMMARY

- The dominant activity of the large-scale software industry is the production of changes to application systems. Most changes are due to enhancements in functionality. The often unexpected and confusing situations that may occur due to changing conditions are new insight during the information systems construction and maintenance process.
- The term ***software maintenance*** denotes all changes to the software of an information system after its first installation in its operational environment. Since software systems do not physical wear out or break. It is deceptively easy to change software (simple editing). Software is therefore changed much more frequently than tangible products.
- Tools for managing change in information systems can broadly be divided into those supporting project management and those supporting implementation. Project management is an activity at the overall software life cycle level and involves tasks like scheduling, team management and resource allocation (people, programming languages, tools, operating systems, hardware, etc).
- Developing the software of large and long-lived information systems is a complex and time-consuming task. Methods and tools should assist in managing this complexity and increase the efficiency and reliability of the development. It is crucial that the software engineers and programmers find it worthwhile to learn and apply the methods and tools.
- The Thesaurus tool was built by the author to support software maintenance at the implementation level. When introducing a tool that automatically checks the quality of software, one should ask:

Who should use the tool? How should the working process be organised to benefit as much as possible from the tool? How should the project management motivate and encourage active use of the tool?

- In order to more accurately identify the requirements and methods and tools for change management, relevant information about the extent and kind of change should be provided. In the health management study reported in the previous section, the automatic change data collection was made complicated by the significant change also to other parts of the system structure and to the development environments.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the categories of software maintenance.
2. List some features of a Thesaurus tool used for software maintenance.

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UNIT 5 DEVELOPING AND MANAGING CUSTOMER EXPECTATIONS IN INFORMATION TECHNOLOGY MANAGEMENT

CONTENTS

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1.0 INTRODUCTION

The acquisition, development and enhancement of application programs and the management of associated databases involve many long-term, strategic issues. Strategic concerns are critical, but the application raises many important tactical issues, as well. In many instances, since the operation and use of the applications and databases defines the farm's modus operandi, they demand serious attention form managers in the tactical and operational timeframes.

Tactical and operational concerns arising in the production operation portion of the IT organization are the focus of this unit. Production operation concern itself with the routine implementation and execution of the application program supporting the firm/s mission. Some of these application arte online nearly continuously. They operate in a highly interactive manner as they support hundreds, perhaps thousands of users. Other systems operate daily, weekly, or at month-end according to predetermined schedule. The nature of this schedule production work is operational and tactical. Because the firm's essential business activities depends on the production operation, the application must operate effectively. This activity is one of the critical success factors for the IT organization.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the tactical concerns in the production operation of IT organization
- discuss the operational concerns in the production operation of IT organization
- explain the disciplined approach to production operations management
- discuss the process of reaching agreement with IT customers on service levels
- explain components of service-level agreement
- outline methods for acquiring measures of customer satisfaction.

3.0 MAIN CONTENT

3.1 Tactical and Operational Concerns

The management of computer operation, whether owned or operate by IT or by a client organization, lends itself to disciplined approach. Careful management of any array of disciplines permits the organization to achieve success in this critical area. A large number of the firm's employee can quickly observe difficulties in computer operations.
Server failure in a distributed processing environment usually leads to failure throughout then client network. Failure of the central processing unit supporting the office system will be noticed promptly from the executive suite to the remote warehouse. Production operation is a vital and highly visible function.

In contrast to routine computer operations, an error or an omission in the strategic planning process, while perhaps more devastating to the long term, may not become apparent for months or even years. Production operation mangers lives are dominated by what is happening today and what will happen next month. It is mandatory that they have a management system that provides the tool essential for their success. More than other managers, they rely upon procedures and discipline to cope with the wide variety of challenges that may come their way.

3.1.1 Expectations

The fulfillment of executive expectations, whether or not they are realistic, is the principal standard against which IT managers are measured. We also learned that expectations are established through a variety of means. Some expectations are developed from sources external to the firm: from meeting with vendors, articles in the trade press, and meeting of business associates. These external developed expectations are re-enforced in the minds of the executives by a number of internal factors, such as the amount of resources devoted to information technology. Expectations may not always be soundly based; in some cases, the IT organization itself forms unreasonable expectations. It is essential that the organizations use a management system designed to coupe with the process of setting and meeting realistic expectations.

In this unit we further look at the tools, techniques, and process of developing and managing customer's expectations in the operation of these applications, processes that apply principally to short term. The concepts are formalized processes from achieving service-level agreements between the IT organization and it client. Theses agreements establish acceptable levels of service and include mechanisms for demonstrating the degree to which service levels are attained.

The objectives of the service-level agreement process are to ensure the entire firm has a clear knowledge of what is expected from the computer center operation. The process must also provide an obvious means for recording and publishing the client service delivered. Objectives always changes over time, and some objectives are not always completely achieved. Given this reality the goal of this unit is to focus on how well their organization is working to achieve it objectives. A clear understanding of this issue will overcome debate and confusion within the firm concerning what then measurements really are. The process being developed establishes service-level agreement and reports service levels achieved.

3.2 The Disciplined Approach

Service-level agreement (SALs) is the foundation of a series of management process collectively called the *disciplines.* A discipline is the management process consisting of procedures, tools, and people organized to deal with an important facet of the production operation, whether located within the IT organization or in a client organization.
Figure1.1 depicts the relationships among the processes comprising the disciplines of production operations.

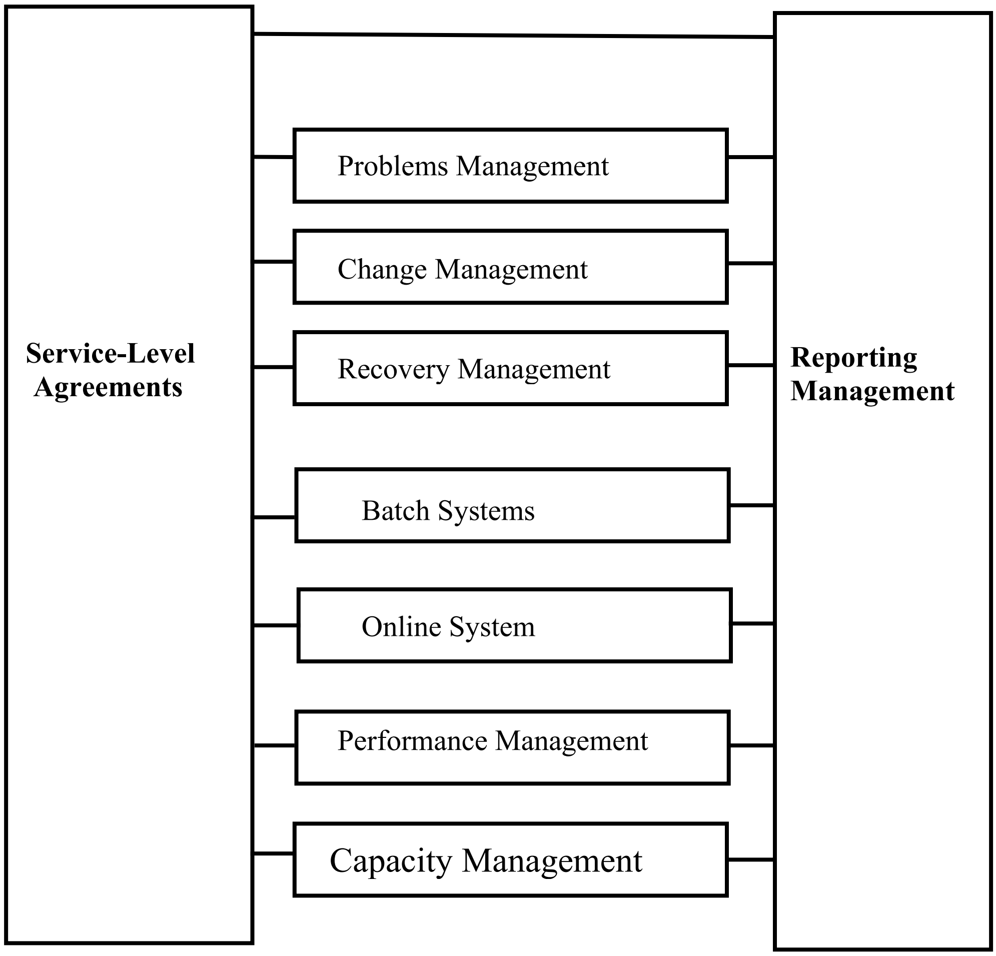

Figure 1.1: The Processes Continued

Computer center performance can best be judged specific, quantifiable service criteria. Negotiated service agreements establish client-oriented performance criteria so that performance assessment can be made. Service control and service management depend critically on these criteria.

Computer center performance is made visible to management through specific reports. Service-level agreement involves all client organization directly; but management reports are focused on specific organizations. Management report are an essential tool for production operations managers because they organize and present the results of the intermediate disciplines. Managers in client organization depend on them, also. The reports provide client with the information regarding the status of the service they are receiving, the actions being taken to correct any problem they may be having, and progress being made on improving systems performance or capacity.

In order to provide superior service, operations manager must control all other aspects of the computer center. The items that must be considered are:

1. **Control problems:** Problems, defects, or faults in operation lead to missed service levels and expenditure of additional resources
2. **Control changes system-wide:** change control is vital because mismanaged change leads to problems and reduced service
3. **Recovery from service disruptions:** Managers must plan to recover from the fault or defects in system that inevitably occur
4. **Batch and on-line operations:** current batch and on-line workload must be scheduled, monitored and the results delivered to the client organizations.
5. **Performance analysis:** system through must be maintained at the planned level in order to meet service agreements
6. **Capacity planning:** capacity can be planned correctly only when the preceding disciplines are operating effectively.

All these issues or topics are essential to the successful operation of the computer IT center. Collectively these processes or disciplines provide the tools and techniques required for successful computer and information technology management operations.

3.3 Service-Level Agreement (SLAs)

The service-level discipline is a management process for establishing and defining levels of service provided by IT or other operators of computer centers or departments. The objective of the service provider is to deliver services to its client organization at an established level. Service planning is the basis for tactical planning in the operations arm of IT. The process that establishes service levels involves a significant degree of negotiation between organizations clients, their mangers and the firm’s senior managers must be involved. In most cases it is an iterative process because the dynamic nature of the business, changing requirements, and new technology. Additionally, the process involve as expectations are developed and leveled.

