COURSE GUIDE

MBA 815
MANAGEMENT INFORMATION SYSTEM

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CONTENTS PAGE

INTRODUCTION

MBA 815, Management Information System is a semester course work of two credit units, for post-graduate students of the School of Business and Human Resources Management.

The course material consist of 15 units that will enable learners understand the design and development of MIS.

COURSE AIMS

This course is designed for the student to have an understanding of how to design and develop an information management system within organizations. To further give the students the details of all the major process and phases embarked upon in systems development. It also exposes the students to specific method of systems development, and in details. Summarily, the aim of the course is for the learners to comfortably design and develop information systems in whatever organization they find themselves.

COURSE OBJECTIVES

The Comprehensive objectives of this course include to:

- teach the concept of systems development.
- trace the evolution of systems development.
- identify the purposes and the key principles of systems development.
- have a knowledge of the basic phases in a typical systems lifecycle.
- identify some of the drawbacks in the application of developedmethods.
- be able to know the steps that has to be taken in developing a strategic information system plan for an organization.
- answer the question of factors that influence the output of a strategic information system plan.
- understand the factors that trigger the initiation of information
- system design.
- explain what constitutes concept development in designing and
- developing information system.
- understand what constitutes the requirement analysis in

designing and developing information system.

- identify some issues that need to be considered in deign phase of a
- system.
- be able to know what are the deliverables from development,
- integration and testing to be used for subsequent phases.
- explain the relationship between cost of maintenance phase
- compared to other phases of systems development.
- be able to identify and discuss the success factors behind the
- operations of dynamic system development method.
- have an understanding of what project management is and how it has
- developed over the years.
- identify the components of a project planning based on structure put
- in place.
- understand risk assessment and management in the context of
- management information system as a project.
- specifically, understand the process of developing a geographic
- information system.

WORKING THROUGH THIS COURSE

The complete this course, learners are expected to have read all the units contained in this course material. Learners are advised to read textbooks recommended under the column for further reading and related materials you can possibly lay your hands on. Attempt all exercises in each unit. Answers to TMA are to be submitted for assessment purpose. At the end of the course, there will be a final examination to test your master of the course.

STUDY UNITS

Module 1

Unit 1	Overview of Systems Development Life Cycle (SDLC)
Unit 2	Overview of Information System Development Methods
Unit 3	Strategic Planning for Design of Information Systems
Unit 4	Initiation of System Design and Development
Unit 5	Concept Development and Planning of System Design

Module 2

Module 3

ASSESSMENT

- The assignments represents 30% of the marks obtainable
- Examination constitutes 70% of the marks obtainable.

MAIN COURSE

CONTENTS **PAGE**

MODULE 1

UNIT 1 OVERVIEW OF SYSTEMS DEVELOPMENT LIFE CYCLE (SDLC)

CONTENTS

1.0 INTRODUCTION

Many organizations spend millions of dollars each year on the acquisition, design, development, implementation, and maintenance of information systems vital to mission programs and administrativefunctions. The need for safe, secure, and reliablesystem solutions is heightened bytheincreasing dependenceon computer systems and technologyto provide services and develop products, administer daily activities, and perform short- and long-term management functions. There is also a need to ensure privacy and security when developing management information systems, to establish uniform privacy and protection practices, and to develop acceptable implementation strategies for these practices.

Organizations need a systematic and uniform methodology for information systems development. Using SDLC will ensure that systems developed by the Department meet IT mission objectives; are compliant with standards and are easy to maintain and cost-effective to enhance. Sound life cycle management practices include planning and evaluation in each phase of the information system life cycle. The appropriate level of planning and evaluation is commensurate with the cost of the system, the stability and maturity of the technology under consideration, how well defined the user requirements are, the level of stability of program and user requirements and security considerations.

Systems Development Life Cycle (SDLC) emphasizes decision processes that influence system cost and usefulness. These decisions must be based on full consideration of business processes, functional requirements, and economic and technical feasibility in order to produce an effective system. The primary objectives of any SDLC are to deliver quality systems that: 1)meet or exceed customer expectationsromised and within cost estimates, 2) work effectively and efficientlywithin the current and planned information technology infrastructure,and 3) are inexpensive to maintain and cost-effective to enhance. ThisSDLC establishes a logical order ofeventsfor conducting development that is controlled, measured, documented, and ultimatelyimproved.

This does notprescribe a single method applicable without change toevery system. Because there is wide variance in the methods, techniques and tools used tosupporttheevolutionofmanagementsystems, and project scopes vary greatly, the SDLC presents guidance for selecting appropriate methods, techniques, and tools based on specific factors. One methodology does not fit all sizes and types of system development efforts.

2.0 OBJECTIVES

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

- understand the concept of systems development
- trace the evolution of systems development

- identify the purposes and the key principles of systems development
- have a knowledge of the basic phases in a typical systems lifecycle.

3.0 MAIN CONTENT

3.1 SDLC Objectives

Key to SDLC

An SDLC isdevelopedtodisseminateprovenpracticesto system developers,projectmanagers, program/accountanalysts andsystem owners/users throughoutanyorganization. The specific objectives expected include the following:

- To reduce the risk of project failure
- To consider system and data requirements throughout the entire life of the system
- To identify technical and management issues early
- To disclose all life cycle costs to guide business decisions
- To foster realistic expectations of what the systems will and will not provide
- To provide information to better balance programmatic, technical, management, and cost aspects of proposed systemdevelopment or modification
- To encourage periodic evaluations to identify systems that are no longer effective
- To measure progress and status for effective corrective action
- To support effective resource management and budget planning
- To consider meeting current and future business requirements.

3.2 Purpose, Scope, and Applicability

3.2.1 Purpose

This SDLC methodologyestablishes procedures, practices,and guidelines governing the initiation, concept development, planning, requirements analysis, design, development, integration and test, implementation, and operations, maintenance and disposition of management informationsystems (MIS) within the organization. It should be used in conjunction withexisting policy and guidelines for acquisition and procurement.

3.2.2 Scope

This methodology should be used for all organizational information systems and applications. It is applicable across all information technology (IT) environments (e.g., mainframe, client, and server) and applies to contractually developed as well as in-house developed applications. The specific participants in the life cycle process, and the necessary reviews and approvals, vary from project to project. The SDLC should be tailored to the individual project based on complexity, and criticality to the agency's mission.

3.2.3 Applicability

The SDLC methodology can be applied across organizational units; Offices, Boards, Divisions and Bureaus (OBDB) who are responsible for information systems development. All Project Managers and development teams involved in system development projects represent the primary audience for the SDLC. The SDLC serves as the mechanism to assure that systems under development meet the established requirements and support an organization's mission functions. It provides a structured approach to managing information technology (IT) projects beginning with establishing the justification for initiating systems development or maintenance effort and concluding with system disposition.

The primary audience for SDLC is the systems developers, IT project managers, program/account analysts and system owners/users responsible for defining and delivering organizational systems, their staff, and their support contractors. Specific roles and responsibilities are described throughout each life cycle phase.

3.3 Key Principles

The SDLC defines traditional information system life cycle management approaches to reflect the principles outlined in the following subsections. These are the foundations for life cycle management.

Life Cycle Management Should be used to Ensure a approach to Information Systems Development, Maintenance, andOperationThis SDLC describes anoverallstructured approachtomanagement. Primary emphasis is placed on the information and systems decisions to be made and the proper timing of decisions. The SDLC provides a flexible framework for approaching a variety systems projects. The framework enables system developers, project managers, program/account analysts, and system owners/users to combine activities, processes, and products, as appropriate, and to select the tools and methodologies best suited to the unique needs of project.

Support the use of an Integrated Product Team

The establishment of an Integrated Product Team (IPT) can aid in the success of a project. An IPT is a multidisciplinary group of people who support the Project Manager in the planning, execution, delivery and implementation of life cycle decisions for the project. The IPT is composed of qualified empowered individuals from all appropriate functional disciplines that have a stake in the success of the project. Working together in a proactive, open communication, team oriented environment can aid in building a successful project and providing decision makers with the necessary information to make the right decisions at the right time.

Each System Project must have a Program Sponsor

To help ensure effective planning, management, and commitment to management information systems, each project must have a clearly identified program sponsor. The program sponsor serves in a leadership role, providing guidance to the project team and securing, from senior management, the required reviews and approvals at specific points in the life cycle. An approval from senior management is required after the completion of the first seven of the SDLC phases, annually during Operations and Maintenance Phase and six-months after the Disposition Phase. Senior management approval authority may be varied based on dollar value, visibility level, congressional interests or a combination of these. The program sponsor is responsible for identifying who will be responsible for formally accepting the delivered system at the end of the Implementation Phase.

A Single Project Manager must be Selected for Each System Project

The Project Manager has responsibility for the success of the project and works through a project team and other supporting organization structures, such as working groups or user groups, to accomplish the objectives of the project. Regardless of organizational affiliation, the Project Manager is accountable and responsible for ensuring that project activities and decisions consider the needs of all organizations that will be affected by the system. The Project Manager develops a project charter to define and clearly identify the lines of authority between and within the agency's executive management, program sponsor, (user/customer),and developer forpurposes of management and oversight.

A Comprehensive Project Management Plan is Required for Each System Project

The project management plan is a pivotal element in the soulcucteisosnful of an information management requirement. The project management plan must describe how each life cycle phase will be accomplished to suit the specific characteristics of the project. The Project management plan is a vehicle for documenting the project scope, tasks, schedule, allocated resources, and interrelationships with other projects. The plan is used to provide direction to the many activities of the life cycle and must be refined and expanded throughout the life cycle.

Specific Individuals Must be Assigned to Perform Key Roles throughout the Life Cycle

Certain roles are considered vital to a successful system project and at least one individual must be designated as responsible for each key role. Assignments may be made on a full- or part-time basis as appropriate. Key roles include program/functional management, quality assurance, security, telecommunications management, data administration, database administration, logistics, financial, systems engineering, test and evaluation, contracts management, and configuration management. For most projects, more than one individual should represent the actual or potential users of the system (that is, program staff) and should be designated by the Program Manager of the program and organization.

Obtaining the Participation of Skilled Individuals is Vital to tShueccess of the System Project

The skills of the individuals participating in a system project are thesingle most significant factor for ensuring the success of the project. The SDLC is not intended as a substitute for information management skills or experience. While many of the skills required for a system project are discussed in later sections, the required skill combination will vary according to the project. All individuals participating in a system development project are encouraged to obtain assistance from
experienced information management professionals.

Documentation of Activity Results and Decisions for Each Phase ofthe Life Cycle are Essential

Effective communication and coordination of activities throughout thelife cycle depend on the complete and accurate documentation of decisions and the events leading up to them. Undocumented or poorly documented events and decisions can cause significant confusionowrasted efforts and can intensify the effect of turnover ofpmraonjeacgtement staff. Activities should not be considered complete, nordecisions made, until there is tangible documentation of the activity ordecision. For some large projects, advancement to the next phase cannotcommence until the required reviews are completed and approved bysenior management.

Data Management is Required throughout the Life Cycle

An organisation considers the data processed by systems to be an extremely valuable resource. Accurate data is critical to support organizational missions. The large, medium and small volumes of data handled by organisation's systems, as well as the increasing trend toward interfacing and sharing data across systems and programs, underscore the importance of data quality. Systems life cycle activities stress the need for clear definition of data, the design and implementation of automated and manual processes that ensure effective data management.

Each System Project Must Undergo Formal Acceptance

The program sponsor identifies the representative who will be responsible for formally accepting the delivered system at the end of the Implementation Phase. The system is formally accepted by the programsponsor by signing an Implementation Phase Review and Approval Certification along with the developer.

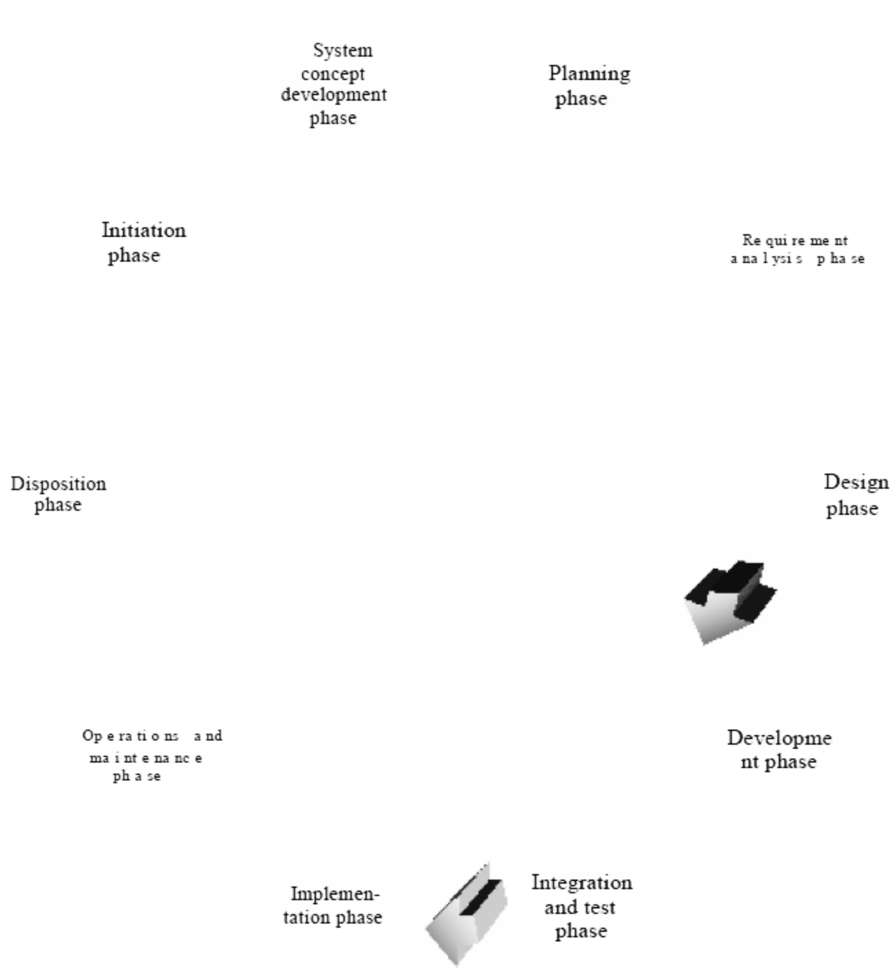
Consultation with Oversight Organizations Aids in the Success of a System Project A number of oversight bodies, as well as external organizations, have responsibility for ensuring that information systems activities are performed in accordance with standards and available resources are used effectively. Each project team should work with these organizations, asappropriate, and encourage their participation and support as early as possible in the life cycleto identify and resolve potential issues or sensitivities and thereby avoid major disruptions to the project. Assume all documentation is subject to review by oversight activities.