The process culminates in a mutually acceptable agreement; it documents the service level each IT client will receive. The purpose of the agreement is to ensure that the clients organization using the service and organization providing the service mutually consents to the terms set forth in the SLA. The agreement discusses all aspects of service expected by the client. During the negotiation phase, the balance between service levels and the cost of providing service needs to be explored in detail. Both parties must strike an effective balance between these issues for the agreement to be mutually satisfactory. A properly constructed service-level agreement establishes a cost effective means for client organization to use IT services.

The agreement must outline the objective method that will be used to measure and report service level. The cost of providing service to the client organization must be justified by the responsibility discharged by that organization on the firm's behalf. For example, the cost of providing improved on-line response to computer-aide design system users must be less that the value of the improved productivity resulting from the response improvement. Much of the cost/benefit resolutions should have occurred during the tactical planning process.

Although the IT organization must initiate the service-level agreement, client line managers and IT manager must negotiate the agreement in especially complicated and difficult cases, the negotiation may occur between then CIO and other executive managers. A high level of attention is required when disagreements cannot be resolved at lower levels due to valid difference of opinion or insufficient breath of vision. Frequently, senior executives are better positioned to define required service levels and justify additional expenses. This is especially true in cases where costs and or benefits are intangible and difficult to quality.

The services that IT will provide must be expressed in term meaningful to client's manager. For instance, response times measured at the user's terminal are more meaningful to clients than CPU seconds measured by the services provider. Turnaround time (the time from job submission to job completion) must be measures at the user's workstation, not the central processor.

All client organization must be included in the SLA process, and nearly all computer operation services should be considered. Applications that are infrequently that are infrequently executed or run on an as-required basis, or that place low demands on the resource of the organization, need not be specifically included in the agreement. An earlier chapter stated that each application requires an owner-manager who takes charge of the application asset and discharges ownership responsibilities. One of the owner's responsibilities is to negotiate service levels with service providers on behalf of all application users. It is the owner's responsibility to use cost-effective trade-offs to achieve a balanced agreement with service providers. The most effective service-level agreements are achieved when the negotiating managers exercise corporate statesmanship, keeping the interests of the firm foremost in their minds during the negotiation process.

3.4 What the SLA Includes

The standard service-level agreement begins with administrative information. This includes the date the agreement was established, the agreement duration, and the expected negotiation date. It may specify unusual conditions, such as significant work load changes, that will mandate renegotiation. The agreements include key measure of service required by the client organization and services levels to be delivered and measured by the service provide. Resources and associated costs required by the provider to deliver the service are also included. The agreement also describes the mechanism to report the actual service levels delivered.

Table 1.1 Service-level Agreement Contents

Effective date of agreement
Duration of agreement
Type of service provided
Measures of service:
Availability
Amount of service
Performance
Reliability
Resource needed or costs charged
Reporting mechanism
Signatures

Time: Negotiation of service-level agreements occurs when the operational plan is being prepared at this time resources for the coming year are being allocated, and near term requirements for IT service are becoming clear. The effective date of the agreement usually coincides with this portion of the planning cycle. For services that are relatively stable in operation, the duration of the agreement will probably be one year. Payroll or general ledger applications are examples of such systems. For the application of this type, the agreement will be renegotiated during the following planning cycle one year later.

Applications that have volatile demands or growing process volumes may require more frequent SLA negotiations. For example, a new strategic system experiencing great implementation success may have rapidly growing demand for IT services. It may require a renegotiated service-level agreement every six months. The agreement should spell out the circumstance that jobs at the beginning of the workday are the critical measurement. The output may consist of reports delivered to the clients' offices, or, more likely, online data sets available for the user's review through personal workstations.

The most critical parameter for online activities is response time (Response time is the elapsed time from the depression of the "program function" key or the "enter" key to an indication on the display screen that the function has been performed) Response time is highly dependant on the type of function being performed. Therefore the type of service should specify it. For example, trivial transactions should have sub seconds response i.e. the operator should not be constrained by system when performing simple transactions. Trivial transaction require so little processing that the response appears to be instantaneous, on the order of several milliseconds less. If sub seconds response time cannot be achieved for trivial transactions, productivity drops substantially and the system becomes a source of annoyance to the user.

Many transactions are distinctly nontrivial. For instance an online system for solving differential equations may provide sub second response time when users enter parameters, but the numerical method used to obtain the solution may require the execution of many millions of computer instructions. The client usually understands this type of condition and appreciates the response time required to solve the problem. Many other situations, particularly applications that query several databases to search for specific data, are decidedly nontrivial even though the customer's query seems simple enough. Everyone one concerned needs to understand these situation thoroughly prior to entering agreements. Education through the information center can achieve the necessary level of understanding.

Schedule and Availability: During the negotiation process, the IT management team must provide several availability and reliability information. An example of an availability statement is: The system will be available 98 percent of the time from 7 A.M. to 7 P.M. Five days per week. An example of a reliability statement is "The meantime between failures will be no less than 30 hours, and the mean time to repair will be no more than 15 minutes." The availability and reliability measures must be unambiguous. Users and IT personnel must be able to measure them easily.

Workload Forecast: workload forecast and required IT resources are essential to service-level agreements. The operations department must install production capacity sufficient to process the load generated by all application in total. The capacity sufficient to process the load generated by all application in total. The capacity must be sufficient to deliver the service promised to all the clients. IT workload should be defined for the period of the service agreement in terms that client managers can understand. IT managers must translate these workload statements into meaningful and measurable units for capacity planning. The forecast should cover batch workload volumes, volumes of online transactions, amount of printed output, and other resource demands that the client requires of the service provider. In many cases, average workloads will suffice. But the negotiations must cover changes in workload if significant daily, weekly, or monthly departures from the average are expected.

On-line transaction volumes can vary by an order of magnitude during the day. They frequently display a morning peak, a lull in activity around noon, and a peak again during the afternoon. Some client/server applications display this pattern. In some cases, the peak loads generated by one application occur during the valley in another application's load. Firm's operating nationally experience workload waves throughout the day. Departments on the east coast open for business three hours before departments on the west coast. The air traffic control system in the United Stated illustrates this phenomenon, as flights begin to depart from Boston and New York airports around 7:00 A.M. local time, several hours before airport activity pick up in Seattle or Los Angeles. Workload follows the sun in international operations.

The coincidence of workload peaks from many applications is a more critical issue for IT managers. Month-end closing of the financial statements is example of activity that usually generates this form of peak activity. In some cases, a number of activities conspire to form a huge bubble of workload for the organization. Year end is a prime example of this phenomenon. Not only is the December closing in process, but other year-end activities are taking place as well. Year end is also convenient time to implement new applications to supply the customer with new and different functions for the coming year. Many times, these new applications are mandated by annual changes in the tax laws or by other government regulations. If the physical year defers from the calendar year, the workload pattern will take yet another form. Satisfactory service level agreements anticipate all these events and keep them in their clear focus

Unanticipated or unusual increases in workload are a frequent cause of missed service levels. Generally, increases in workload do to occur without warning. An alert organization will reopen the discussion on service levels when such increases are first anticipated. Everyone benefits from well-planned workload management. Generally, all organizations suffer from one organization's poor planning. Sometimes the work load is difficult to predict because of changes in the consolidation are examples of global organizational change. In these cases a reanalysis of the load and a new forecast should be prepared for the client organization.

Reasonably accurate forecast are essential for providing satisfactory service, although workload forecasting is often tedious and time consuming. History is good guide for most forecast. IT should provide clients with current workload volumes and trend information; a particularly easy task if a cost accounting or charging mechanism is installed. IT charging or cost recovery mechanisms are valuable in the SLA process because they help on cost-effective service levels. It is mandatory to IT and clients that the load analysis and load forecasting proceed successfully.

Measurement of satisfaction: key service parameters contained in the service-level agreement must be routinely and continuously measured and reported. Specific, quantifiable parameters are preferable to more ambiguous measures. In general if the IT organizations report these critical measures ambiguously, or if the reported data contain error of fact, the client organization will develop their own track mechanism. Uncoordinated measure and reports usually lead to conflict, accusations, and finger-pointing, and needlessly consume energy. The most effective approach is to provide unambiguous, credible reporting techniques at the onset.

One additional consideration must be addressed. Although it appears obvious, service providers must measure and report service from the user's perspective. It does not help to report job completion time if the output is not available to the client organization until later. It only confuses matters to measure online transaction response time at the server. What the user sees at the workstation is all that maters.

Response times are easy to obtain if the computer operations department has a personal computer programmed to execute a representative sample of the interaction of the CPU with the server. The PC can log transaction data and report statistics on response times. It can be switched to various ports on the I/O channels, and will provide valuable data on user response time. This device can be the benchmark for establishing and monitoring online response time.

It is essential IT's measurement systems have high credibility with client organizations. This credibility leads to mutual trust and confidence and results in open objective discussions when events don't transpire as planned. For any number of reasons, small excursions from the norm may occur. These deviations are corrected most expeditiously in an atmosphere of open communication and mutual respect. Precision measurements of delivered service built trust and confidence between the service provider and its clients. Objectives, credible reporting on service-level achievements paves the way for improvements in other activities.

4.0 CONCLUSION

No doubt service-level agreement is the key tool for the management of customer's expectations in information technology business. Service-level agreements are the foundation on which the management systems of production operation rely. Service-level agreements are essential and valuable tools in the IT management system. But they are important for other reason too. The process of negotiating the agreement develops and enhances understanding and mutual respect between the service providers and their clients.

5.0 SUMMARY

- The acquisition, development and enhancement of application programs and the management of associated databases involve many long-term, strategic issues. Strategic concerns are critical, but the application raises many important tactical issues, as well.
- The management of computer operation, whether owned or operate by IT or by a client organization, lends itself to disciplined approach.
- The fulfillment of executive expectations, whether or not they are realistic, is the principal standard against which IT managers are measured.
- Service-level agreement (SLA) is the foundation of a series of management process collectively called the *disciplines.* A discipline is the management process consisting of procedures, tools, and people organized to deal with an important facet of the production operation, whether located within the IT organization or in a client organization.
- In order to provide superior service, operations manager must control all other aspects of the computer center.
- The service-level discipline is a management process for establishing and defining levels of service provided by IT or other operator of computer centers or departments.
- Although the IT organization must initiate the service-level agreement, client line managers and IT manager must negotiate the agreement in especially complicated and difficult cases, the negotiation may occur between then CIO and other executive managers.
- The standard service-level agreement begins with administrative information. This includes the date the agreement was

established, the agreement duration, and the expected negotiation date.

- Negotiation of service-level agreements occurs when the operational plan is being prepared at this time resource for the coming year are being allocated, and near term requirements for IT services are becoming clear.
- The most critical parameter for online activities is response time (Response time is the elapsed time from the depression of the "program function" key or the "enter" key to an indication on the display screen that the function has been performance)
- Workload forecast and required IT resources are essential to service-level agreements. The operations department must install production capacity sufficient to process the load generated by all application in total.
- Key service parameters contained in the service-level agreement must be routinely and continuously measured and reported. Specific, quantifiable parameters are preferable to more ambiguous measures.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss 5 Items that must be considered if an operations manager wants to effectively control the activities of a computer center
2. List the content of a Service-Level Agreement

7.0 REFERENCES/FURTHER READINGS

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MODULE 3

Unit 1 Information Technology Management Issues and Success Factors
Unit 2 Challenges of Information Technology Management
Unit 3 Failure of Information Technology Management
Unit 4 Information Systems Planning Process: A Case Study

UNIT 1 INFORMATION TECHNOLOGY MANAGEMENT ISSUES AND SUCCESS FACTORS

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Content
 3.1 Surveys
 3.2 The Maturation of IT Management
 3.3 Managing Mature IT Organization
 3.4 Skills That Favour Factors
 3.5 A Model for the Study of IT Management
4.0 Conclusion
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7.0 References/Further Readings

1.0 INTRODUCTION

The task of managing information technology functions remains difficult for a variety of important reasons. The issues and concerns relate to very basic concepts involving the inner workings of the firm and the utilization of information technology within organization. For the most part, these are managerial issues rather than technical concerns. Management skills are mush more valuable in coping with difficulties than are technical skills.

2.0 OBJECTIVES

At the end of the unit, you should be able to:

- identify and explain some of the key issues that are facing information technology management
- discuss the outcomes of several survive in information technology management

- discuss the major phases towards the development of information technology management
- list the factors to be put in place in the management of a nature IT organization
- enumerate what is critical success factors and its applications in IT management.

3.0 MAIN CONTENT

3.1 Surveys

Various organizations and individual have conducted key issue survey among senior IT executives, their superiors, consultants, and educators in the field. These analysis categorize their concerns facing IT managers, their peers, and their superiors, and rank them according to importance. For example, university researchers have conducted key issues surveys of corporate members of the society of information Management approximately every three years. These surveys identify current issues while revealing trend information. CSC Index, Inc., Digital Equipment Company, and several consulting firms have developed lists of issues and performed analysis of the trends and considerations behind the issues.

In recent years, specific issues have varied in importance, as can be expected; however, some key concerns have shown remarkable consistency. For example, strategic planning for information technology has been one of the top five issues since the mind 1980s. During this period, aligning corporate and IT goals has also been a prominent issue. Recently, reengineering business processes has risen in importance as firms struggle to improve efficiency by reorganizing and integrating technology more deeply into their activities.

A Survey of 202 managers taken in November, 1993 *by Datamation* revealed that more than half of the respondents believed that using IT to improve productivity and quality, creating competitive advantage through information technology, reengineering IT to better reflect company strategy and reengineering the business processes were critical budgets, and selling IT to top management. This portends more challenge, realignment and restructuring, decentralization and managing tight financial constraints.

In a survey of 603 senior IT executives in 1995 by CSC Consulting Group, the top five issues were:

1 Aligning IT and corporate goals
2 Instituting cross-functional systems

3 Organizing and using data.
4 Implementing business reengineering.
5 Improving the IT human resources

Reengineering business process has been in the top five recent years but did not make the top ten when this research was begun in 1988. According to these researches, the main goal of reengineering are to increase productivity, improve customer satisfaction, and improve quality. Additional goals of reengineering are to reduce costs, to reduce cycle time, and to increase revenue. Reengineering is consistently at the heart of business effectiveness.

At their annual conference in 1994, the society for information management reported that information systems/technology organizations' main focuses now are on business strategies, setting enterprise wide standards, managing partnerships with user and vendors, and building and managing state-of-threat information infrastructures. And according to the report, if they are not are focused on these areas, they should be.

Other issues seem to be declining in rank although they remain important. Some of these are technology interaction, end-user computing, and the IT role and contribution. Studiers report the idea that key issues overseas tend to be similar to those in US.

What is the fundamental meaning in all of this? The following subunits help glean some basic understanding of this information generally useful to it managers.

3.2 The Maturation of IT Management

One emerging theme is that the issues and concerns of IT managers are moving from specific to general, from technical to managerial, as IT moves from the technology orientation of the 1960s and 1970s to the business orientation of late 1980s and 1990s.

Telecommunications, competitive advantages, organizational learning, role and contribution to IT, and acting as change agents dominated IT managers thinking in the late 1980s. in the mid 1990s, organization are restructuring, reengineering, and realigning to bring IT closer to internal clients and the firm closer to external customers and suppliers. Now as firms restructure, improving business effectiveness dominates manager's thinking. And to reduce costs and improve internal efficiency, corporations and IT organizations are downsizing and outsourcing. In the 1990s, firms and their IT organizations are struggling with plan alignment issues, reengineering, downsizing, establishing standards, and resolving policy issues. In part the rise of CIO reflects these new roles for information technology. As information technology becomes a mature management discipline in tomorrow's organizations, governance-stabilizing rule of conduct in the firm-will become a more dominate concern for IT executives.

Today, the typical IT organization is struggling in its relationship with senior executives and other functions as it contends with distributed architectures, users-developed systems, and rapid changes in business environment. The firm is affected by the growing complexities wrought by the technology. IT executive are expected to contribute to the firm's financial results and are struggling with their responsibilities. Meanwhile they are experiencing some of the same old problems; backlogs of work, mergers and organizations, training and retraining employees, and, managing with constrained financial resources. The IT executive needs a keen awareness of business issues and refined general management skills to contend successfully with this difficult environment.

3.3 Managing Mature IT Organization

As IT becomes a more mature discipline in tomorrow's organizations, IT managers must develop more sophisticated, more mature models of behavior. They must be knowledge about technology and the trends, but this knowledge is not enough. Broad-based business experience is critical to ITY managers, but, but itself, is insufficient for success. Tomorrow's successful IT managers need solid business skills and a sound understanding of technology, its trends and its implications. In addition, IT managers need models of behavior and framework of business management.

In an important work, Paul Strassmann present a model of information Management Superiority premised on the idea that IT management only has value within the context of business management. He goes on to say that 'the benefits of investments in information technology, can be assessed only as seen from the standpoint of business plan.' His model depicts information technology superiority being sustained by five reinforcing and interacting ideas.

Information Management Superiority depends on:

1. *Governance:* Governance or information politics, is used not only to exercise authority, but is an art for achieving corporate consensus. It guides how individuals and groups corporate to achieve business objectives.

2. *Business Plan Alignment:* IT business plan must be congruent with the organization's business plan or the worth of IT plan will always be suspect.
3. *Process Improvement:* All IT and business activities should be regularly scrutinized to identify area where improvements, however small, can be made.
4. *Resource Optimization:* Managers must always be questioning whether money, space, time and people can be used more effectively to further corporate goals.
5. *Operating Excellence:* All the operational details of the business must be performed in a superior fashion. Quality in the business process must be an overriding consideration in throughout the business.

According to Strassmann, Information management superiority is achieved by constant Management interaction among these five activities. For, example, a manufacturing process improvement may require alterations to business plan. Suppose for instance, the inspection of arriving chemicals will be delegated to an independent testing lab, and therefore, the receiving inspection system are no longer required. Later, this may lead to a policy change regarding all incoming supplies, thus changing the governance. The importance of this model will be clearer as we explore subsequent issues in the unit.

Strassmann's model helps explain the developing maturity of IT management. Some years ago, EDP managers were concerned with improving their operations, getting more works through PCs and keeping systems ruining around the clock. Management task was secondary for many. Twenty years ago, optimizing hardware systems reached a fine art and IT concentrated on improving IT processes, more attention was given to application development. During the 1980s, IT executive concentrated on end-user systems, teaching organizations about technology, and developing strategies aligned with business strategy.

Today, as IT matures, executives are concentrating on the rules governing technology disbursement, and establishing policies regarding distributing computing, portable computer (notebooks and laptop computer), and wireless networks. Policy making and the establishment of authority for technology acquisition and deployment are now more critical than owing any operating wide-area networks. Increasingly, IT executives are delegating routine development, maintenance, and system operation to information service firms in order to concentrate on the larger, more important policy issues.

3.4 Skills that Favour Factors

With knowledge of the important problem facing IT executive, and with a perspective or model for understanding them, managers are positioned to describe the factors necessary for success. What actions must IT executive carry out successfully,? What management systems and processes are vital for their personal success, and for the success of the IT organization?

Critical Success Factors

The answers to some of these questions are found in the notion of Critical Success Factors (CSF). The idea of critical success factors was developed by Rockart in the late 1970s to help executives define their information needs. The concept was useful in information technology planning. Critical success factors identify those few areas where things must go right. They are executive's necessary conditions for success. They apply to IT executives, to their subordinate managers, and to their senior executive in the firm.

Rockart identified four sources or area where executives should search for critical factors; the industry in which the firm operates, the company itself, the environment, and time-dependent organizational areas. This last sources accounts for the possibility that some organizational activity may be outside the bounds of normal operations and require intense executive attention for a short- period. In addition, Rockart identified two types of critical success factors; the monitoring type keeps track of the ongoing operations. The building type initiates activity designed to change the functions of the organization in some way.