A System Project may not Proceed until Resource

Availability is Assured Beginning with the approval of the project, the continuation of a system is contingent on a clear commitment from the program sponsor. This commitment is embodied in the assurance that the necessary resources will be available, not only for the next activity, but as required for the remainder of the life cycle.

3.4 SDLC Phases

The SDLC includes phases, for example ten phases in this model; during which defined IT work products are created or modified. The phase occurs when the system is disposed of and the task performed is either eliminated or transferred to other systems. The tasks and workproducts for each phase are described in subsequent chapters. Not every project will require that the phases be sequentially executed. However, the phases are interdependent. Depending upon the size and complexity of the project, phases may be combined or may overlap. See Figure 1-1.



The initiation of a system (or project) begins when a business need or opportunity is identified. A Project Manager should be appointed to manage the project. This business need is documented in a Concept Proposal. After the Concept Proposal is approved, the System Concept Development Phase begins.

System Concept Development Phase

Once a business need is approved, the approaches for accomplishing the concept are reviewed for feasibility and appropriateness. The SystemsBoundary Document identifies the scope of the system and requires Senior Official approval and funding before beginning the Planning Phase.

Planning Phase

The concept is further developed to describe how the business will operate once the approved system is implemented, and to assess how the system will impact employee and customer privacy. To ensure the products and /or services provide the required capability on-time and within budget, project resources, activities, schedules, tools, and reviews are defined. Additionally, security certification and accreditation activities begin with the identification of system security requirements and the completion of a high level vulnerability assessment.

Requirements Analysis Phase

Functional user requirements are formally defined and delineate the requirements in terms of data, system performance, security, and maintainability requirements for the system. All requirements are defined to a level of detail sufficient for systems design to proceed. All requirements need to be measurable and testable and relate to the business need or opportunity identified in the Initiation Phase.

Design Phase

The physical characteristics of the system are designed during this phase. The operating environment is established, major subsystems and their inputs and outputs are defined, and processes are allocated to resources. Everything requiring user input or approval must be documented and reviewed by the user. The physical characteristics of the system are specified and a detailed design is prepared. Subsystems identified during design are used to create a detailed structure of the system. Each subsystem is partitioned into one or more design units or modules. Detailed logic specifications are prepared for each software module.

Development Phase

The detailed specifications produced during the design phase are translated into hardware, communications, and executable software. Software shall be unit tested, integrated, and retested in a systematic manner. Hardware is assembled and tested.

Integration and Test Phase

The various components of the system are integrated and systematically tested. The user tests the system to ensure that the functional requirements, as defined in the functional requirements document, are satisfied by the developed or modified system. Prior to installing and operating the system in a production environment, the system ndergo certification and accreditation activities.

Implementation Phase

The system or system modifications are installed and made operational in a production environment. The phase is initiated after the system has been tested and accepted by the user. This phase continues until thesystem is operating in production in accordance with the defined user requirements.

Systems development life cycle model:

There are a lot of SDLC models. Some relevant models are disculssed within the content of this course material.

Operations and Maintenance Phase

The system operation is ongoing. The system is monitored for continued performance in accordance with user requirements, and needed system modifications are incorporated. The operational system is periodically assessed through In-Process Reviews to determine how the system can be made more efficient and effective. Operations continue as long as the system can be effectively adapted to respond to an organization's needs. When modifications or changes are identified as necessary, the system may reenter the planning phase.

Disposition Phase

The disposition activities ensure the orderly termination of the system and preserve the vital information about the system so that some or all of the information may be reactivated in the future if necessary. Particular emphasis is given to proper preservation of the data processed by the system, so that the data is effectively migrated to another system or archived in accordance with applicable records management regulations and policies, for potential future access.

3.5 Documentation

This life cycle methodology specifies which documentation shall be generated during each phase. Some documentation remains unchanged throughout the systems life cycle while others evolve continuously during the life cycle. Other documents are revised to reflect the results of analyses performed in later phases. Each of the documents produced are collected and stored in a project file. Care should be taken, however, when processes are automated. Specifically, components are encouraged to incorporate a long-term retention and access policy for electronic processes. Be aware of legal concerns that implicate effectiveness of or impose restrictions on electronic data or records. Contact your Records Management Office for specific retention requirements and procedures.

3.6 Systems Development Life Cycle Models include

3.6.1 The Waterfall Model

This is the classic SDLC model, with a linear and sequential method that has goals for each development phase. The waterfall model simplifies task scheduling, because there are no iterative or overlapping steps. One drawback of the waterfall is that it does not allow for much revision.

3.6.2 Rapid Application Development (RAD)

This model is based on the concept that better products can be developed more quickly by: using workshops or focus groups to gather system requirements; prototyping and reiterative testing of designs; rigid adherence to schedule; and less formality of team communications such as reviews.

3.6.3 Joint Application Development (JAD)

This model involves the client or end user in the design development of an application, through a series of collaborative workshops called JAD sessions.

3.6.4 The Prototyping Model

In this model, a prototype (an early approximation of a final system or product) is built, tested, and then reworked as necessary until acceptable prototype is finally achieved from which the complete system or product can now be developed.

3.6.5 Synchronize-and-Stabilize

This model involves teams working in parallel on individual application modules, frequently synchronizing their code with that of other teams and stabilizing code frequently throughout the development process.

3.6.6 The Spiral Model

This model of development combines the features of the prototyping model and the waterfall model. The spiral model is favored for large, expensive, and complicated projects.

4.0 CONCLUSION

Systems development life cycle is a system by which analysts, software engineers, programmers and end users build information systems and computer applications has brought about a disciplined approach to systems development. This has resulted in the reduction of project time and cost. It has also brought about consistency and continuity in systems design and development.

5.0 SUMMARY

- Many organizations spend millions of dollars each year on the acquisition, design, development, implementation, and maintenanceof information systems vital to mission programs and administrative functions.

- An SDLC is developed to disseminate proven practices to system developers, project managers, program/account analysts and system owners/users throughout any organization.

- This SDLC methodology establishes procedures, practices, and guidelines governing the initiation, concept development, planning, requirements analysis, design, development, integration and test, implementation, and operations, maintenance and disposition of management information systems (MIS) within the organization

- This SDLC describes an overall structured approach to information management. Primary emphasis is placed on the information systems decisions to be made and the proper timing of decisions.

- The skills of the individuals participating in a system project are the single most significant factor for ensuring the success of the project.
- The SDLC includes phases, for example ten phases in this model; during which defined IT work products are created or modified.
- The initiation of a system (or project) begins when a business need or opportunity is identified.
- This life cycle methodology specifies which documentation shall be generated during each phase. Some documentation remains unchanged throughout the systems life cycle while others evolve continuously during the life cycle.

In the next study unit, you will be exposed to overview of information system development methods.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the key principles to adopt in the development of SDLC.
2. Briefly differentiate the models of SDLC.

7.0 REFERENCES/FURTHER READINGS

Information Resources Management (2003).The Department of Justice Systems Development Lifecycle Guidance Document.

Norton, P (1995). Introduction to Computers.Macmillan/McGraw-Hill.

UNIT 2 OVERVIEW OF INFORMATION SYSTEM DEVELOPMENT METHODS

CONTENTS

1.0 INTRODUCTION

This unit introduces you to historical perspectives and concepts information system development. It also exposes you to Re-evaluation and use of methods in JSD. Finally, it examines the degree modification and frequency of method modifications in ISD

2.0 OBJECTIVES

This unit of the course is designed for you to:

- understand the concepts and the evolution of information systems development
- identify some of the drawbacks in the application of developed methods
- answer the question of how popular are locally developed methods
- be able to identify the degree to which methods are modified.

3.0 MAIN CONTENT

3.1 Concept of Information System Development

In designing and developing management information systems despite the efforts poured into method development and research, there seems to be no universal agreement whether methods are useful in ISD at all. Several fundamental questions on ISD methods are largely unanswered. Of these questions two are especially important: "are methods actually used in practice?" and"why are local methods developed?" The importance of these questions is further emphasized because of the contradiction between the great efforts made to promote text-book methods and their surprisingly low use in practice. In short, there are thousands of methods available and new ones are continually developed, but at the same time empirical research reveals that many companies do not use them, and if they do then they have developed their own variants As a result, it seems that method development is relatively easy since so many of them exist, but methods developed by others do not meet method users' requirements. We can find reports and studies aboutorganizations which have found their local methods applicable or even reported success stories of method use. These observations lead us to analyze two paradoxes of methods in more detail, namely the low acceptance of methods and the popularity of local methods.

3.1.1 Tacit Method Knowledge

The underlying paradigm behind many ISD methods is scientific reductionism. This rests on the assumption that the solution can be achieved through a sequence of steps, decisions, and deliverables pre-defined in the method knowledge (Fitzgerald 1996). The expectation of a complete and explicit set of methodical knowledge is, however, too narrow.

The dominant approach underpinning many methods can be characterized as "technical rationality": situations in practice can be scientifically categorized, problems are firmly bounded, and they can be solved by using standardized principles. This view of development and use of methods is by no means wrong or "bad": it has produced a great deal of knowledge about ISD and led to the development of useful routine procedures which are generally known and used. In fact, the main principle of method development can be said to be to provide knowledge about ISD which is explicit and applicable for future ISD efforts. However, not all tasks of ISD fit the view of scientific reductionism. In other words, it is not possible to have full knowledge about the problem (and thus the applicable method) beforehand, nor can pre-defined method knowledge cover all possible situations. Moreover,part of theknowledge related to ISD in general and toknowledge in particular is tacit and thus can not be expressed. Therefore, we claim that the technical rationality is too narrow address and explain the use of methods as it takes place in practice. As a result, it is our belief that system development can not be completely carried out by following pre-defined methods.

A liberating perspective to support method development is what Schön (1983) calls "reflection-in-action". Here, the fundamental assumptions are uniqueness of situations and tacit, intuitive knowledge. Part of our knowledge of ISD is based on our reflection on the situations in which we find ourselves, rather than being found solely by using predefined methods. Thus, methods need tobemaintainedbasedonpractice, transforming tacit knowledge into explicit knowledge. The importance of tacit knowledge partly explains the low acceptance and use of methods, and why successful ISD efforts can be carried out a-methodically (Baskerville et al. 1992) without the use of any "explicit"method. Hence, method is not everything. On the other hand, all ISD efforts cannot be carried out based on pure intuition andknowledge (Jaaksi 1997). Therefore, we see the views of reflection-in-action and technical-rationality as complementary views of method development and use: both explicit and tacit knowledge are necessary
and useful for successful ISD. Accordingly, a good method should take both aspects into account, on the one hand, providing knowledge which can be rigidlyfollowed as
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3.1.2 Method Use is a Learning Process

The other assumption behind scientific reductionism (Fitzgerald 1996) isthatthedeveloper canobtaindetailedknowledge about the situation and about applicable methods. This view expects thatnecessary knowledge about the method, whether it is tacit or explicit, is available beforehand. In addition to this expectation of complete and explicit methodical knowledge the introduction of methods as readily available "routines" is seen as being easy, and the use of assumed to lead to solutions which are repeatable. For example, one of the goals of ISD (Cameron 1989) is to eliminate personal differences and even creativity from the development process. According to this view the key problem for IS developers would be to select the right method rather than to use it.

We question this by emphasizing that method use is a learning process in which the current level of expertise is crucial to successful (Curtis 1992, Hughes and Reviron 1996). The learning process occurs at two levels; in the domain of IS, and in the domain of ISD. The former means learning about successful (or unsuccessful) ISs. The latter means that any organization that builds ISs, not only delivers systems - they also learn how to carry out ISD, and use methods. This learning about methods means that they gain experience about the applicability of methods. This experience can complement the method knowledge they already possess.

Another factor explaining the low use of methods is organizations' surprisingly shallow knowledge and experience of methods (see Aaen et al. 1992), and their poor capability to manage ISD (see Humprey 1988). For example, a survey by Aaen et al. (1992) observed that more than half of the organizations considered their knowledge and experience of methods small. Similar results have been found in other surveys (cf. Smolander et al. 1990). Research on software process maturity (Humprey 1988) has shown that understanding of one's own work must precede any further steps in method definition and improvement.

3.1.3 Evolution of Methods

Instead of viewing methods as finished articles, a view which few method promoters take, methods must be viewed from an evolutionary perspective. Shifts in method knowledge are known (Joosten and Schipper 1996) and an examination of current developments in the field of object-oriented methods, workflow methods or business process re-engineering methods gives no reason to expect that this would change in the near future. An indication of method evolution is that organizations must deal with different method versions, introduce new method types, such as object-oriented methods, and abandon old methods which have been found inapplicable for new technologies and applications (Bubenko and Wangler 1992).

Basically, two different types of evolution exist: those reflecting general requirements of technical evolution and business needs, and those relevant to the ISD situation at hand. The former deals with the general historical perspective and the latter with how these general requirements are adapted into local situations and how they affect the method evolution.

3.2 Historical Perspective of ISD

The method literature includes several reviews of the development and use of ISD methods (e.g. Welke and Konsynski 1980, Bubenko1986,Norman and Chen1992, Moynihan and Taylor1996). Most of theseexplain method evolution though an interaction with available or emerging technologies which are used either in the developed systems or in the ISD tools.

Bubenko (1986) analyzed methods from a historical perspective: the need for methods has grown while the complexity and size of ISs has increased. The earliest methods were developed in the 1960's when the first large scale batch and transaction-processing systems were developed. Furthermore, the emergence of databases in the 1970's led to the introduction of data modeling techniques. At the same time structured design and analysis methods derived their origins from structured approaches and from the evolution in programming languages. Similarly, Welke and Konsynski(1980) characterize advances in technologies, such as database management systems, which were reflected in ISD methods. Likewise, today these surveys could be extended to object-oriented technologies, mobile phones, business process changes, and multimedia. As a result, Welke and Konsynski emphasize that method developers should be aware of technological developments, as they form one key factor in improving and maintaining methods.