Critical success factors apply to the IT manager. What are conditions necessary for the IT manager's success? What task must be carried out very well in order for the manager to succeed? The critical issues studied previously in conjunction with Strassmann's model provide the information needed to answer these questions. The factors necessary for success can be grouped into several classes as shown in Table 1.1.

Table 1.1: Critical Area for IT Manager

1. Business Management Issues
2. Strategic and Competitive Issues
3. Planning and Implementation concerns
4. Operational items

The firm's management team must take action in these critical areas. The IT manager must have goals and objectives to solve problems, if here are problems, and to prevent the development of issues. Outstanding managers may use a roadmap of critical success factor (CSF) to asses their posture on these vital topics. The following CSF list serves as a roadmap that successful IT manager might follow:

1. Business Management Issues
   - Obtain agreement with the firm's executive on how information technology will be managed within the firm
   - Operate the IT function within the parent organization's cultural norms
   - Attract and retain highly skilled people
   - Practice good people management skill
   - Improve IT productivity

2. Strategic and Competitive Issues (long range)
   - Develop IT strategies aligned with the firm's strategic goals and objectives
   - Provide leadership in technology application to attain advantage for the firm
   - Educate the management team about the opportunities and challenges surrounding technology introduction
   - Ensure realism in long-term expectation

3. Planning and Implementing Concern (Intermediate range)
   - Develop plans supporting the firm's goals and objectives
   - Provide effective communication channel so that plans and variance are widely understood
   - Establish partnership with client IT organizations during planning and implementation
   - Maintain realism within the organization regarding intermediate term expectations

4. Operational Items (short ranges)
   - Provide customer service with highly reliability and availability
   - Deliver services of all kinds on schedule and within planned cost
   - Respond to unusual customer demands and to emergencies
   - Maintain management processes that align operational expectations with IT capabilities.

Not all these items will be on every IT manager's list of critical success factors. In many cases come of the critical area will be operating smoothly and routine attention will maintain high-quality operation. In other instances, managers must add temporal organizational factors or company specific factors to the list. In all case, superior managers remain attentive to these factors necessary for their success. Information technology managers who can accomplish the tasks outlined above have a good chance of becoming highly successful. They have developed general management skills that will prepare them for increased future responsibility.

3.5 A Model for the Study of IT Management

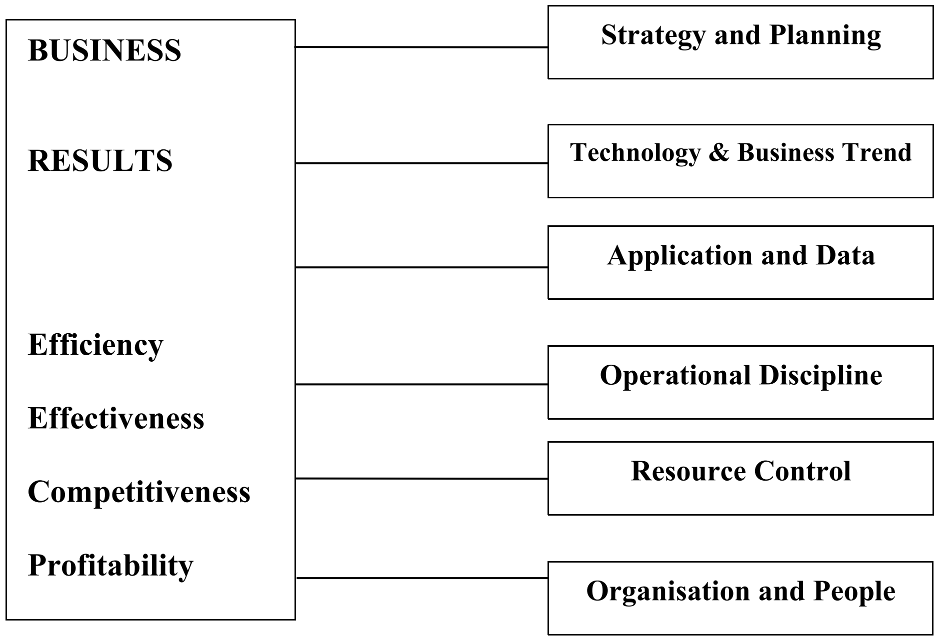
The study of information technology management concentrates on business results, attaining efficiency and effectiveness, and competitiveness with the external environment. The intended result is improving profitability for the firm. The structure of this text is related to business result and is portrayed in figure 1.1

Each of the topics on the right side of figure 1.1 contributes to the success of the firm in an essential manner. Each represents tangible or intangible factor to be accounted for.

4.0 CONCLUSION

The issues that are confronting information technology management are not necessarily unique, but could be said to be common. However, dealing with these issues demands experience and understanding which seems to be lacking in information technology business. These issues will continually come in various forms because of the dynamic nature of businesses, technology and environment.

Figure 1.1: ***A model for study of IT Management***



5.0 SUMMARY

- The task of managing information technology function remains difficult for a variety of important reason. The issues and concern relate to very basic concepts involving the inner workings of the firm and the utilization of information technology within organization.
- Various organizations and individuals have conducted key issue surveys among senior IT executives, their superiors, consultants, and educators in the field. These analysts categorize their concerns facing IT managers, their peers, and their superiors, and rank them according to importance.
- One emerging theme is that the issues and concerns of IT managers are moving from specific to general, from technical to managerial, as IT moves from the technology orientation of the 1960s and 1970s to the business orientation of late 1980s and 1990s.
- As IT becomes a more mature discipline in tomorrow's organizations, IT managers must develop more sophisticated, more mature models of behaviour. They must be knowledgeable about technology and the trends, but this knowledge is not enough.
- With knowledge of the important problems facing IT executive, and with a perspective or model for understanding them, managers are positioned to describe the factors necessary for success.
- The firm's IT management team must take action in these critical areas. The IT manager must have goals and objective to solve problems, if there are problems, and to prevent the development of issues

- The study of information technology management concentrates on business results, attaining efficiency and effectiveness, and competitiveness with the external environment

6.0 TUTOR-MARKED ASSIGNMENT

1. List the top 5 information technology issues that are priority to senior executives of information technology
2. Discuss the critical

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UNIT 2 CHALLENGES OF INFORMATION TECHNOLOGY MANAGEMENT

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1.0 Introduction
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1.0 INTRODUCTION

For varied new and emerging reasons, information technology managers have difficult tasks to perform. Although many IT managers have established brilliant performance records, others have fares less well. Mediocre performance and a lack of success have dominated the career of many IT managers who have fallen short in their effort to manage rapid technological change effectively.

Many information technology managers find themselves and organizations in untenable positions. They are implementing new technology that have high potential value to the organization but that carry commensurately high risk. They are supporting clients who are requesting increased services while senior executives, observing productivity rising slowly or not at all, are questioning the increasing expense levels. The unmanaged demand for services is manifested in expanding backlogs of work. Expectations in many parts of the firm are rising, and many senior IT managers are unable to meet concomitant challenges effectively.

Many IT managers have been trained in technology and lock the general management skills demanded by their organizational role. They and their organizations are under constant scrutiny. Their jobs demand knowledge of people management and organizational considerations rather than programming or hardware expertise. Their jobs also require them to demonstrate productivity improvements in return for the resources they consume. In addition, mergers, acquisitions, and reorganizations of all kinds are threatening the stability of their position.

The root causes of the difficulties of information technology management are ill-prepared managers in charge of complex, rapidly changing technology. Executive expect to restructure and streamline their organizations around information technology, but the technology itself causes structural and personal dislocations and generates high expectations within the organization and among its managers. To address this situation, IT managers must acquire general management skills that will allow them to content successfully with these complexes issues. Their skills must include managing expectations and coping with the personal and structural change. In short, the IT manager of the future must be the organization's technological and a superb generalist as well. They must capitalize on their technological expertise while solidifying their platform of managerial experience and skill.

In addition, it is imperative that IT managers have extensive management systems and processes to assist them in discharging their responsibilities. Understanding these management systems and processes and their application and use within the firm are necessary conditions for success. This text devotes considerable attention to the development of these systems and processes.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the challenges facing IT management
- identify the challenges facing management of IT
- discuss research breakthroughs that have been carried out in identifying IT challenges

3.0 MAIN CONTENT

3.1 Challenges

3.2 Technological Complexity

The semiconductor computer chips are commercially available for several hundred dollars and Naira each. These chips carry millions on electronic circuits and cost $200-300 million or more to develop. The people of the world are linked electronically through strands of fibre optic cables capable of carrying 100,000 simultaneous telephone conversations. Hundreds of earth satellites relay enormous amount and kinds of data while thousands more are being planned. High tech storage devices maintain huge databases at very moderate cost, serving as sources and links of data for telecommunications and computer systems around globe. Not only is the complexity of this technology increasing over time, but the rate of change is accelerating as well. The development of modern computer systems is the most complex human activity ever undertaken, and their application is also monumentally complex.

3.3 Pervasiveness

Computer and telecommunications technology is deeply infused and widely disbursed in today's organizations. Business users of information technology are installing intelligent workstations as a rapid pace; most professional employees have their own individual workstation or terminal. Workstation for office and professional workers in our organizations are mostly interconnected by local area networks that access servers connected to other nets or to large computer databases. The server functions as message-switching systems connecting to sophisticated telecommunication networks. These internets or information highways link the firm's sites nationally and internationally, electronically uniting these firms with their customers and suppliers around the globe. The penetration of information technology into the fabric of human activity will continue unabated into the foreseeable future.

3.4 Application and Data

Rapidly growing advanced computer and telecommunication systems are facilitating large, sophisticated, and very valuable applications programs for today's firm. The firm's databases are growing in size and importance. The acquisition and maintenance of the vast programs and data resources demands very careful attention from many members of the fir's senior management team. Application programs and databases in the US is valued at $ trillion or more are expensed during development, and are recorded on the corporate balance sheet. But these and other intellectual assets are the foundation of today's information-based organizations.

3.5 Computer Operations

Skillfully managed computer and network operations are vital for the efficient performance of the firm. Today, many firms process hundreds of transactions per second that must be executed promptly and flawlessly. In effect, the firm's information system is in series with firms operations. Loss of service for even a few seconds has serious consequences to the firm's financial health and reputation. Management performance demanded by this kind of operation is extremely challenging.

3.6 Control and Environment Factors

Knowledge-based organization must rely on careful, constant control. Weak ineffective control is highly valuable and highly automated operations, rapidly progress errors. External and internal threats to sophisticated human and machine business operations must be meutralized through careful attention to business control of all types. The control issue grows in importance as networked systems and interconnections increase.

The social and political environment surrounding the technological evolution is also critically important. Internationalization of business and growing international competition, partly enable by technological advances, is altering the firms conduct their affairs. International government activity is shaping business enterprise worldwide, and the pace of change in the business sector is increasing with time. This moving backdrop against which business strategy and planning take place greatly increase the management task for the firm's executives, and for the It executive as well.

3.7 Strategic Considerations

Information technology has great strategic value and significant for organization today. Information technologist and their organizations are expected to provide the tools with which firms can capture competitive advantage. Consequently, many information technology organizations and managers are on their firm's critical path to success. The IT organization may be limiting its parent organization's long-term performance. Obviously, this poses a very special challenge for the firm and its executives.

3.8 People and Organization

Information technology alters the nature of work in industrialized societies. The technology impact organizations, manager, and workers at every level. Not all the consequences are perceived favorably; many are considered threatening or intimidating to managers and workers alike. These personal and organizational dislocations further heighten the management challenges accompanying the technology.

To cope successfully with these challenges, effective managers rely upon their increased awareness and keen appreciation of the phenomena, and fine tune their people-management skills. High-performance organizations have found ways to maximize their human resources. They recognize that people are the key to capturing the benefits of technological advances in today's information age. Effective understand this extremely well.

3.9 Problems Affecting Practice and Theory

Understanding the problems of rapid IT change is important to both practice and theory.

3.9.1 Practice

"Over the last decade, the world has been changing so rapidly that one can no longer imagine managing in a steady state. The need to adapt and change continuously has become a given in managerial life. In no other domain has this observation been more relevant than the field of information technology" (Manzoni, and Angehrn, 1998, pp. 109). Such IT change is replete with "starting innovations and drastic, unpredictable shifts in technology's direction" (Sanders, 1999, p. 62). The change is not only rapid, but also is expected to continue into the future (Benjamin and Blunt, 1992; Boar, 1994; Geisler, 1992; Horn, 1999; Peha and Strauss, 1997). In fact, the pace of change is accelerating (Anonymous, 199; Horn, 1999).

Industry observers have suggested that this swiftly changing IT is causing difficulties for today's IT management. Traditional IT structures cannot cope with continual change and the rapid introduction and utilization of information technologies (Boar, 1994; Boar, 1998). New IT must be absorbed, mastered, and controlled. This demands the ability to apply new ideas and practices that in turn require abstract thinking, problem solving, and inference (Montealegre, 1998). As a result, new IT is difficult to manage (Bhattacherjee, 1998).

Thus realizing the potential of new IT while avoiding associated risks can pose a complex challenge to IT management. Mistakes can be costly and IT managers cannot be experts on all emerging its. Because of the lengthy duration of it acquisition and implementation processes, many Its become old before ever actually contributing to their intended purpose. In fact, a new IT can even become obsolete before its initial use in production. This vulnerability to obsolescence is especially disconcerting (Sanders, 199). Indeed, surveys of executives have repeatedly confirmed the fact that changing IT is a major challenge to many organizations (Paul, 1994; Computer World, 1995; Pearson, 1998).

3.9.2 Theory

Although little research has directly addressed the problems of the management of IT in a changing technological environment, it has considered broader related matters. For example, Lewin (1947) investigated change itself. He recognize the manner in which organizations change by proposing that they unfreeze from, move to, and refreeze in states of equilibrium.

In addition, research has considered how IT has affected the overall organization (Allen and Scott Morton, 1994; Kotter, 1979; Orlikowski and Robey, 1991; Scott Morton, 1991). For example, Orilikowski and Robey (1991) examined the role of IT in change to the entire organization. However, they did not focus on the effect of IT change on IT management.

Research has also investigated organizational issues caused by a changing environment (Davis and Weber, 1983; Lawrence and Lorsch, 1967). Lawrence and Lorsch 1967) suggested a contingency theory where different environmental conditions (analogous to IT change) require different organizational design. Davis and Weber (1983) viewed an organization as a hierarchical set of systems where changes in higher level systems (e.g., IT change) lead to changes in lower level ones. However, none of these authors specifically considered IT change.

More specific to this research, an environment impact theory proposed that changing dimensions of the environment cause various IT management problems (Lederer and Mendelow, 1990). IT was one of five dimensions of the environment. Six illustrative IT management problems were provided. The theory was based on structured interviews with 20 IS executives and on organizational research (Dill, 1958; Emery and Trist, 1965; Katz and Kahn, 1966; Kotter, 1979; 1982; porter, 1980; Thompson, 1967).

That research suggests that organizations are reactive or proactive in dealing with environmental change. The reactive perspective, called environmental determinism, concerns the degree to which environment dominates organizations (Clark, Varadarajan, and Pride 1994; Maranville 1999). It views organizations as reacting to problems caused by changes in its environment. The proactive perspective, strategic choice, concerns the degree to which organizations attempt to influence their environment (Clark, Varadarajan, and Pride 1994; Maranville

1999). Instead of simply reaction to the problems it causes, some organizations adopt policies to try to modify it and thus prevent them.

A later study examined the environment impact theory (Benamati, Lederer, and Singh, 1997). It focused exclusively on IT change and the problems it causes. It was based on sixteen additional structured interviews with IT professionals who were asked to elucidate problems stemming from specific, new IT in recent projects in their organizations. The study suggested that IT organizations experience eleven categories of problems due to change in IT. The eleven problem categories resulted from the analysis of descriptions of 142 problems experienced by the sixteen IT professionals' organizations. The leftmost column in Table 1 lists the problem categories.

The original theory and follow-up study used qualitative methods with small samples. This paper describes additional research on the categories of problems. It uses a large sample, quantitative study to understand them better. In doing so, it proposes an instrument for future research to use measure the extent of those problems.

4.0 CONCLUSION

This study has refined the understanding of problems IT manager face due to today's rapidly changing IT. Such change is likely to increase in the near future. Perhaps by understanding the problems, IT managers can anticipate and cope with them better in the future

5.0 SUMMARY

- For varied new and emerging reasons, information technology managers have difficult tasks to perform. Although many IT managers have established brilliant performance records, others have fared less well.
- The semiconductor computer chips are commercially available for several hundred dollars and Naira each. These chips carry millions of electronic circuits and cost $200-300 million or more to develop.
- Computer and telecommunications technology is deeply infused and widely disbursed in today's organizations.
- Rapidly growing advanced computer and telecommunication systems are facilitating large, sophisticated, and very valuable applications programs for today's firm. The firm's databases are growing in size and importance.
- Skillfully managed computer and network operations are vital for the efficient performance of the firm.

- Knowledge-based organizations must rely on careful, constant control. Weak ineffective control is highly valuable and highly automated operations, rapidly progress errors.
- Information technology has great strategic value and significance for organization today. Information technologists and their organization are expected to provide the tool with which firms can competitive advantage.
- Information technology alters the nature of work in industrialized societies. The technology impacts organizations, manager, and workers at every level.
- "Over the last decade, the world has been changing so rapidly that one can no longer imagine managing in a steady state. The need to adapt and change continuously has become a given in managerial life.
- Although little research has directly addressed the problems of the management of IT in a changing technological environment, it has considered broader related matters.
- That research that organizations are reactive or proactive in dealing with environmental change. The reactive perspective, called environmental determinism, concerns the degree to which environments dominate organizations.

6.0 TUTOR-MARKED ASSIGNMENT

1. Mention 5 major challenges facing Information Technology management.
2. Site 5 author who made researches in discovering the challenges of IT management.

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UNIT 3 FAILURE OF INFORMATION TECHNOLOFY MANAGEMENT

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  3.1 Case of Failed IT Project
  3.2 Why IT Projects Fail?
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    3.2.2 Unclear Goals and Objective
    3.2.3 Objective Changes during Project
    3.2.4 Unrealistic Time or Resources Estimate
    3.2.5 Lack of Executive Support and User Involvement
    3.2.6 Failure to Communicate and Act as a Team
    3.2.7 Inappropriate Skills
  3.3 Solution to IT Management Failure
    3.3.1 Management Involvement and Governance
4.0 Conclusion
5.0 Summary
6.0 Tutor-Marked Assignment
7.0 References/Further Readings

1.0 INTRODUCTION

Managing information technology is not easy task. The information systems function has performances problems in many organizations. The promised benefits of information technology have not occurred in many documented cases. Studies by management consulting firms and university researchers have shown that many business have not been successful in managing their use of information technology. Thus it is very obvious that in many organizations, information technology is not being used effectively and efficiently.

Also, business environments these days are characterized by complexity, and acceleration of everything from communication to production methods. IT has been one of the major drivers of this complexity and acceleration.

There are nearly limitless applications of IT in the service of business. IT improves productivity through streamlining of process and enhances efficiency and effectiveness of individual workers as well groups through connectivity that it offers. IT also makes it possible for business to grow by access to new markets and new partners.