Likewise, Norman and Chen(1992) explain method evolution in termsofan evolutionofapplicationsdeveloped.Theyalsorelatevolution to CASE tools. Although they primarily discuss the evolution of CASE, a close connection to parallel advances in methods rec ognized. For them new applications drive the creation of methods and later lead to the development of CASE tools. Thus, developers should follow advances in technologies which could support new forms of ISD methods. For example, the emergence of graphical user interfaces and CASE tools supported the introduction and use of methods (Chikofsky and Rubenstein 1988).

Another indication of a method's historical evolution can be found by studying different versions of commercial methods such as SDM (Turner et al. 1988), and SSADM (CCTA 1995). These were developed over long periods of time. For example, SDM (System Development Method), has been developed and updated since 1974 because of the changes in software tools, organizational impact of ISs, and the need to support system maintenance (Turner et al. 1988).

3.3 Paradox to the Use of Methods

3.3.1 Low Acceptance and Use of Methods

Although the capability of methods to improve the productivity and quality of ISD has commonly been acknowledged, systematic use of methods is still surprisingly low .Thus, there is a paradox here between the claimed advantages of methods, which should indicate high use, and the empirical observations revealing low acceptance of methods. This paradox is further emphasized when we consider the amount of work both industry and academics put into the development and study of methods.

The low acceptance of methods is reported by many professionals, confirmed by empirical research and recognized in many studies focusing on the use of tools. For example, Yourdon has estimated that only 10% of software professionals have actively used structuredmethods in their daily practice, and 50% of organizations have triedthem at some time. Nevertheless, 90% of developers are familiar with structured methods, emphasizing the low acceptance of methods.

In addition, several empirical studies on the use of methods or tools confirm the estimations on the low use of methods. A study by Fitzgerald (1995) into 162 organizations observes that only 40% of them apply methods. Another study by Necco et al. (1987) into 97 organizations shows that 62% of companies used a structured approach. A study by Hardy et al. (1995) indicates that method use can be as high as 82%. As can be seen, these studies have different or even conflicting results. One reason for the variety lies in the selection of the sample and in the definition of 'method use'. First, samples are not homogeneous. For example, Fitzgerald (1995) included small companies which did not have large ISD projects, companies which applied packaged software, and companies which had outsourced ISD. These companies were also found to be less favorable to the use of methods, which explains the lower use rate found. On the other hand, studies concentrating on method use normally show higher rates of method use, e.g. 82% in Hardy et al. (1995). Nevertheless, a study by Russo et al. (1995) which focused on organizations using methods still found that 7% of organizations which had claimed in an earlier survey to have a method did not use it. Hence, even if the sample organizations would be the same, respondents can have a different understanding of what methods and method use mean.

Second, distinctions between levels of method use is important, especially the borders between systematic, ad-hoc, and no use of methods. What does it actually mean when ISD professionals say thatthey follow some method? For example, how fully should method use be defined and documented, how completely should they be followed, and how widely spread and obligatory method use should be in an organization before we can make a judgment that methods are actually used. For example, although in the survey by Hardy et al. (1995) 82% of organizations claim to use methods, it does not mean that they always follow them. In a partial solution to this problem, Fitzgerald (1995) suggests a distinction between formalized and non-formalized methods: a formalized method denotes a commercial or a documented method, and a non-formalized a non-commercial or an undefined method. An organization's own methods could fall into both categories. By considering only the use of formalized methods the rate of method use drops considerably: from 40% to 26% (Fitzgerald 1995). A field study by Smolander et al. (1990) partly confirms these findings by showing that the methods applied were mostly a collection of loosely coupled informal techniques. Moreover, Russo et al. (1996) characterizes method use based on frequency — used always, seldom or occasionally — to find out the adherence to methods. This categorization shows that most organizations having a method actually apply them (66%).

Thus, the diversity of the meaning of method use and theknowledge regarding how methods are actually used explains differences in survey results. It seems that the use of surveys to study method use and commitment to methods.

Empirical studies, however, reveal the major benefits and drawbacks of method use. Major benefits include enhanced documentation, systematized ISD process, meeting requirements better, and increased user involvement (Smolander et al.1990, Hardy et al. 1995).

Organizations which do not use methods consider the improvements caused by methods to be modest: methods are considered labor-intensive, difficult to use and learn, and as having poorly defined and ambiguous concepts (McClure 1989, Brinkkemper 1990). Methods are also seen as limiting and slowing down development, generating more bureaucracy and being unsuitable (Smolander et al. 1990). Hence, introduction of a method changes the prevailing practices of ISD to such an extent that the method is abandoned or at least its use voluntary to summarize, method developers have partly failed in introducing methods which would be acceptable by the ISD community at large. There is some empirical evidence which explains which aspects methods and their use situations influence their success(or(Wilyne)koop and Russo 1993).

3.3.2 Popularity of Local Method Development

A paradox that arises is the use of local methods in contrast to applying third-party methods (i.e. commercial or text-book methods). Surveys investigating method use in organizations as well as case studies and descriptions of organization specific methods reveal that organizations tend to develop their own local “variants” of methods, or adapt them to their specific needs. Hence, there is a paradox here between method developers proposing situation-independent methods and method users who have developed situation-bound methods.

Surveys indicate that local methods are more popular than their commercial counterparts. This partly explains the low acceptance of CASE tools which normally necessitate the use of a fixed method. Among the surveys, both Russo et al. (1995) and Fitzgerald (1995) show that 65% of the organizations which use methods have developed them in-house: their own method is preferred over a third-party one. Other studies obtain similar figures: 62,5% (Flynn and Goleniewska 1993),42% (Russo et al. 1996), 36% (CASE Research Corporation cited inYourdon1992), and 38% (Hardy et al. 1995) of organizations have developed their own methods. Hardy’s study, furthermore, claims that 88% of the organizations adapted the methods in-house; the same percentage was found in the study by Russo et al. (1995). Thus, although organizations develop their own methods, methods need to be adapted to different use situations in the same way as with third-party methods. This means that organizations’ own methods do not completely fit with the use situations in their projects. Some studies (Hardy et al. 1995), however, have found that organizations which have developed their own methods are more satisfied with them than users of third-party methods. This is quite obvious, since otherwise the local method would hardly have been developed and maintained. On the other hand, few would announce that they have developed abadmethod. Thus, it seems natural that methods developed locally are considered better than third-party methods.

Unlike surveys of method use, surveys of local method development get surprisingly similar results, although it would be expected that the distinction between local and external methods as well as between levels of adaptation would be more difficult to make. However, since surveys do not go into details, they do not provide answers about what local method development actually means, or what aspects of method knowledge are modified.

To sum up, many of the organizations or projects which apply methods do not use the methods proposed by others. Commercial methods are modified for example by simplifying or by combining them with other methods (e.g. Jaaksi 1997), or then organizations develop their own methods. This is noteworthy since commercial methods claim to have a well-thought out conceptual structure together with process models and guidance which have worked successfully in other ISD efforts. These methods are furthermore backed by manuals, training programs, tutorials, and tools, necessary when introducing methods. The reason for local method development can not be simply a negative attitude towards something developed outside the organization (i.e. 'not invented here'attitude). Development of a local method requires significant expenditure of resources which would not be needed if commercial methods were applied. The relatively high costs, need for resources and recognized ad-hoc method development practices (Smolander at al. 1990) would also discourage local method development efforts. Thus, it seems that the need for more applicable methods is so great that it leads organizations to develop their own methods, either organization specific or project specific.

3.4 Re-Evaluation of Method Use

The two paradoxes above raise several questions about the acceptance and applicability of methods in general and commercial text-book methods in particular. For example, why develop commercial methods or yet another modeling approach if hardly anyone is going to use it? Based on the paradoxes we take a different starting point and re-evaluate the prevailing view of method use. Instead of viewing methods universal, fixed, and readily applicable mechanisms for instrumental problem solving we view methods more as being situation-bound and describing only part of the knowledge necessary for ISD. Methods are related to an organization's current level of expertise, and they are under constant evolution in organizations which apply them. Thus, the evaluation of method use describes a new understanding of methods and seeks to explain the popularity of local methods.

The re-evaluation does not mean that methods should not be standardized or situation-independent, or that commercial text-book methods should not be developed. At least 14% of organizations are still using text-book or commercial methods as specified and without adaptation (Fitzgerald 1995).
Thesemethodsalsoprovideapoint for development of local methods. In this unit we are, however, concerned with the rest of the organizations: those which develop their own methods, those which adapt available methods, and those organizations which could benefit from methodical support once methods have been defined and constructed to meet their contingencies.

3.5 Degree of Modifications

The degree of modifications defines how large the changes are that are made to the local method to improve its applicability. These modifications can be (cf. Harmsen et al. 1994):

This classification allows us to distinguish how much a method used in an organization differs from other methods. The degree of modifications could also compare two changes at different times in the same method by analyzing the number of method components changed at each time. This alternative dimension is excluded here because ases are not reported in such detail that categories could be formed.

Hence, in the following, each degree of method modifications is discussed by analyzing the current method in use (instead of the current changes).

1. Selection Paths within a Method describe one extreme of ME. Here the only possible modification alternatives are those provided by the method (i.e. built-in flexibility), and thus are limited to a few contingency factors. Examples of these contingencies include development of small versus large systems, the use of prototyping, and the use of application packages. It is, however, unrealistic to expect that methods should include a much larger set of contingencies and condense them into modification guidelines (Hardy et al. 1995).

2. A Combination of Methods for internal use

occurs when a chosen method, and its possible selection paths, does not meet the situational contingencies. In a combination the local method is based on the constructs offered by several commercial methods, and partly based on modified or totally new constructs. A study by Russo et al. (1996) shows that 37% of the methods used in organizations is combinations of commercial and in-house methods. Accordingly, the adaptation can be carried out either by combining available methods or by modifying a single method for internal use (e.g. Bennetts and Wood-Harper 1996, Nuseibah et al. 1996).

3. An Organization or a Project which develops its Own Methods faces situations which are outside the set of situations to which known methods are suited. Minor modifications into known methods are no longer sufficient, and thus the developed method does not have any close "relative" among other methods.

Ryan et al. (1996) characterizes this category as an effort to develop new conceptual. An example of a company which has developed its own methods is USU, a consulting company (reported in Nissen et al. 1996). The method developed, called PFR, focused on rapid requirements capture in team workshops and individual interviews.

Locally developed methods are often considered propriety andinformation about them is difficult to obtain. Many of the methodswhich can today be characterized as commercial have a background inan organization's internal needs. For example, Business SystemsPlanning(IBM1984) was originally developed to solve the problemswhich IBM noticed in the management of its own ISs. Similar historiesare shared by Objectory (Jacobson1992) and Octopus(Awad et al.1996).

3.6 Frequency of Method Modifications

The frequency of method modifications, explains how often a method is changed. More specifically, it measures how often changes in situationsare reflected in methods. From the available cases four basic categories can be found:

1. Method Modifications Based on Advances in External Method Knowledge are typical in organizations where methods follow a national or industry standard or a method-dependent CASE tool. Thus, new

versionsare the result ofdecided modifications. Because of the slow standardization process such modifications are carried out infrequently, and do not necessarily relate to organization specific situations.

Similarly, if the method is supported by a method-dependent CASE tool, the vendor can dictate the frequency of new versions. Method changes in this category do not normally occur more often than once a year.

2. Method Modifications Based on Changes in an Organization's ISD Situations deal with local method development in which contingencies related to the whole organization change and are reflected in methods. Examples ofsuch changes are outsourcing ISD, introducing new technologies (e.g. Bennetts and Wood-Harper1996),or starting to develop new type of IS. Hence, the relevant contingencies here are the same for the whole organization). This type of organization-wide method change can occur many times a year.

3. Method Modifications on a Project-by-Project Basis areconsidered inures which need to be mapped to methods. Modifications are not made during the method use but only at the beginning of every project. Because each project is dealt with individually this approach is relevant to project-based ME. The changes in methods are always based on the schedules of the projects (i.e. a timeframe of months in general).
4. Continuous Method Refinement happens when ISD contingencies are uncertain or change rapidly, e.g. when a new method or methods are used in a new area. Although methods are typically introduced as a whole, the ME efforts analyzed show that method adaptations occur frequently during an ISD project.

These modifications do not occur only at the individual level, but also in ISD projects, and in the longer run in the rganization.

4.0 CONCLUSION

Based on the IS research literature, there appear to be at least three possible ways to research method use. The first is to continue the widely followed research approach to develop new situation-independent and universal methods, compare them conceptually (e.g. frameworks), and use them in cases. However, this approach, despite its use in multiple studies, has proven to be inadequate for resolving problems related to the wider acceptance of methods. The second option is to pursue comprehensive empirical studies on methods in realistic environments. Although this proposition is basically correct, it is not a realistic approach for today's organizations. The third option is method engineering: to focus on mechanisms that support local method development and use.

5.0 SUMMARY

- In designing and developing management information systems despite the efforts poured into method development and research, there seems to be no universal agreement whether methods are useful in ISD at all.
- The other assumption behind scientific reductionism (Fitzgerald 1996) is that the developer can obtain detailed knowledge about the problem situation and about applicable methods.
- In addition, several empirical studies on the use of methods or tools confirm the estimations on the low use of methods.
- The low acceptance of methods is reported by many professionals, confirmed by empirical research and recognized in many studies focusing on the use of tools.
- The underlying paradigm behind many ISD methods is scientific reductionism. This rests on the assumption that the solution can be achieved through a sequence of steps, decisions, and deliverables pre-defined in the method knowledge.
- Method developers have partly failed in introducing methods which would be acceptable by the ISD community at large.
- Methods are related to an organization's current level of expertise, and they are under constant evolution in organizations which apply them. Thus, the re-evaluation of method use describes a new understanding of methods and seeks to explain the popularity of local methods.
- Many of the organizations or projects which apply methods do not use the methods proposed by others. Commercial methods are modified for example by simplifying or by combining them with other methods (e.g. Jaaksi 1997), or then organizations develop their own methods.
- Method developers have partly failed in introducing methods which would be acceptable by the ISD community at large. There is some empirical evidence which explains which

aspects of methods and their use situations influence their success (or failure) (Wynekoop and Russo 1993).
- An organization or a project which develops its own methods faces situations which are outside the set of situations to which known methods are suited.