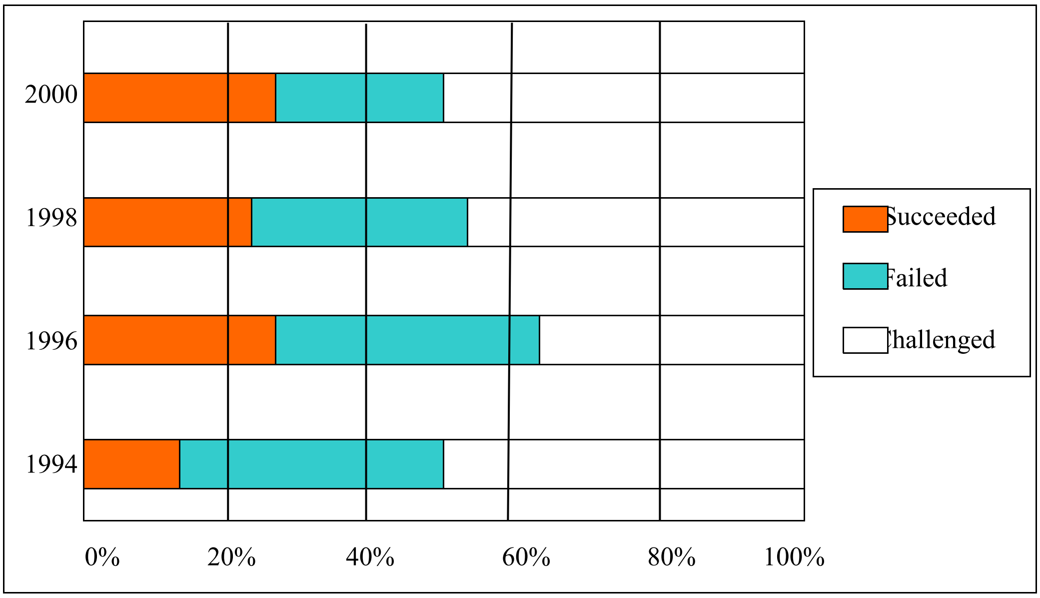
Considering those capabilities of IT, it can be disappointing to see the limited success that has been achieved in applying it in real business environments. Researcher continually shows that companies have difficulty with IT projects. One example is the Standish Group's study of 30,000 IT application projects in US companies (The Standish Group International, 2001). The data on project outcomes are shown on figure 1.1

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss why information technology management failed in an organization
- identify the various reasons for failure of IT
- identify what to do to avoid IT management failure
- explain how senior management personnel can be involved in avoiding IT.

Figure 1.1: Project outcomes history (1994-200)



The category definitions for the Standish Group research International, 1999) are as follows:

- Successful projects were completed on time and on budget, with all the features and functions that initially specified.
- Failed project were cancelled before completion or never implemented.
- Challenged project were completed and operational, but over-budget, over the time estimate, and with fewer features.

The Standish Ground research confirms that large projects are more likely to fail than small projects (The Standish Group International, 1999). That is likely because large projects tend to be more complex.

Although success rates increased, and failure rates decreased during the six years of the study, the numbers still indicate a problem. It is an obvious question to ask "why" when confronted with data such as the Standish data. Before answering this question, it is important to consider a failure example of an IT project.

3.0 MAIN CONTENT

3.1 Case of Failed IT Project

The best documented IT failed projects are the ones involving public money. The most recent example is the Virtual Case File Project for the United States Federal Bureau of Investigation (FBI).

The FBI had admitted the Virtual Case File Technology had failed to meet the Bureau's requirement and that:

- Five years of development and
- $US 170 million in cost had been lost (Friden, 2005).

The Virtual Case File delivered by Science Application International was aimed at facilitating case file management by integrating data from older system, including the Automated Case support system, and eventually replacing them (National Research Council, 2004).

The National Research Council (2004) saw no evidence that backup and contingency plans had been formalized. The transition plan did not include the availability of the Automated Case Support system after the cutover to the Virtual Case File (National Research Council, 2004).

Science Application International Corporation said it delivered the first phase of the project ahead of schedule and under budget, but the requirements for the software changed more than one time after the September 11, 2001 terrorist attacks on the USA (Gross, 2005). The office of the inspector general found that FBI was still defining the requirement after two years since the start of the project (Fine, Glenn, 2002). Science Application International Corporation also said that the communication with FBI was difficult because of the high turn over of top IT managers (Gross, 2005).

National Research Council (2004) also found that the requirements for the FBI mission were not included in the Virtual Case File design.

The example of Virtual Case File fives a levels overview of the difficulties to successful completion of complex IT projects. The example has shown that the difficulties are related more to the people than the technology itself (Tilmann and Weinberger, 2004), even though technology may increase complexity.

3.2 Why IT project fail

The project team, the suppliers the customers and other stakeholder can all provide a source of failure, but the most common reason for project failure are rooted in the project management process itself and the aligning of IT with organizational cultures (Tilman and Weinberger, 2004).

Based on a research carried out by the Coverdale Organization (Cushing, 2002), the respondents identified estimation mistakes, unclear project goals and objectives, and project objectives changing during the project as key factors in project failures.

The following lists are the primary causes for the failure of complex IT projects:

- Poor planning
- Unclear goals and objectives
- Objectives changing during the project
- Unrealistic time or resource estimates
- Lack of executive support and user involvement
- Failure to communicate and act as a team
- Inappropriate skills

The remainder of the paper elaborates on these causes.

3.2.1 Poor planning

Sometimes IT management are not given the opportunity to plan because time pressure from senior management take over most of the time the project is on way before it has been clearly defined (New Zealand Management, 2003). In such cases, people see planning as a waste of time because they believe that time is better spent doing something rather than planning (Fichter, 2003).

Most large IT projects are planned these days, but that is not enough. Most projects have major milestones, and the problem is that the work continues throughout each milestone (Humphrey, 2005); implementing sometimes starts before plan completion and continues through most of the testing.

A fundamental reason the Virtual Case File software project fail was due to poor planning. It was found for example that very little code had been released to test (Gross, 2005). It projects are full of start to finish relationship. Many activities can only start once another activity is completed and approved. The critical path is important, because any deviation from the schedule in this path could cause entire project failure (Fichter, 2003).

Detailed plans are not effective for managing IT work. The reason is that the managers do not know enough about the work to make detailed plans (Humphrey, 2005). Team members might make their own plan but most of them do not want to. They would rather implement the solution. Few of them have the skills and experience to make complete plans, and there is a big risk in trusting them in producing their own plans that will meet management objectives (Humphrey, 2005).

Every IT project involves some degree of risk. Not doing an explicit risk calculation is one major problem with project planning (Armour, 2005). In IT projects, project managers often do not know what level of risk they are taking when they make a plan because they have not set up the necessary processes to calculate and inform the risk (Armour, 2005). New technologies which replace old ones imply new and unknown risks (Pinto and Kharbanda, 1996). The Virtual Case File project was aimed at replacing older systems, and the plan did not include the availability of those systems (National Research Council, 2004). Not including the availability of those systems is a proof that risk calculations were not set up probably in the Virtual Case File project.

3.2.2 Unclear Goals and Objectives

Sometimes the goal of a project may be only partially clear due to a poor requirement gathering in the definition stage of a project (Glaser, 2004). For example, the FBI had decided it should implement the Virtual Case file system to make it easier for agents to organise, analyze and communicate data on criminal and terrorism cases. It is not really clear how the Virtual Case file system would be used to ease the analysis and communication of data. The definition of "easy" was left up to the project participants to interpret.

The same will apply for an organisation that has decided to implement a computerised customer relationship management system to improve the quality and efficiency of customer care. It is also not clear how the computerised customer relationship management system will be used to improve customer care. And again, the definition of customer care improvement is left up to the project participants. In both examples, the scope and schedule of the project cannot possibly be accurate because their objectives are unclear.

Defining clear requirements for a project can take time and lots of communication, but sometimes goals and objectives might be unclear because project sponsors lack the experience to describe what they really require (Fitcher, 2003).

Many participants in the Jensen Group Study said goals were unclear in their projects simply because there are too many of them (The Jenson Group, 2000). Others said it was not the objective that was unclear, but the inability to provide direct and honest feedback on the progress (The Jenson Group, 2000).

Sue Young, CEO of AND Consulting in Colchester, stated in an interview with Computerworld magazine that the status for most IT projects is not reported in observable terms, but it is often put in subjective terms like "percent done" (Bert, 2003). Sue Young clarified that results can be coloured with reporting is done in subjective terms (Bert, 2003).

3.2.3 Objective Changes during Project

Many project managers had the feeling that their IT project would never stop growing. For example, the requirements for the Virtual Case File software changed more than one time after the September 11, 2001 terrorist attacks (Gross, 2005). The Virtual Case File Software and similar IT projects suffer from two classical problems in project management:

- Scope creep
- Feature creep

Scope creep refers to uncontrolled and unexpected changes in user expectations and requirements as a project progress, while feature creep refers to uncontrolled addition of features to a system with a wrong assumption that one small feature will add nothing to cost or schedule (Fitcher, 2003).

Project managers not understanding project tradeoffs will result in not making decisions regarding objectives on the basis of rational insight. Staying devoted to the initial requirement will result in failure when the requirement of a project changes more than one time.

3.2.4 Unrealistic Time or Resource Estimate

Estimation mistakes of time or resource cause project related problems. One common problem during the creation of the Work Breakdown Structure is assuming that the time on task equals duration. The time on tasks is the time the task will take to complete without interruptions, whereas duration is the time the task actually take to complete including interruptions. Using the time on task to estimate schedule is one of the common mistakes made by project managers (Fitcher, 2003).

Another common problem is using linear approximation when estimating schedule (Grossman, 2003). For example, if you doubled the cows in a farm, you double your production of milk. The IT projects are beyond the scope of such approximations (Grossman, 2003). Assume we have a large IT project using a team with a staff of one hundred people, linear thinking would support the conclusion that increasing the people by 100 percent would decrease the schedule and increase the cost to approximately the same degree. In reality, doubling the staff produce a non-linear result (Grossman, 2005).

3.2.5 Lack of Executive Support and User Involvement

The research companies and academic institutions have focused on the lack of executive support and user involvement as two main difficulties in managing IT projects (Jenster and Hussy, 2005). The project manager is the interface between the business and technology sides of the company (The Standish Group, 1999). Without executive support, project managers in the organisation find difficulty in aligning business with their projects. The executive management also needs to be straightforward if they have reservations about the project, otherwise, once problems are encountered in the project, their support will weaken (Glaser, 2004).

Most IT projects will change the work life of many users and require that they participate in design and implementation. Without user involvement, nobody in the organisation feels committed to the project. User involvement requires time and effort, but the staff might be already stretched and unable to find time for a new project on their schedule. That is why executive management support is important to make priority clear to the staff.

3.2.6 Failure to Communicate and Act as a Team

Projects sometimes fail due to improper communication. Science Application International Corporation said that the communication with FBI was difficult because of the high turnover of top IT managers

(Gross, 2005). Communication problems are common on large IT projects. Because complex IT projects often involve large amount of analysis and work, the project teams are busy and the executive management sees no progress. IT project managers do not communicate progress regularly because they believe that progress will not be seen by the executive management (Glaser, 2004). In many IT projects, there is no one person who has an overview of the whole project (Gross, 2005).