In the next study unit, you will be taken through strategic planning for design of information systems.

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and compare the paradox to the use of Information Systems Design methods.
2. Discuss the concepts behind the development of information system methods.

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UNIT 3 STRATEGIC PLANNING FOR DESIGN OF INFORMATION SYSTEMS

CONTENTS

1.0 INTRODUCTION

This unit introduces you to strategic information systems planning, factors that initiate strategy information system planning, major contents of information system strategic plan and hierarchy of company's strategies.

It also exposes you to the importance's and benefits of strategic information systems planning, factors responsible for the failure of information system strategy and how to develop an information system strategy.

2.0 OBJECTIVES

The objectives of this unit among others are for you to:

- understand what is strategic information system planning and how the concept associates with the general principle of strategic planning
- identify the factors that initiates strategic information system planning
- be able to know the major components of atypicalinfsystem planning
- beabletoknowthestepsthathastobe takenindestrategic information system plan for an organization
- answer the question of factors that influence the output of a strategic information system plan.

3.0 MAIN CONTENT

3.1 Definition

Strategic planning is the process by which an organization identifies its businessobjectives; selects the acceptable means to achieve them; initiates the necessary causes of action and allocation of resources Neither general strategic planning nor information systems planning are simple activities but most managers will say that they perform more effectively if they plan and stick to the objectives of the plan.

Despite ahistoryofneglected planning,information system and developmentneed effectivestrategic planning asmuch andmore than other functional areas. Just as other functional areas information system consumes a portion of organization's finiteresources. Without a clear view of value (the aim is(planning),allocation of resources is unlikely to match that value.

Information system must accommodate rapid technological changes, its projects are often very high cost, and increasingly competitive, organizational well-being depends on information system delivering those systems that enable the business to function effectively. Planning and implementing an appropriate information system strategy produces the organizational confidence that information system will cost-effectively deliver those strategic systems. Systems without planning will mean for most organizations not only financial loss, but additional burden and often greater cost such as lowered staff morale, opportunities, continuous management fore-fighting and customer dissatisfaction. Planning helps an organization to identify it information need and find new opportunities for using that information and it defines the activities needed to implement the chosen strategy.

While management information system produces information that assists managerial decision-making, information systems strategy is a plan for information system and their supporting infrastructures which maximizes the ability of management to achieve organizational objectives.

Underlying all management activities in government and organizations is information, made useful and available through information systems.

Many organizations have invested in information technology to improve their information system but done so in bad adhoc manner, dealing with each new system on its own merits. Some overarching mechanism is therefore needed to guide and coordinate the use of the information technology. Information system strategy is such a mechanism.

Information system strategic planning consists of a series of steps from identifying organizational objectives to auditing information system resources, to prioritizing future information system developments to detailing an implementation plan. As a strategic exercise affecting the whole organization, it must involve senior management

An organization's information strategy and the plan that documents it must be consistent with:

- Its corporate plan
- Its management review of the role of information system in the organization, and
- Its stage of maturity of use and management information system.

3.1.1 What Is Strategic Information Systems Planning?

Strategic information systems' planning is a disciplined, systematic approach to determining the most effective and efficient means of satisfying organizational information needs. It is a top-down, structured approach which, to be successful, must employ technical and managerial processes in a systems engineering context. Under this approach, the characteristics of the system's hardware, software, facilities, data, and personnel are identified and defined through detailed design and analysis to achieve the most cost-effective system for satisfying the organization's needs. The process must consider system's life cycle management, and the organization's policy and budget as important integral factors, and include all organizational participants (e.g., managers, users, maintainers, operators, and designers) throughout the process. It is an iterative process in that changes identified during the process must be evaluated to determine their effect on completed analyses. Strategic information system's planning is not a one-time event, it should be revisited periodically to ensure a system's continued viability in meeting information needs and achieving long-term missions.

3.2 Factors that Initiate Strategic Information SystemPlanning

Information system planning like any planning, is not a one-off activity, ideally it would be a continuous cycle synchronized with or better yet, embedded into the cycle of general business planning. Given 0 rganizations may address information system's planning different ways, there is still a potentially common circumstance that requires reassessment of the information system's strategic planning. Short-term plan elements of the plan will naturally require frequent revision reflect technological changes. The reassessment referred here is long -term element that provides the sense of direction; the what of the plan (the short-term element providing the how of the plan).

Three common circumstances that initiate and alter the objective of an information system's plan are:

- Major Corporate Changes
- External Competitive Opportunities or Threats
- Evolutionary Changes in information System Maturity

3.2.1 Major Corporate Changes

When there is a major corporate change the symptoms are usually plain to see. The collective result of new owners, management, rationalization programmes, restructuring exercises or other corporate changes is analteration in the real or perceived role of information system in matching the needs of the new business. There is now a different business that needs things from information system. If these obvious symptoms are present, then the information system's strategy is likely to have as its objective, the definition of new role for information system. Its scope will be uncertain, but the emphasis is to build upon senior management to the changing role of information system within the new organization.

3.2.2 External Competitive Opportunities or Threats

The likely symptoms of this type of change are the emergence of new markets and/or products that may be created by information system or the competitive need for major cost factor changesandperformance. Again this need may be generated by information system itself, or the awareness of new challenges and advantages emerging, and yet again opportunities/threats may be driven by information system.

This set of circumstances is likely to produce a plan where objectives is to move information system's resources in the widest sense of the term, into the new but long-term commitment to high benefits or threat protection. The scope of the plan created to respond to these circumstances is likely to be much more limited than the strategies produced in other situations. This plan focuses efforts and resources upon those areas where the most good can be achieved. The emphasis of the plan is to exploit information system strengths and weaknesses of the competitors by being entrepreneurial and developing new attitudes, skills and uses of information system in these new commitments.

3.3.3 Evolutionary Changes

Probably a more frequent reason for reassessing the information system's strategy is that information system itself experiences an evolutionary change. The most noticeable symptoms of this are changing view on the required level of control over information system or its budget allocations, and/or the degree of dissatisfaction expressed by everyone. Growing is always painful since moving from one state to another generates fears and anxieties. Under these circumstances theplan's objective is to get and keep the senior management commitment, if not already present, and to demonstrate managed evolution. The emphasis is upon setting and resetting resource levels and styles and releasing and controlling information system in the appropriate way for the stage of growth.

3.3 Major Contents of Information System's Strategic Plan

The content of a given organization's strategic planning may vary widely depending on its particular emphasis, and it should not be forgotten that the process would tend not to be captured in the plan document but are nonetheless real. However once created, the plan is a conception of the future and therefore aims to achieve two things:

- Clearly identify where information system intends to go, and to avoid the danger of getting lost i.e. taking courses of action that do not contribute to the overall mission.
- Provide a fundamental set of benchmarks so that progress in this journey can be monitored.

Despite the possible variety of formats, it is possible to identify the necessary core elements to the information system plan, which are:

1. A clear statement of the information system objectives, that gives a clear sense of direction i.e. where the organization wishes to be.
2. An inventory and assessment of both the current organizational capabilities and problems resulting from current practices i.e. where the organization is now.
3. A concrete implementation plan that translates the sense of direction and knowledge of the start point into a navigable route map, i.e. how to get from point'1' to '2'. The plan must identify both long-term and short-term actions and resources allocations. Additionally, theinformation system's strategic plan must acknowledge that organizational change is an almost inevitable corollary to the planning process.

Ward, in his model of a planning process, suggests that the information system's strategic planning should contain three major elements:

3.3.1 Business Information Strategy

This indicates how information will be used to support the business. Priorities that the organization has for systems development are defined in general, perhaps by suggesting a portfolio of current and required systems. It may outline information requirements via blueprints, a pplication development of the future are defined.

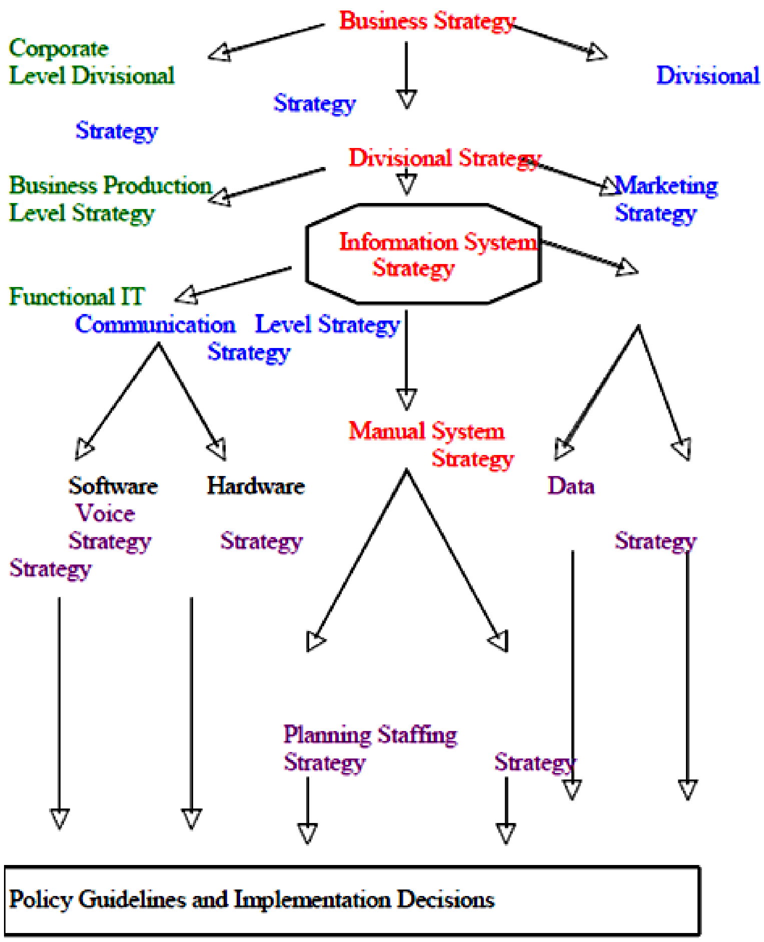
3.3.2 Information System Functional Strategy

This indicates what features and performance the organization will need for the system. It demonstrates how the resources will be used, provide policy guidelines for the information resource management and perhaps policies for communication networks, hardware architecture, software infrastructures and management issues such as security, development approaches, organizations and allocation of resources.

3.3.4 Information System/Information Technology Strategy

These define policies for software and hardware; for example, standards to be used and any stand on preferred suppliers. These alsodefine the organizations stand on the information system organized. For example, whether it is to be centralized or distributed, what are to be the investment, vendor and human impact policies, and information systems techniques.

3.4 Hierarchy of Company Strategies



3.5 Benefits andImportance of Strategic Information Systems Planning

Information systems are important tools for effectively meeting organizational objectives. Readily available, complete, and accurate information is essential for making informed and timely decisions. Being unable to obtain needed data, wading through unneeded data, or inefficiently processing needed data wastes resources. The organization must identify its informationneeds on the basis of aidentification and analysis of its mission and functions to be performed, who is to perform them, the information and supporting data needed to perform the functions,and the processes needed to moststructure the information. Successful information system development and acquisition must include a rigorous and disciplined process of data gathering, evaluation, and analysis prior to committing significant financial and human resources to any information system development. While implementing such an approach may not preclude all information system acquisition problems, it should produce detailed knowledge of organizational missions and operations, user information needs and alternatives to address those needs, and an open and flexible architecture that is expandable or that can be upgraded to meet future needs.

A successful strategy brings the following benefits:

- Information System opportunities and needs are identified and prioritized according to the organization's fundamental objectives rather than to technical criteria

- Top management develops commitment to a strategic vision for information system
- Methods for future information system's development, management and investment decision are specified

- Compatibility between information systems is ensured, thus avoiding wasted investments.

3.6 Factors for Failure of Information System's is Strategy

Information system is planning may falter when:

- There is little demand for information and little experience of the problems caused by an adhoc approach to information system
- There are insufficient in-house skills in strategic planning; IS analysis, design and managing; management

services; and project management
- Organizational sub-unit resists this top-down approach
- The required participation, openness and feedback are not present
- Departments are unwilling to share their information with others
- The external environment is too unstable to permit long-term planning.

3.7 How to Develop an Information System Strategy

Overall, the strategic planning exercise answers three questions:

1. Where are we now?
2. Where do we want to be?
3. How do we get there?

Information System strategic planning is presented as a complete, objective, depersonalized, step-by-step process. Of course, in reality, no process is like this. The steps recommended must therefore be taken as approximate parameters within which fallible, political process of argument, negotiation and iteration will take place.

First, create a strategic decision-making- the IS Steering Committee. This will consist of departmental heads and IT manager with the clout to push through change. They set the scope by deciding which of the steps presented is relevant. They set the resources for strategic planning, make decisions on the options suggested, and ensure plans are implemented. Teams to produce strategy report and to implement the action plan are also required.

Therefore the following are required in developing an information system strategy:

1. Understand Organizational Objectives

Information systems help the organization achieve its objectives. If objectives are not known, use short-term plans instead even though this makes it difficult to prioritize and review IT's contribution toorganization.Undertake a survey to outline and prioritize both organization's information related opportunities presented bytechnological developments.

2. Establish Organizational Information Requirements

Identify the informationrequiredtosupporttheorganization's key activities. Information may be generic and shared across the organization or specific to a particular sub-unit. Performance indicators, information flows and timeliness of data are identified.

3. Outline Generic Systems and Technology to Meet Organizational Information Requirements

Provide a generic description of information system required and the technologies on which to base them. For example, there might overlap in the informationneeds of organizational units. Afinancial information system could be proposed, based on a computer network. Present alternative solutions with their costs and implications.

4. Conduct Information System Audit

5. Survey the organization's existing information-related resources

This audit includes organizational structure and staffing; paper-based records; computer application with their hardware, software and networks; IS undergoing or awaiting development; and sources of training and support. The gap between existing and required Information System is identified.

6. Determine Major Issues Affecting Information System

- Finance and skill constraints
- Socio-cultural constraints including political pressures, the relatively slow rate at which organizations can assimilate new information system, and difficulties of ensuring staff participation in information system implementation
- Short-term need to improve paper-based records versus long-term need to computerize them
- Conflicting forces of centralization, standardization and decentralization, if information and staff are to move freely within the organization, then standards for data items, software, hardware and networking must be imposed. The spread of open standards, independent of any individual vendor, is helping but organizational units are to build their own microcomputer-based information system
- Technical issues such as down-sizing, that is, the move away from information system based on single, large mainframe computers to cheaper, easier information system based on networks of microcomputers
- Access to and attitude of information system vendors and developers.

7. Decide Information System Priorities and Strategies

Consider the finding so far with the information systems Steering Committee; provide a broad indication of system priorities, and choose between alternatives such as different types of technology. Full costs and benefits are impossible to estimate with any real accuracy. Cost-benefit analysis should therefore be treated as an informed guess, assisting a prioritization process decided more on gut feelings and organizational, political factors.

8. Estimate Alternatives and Decide about

- Implementation by existing computer center, by delegation to individual units, by creating a new information system organization, or by contracting out. This includes:
  - System Development, that is, creating new system in-house (providing a better fit to needs) or by buying a package fromoutside (providing a quicker cheaper solution).
  - Training, using in-house technical staff, or in-house users, or vendors or external users
  - System Operation that is, running and supporting computer systems with in-house staff or contracting to a facility management firm.
- Procedure for tendering and selecting externally purchased services.
- Standard methodologies to use for information system development.

9. Determine Role of Financial and Human Resources

Provide core specific details on funding, its source and time-scale; on any new organizational structures; on management of new information system and related organizational changes; on new skills needed and old skills no longer needed, and implication for training and job.

10. Detailed Action Plan for Strategy Implementation

11. Manage, Review and Evolve Information System Strategy

Strategic planning is a continuous process. Completely review the plan at the end of the strategic framework period or earlier if circumstances change or if objectives are not attained.

Information system strategic planning takes six months to a year to complete, and usually provides a strategic framework for a five-year period. It produces a strategy report containing evidence, analysis, arguments, and proposals on the steps outlined above. This is circulated in shortened form as a strategy statement. Once implemented, strategy will often produce cross-organizational information system.

4.0 CONCLUSION

The purpose of strategic planning for information system is to identify the most appropriate targets for technological support, and to schedule that technological adoption. Also, it is desirable to plan ahead for the information system function and that planning should be at a strategic, organizational level; it should not be at the project planning level, that is where decision has already been taken about which project is to implemented. Orderly planning allows information system to focus on higher levels than simply completing projects.

5.0 SUMMARY

- Strategic planning is the process by which an organisation identifies its business objectives; selects the acceptable means to achieve them; initiates the necessary causes of action and allocation of resources.
- Systems without planning will mean for most organizations not only financial loss, but additional burden and often, greater cost such as lowered staff morale, missed opportunities, continuous management fore-fighting and customer dissatisfaction.
- While management information systemproduces information that assists managerial decision-making, information systems strategy is a plan for information system and their supporting infrastructures which maximizes the ability of management toachieve organizational objectives.
- Strategic information system's planning is not a one-time event. It should be revisited periodically to ensure a system's continued viability in meeting information needs and achieving long-term missions.
- Probably a more frequent reason for reassessing the information system strategy is that information system itself experiences an evolutionary change.
- Information system planning like any planning is not a one-off activity; ideally it would be a continuous cycle synchronized with or better yet, embedded into the cycle of general business planning.
- Despite the possible variety of formats, it is possible to identify the necessary core elements to the information system plan.
- Provide a generic description of information system required and the technologies on which to base them.
- Full costs and benefits are impossible to estimate with any real accuracy. Cost-benefit analysis should

therefore be treated as an informed guess, assisting a prioritization process decided more on gut, feelings, and organizational, political factors.

The next study takes you through initiation of system design and development

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss with examples some of the factors responsible for the failure of information System strategies.
2. Under what conditions do we observe the development of strategic plans within an organization?

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UNIT 4 INITIATION OF SYSTEM DESIGN AND DEVELOPMENT

CONTENTS

1.0 INTRODUCTION

From the previous study unit, you have learnt about the strategic planning for design of information systems. This unit focuses on approach to systems design initiation, related tasks and activities, phase review activities, deliverables, roles and responsibilities related to system design and development.

2.0 OBJECTIVES

The objectives of this unit of the course are for you to:

- understand what is, and how to initiate a information system design and development project
- explain the factors that trigger the initiation of information system isdesign
- identify the activities that constitutes the initiation process
- have a checklist to guide in the process of design initiation.

3.0 MAIN CONTENT

3.1 Definition

Design project initiation may be defined as the process of panned deliverables and anticipation of those actions needed in order to complete a design project. It will involve the identification of activities, tasks and a sequence in a project schedule, including both milestones and deadlines. In addition, it involves estimating those resources that will be needed in the project together with projected costs.

This is when the individual project is initiated. The project is scoped; the project objectives and benefits are established; the end users identified, the project SWOT is identified; risk analysis is performed; sponsor is identified; project funding is obtained; and a project plan is approved.

3.1.1 Purpose of Initiation

The Initiation Phase begins when management determines that it necessaryto enhance a business process through the application information technology. The purposes of the Initiation Phase are to:

- Identify and validate an opportunity to improve business accomplishments of the organization or a deficiency related to business need,
- Identify significant assumptions and constraints on solutions to that need, and
- Recommend the exploration of alternative concepts and methods to satisfy the need.

MIS projects may be initiated as a result of business process, improvement activities, changes in business functions, advances in information technology, or may arise from external sources, such public law, the generalpublicorstate/local agencies.TheSponsor articulates this need within the organization to initiateproject life cycle. During this phase, a Project Manager is appointed who prepares a Statement of Need or Concept Proposal. When opportunity to improve business/mission accomplishments or to address
a deficiency is identified, the Project Manager documents these opportunities in the Concept Proposal.

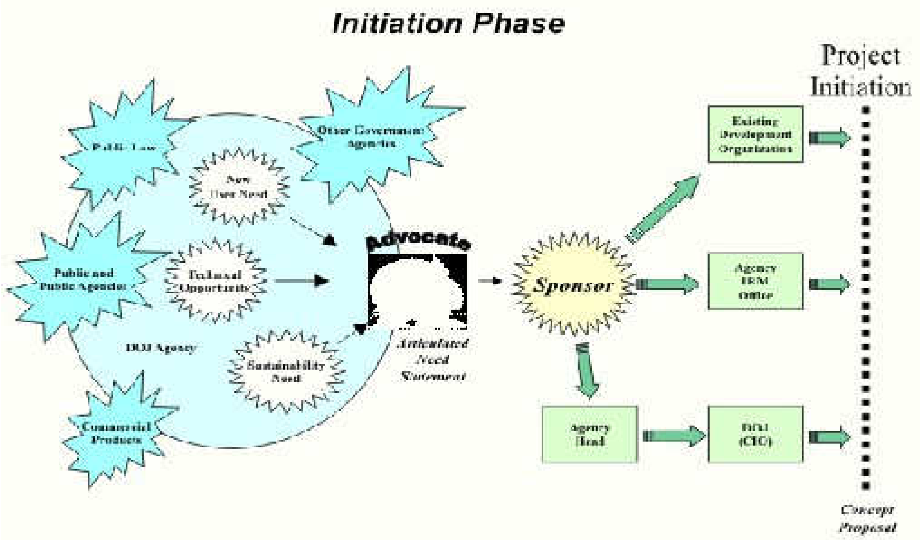

Figure 4.1: Design Project Initiation Diagram

3.2 Tasks and Activities

The following activities are performed as part of the Initiation Phase. The results of these activities are captured in the Concept Proposal. For every MIS project, the agency should designate a responsible organization and assign that organisation sufficient resources to execute the project.

Identify the Opportunity to Improve Business Functions

Identify why a business process is necessary and what business benefits can be expected by implementing this improvement. A business scenario and context must be established in which a business problem is clearly expressed in purely business terms. Provide background information at a level of detail sufficient to familiarize senior managers to the history, issues and customer service opportunities that can be realized through improvements to business processes with the potential support of IT. This background information must not offer or predetermine any specific automated solution, tool, or product.

Identify a Project Sponsor

The Project Sponsor is the principal authority on matters regarding the expression of business needs, the interpretation of functional requirements language, and the mediation of issues regarding the priority, scope and domain of business requirement.

Form (or Appoint) a Project Organization

This activity involves the appointment of a project manager who carries both theresponsibilityand accountabilityforexecution.Small efforts, this may only involve assigning a project to a manager withinan existingorganizationthatalreadyhas aninherent structure.Fornew,majorprojects,acompletelynewelement may be formed - requiring the hiring and reassignment of manytechnical and business specialists.

Each project shall have an individual designated to lead the effort. The individual selected will have appropriate skills, experience, credibility, and availability to lead the project. Clearly defined authority and responsibility must be provided to the Project Manager.

The Project Manager will work with Stakeholders to identify the scope of theproposed program, participation of the key organizations,potential individuals who can participate in the formal reviews of the project. This decision addresses both programmatic and information management-oriented participation as well as technical interests in the project that may be known at this time. In view of the nature and scope of the proposed program, the key individuals and oversight committee members who will become the approval authorities for the project will be identified.

Document the Phase Efforts

The results of the phase efforts are documented in the Concept Proposal.

Review an Approval to Proceed

The approval of the Concept Proposal identifies the end of the Initiation Phase. Approval should be annotated on the Concept Proposal by theProgram Sponsor and the Chief Information Officer (CIO), or Chief Executive Officer (CEO) and the management.

Other forms of tasks include the following

- Set initial project objectives and scope.
- Define project scope.
- Define project's benefits.
- Identify sources of business knowledge.
- Prepare preliminary project timeline.
- Determine preliminary project costs.
- Establish business user participation.
- Identify source of project funding/resources.
- Decide whether to continue with project.

- Prepare project plan.
- Create formal project plan document.
- Set analysis stage standards.

3.3 Approaches to System Design Initiation

When a consultant is assigned in order to advise on project initiation, there will be a very structured approach as to how advice will be given.

One of the first actions on a project, once the client has confirmed the appointment of the consultant, will be to confirm the appointment of the project manager. The organizational structure and hierarchy must be put in place as a necessary first step. This will include the defining of the roles and responsibilities associated with this structure. Figure 4.2 defines a typical organisation structure for a project start-up situation.

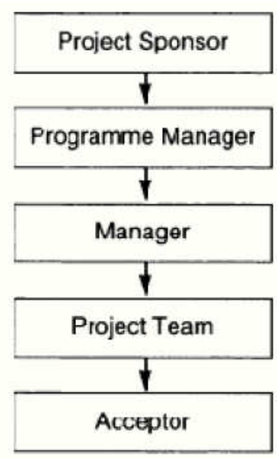

Figure 4. 2

Establishing Structure
The success and profitability of a project is normally determined at the time a design project plan is established. Where the plans are properly completed, easy to understand and well defined, then the project will normally succeed. The approach to follow assumes that a contract is not yet in place and will be one of the activities completed during project initiation stage.

3.3.1 The Statement of Requirement

The project manager (or the advising consultant adopting this role) must ensure that the project sponsor has produced a written Statement Rfequirements (SOR). This must be a thorough document which is:

- Unambiguous
- fully defined or complete
- verifiable deliverables
- no conflicts
- consistent
- auditable

The SOR will be the document against which change control will be exercised. The SOR should be closely matched to the contract and there should be no conflict of interests between the two. Where consultantsare involved, the client or sponsor, SOR, will normally form the basis of the proposal. All of these documents must carefully align and there should be no scope for misinterpretation, confusion, or lack of understanding. This will be the cornerstone of the project.

3.3.2 The Project Plan

The Project Plan is a vital part of the project initiation stage. The plan should normally contain the following information:

- Introduction and status of the plan
- The authorization procedures
- Statement of project objectives
- Statement of requirements
- Deliverables in the project
- A Work Breakdown Structure
- The project milestones
- The resource requirements
- Interdependencies of work
- The timetable of events
- Staffing, organization, and responsibilities
- Development methods and toolsets to be used
- Source documentation
- Resource and financial summary

This information creates the generation of a Project Book (log). The log should be in a loose-leaf binder with clearly identified sections version control exercised over the documentation sets.

These logs are now often retained as computer file, which enables a greater level of security to be maintained over them and version control to be established as an automatic feature.

3.3.3 The Quality Plan

Every project must have a quality plan. The quality plan will be presented as a section in the project plan. It is drawn up by the project manager at the start of the project and should be agreed with the project sponsor. You would expect the quality plan to contain the following elements:

- Statement of the quality control organization
- Identification of specific standards and methods that will be used
- Definition of the quality control procedures; this is aligned to the Work
- Breakdown structure
- Specification of quality milestones
- Detail of unusual features
- Change, control, and configuration management
- Detail of acceptance procedures
- Specification of quality assurance procedures

3.3.4 Project Control and Reporting

Project control may be considered to be one of the continuous objectives for the project manager. As such he is responsible for taking remedialactions, within the defined terms of reference, to correct potential problems or taking risk avoidance measures. The prime objective is to protect the integrity of the project at all times.

Formal methods assist in control procedures by having project steering committees that meet at regular intervals and at project milestones.

The frequency of project reporting is agreed at the outset of the project. It is normal for status reports to be produced at weekly intervals. These are then consolidated at monthly intervals to show:

- Project Status Report
- Financial Status Report
- The Client Report

Reports should describe any deviations from plan and highlight any problems on the project. They should clearly state any corrective action taken, person responsible, date to be achieved and anticipated result. Reports should also indicate progress against milestone achievement.

3.3.5 Project Control Log

It was mentioned earlier that a Project Control Log should be maintained by the project manager. It is useful to note what information should be contained in the log and maintained:

- Copy of contract
- Project terms of reference
- Statement of Requirement
- The Project Plan (including Quality Plan)
- Project status reports
- Financial status reports and cost estimates
- Resource Plans
- Client Reports
- Milestone Reports
- Exception Conditions
- Change Control documents
- Deliverable Reports
- Summary completion reports
- Quality control records
- Resource resumes (CVs)
- Cost Ledgers
- Expense Reports

3.3.6 Project Completion

At theend of projects the project manager has certain actions. aandatory It is important that these actions are fully understood at project initiation time. The following checklist is offered to assist this process:

- Produce a project debriefing report raising any important issues that may assist future projects.
- Report on the actions taken to address any QA issues raised.
- Obtain written acceptance documents from the Acceptor.
- Get a written approval from the project sponsor in order to say that contractual conditions have been met.
- Raise a final completion report on the projectindicatingbe achieved.
- Archive a complete version of the project log including electronic (soft copy) backups.
- Lodge any specific standards with QA office.
- Conduct external project compliance audit and comply with findings for close-off procedures.