3.2.7 Inappropriate Skills

The challenge of global competition, the rapid growth of knowledge and the constant changes of technology make it hard to predict what kind of skilled people will be needed. Most IT projects require a diverse range of skills. Many teams lack the breadth and depth they require (Fitcher, 2003). It is also not easy for technology-based organisation to find the experienced people they need because sometimes few people in the labour market have the necessary skills.

The larger the project, the more need there is also for people with excellent planning, oversight, organisation and communication skills; experienced technology skilled people do not necessarily have these abilities (Glaser, 2004).

3.3 Solution to IT Management Failure

3.3.1 Management Involvement and Governance

What is the solution to failures in the information system function? There are so quick and easy answers. However, the experiences of successful organisations reveal that extensive and meaningful ***managerial and end-user involvement*** is the key ingredient of high-quality information systems performance. Involving business managers in the governance of the IT function and business professional in the development of IT / IS application should thus shape the response of management to the challenge of improving the business value of information technology.

Involving managers in the management of IT (from CEO to the manager of business units) requires the development of ***governance structure*** (such as executive steering committees) that encourages their active participation in planning and controlling business uses of IT. Thus, many organisations have policies that require managers to be involved in IT decision that affect their business units. This helps managers avoid IT / IS performance problems in their business units and development project. With this high degree of involvement, managers can improve the strategic business value of information technology.

Also, the problem of employees' resistance and poor user interface design can also be solved by direct end-user participation in systems development projects. Overseeing such involvement is another vital management task.

Table 1.1: Senior Management Role in IT / IS Decision Process

IT Decision	Senior Management's Role	Consequences of Abdicating the Decision
How much should we spend on IT?	Define the strategic role that IT will have to play in the company and then determine the level of funding needed to achieve that objective	The company fails to develop an IT platform that furthers its strategy, despite high IT spending
What business processes should receive our IT money?	Make clear decisions about which IT initiative will and will not be funded	A lack of focus overwhelms the IT unit, which tries to deliver many projects that may have little company-wide value or can't be implemented well simultaneously
Which IT capabilities need to be company-wide?	Decide which IT capabilities should be provided centrally and which should be developed by individual businesses	Examine technical and process standardization limit the flexibility of business units, or frequent exceptions to the standards increase costs and limit business synergies
How good do our IT services really need to be?	Decide which feature, for example, enhanced capability or response time are needed on the basis of their costs and benefits	The company may pay for service options that, given its priorities, aren't worth their costs
What security and privacy risks will we accept?	Lead the decision making on the tradeoffs between security and privacy on the one hand and convenience on the other	An over-emphasis on security and privacy may inconvenience customers, employees and suppliers, an under-emphasis may make data vulnerable
Whom do we blame if an IT initiative fails?	Assign a business executive to be accountable for every IT project; monitor business metrics	The business value of systems is never realised.

Others

Project managers can position themselves to reduce the possibility of project failure by considering the following recommendations:

- Make sure to plan before starting the development or implementation
- Pay attention to tasks in the critical path
- Set up the necessary processes to calculate and inform the risk
- Ensure that the IT project has clear objectives
- Understand project tradeoffs when making decisions regarding objectives change
- Use the duration instead of the time on task to estimate schedule

- Avoid using linear approximation when estimating time or resources
- Get the support from the executive management and ask them to be open if they have any reservations about the project
- Ensure and communicate regularly about the progress, even if it seems invisible
- Require that users participate in design and implementation of your project
- Make sure you have the appropriate planning, communication and technology skills.

These recommendations, along with solid project management, can reduce the risk that an IT project fails.

4.0 CONCLUSION

Researches continually show that companies have difficulty with information technology (IT) projects to complete on time or on budget. In fact, many are cancelled before completion or not implemented.

The most common causes for IT failures are related to project management. The primary management causes for the failure of complex IT projects as observed from the Virtual Case File example are listed. These causes are elaborated upon with some examples.

The past failure need not discourage project managers from future efforts. Past examples of IT project failures gives us the opportunity to point to the relevant lessons that can be derived from recognising areas where IT projects is more likely to fail.

5.0 SUMMARY

- Managing information technology is not an easy task. The information systems functions have performance problems in many organisations. The promised benefits of information technology have not occurred in many documented cases. The best documented IT project failures are the ones involving public money. The most recent example is the Virtual Case File project for the United States Federal Bureau of Investigation (FBI).
- Sometimes IT managers are not given the opportunity to plan because time pressure from senior management take-over and most of the time the project is on its way before it has been clearly defined. Sometimes the goal of a project may be only partially clear due to a poor requirement gathering in the definition stage of a project.

- Many project managers had the feeling that their IT project would never stop growing. Estimation mistakes of time or resource cause project-related problems. One common problem during the creation of the Work Breakdown Structure is assuming that the time on task equals duration.
- The research companies and academic institution have focused on the lack of executive support and user involvement as two main difficulties in managing IT projects. Project sometimes fails due to improper communication.
- The challenge of global competition, the rapid growth of knowledge and the constant changes of technology make it hard to predict what kind of skilled people will be needed. Involving managers in the management of IT (from CEO to the manager of business units) requires the development of *governance structure* (such as executive steering committees) that encourages their active participation in planning and controlling business uses of IT.
- Project managers can position themselves to reduce the possibility for project failure by considering some recommendations.

6.0 TUTOR-MARKED ASSIGNMENT

1. List five (5) primary reasons for the failure of IT projects.
2. Discuss Senior management's role in IT decision-making process.

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UNIT 4 INFORMATION SYSTEMS PLANNING PROCESS: A CASE STUDY

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1.0 INTRODUCTION

In the early 1980's, the State of Tennessee recognised that the role of government was changing, that the needs for government services would continue to grow, and that resources available to government were decreasing. Effective use of information technology was viewed as a major avenue that could assist government in managing this change. It was also understood that well-defined business and information technology planning processes were critical success factors.

The State of Tennessee has developed a comprehensive technology planning process to enhance technology project initiation, review and approve. In 2004, the National Association of State Chief Information Officers (NASCIO) recognised the State of Tennessee's Information Systems Planning Process with an award of excellence.

2.0 OBJECTIVES

This unit is used as a case study to demonstrate real life application of information system planning. Therefore, at the end of this unit, you should be able to:

- discuss a background knowledge of the State of Tennessee
- identify the organisations that are involved in the IT process of State of Tennessee
- answer the question of the processes involved in IT planning process
- discuss the benefits the State of Tennessee has derived from adopting information technology planning.

3.0 MAIN CONTENT

3.1 Organisations

The organisations in this IT planning process are as follows:

- Information Systems Council (ISC)

The ISC is charged with ultimate authority over information technology within State Government. The Council is comprised of the following representatives from the legislative, executive and judicial branches of State Government:

- Three members of the State Senate and three from the House of Representatives
- Comptroller of the Treasury
- Chief Justice of the Supreme Court of Tennessee
- Commissioner of Finance and Administration, Chairman
- Commissioner of General Services
- Representative of the Tennessee Regulatory Agency
- Representative from the State Legislature
- Two private citizens with experience in information technology.

- Office of the Budget

  Central budget authority for State Government.

- Office for Information Resources (OIR)

  Central Technology Authority for State Government.

- Management Advisory Committee (MAC)

A Management Advisory Committee is established within each agency to enable executive management to more effectively direct information technology activities. The Deputy Executive Officer of the agency typically chairs the MAC, with program / functional area executives as MAC members. Some agencies include their General Council, Chief Financial Officer, or Internal Auditor on the MAC. Agency IS Director is staff to the MAC. The MAC is accountable directly to the Commissioner or agency head.

3.2 The Process

The information systems planning process in Tennessee has been in operation since 1981. It involves the preparation and agency authorization of the Information Systems Plans (ISP), a review by the central administrative agency, and final authorization by the major directing body for technology within Tennessee State Government.

In 1997, key leaders in Tennessee State Government, including the Governor and his Senior Staff, the Commissioner of the Department of Finance and Administration, the Comptroller of the Treasury and the State Treasurer agreed that the State would greatly benefit from the development and implementation of formal strategic business plans. In August, 1997, the Governor's Senior Staff initiated the strategic planning process within the Executive Branch. A plan was developed that enabled the 23 Executive Branch departments to align their strategic goals and objectives to the State's business goals and objective. Each year, the Governor and his Cabinet formulate the overall State Strategic Plan. Each agency in the Executive branch develops their agency Strategic Business Plan based on the goals and objectives of the State Strategic Plan. In 1998, the State established a formal Strategic Information Technology Planning Process. Input to this statewide IT planning effort comes from the State Strategic Business Plans, agency Information Systems Plans and technology trends in the marketplace. Executive management within the Office for Information Resources, with agency representation, leads this planning effort.

Prior to the beginning of the fiscal year (July 1), each agency develops an Information Systems Plan (ISP) covering a three-year planning horizon. Year One identifies projects for the current fiscal year for which funding is already in place. Year Two covers the following fiscal year. Funding will be requested in the budget submitted in October. Year Three covers future projects. Development of the agency's ISP is a cooperative effort between executive management, and business staff; with Information Systems staff assistance, performing the following activities:

Review of the strategic business plan for the agency, including the statement of mission, goals, objectives, strategies and priorities that set business direction. Assessment of the current technological environment within the agency, including evaluation of the primary hardware requirements, application software and connectivity. Development of an Information Technology Strategy based upon the analysis of the current environment and the business goals to be achieved.

This strategy identifies the agency's short and long-range goals related to managing and sharing information and information technology in support of the agency's business strategic plan. The strategy also addresses agency technology weaknesses and needs. Information technology projects are identified and documented in the ISP in support of the Information Technology Strategy. These projects may include traditional application development or acquisition projects, as well as projects involving specific technologies including voice response systems, geographic information systems and communication infrastructure projects.