- Report to the programme manager where the project forms part of a large programme.
- The programme manager must also sign off as complete.

3.3.7 Project Initiation Checklist of Requirements

As an aid to help in considering depth of coverage at project initiation, I have provided a brief checklist for compliance checking:

- Every project must have a project manager appointed.
- No individual shall QA his or her own work.
- The client must provide a written Terms of Reference statement.
- There must be an agreed contract.
- Each project must have a plan.
- There must be a quality plan.
- There must be plans to cover (a) a detailed work breakdownstructure, (b) costs, (c) resource estimates.
- Reporting frequency and structure must be defined.
- Methods and toolsets to be used are to be defined.
- A project log must be set up.
- Documentation standards are to be complied with.
- Milestone reporting — a must!
- Deliverable reporting — a must!
- Project benefits must be assessed and quantified at the end of the project.
- Control documents must be maintained.
- Configuration control andversions mustbemaintained for audit trail.
- Individual roles and responsibilities must be clearly defined.
- Maintain record over all internal/external communications.
- The project log must be kept up to date at all times and when the project is complete it should be properly archived. Upon completion of project initiation in the management process, we should have achieved:
- A clear definition of the deliverables in the project.
- clear understanding of the relationships between individuals in the project organisation structure, including roles and responsibilities.
- Personal commitments for the deliverables.
- The levels of personal commitments are achieved by establishing explicit goals for individuals. It is necessary to ensure that there is a clear understanding of the deliverables. With responsibilities and goals clearly understood, there should never be any ambiguity about the project.
- Top of Form.

3.4 Roles and Responsibilities

1. Sponsor: The Sponsor is the senior spokesperson for the project, andis responsible for ensuring that the needs and accomplishmentswithin the business area are widely known and understood.Sponsor is also responsible for ensuring that adequate resources toaddress their businessarea needs are made available in amanner.
2. Project Manager: The appointed project manager is charged with leading the efforts to ensure that all business aspects of the process improvement effort are identified in the Concept Proposal. This includes establishing detailed project plans and schedules.

3.5 Deliverables

The following deliverables shall be initiated during the Initiation Phase:

Concept Proposal - This is the need or opportunity to improve business functions. It identifies where strategic goals are not being met or mission performance needs to be improved. .

3.6 Issues for Consideration

Inthisphase,itisimportanttostatetheneedsorbusiness terms. Avoid identifying a specific product or vendor as thesolution. The Concept Proposal should not be more than2-5 pages inlength.

3.7 Phase Review Activity

At the end of this phase, the Concept Proposal is approved proceeding to the next phase. The Concept Proposal should convey that this project is a good investment and identify any potential impact on the infrastructure/architecture.

The phase output should bring approval to launch a project of defined mission and scope. It should include the following:

- Information System Preliminary Requirements
- Project Scope Document
- Preliminary Project Plan
- Next Stage Project Plans
- Needs Analysis Report
- Decision As To Whether To Proceed With Project As Defined.

4.0 CONCLUSION

The cause of many project failures can be traced back to the early days of the project. What eventually causes it to come tumbling down is often visible from the start. The fault is that everyone hoped it would go away. It is the responsibility of the Project Manager to identify these problems, and either solve them, or escalate them to the Sponsor.

The Sponsor has a responsibility to the project. Part of that responsibility is, at any point in time, to decide if the project should continue. If there is a major success-threatening issue that the Project Manager cannot resolve, and the Sponsor cannot resolve, the Sponsor has the obligation to stop the project. On the other hand, if the Project Manager cannot solve the problem, and the Sponsor can, the Sponsor has an obligation to fix the problem.

Project initiation is about scouting around to find out if there are any problems that will impede progress and addressing them on day one.

The further the project goes, the harder they are to fix. It also means that planning can be more effective because, the project manager better understands the context of the project.

Project initiation and interviewing stakeholders is not about gathering requirements. It is about understanding if we have a project, does everyone see it as the same project and can it be a successful project.

5.0 SUMMARY

- Design project initiation may be defined as the process of defining planned deliverables and anticipation of those actions needed in order to complete a design project.
- The Initiation Phase begins when management determines that it is necessary to enhance a business process through the application of information technology.
- MIS projects may be initiated as a result of business process improvement activities, changes in business functions, advances in information technology, or may arise from external sources, such as public law, the general public or state/local agencies.
- The approval of the Concept Proposal identifies the end of the Initiation Phase.
- The success and profitability of a project is normally determined at the time a design project plan is established.

- The Project Plan is a vital part of the project initiation stage.
- Every project must have a quality plan. The quality plan will be presented as a section in the project plan.
- At the end of projects the project manager has certain mandatory actions.
- The levels of personal commitments are achieved by establishingexplicit goals for individuals.
- When a consultant is assigned in order to advise on project initiation, there will be a very structured approach as to how advice will be given.
- The Sponsor is the senior spokesperson for the project, and is responsible for ensuring that the needs and accomplishments within the business area are widely known and understood.
- At the end of phase review activities, the Concept Proposal is approved before proceeding to the next phase.

In the next unit, you will be exposed to concept developmentplanning of system design.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss thefactors thatcanbringaboutheinitiationof management information system design.
2. Enumerate 5 project design tasks and activities.

7.0 REFERENCES/FURTHER READING

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UNIT 5 CONCEPT DEVELOPMENT AND PLANNING OF SYSTEM DESIGN

CONTENTS

1.0 INTRODUCTION

This unit dwells on planning of system design and the development of their concepts. It further examines issues on task and activities, roles and responsibilities, deliverables and finally, activities on phase review.

2.0 OBJECTIVES

This unit is designed in such a way that you will be able to:

- understand what constitutes concept development in designing and developing information system
- explain what constitutes planning in designing and developing information system
- identify the tasks you need to embark on during the concept development phase of system's development
- identify the tasks you need to embark on during the planning

phase of system's development

- comfortably answer the question of responsibilities and roles in executing the conception and planning of a project.

3.0 MAIN CONTENT

3.1 Tasks and Activities

3.1.1 Concept Development

System Concept Development begins when the Concept Proposal has been formally approved and requires study and analysis that may lead to system development activities.

The review and approvaloftheConceptProposal begins thestudies and analysis of the need in the System Concept Development Phase and begins the life cycle of an identifiable project.

Planning
Many of the plans essential to the success of the entire project created in this phase; the created plans are then reviewed and updated throughout the remaining SDLC phases. In the Planning Phase, concept is further developed to describe how the business will operate once the approved system is implemented and to assess how the system will impact employee and customer privacy. To ensure the products and/ or services provide the required capability on-time and within budget, project resources, activities, schedules, tools, and reviews are defined. Additionally, security, certification and accreditation activities begin with identification of system security requirements and the completion of a high-level vulnerability assessment.

3.1.1.1 Concept Development

The following activities are performed as part of the System Concept Development Phase. The results of these activities are captured in the four phase documents and their underlying institutional processes and procedures (See Figure 4-1).

MBA 815 MANAGEMENT INFORMATION SYSTEM

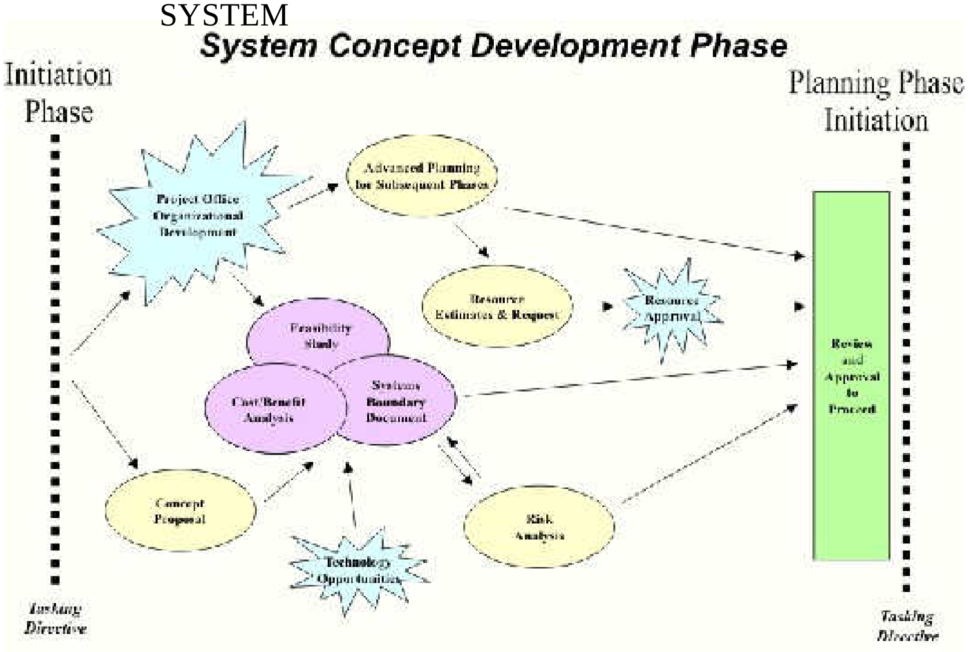

Figure 4-1. System Concept Development Phase Activities

Study and Analyze the Business Need

The project team, supplemented by enterprise architecture or other technical experts, if needed, should analyze all feasible technical, business process, and commercial alternatives to meeting the business need. These alternatives should then be analyzed from a life cycle cost perspective. The results of these studies should show a range of feasible alternatives based on life cycle cost, technical capability, and scheduled availability. Typically, these studies should narrow the system technical approaches to only a few potential, desirable solutions that should proceed into the subsequent life cycle phases.

Plan the Project

The project team should develop high-level (baseline) schedule, cost, and performance measures which are summarized in the System Boundary Document (SBD). These high-level estimates are further refined in subsequent phases.

Form the Project Acquisition Strategy

The acquisition strategy should be included in the SBD. The project team should determine the strategies to be used during the remainder of the project concurrently with the development of the CBA and Feasibility Study. Will the work be accomplished with available staff or do contractors need to be hired? Discuss available and projected technologies, such as reuse or Commercial Off-the-Shelf and potential contract types.

Study and Analyze the Risks
Identify any programmatic or technical risks. The risks associated with further development should also be studied. The results of these assessments should be summarized in the SBD and documented in the Risk Management Plan and CBA.

Obtain Project Funding, Staff and Resources
Estimate, justify, submit requests for, and obtain resources to execute the project in the format of the Capital Asset Plan and Justification

Document the Phase Efforts
The results of the phase efforts are documented in the System Boundary Document, Cost Benefit Analysis, Feasibility Study, and Risk Management Plan.

Review and Approval to Proceed
The results of the phase efforts are presented to project stakeholders and decision makers together with a recommendation to (1) proceed into the next life-cycle phase, (2) continue additional conceptual phase activities, or (3) terminate the project. The emphasis of the review should be on (1) the successful accomplishment of the phase objectives, (2) the plans for the next life cycle phase, and (3) the risks associated with moving into the next life-cycle phase. The review also addresses the availability of resources to execute the subsequent life-cycle phases. The results of the review should be documented reflecting the decision on the recommended action.

3.1.1.2 Planning

The following tasks are performed as part of the Planning Phase. Theresultsof theseactivitiesarecaptured invariousprojectplanssolicitation documents.

Define Acquisition Strategy in System Boundary Document
Define the role of system development contractors during the subsequent phases. For example, onestrategy option wouldactive participation of system contractors in the Requirements Analysis Phase. In this case, the Planning Phase must include complete planning,solicitation, preparation, and source selection of the participating contractors (awarding the actual contract may be the first activity of thenext phase). If contractors will be used to complete the required documents, up-front acquisition planning is essential.

Analyze Project Schedule

Analyze and refine the project schedule, taking into account risks and resource availability. Develop a detailed schedule for the RequirementsAnalysis Phase and subsequent phases.

Create Internal Processes

Create, gather, adapt, and/or adopt the internal management, engineering, business management, and contract managementinternal processes that will be used by the project office for all subsequent life-cycle phases. This could result in the establishment of teams or working groups for specific tasks, (e.g., quality assurance, configuration management, changes control). Plan, articulate, and gain approval for the resulting processes.

Staff Project Office

Further, staff the project office with needed skills across the broad range of technical and business disciplines. Select Technical Review Board members and document roles and responsibilities. If needed, solicit and award support contracts to provide needed non-personal services that are not available through agency resources.

Establish Agreements with Stakeholders

Establish relationships and agreements with internal and external organizations that will be involved with the project. These organizations may include agency and oversight offices, agency personnel offices, agency finance offices, internal and external audit organizations, and agency resource providers (people, space, office equipment, communications, etc).

Develop the Project Management Plan

Plan, articulate and gain approval of the strategy to execute the management aspects of the project (Project Management Plan). Develop a detailed project work breakdown structure.

Develop the Systems Engineering Management Plan (SEMP)

Plan, articulate, and gain approval of the strategy to executetechnical management aspects of the project(SEMP). Develop adetailed system work breakdown structure.

Review Feasibility of System Alternatives

Review and validate the feasibility of the system alternatives developed during the previous phase (CBA, Feasibility Study). Confirm the continued validity of the need (SBD).

Study and Analyze Security Implications

Study and analyze the security implications of the technical alternatives and ensure the alternatives, address all aspects or constraints imposed by security requirements (System Security Plan).

Plan the Solicitation, Selection and Award

During this phase or subsequent phases, as required by the Acquisition Regulation (FAR), plan the solicitation, selection and award of contracted efforts based on the selected strategies in the SBD. Obtain approvals to contract from appropriate authorities (Acquisition Plan). As appropriate, execute the solicitation and selection of support and system contractors for the subsequent phases.

Develop the CONOPS

Based on the system alternatives and with inputs from the end-user community, develop the concepts of how the system will be operated, and maintained. This is the Concept of Operations. (CONOPS)

Revise Previous Documentation

Review previous phase documents and update if necessary.

3.2 Roles and Responsibilities

3.2.1 Concept Development

- Sponsor: The sponsor should provide direction and sufficient study resources to commence the System Concept Development Phase.
- Project Manager: The appointed project manager is charged with leading the efforts to accomplish the System Concept Development Phase tasks discussed above. The Project Manager is alsoresponsible for reviewing the deliverables for accuracy, approvingdeliverables and providing status reports to management.
- Component Chief Information Officer (CIO) and ExecutiveReview Board (ERB): The CIO/ERB approves the System'sBoundary Document. Approval allows the project to enter the Planning Phase.

3.2.2 Planning

- Project Manager: The project manager is responsible and accountable for the successful execution of the Planning Phase. The project manager is responsible for leading the team that accomplishes the tasks shown above. The project manager is also responsible for reviewing deliverables for accuracy, approving deliverables; and providing status reports to management.

- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager.
- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities and signs contract awards.
- Oversight Activities: Agency oversight activities, including the IRM office, provide advice and counsel to the project manager on the conduct and requirements of the planning effort. Additionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews and in support of project decision milestones.

Chief Information Officer/Executive Review Board: At an appropriate level within the organization, an individual should be designated as the project decision authority (may or may not be the same individual designated as the sponsor in the previous phase). This individual should be charged with assessing:

(1) the completeness of the planning phase activities,
(2) the robustness of the plans for the next life-cycle phase,
(3) the availability of resources to execute the next phase, and
(4) the acceptability of the acquisition risk of entering the next phase.

For applicable projects, this assessment also includes the readiness to award any major contracting efforts needed to execute the next phase.

During the end of phase review process, the decision maker may (1) direct the project to move forward into the next life-cycle phase (including awarding contracts), (2) direct the project to remain in the Planning Phase pending completion of delayed activities or additional risk reduction efforts, or (3) terminate the project.

3.3 Deliverables

3.3.1 Concept Development

The following deliverables shall be initiated during the System Concept Development Phase:

System Boundary Document (SBD) - Identifies the scope of a system (or cap ability). It should contain the high level requirements, benefits, business assumptions, and program costs and schedules. It records management decisions on the envisioned system early in its development and provides guidance on its achievement.

Cost-Benefit Analysis - Provides cost or benefit information for analyzing and evaluating alternative solutions to a problem and making decisions about initiating, as well as continuing, the development of information technology systems. The analysis should clearly indicate the cost to conform to the architectural standards in the Technical Reference Model (TRM).

Feasibility Study - Provides an overview of a business requirement or opportunity, and determines if feasible solutions exist before full lifecycle resources are committed.

Risk Management Plan - Identifies project risks and specifies the plans to reduce or mitigate the risks.

3.3.2 Planning

Acquisition Plan
This document shows how all human resources, contractor support services, hardware, software and telecommunications capabilities are acquired during the life of the project. The plan is developed to help ensure that needed resources can be obtained and are available when needed.

Configuration Management Plan
The CM Plan describes the process that will be used to identify, manage,control, and audit the project's configuration.The plan shouldalsodefine the configuration, management structure, roles, and responsibilities to be used in executing these processes.

Quality Assurance Plan
The QA Plan documents that the delivered products satisfy contractual agreements, meet or exceed quality standards, and comply with the approved SDLC processes.

Concept of Operations
The CONOPS is a high-level requirements document that provides a mechanism for users to describe their expectations from the system

System Security Plan
A formal plan detailing the types of computer security is required for the new system based on the type of information being processed and the degree of sensitivity. Usually, those systems that contain personal information will be more closely safeguarded than most.

Project Management Plan
This plan should be prepared for all projects, regardless of size or scope. It documents the project scope, tasks, schedule, allocated resources, and interrelationships with other projects.

The plan provides details on the functional units involved, required job tasks, cost and schedule performance measurement, milestone and review scheduling. A revision to the Project Management Plan occurs at the end of each phase and as information becomes available. The Project Management Plan should address the management oversight activities of the project.

Validation and Verification Plan
The Validation and Verification Plan describes the testing strategies that will be used throughout the life-cycle phases. This plan should include descriptions of contractor, government, and appropriate independent assessments required by the project. Appendix C-12 provides a template for the Validation and Verification Plan.

System’s Engineering Management Plan
The SEMP describes the system is engineering process to be applied to the project; assigns specific organizational responsibilities for the technical effort, and references technical processes to be applied to the effort

3.4 Issues for Consideration

3.4.1 Concept Development

After the SBD is approved and the program and/or executive management accept a recommendation, the system is project planning begins. The Project Manager takes a number of project continuation and project approach decisions.

ADP Position Sensitivity Analysis
All projects must ensure that all personnel are cleared to the appropriate level before performing work on sensitive systems. Automated processing (ADP) position designation analysis, applies to allorganizational personnel, including contract support personnel who arenominated to fill an ADP position. ADP positions are those that require access to ADP systems or require work on management, design, development, operation, or maintenance of organizational automated information systems. The sensitivity analysis should be conducted only to determine an individual's eligibility or continued eligibility for access to ADP systems, or to unclassified sensitive information. Such analysis is not to be construed as the sole determination of eligibility.

Identification of Sensitive Systems
Public Law100-235, the Computer security Act of1987ofequires Federal agencies to identify systems that contain sensitiveinformation. In general, a sensitive system is a computer system thatprocesses, stores, or transmits sensitive-but-unclassified(SBU) data.SBU data areanyinformationthat the loss,misuse, oracess to, or modification of, could adversely affect the national interest,the conduct of organizational programs, or the privacy to which individuals are entitled under the Privacy Act. These procedures will help determine the type of sensitivity level to the data that processed, stored, and transmitted by the new or changed system.

Project Continuation Decisions
The feasibility study and CBA confirm that the defined information management concept is significant enough to warrant an IT project with life-cycle management activities.

The feasibility study should confirm that the information management need or opportunity is beyond the capabilities of existing systems and that developing a new system is a promising approach.

The CBA confirms that the projected benefits of the proposed approach justify the projected resources required. The funding, personnel, andother resources shall be made available to proceed with the Planning Phase.

3.4.2 Planning

Audit Trails

Audit trails, capable of detecting security violations, performance problems and flaws in applications, should be specified. This includes the ability to track activity from the time of logon, by user IDocation of the equipment, until logoff. Identify any events that are to be maintained regarding the operating system, application and user activity.

Access Based on "Need to Know"

Prior to an individual being granted access to the system, the program manager's office should determine each individual's "Need to Know"and should permit access to only those areas necessary to allow the individual to adequately perform her/her job.

3.5 Phase Review Activity

3.5.1 Concept Development

The System Concept Development Review shall be performed at the end of this phase. The review ensures that the goals and objectives of the system are identified and that the feasibility of the system is established.

Products of the System Concept Development Phase are reviewed including the budget, risk, and user requirements. This review is organized, planned, and led by the Program Manager and/or representative.

3.5.2 Planning

Upon completion of all Planning Phase tasks and receipt of resources forthe next phase, the Project Manager, together with the projectshould prepare and present a project statusreview for themaker and project stakeholders. The review should address:

(1) Planning Phase activities status,
(2) planning status for all subsequent life-cycle phasesth significant detail on the next phase, to include the status pen ding contract actions),
(3) resource availability status, and
(4) acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy.

4.0 CONCLUSION

Concept development plays strategic role in defining the outcome of a systems development. If the concept is wrong, for sure the outcome will also be wrong. It is concept development that actually initiates the whole idea of developing a system. Planning on the other hand ensures that all the necessary steps to bringing to pass conceptualized ideas are followed. Without adequate planning, no matter the potentials of the concept, the designed system will equally fail.

5.0 SUMMARY

- System Concept Development begins when the Concept Proposal has been formally approved and requires study and analysis that may lead to system development activities.
- The project team, supplemented by enterprise architecture or other technical experts, if needed, should analyze all feasiblebusiness process, and commercial alternatives to meeting thebusiness need.
- The project team should develop high-level (baseline) schedule, cost, and performance measures which are summarized in the System Boundary Document (SBD).
- At an appropriate level within the organization, an individual should be designated as the project decision authority (may or may not be the same individual designated as the sponsor in the previous phase).
- Establish relationships and agreements with internal and external organizations that will be involved with the project.
- After the SBD is approved and the program and/or executive management accept a recommendation, the system project planning begins.
- Audit trails, capable of detecting security violations, performance problems and flaws in applications should be specified.
- Upon completion of all Planning Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team should prepare and

present a project status review for the decision maker and project stakeholders.

In the next study unit, you will be taken through requirements analysis of system design.

6.0 TUTOR-MARKED ASSIGNMENT

Compare and contract concept development and planning in term of tasks activities and roles in the design and development of information system.

7.0 REFERENCES/FURTHER READING

Information Resources Management (2003).The Department of Justice Systems Development Lifecycle Guidance Document.

Norton, P (1995). Introduction to Computers.Macmillan/McGraw-Hill.

MODULE 2

UNIT 1 REQUIREMENTS ANALYSIS OF SYSTEM DESIGN

CONTENTS

1.0 INTRODUCTION

Requirements analysis of system design begins with Documentation phase which precedes the requirement analysis phase.

In this unit, you will be made to understand the requirements analysis of system deign.

2.0 OBJECTIVES

This unit is designed for you to:

- understand what constitutes requirement analysis in designing and developing information system
- identify the tasks you need to embark on during the requirement analysis phase of systems development
- comfortably answer the question of responsibilities

and roles in executing the requirement analysis of a systems design project
- identify some issues that need to be considered in requirement analysis.

3.0 MAIN CONTENT

3.1 Requirements Analysis Phase

The Requirements Analysis Phase will begin when the previous phase documentation has been approved, or by management direction.

Documentation related to user requirements from the Planning Phase shall be used as the basis for further user needs analysis and development of detailed user requirements. The analysis may reveal new insights into the overall information systems requirements, and, in such instances, all deliverables should be revised to reflect this analysis.

During the Requirements Analysis Phase, the system shall be defined in more detail with regard to system inputs, processes, outputs, and interfaces. This definition process occurs at the functional level. The system shall be described in terms of the functions to be performed, not in terms of computer programs, files, and data streams. The emphasis in this phase is on determining what functions must be performed rather than how to perform those functions.

3.2 Tasks and Activities

The following tasks are performed during the Requirements Analysis Phase. The tasks and activities actually performed depend on the nature of the project.

Analyse and Document Requirements
First, consolidate and affirm the business needs. Analyze the intended use of the system, and specify the functional and data requirements. Connect the functional requirements to the data requirements. Define functional and system is requirements that are not easily expressed in data and process models. Define the high level architecture and logical design to support the system and functional requirements.

A logical model is constructed that describes the fundamental processes and data needed to support the desired business functionality. This logical model will show how processes interact, and how processes create and use data. These processes will be derived from the activity descriptions provided in the System Boundary Document.

Functions and entity types contained in the logical model are extended and refined from those provided in the Concept Development Phase. End-users and business area experts will evaluate all identified processes and data structures to ensure accuracy, logical consistency, and completeness. An analysis of business activities and data structures is performed to produce entity-relationship diagrams, process hierarchydiagrams, process dependency diagrams, and associated documentation.

An interaction analysis is performed to define the interaction between the business activities and business data. This analysis produces process logic and action diagrams, definitions of the business algorithms, entity life-cycle diagrams, and entity state change matrices. A detailed analysis of the current technical architecture, application software, and data is conducted to ensure that limitations or unique requirements have not been overlooked.

Include all possible requirements including those for:

- functional and capability specifications, including performance, physical characteristics, and environmental conditions under which the software item is to perform;
- interfaces external to the software item;
- qualification requirements;
- safety specifications, including those related to methods of operation and maintenance, environmental influences, and personnel injury;
- security specifications, including those related to compromise of sensitive information;
- human-factors engineering (ergonomics), including those related to manual operations, human-equipment interactions, constraints on personnel, and areas needed concentrated human attention, that are sensitive to human errors and training;
- data definition and database requirements;
- installation and acceptance requirements of the delivered software product at the operation and maintenance site(s);
- user documentation;
- user operation and execution requirements;
- user maintenance requirements.

Develop Test Criteria and Plans

Establish the test criteria and begin test planning. Include all areas where testing will take place and who is responsible for the testing. Identify the testing environment, what tests will be performed, test procedures; and traceability back to the requirements.

Describe what will be tested in terms of the data or information. If individual modules are being tested separately, this needs to be stated in the Master Plan. Smaller plans may be needed for specialized testing, but they should all be referenced in the Master Plan.

Develop an Interface Control Document

The project team responsible for the development of this system, needs to articulate the other systems (if any) this system will interface with.

Identify any interfaces and the exchange of data or functionality that occurs. All areas that connect need to be documented for security as well as information flow purposes.

Review and Assess FOIA/PA Requirements

The FOIA/PA describes the process and procedures for compliance with personal identifier information. A Records Management representative will determine if what you plan constitutes a system as a Privacy Act System of Records. A system of records notice must be published for each new system of records that is established or existing system of records that is revised. If needed, a Privacy Act Notice for the Federal Register will be prepared.

The collection, use, maintenance, and dissemination of information on individuals by any Department component require a thorough analysis of both legal and privacy policy issues. Whether a system is automated or manual, privacy protections should be integrated into the development of the system. To ensure that the Department properly addresses the privacy concerns of individuals as systems are developed, Departmental policy mandates that components develop and utilize the Privacy Impact Assessment (PIA) processes.

Federal regulations require that all records no longer needed for the conduct of the regular business of the agency be disposed of, retired, or preserved in a manner consistent with official Records Disposition Schedules. The decisions concerning the disposition criteria, including when and how records are to be disposed, and the coordination with the Records Management representatives to prepare the Records Disposition Schedule for the proposed system, shall be the responsibilities of the Project Manager.

Conduct Functional Review

The Functional and Data Requirements Review is conducted in Rhequirements Analysis Phase by the technical review board. This wish ere the functional requirements identified in the FRD are reviewed to see if they are sufficiently detailed and are testable. It also provides the Project Manager with the opportunity to ensure a complete understanding of the requirements and that the documented requirements can support a detailed design of the proposed system.

Revise Previous Documentation

Review and update previous phase documentation if necessary before moving to the next phase.