Each project with initial costs over US$100,000 is described in a Project Proposal. The Project Proposal addresses the business process to be impacted by the project and specifies the business strategy or objectives supported by the project. A Cost-Benefit Analysis document is also included to detail the costs, benefits, risks and funding sources for the project. The Project Proposal and Cost Benefit Analysis provide a framework for an agency's executive management to evaluate and prioritise proposed projects, as well as provide a mechanism to monitor costs and benefits during project implementation.

These documents also provide executive management in the State Government with the information needed to understand the business impact to the State, prioritise projects on a statewide basis and recommend funding. The Information Systems Plans are reviewed and authorized by Management Advisory Committees (MACs) within each agency. Management Advisory Committees perform the following functions:

1. Sets the information technology agenda as an adjunct to the development of the business strategy for the agency.
2. Ensures that the agency information technology strategy is carried out and that projects are appropriately targeted to support specific business strategies.
3. Reviews the cost assumptions and benefit estimates in order to approve submission of the project.
4. Sets priorities within the agency for a project in relation to other projects competing for resources.
5. Ensures that authorized projects meet targets established in the project proposal and cost benefit analysis.
6. Ensure that technology projects are in line with business needs and direction.
7. Authorises the Information Systems Plan and technology projects contained therein.

External review of the Information Technology Strategy and supporting projects begins with submission of the Information Systems Plans to the Office for Information Resources. The Tennessee Department of Finance and Administration houses the State Budget Office and the Office for Information Resources (OIR). The State Budget Office oversees development and management of the Budget for al of State Government, and OIR oversees information technology for all of State Government. Representatives from these organisations serve on a review group, the Information Technology Assessment and Budget Review Committee (IT-ABC). They have the responsibility of addressing information systems issues from a statewide (corporate) view, to take a strategic view on major technological issues and to provide a process for monitoring technology projects. The review of Information Systems Plans is an important step in the accomplishment of these responsibilities. There are multiple purposes for plan review including:

- Approval or disapproval of current projects based on support of the State and Agency Strategic Plan and resource availability; adherence to the State's information systems architecture, policies and procedures; and contribution to fulfillment of the State's service delivery to its citizens.
- Recommendation of projects for inclusion or exclusion in funding formulas for the next fiscal year.
- Review of future projects in an attempt to identify long-term needs for information technology resources.
- Review of the Information Technology Strategy in an attempt to evaluate the agency's approach in using information technology to enable and enhance service delivery as outlined in its Business Strategy.
- Review of the plan to develop an understanding of the issues related to the effective and efficient use of information technology in the agency and the State as a whole. This information is important to identifying issues that, not only affect the agency, but also the systems community in the State. In its role as staff to the Information Systems Council, OIR is then better positioned to help pursue strategic initiatives to address major issues.
- Overall view of projects across agencies that may be performing similar functions, generating redundant data, or demonstrating a need for sharing data or resources. This view assists the state in addressing a growing need for sharing data among agencies in order to facilitate better service to the citizens of the State.

The IT-ABC is made up of senior management from the following areas:

- Quality, Planning, Performance and Security;
- Chair Data Networking and Telecommunications;
- Division of Budget;
- Data Resource Management;
- Enterprise Computing Support;
- Systems Development and Support;
- Information Technology Planning;
- Special Services, and
- Quality Assurance, Testing and Research.

The IT-ABC plan review begins each year when the Information Systems Plans are submitted May 15 for small agencies and July 1st for large agencies. The plans as well as reviewer comments about the plans and each major project are shared electronically. Approximately 80 staff members from the various divisions within OIR and Budget read and comment on the plans and/or projects. IT-ABC members complete a review of each ISP, as well as a review of the comments provided by staff. The actions by the agency's Management Advisory Committee in defining and setting project priorities also helps the IT-ABC understand the relative importance of each project in the further prioritization and ranking of al project requests throughout State Government.

After the preliminary review, an agenda memo noting issues of concern to individual agencies is prepared; a meeting is held by the IT-ABC with each agency's MAC and IS staff to address the issues identified. After the formal meeting, the agency is provided with a formal disposition on their Plan and each project in the Plan. Funding considerations based on the IT-ABC disposition of projects are finalized, and the statewide agency initiatives are presented to the Information Systems Council. The Council makes the final disposition on major projects and initiatives for State Government. A Statewide Information Systems Plan is developed annually based upon the individual agency plans.

3.3 Information System Plan

The Statewide Information Systems Plan consists of the following segments:

- Overview of the State's strategic business and information systems planning efforts, statewide initiatives and major statewide achievements through technology.
- Overview of the information technology environment in Tennessee.
- Overview of agency business strategy, technology strategy, achievements and planned technology projects.

3.4 Benefits

The operation of the State Government has improved in three general areas directly related to the Information Systems Planning process:

1. Improvements in the way agencies define, prioritise and monitor information technology projects;
2. Improvements in the Statewide technology and fiscal review of projects, and
3. Significant improvements in overall information technology planning.

Agency Improvements

Individual projects are now more clearly defined due to the standardization of a comprehensive project planning format as required by the Project Proposal and Cost Benefit Analysis methodology. Anticipated review of these deliverables within the agency and outside the agency increases the accuracy of the descriptions and estimates. Project sponsors, as well as MAC members, are encouraged to be closely involved in the cost benefit analysis process. Their role as the responsible parties has been crucial for ensuring that business objectives within the estimated costs and delivering the specified benefits.

Individual projects are now part of an overall technology strategy that moves the agency toward defined goals. The goals to be supported are part of the agency's business strategy. The close link between the business needs and technology enhances the visibility of information technology initiatives that are usually costly in both dollars and manpower resources. Due to the nature of the need for technology strategies to support the business initiatives of the agency, management overview and direction of information technology strategy to support projects is emphasised. Business management's key role in the development of the information technology strategy aids in ensuring that technology projects are more likely to be supported with the needed resources. Technology advancement relies on an agency business strategy. The development of agency business strategies has accelerated due to this dependence.

Statewide Technology and Fiscal Review

The explicit statement of the business need driving technology projects, as well as the definition of the project and associated costs and benefits, improves the understanding of the need for the project outside of the agency. A more objective review of all information technology projects can take place. Approvals and prioritization are based on more factual data and less on subjective issues.

Improvements in Overall Technology Planning

Through the plan review process, an enterprise-wide view is obtained so that initiatives can be viewed as State initiatives rather than agency initiatives. Resource maximization can take place through this view of similar, cooperative projects. Similar or overlapping efforts can be coordinated across agencies. Conformance of information technology initiatives to the State's architectural standards is more readily encouraged and achieved.

Information System Planning

Against the backdrop of our planning process, projects and initiatives are initiated, approved and monitored to ensure they meet the business needs of the State. An atmosphere has been fostered to encourage cost effective technology solutions to service delivery challenges of State Government. The effective and efficient use of resources expended on technologies, the close management control over the projects and the benefits in citizen service have fostered the expanded use of information technology. Information technology in State Government is driven by business goals established by the elected representatives of the citizens of the State. Executive management is accountable for technology initiatives. More realistic technology projects are defined and evaluated on a more objective basis. The impact of more effective planning is difficult to measure. However, there is no doubt that business and information technology planning has enabled significant process in the operation of State Government. One indicator of that progress and effectiveness is national recognition of our accomplishments. Tennessee has been honoured with the following:

- "The Best Managed State in the Country" by one national publication, and "One of the Best Managed States" by another publication, and the only state to make the top five in both.
- "One of the Top 100 organisations among both private and public sector organisations by CIO Magazine".
- "The first and only State to receive ALL three Government Finance Officers Association (GFOA) awards of excellence and information systems that have been awarded the NASIRE and Smithsonian.
- One of the top six States in the nation for effective management of information technology. (Study conducted by Syracuse University, "*Governing*" and "*Government Executive*" magazines).

- 2004 National Association of State Chief Information Officers (NASCIO) recognised the State of Tennessee's Information Systems Planning Process with an award of excellence.
- 2003 First in the Nation in Brown University's third annual survey of State e-government performance, and
- 2002 BEST OF THE WEB – Centre for Digital Government.

As the State has adopted technology to enhance service to citizens, IT projects that require significant investment have increased in number and cost. In support of this effort, the State established a fund, called the Systems Development Fund (SDF), as a mechanism for funding large application development projects and for large equipment purchases. State agencies can request funding from the SDF to cover initial investment and pay back the funds over a three to five-year timeframe. Projects approved for expenditure from this fund are determined by the Information Systems Council based on the recommendation of the Commissioner of Finance and Administration.

The State has also created an Equipment Replacement Fund (ERF) that can be used to replace desktop hardware. Agencies using the ERF must be able to escrow a portion (1/3, ¼, or 1/5 depending upon the equipment's life cycle) of the replacement funds annually in order to accumulate sufficient replacement dollars for their next replacement cycle.

4.0 CONCLUSION

The State of Tennessee as a case study has demonstrated that there are benefits associated with adopting formalized planning process. The basic outline of the processes can be adopted with specific modifications to suit individual corporate need.

5.0 SUMMARY

- The information systems planning process in Tennessee has been in operation since 1981. It involves the preparation and agency authorization of the Information Systems Plans (ISP), a review by the central administrative agency and final authorization by the major directing body for technology within Tennessee State Government.
- A Management Advisory Committee is established within each agency to enable executive management to more effectively direct information technology activities. Review of the strategic business plan for the agency, including the statement of mission, goals, objectives, strategies and priorities that set business direction.

- External review of the Information Technology Strategy and supporting projects begins with submission of the Information Systems Plans to the Office for Information Resources.
- The IT-ABC plan review begins each when the Information Systems Plans are submitted on May 15 for small agencies and July 1 for large agencies. Individual projects are now more clearly defined due to the standardization of a comprehensive project-planning format as required by the Project Proposal and Cost Benefit Analysis methodology.
- Against the backdrop of our planning process, projects and initiatives are initiated, approved and monitored to ensure they meet the business needs of the State. The ISC is charged with the ultimate authority over information technology within the State Government. As the State has adopted technology to enhance service to citizens, IT projects that require significant investment have increased in number and cost.

6.0 TUTOR-MARKED ASSIGNMENT

1. List at least five (5) representatives of Information System Council in the case study.
2. Discuss the major functions of the Management Advisory Committees of the State of Tennessee.

7.0 REFERENCES/FURTHER READINGS

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