3.3 Roles and Responsibilities

- Project Manager: The project manager is responsible and accountable for the successful execution of the Requirements Analysis Phase. The project manager is responsible for leading the team that accomplishes the tasks shown above. The Project Manager is also responsible for reviewing deliverables for accuracy, approving deliverables and providing status reports to managers.
- Technical Review Board: Formally established board that examines the functional requirements documented in the FRD for accuracy, completeness, clarity, attainability, and traceability to the high-level requirements identified in the Concept of Operations.
- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager.
- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities and signs contract awards.
- CIO/ERB: Agency oversight activities, including the Executive Review Board office, provide advice and counsel to the manager on the conduct and requirements of the Requirements Analysis Phase effort. Additionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews

and in support of project decision milestones.

3.4 Deliverables

Functional Requirements Document

Serves as the foundation for system design and development; captures user requirements to be implemented in a new or enhanced system; the systems subject matter experts document these requirements into the requirements traceability matrix, which shows mapping of each detailed functional requirement to its source. This is a complete, user oriented functional and data requirements for the system which must be defined, analyzed, and documented to ensure that user and system is requirements have been collected and documented.

All requirements must include considerations for capacity and growth. Where feasible, I-CASE tools should be used to assist in the analysis, definition, and documentation. The requirements document should include, but is not limited to records and privacy act, electronic record management, record disposition schedule, and components' unique requirements. Consideration must also be given to persons with disabilities as required by the Rehabilitation Act, 20 U.S.C., Sec 794d (West Supp. 1999)

Test and Evaluation Master Plan

Ensures that all aspects of the system are adequately tested and can be implemented; documents the scope, content, methodology, sequence, management of, and responsibilities for test activities. Unit, integration, and independence acceptance testing activities are performed during the development phase. Unit and integration tests are performed under the direction of the project manager. Independence acceptance testing is performed independently from the developing team, and is coordinated with the Quality Assurance (QA) office. Acceptance tests will be performed in a test environment that duplicates the production environment as much as possible. They will ensure that the requirements are defined in a manner that is verifiable. They will support thetraceability of the requirements; form the source documentation, to the design documentation, to the test documentation. They will also verify the proper implementation of the functional requirements.

The types of test activities discussed in the subsequent sections are identified more specifically in the Integration and Test Phase of the life cycle and are included in the test plan and test analysis report, viz:

- Unit/Module Testing;
- Subsystem Integration Testing;
- Independent Security Testing;
- Functional Qualification Testing;
- User Acceptance Testing; and
- Beta Testing.

Interface Control Document

The Interface Control Document (ICD) provides an outline for use in the specification of requirements imposed on one or more systems, subsystems configuration items, or other system components to achieve one or more interfaces among these entities. Overall, an ICD can cover requirements for any number of interfaces between any number sfystems.

Privacy Act Notice/Privacy Impact Assessment

For any system that has been determined to be an official System of Records (in terms of the criteria established by the Privacy Act (PA)), a specialSystem ofRecordsNoticeshallbepublished intheRegister. This Notice identifies the purpose of the system; describes its routine use and what types of information and data are contained in its records; describes where and how the records are located; and identifies who the System Manager is. While the Records Management Representatives are responsible for determining if a system is a System of Records, it is the Project Manager's responsibility to prepare the actual Notice for publication in the Federal Register. As with the Records Disposition Schedule, however, it is the Project Manager's responsibility to coordinate with and assist the System Proponent preparing the PA Notice.

The System of Records Notice shall be a required deliverable for the Requirements Analysis Phase of system development. The Privacy Impact Assessment is also a deliverable in this Phase. This is a written evaluation of the impact that the implementation of the proposed system would have on privacy.

3.5 Issues for Consideration

IntheRequirementsAnalysisPhase,itisimportanttoget involved with the project to discuss and document their requirements. A baseline is important in order to begin the next phase. The requirements from the FRD may become part of a solicitation in the Acquisition Plan.

3.6 Phase Review Activity

Upon completion of all Requirements Analysis Phase tasks, and receipt of resources for the next phase, the Project Manager, together with the project team, should prepare and present a project status review for the decision maker and project stakeholders. The review should address:

(1) Requirements Analysis Phase activities status,
(2) planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions),
(3) resource availability status, and
(4) acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy.

4.0 CONCLUSION

Requirements analysis allows for further analysis to know if more items and details should be added, therefore serves to define system's design and development. In some system's development lifecycle, this phase is not identified but is considered as part of the general analysis phase.

5.0 SUMMARY

- During the Requirements Analysis Phase, the system shall be defined in more detail with regard to system inputs, processes, outputs, and interfaces.
- End-users and business area experts will evaluate all identified processes and data structures to ensure accuracy, logical consistency, and completeness.
- The project manager is responsible and accountable for the successful execution of the Requirements Analysis Phase.
- The collection, use, maintenance, and dissemination of information on individuals by any Department component require a thorough analysis of both legal and privacy policy issues.
- The Functional and Data Requirements Review is conducted in the Requirements Analysis Phase by the technical review board. This is where the functional requirements identified in the FRD are reviewed to see if they are sufficiently detailed and are testable.
- All requirements must include considerations for capacity and growth.
- The Interface Control Document (ICD) provides an outline for use in the specification of requirements imposed on one or

more systems, subsystems' configuration items, or other system components, to achieve one or more interfaces among these entities.

- Upon completion of all Requirements Analysis Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team should prepare and present a project review for the decision maker and project stakeholders.

You are going to learn design of system in the next study unit.

6.0 TUTOR-MARKED ASSIGNMENT

Discussthetypesofrequirementsthatneedtoanalyzedindevelopment.

7.0 REFERENCES/FURTHER READING

Information Resources Management (2003). The Department of Justice Systems Development Lifecycle Guidance Document.

Norton, P (1995). Introduction to Computers. Macmillan/McGraw-Hill.

UNIT 2 DESIGN OF SYSTEM

CONTENTS

1.0 INTRODUCTION

This unit dwells on transformation of the Design phase which in turn services as a guide for the Development phase. It also examines tasks and activities, Roles and responsibilities anddeliverables as they concern design of system.

2.0 OBJECTIVES

This unit is designed for you to:

- understand what constitutes design phase in designing and developing information system
- identify the tasks you need to embark on during the design phase of system's development
- comfortably answer the question of responsibilities and roles in executing the design phase of a system's development project
- be able to know what are the deliverables from design to be used for subsequent phases
- identify some issues that need to be considered in deign phase of asystem.

3.0 MAIN CONTENT

3.1 Design of System

The objective of the Design Phase is to transform the detailed, defined requirements into complete, detailed specifications for the system to guide the work of the Development Phase. The decisions made in this phase, address, in detail, how the system will meet the defined functional, physical, interface, and data requirements. Design Phase activities may be conducted in an iterative fashion, producing first, a general system design that emphasizes the functional features of the system, and then a more detailed system design that expands the general design by providing all the technical detail.

System design is also the evaluation of alternative problem solution, and the detailed specification of the final system. The specification produced in the analysis phaseis usedtoconstructa design for the sytem. The emphasis of system design is to develop a new system that helps to achieve the goals and objectives of the organization overcomes some of the shortcomings and limitations of the existing system. If the problems are minor only small modifications are required. On the other hand major changes may be suggested by system analysis. Regardless of the complexity and scope of any system, it is the purpose of system design to develop the best possible system.

The purpose of the system's design stage is also to architect and design a technical solution that is able to meet all the requirements customer, as defined in the business requirements document.

The recommended technical solution will comprise of various elements: a specification of the technical architecture to be employed and required configuration; programme structure and flow; a definition of any interfaces between systems; and screen design (if required).

The TAD and SDS should be circulated within MIS first for review. If necessary an internal meeting should be held to discuss and resolve any issues. The documents should then be presented to the project stakeholder for sign off and the PPDR template used to record distribution, lists and actions.

This stage completes when all the key tasks have been performed and the exit criteria met.

3.2 Tasks and Activities

The following tasks are performed during the Design Phase. The tasks and activities actually performed depend on the nature of the project.

Establish the Application Environment
Identify/specify the target, the development and the design and testing environment. How and where will the application reside? Describe the architecture where this application will be developed and tested, and who is responsible for this activity.

Design the Application
In the system design, first the general system characteristics are defined. The data storage and access for the database layer need to be designed. The user interface at the desktop layer needs to be designed. The business rules layer or the application logic needs to be designed.

Establish a top-level architecture of the system and document it. The architecture shall identify items of hardware, software, and manual-operations. All the system requirements should be allocated among the hardware configuration items, software configuration items, and manual operations.

Transform the requirements for the software item into an architecture that describes its top-level structure and identifies the software components. Ensure that all the requirements for the software item are allocated to its software components and further refined to facilitate detailed design. Develop and document a top-level design for the interfaces external to the software item and between the software components of the software item.

Develop Maintenance Manual
Develop the maintenance manual to ensure continued operation of the system once it is completed.

Develop Operations Manual
Develop the Operations Manual for mainframe systems/applications, and the System Administration Manual for client/server systems/applications.

Conduct Preliminary Design Review

This is an ongoing interim review of the system design as it evolves through the Design Phase. This review determines whether the initial design concept is consistent with the overall architecture and satisfies the functional, security, and technical requirements in the Functional Requirements Document.

Design Human Performance Support (Training)
Identify the users and how they will be trained on the new system. Be sure to address the Americans with Disabilities Act (ADA) requirements to ensure equal access to all individuals.

Design Conversion/Migration/Transition Strategies
If current information needs to be converted/migrated/transitioned to the new system, plans need to be designed for those purposes, especially if converting means re-engineering existing processes.

Conduct a Security Risk Assessment
Conduct a security risk assessment by addressing the following components: assets, threats, vulnerabilities, likelihood, consequences and safeguards. The risk assessment evaluatescompliance with baseline security requirements, identifies threats and vulnerabilities, and assesses alternatives for mitigating or accepting residual risks.

Conduct Critical Design Review
The Project Manager and System is Proponent conduct the de sign review and approve/disapprove the project into the Development Phase. This review is conducted at the end of the Design Phase verifies that the final system design adequately addresses all functional, security, and technical requirements and is consistent with the overall architecture.

Revise Previous Documentation
Review documents from the previous phases, and assess the need to revise them during the Design Phase. The updates should be signed off by the Project Manager.

Other tasks associated with design and development of information systems are:

1. Book a technical architect to write the TAD
2. Book a system analyst and, where necessary, a system designer to write the SDS
3. Circulate completed TAD and SDS documents to MIS distribution list and arrange internal meeting to discuss, where necessary
4. Obtain sign off of TAD and SDS from project stakeholders
5. Complete PPDR template

6. Obtain final resource estimates for build stage tasks from the system analyst and provisionally book developer and technical architect resource for the build stage
7. Provisionally book the system analyst at 10% throughout the Buildstage
8. Update sign off log.

3.3 Roles and Responsibilities

- Project Manager: The project manager is responsible and accountable for the successful execution of the Design Phase. The project manager is responsible for leading the team that accomplishes the tasks shown above. The Project Manager is also responsible for reviewing deliverables, for accuracy, approving deliverables and providing status reports to management.
- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager.
- Contracting Officer: The contracting officer is responsible and accountable for procurement activities and signs contract awards.
- Oversight Activities: Agency oversight activities, including the IRM office, provide advice and counsel to the project manager on the conduct and requirements of the Design Phase. Additionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews, and in support of project decision milestones.

3.4 Deliverables

The content of these deliverables may be expanded or abbreviated depending on the size, scope, and complexity of the corresponding system's development effort.

Security Risk Assessment

The purpose of the risk assessment is to analyze threats to vulnerabilities of a system to determine the risks (potential for losses), and using the analysis as a basis for identifying appropriate and cost-effective measures.

Conversion Plan

The Conversion Plan describes the strategies involved in converting data from an existing system to another hardware or software environment. It is appropriate to re-examine the original system's functional requirements for the condition of the system before conversion, doetermine if the original requirements are still valid.

System Design Document

This describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, human-machine interface, detailed design, processing logic, and external interfaces. It isused in conjunction withFunctional Requirements Document (FRD), which is finalized in thisphase, to provide a complete system specification of all user requirements for the system and reflects the user's perspective of the system design. Includes all information required for the review and approval of the project development. The sections and subsections of the design document may be organized, rearranged, or repeated as necessary to reflect the best organization for a particular project.

In most cases there are both user and technical documentation. Without good documentation the new system may never be used, and it may be virtually impossible to modify the system in future. Poorly documented systems have resulted in mistakes that can lead to great loss.

Implementation Plan

The Implementation Plan describes how the information system will be deployed and installed into an operational system. The plan contains an overview of the system, a brief description of the major tasks involved in the implementation, the overall resources needed to supportimplementation effort (such as hardware, software, facilities, materials,and personnel), and any site-specific implementation requirements. This plan is updated during the Development Phase; the final version provided in the Integration and Test Phase and used for guidance during the Implementation Phase.

Maintenance Manual

The Maintenance Manual provides maintenance personnel with the information necessary to maintain the system effectively. The manual provides the definition of the software support environment, the roles and responsibilities of maintenance personnel, and the regular activities essential to the support and maintenance of program modules, job streams, and database structures. In addition to the items identified for inclusion in the MaintenanceManual, additional information may be provided to facilitate the maintenance and modification of the system. Appendices to document various maintenance procedures, standards, or other essential information may be added to this document as needed.

Operations Manual or Systems Administration Manual

For mainframe systems, the Operations Manual provides computer control personnel and computer operators with a detailed operational description of the information system and its associatedenvironments, such as machine room operations and procedures. The Systems Administration Manual serves the purpose of an Operations Manual in distributed (client/server) applications.

Training Plan

The Training Plan outlines the objectives, needs, strategy, and curriculum to be addressed when training users on the new or enhanced information system. The plan presents the activities needed to support the development of training materials, coordination of training schedules, reservation of personnel and facilities, planning for training needs, and other training-related tasks. Training activities are developed to teach user personnel the use of the system as specified in the trainingcriteria. Includes the target audience, and topics on which training must be conducted on the list of training needs. It includes, in the training strategy, how the topics will be addressed, and the format of the training program, the list of topics to be covered, materials, time, space requirements, and proposed schedules.

User Manual

The User Manual contains all essential information for the user to make full use of the information system. This manual includes a description of the system functions and capabilities, contingencies and alternate modes of operation, and step-by-step procedures for system access and use.

3.5 Issues for Consideration

Project Decision Issues

The decisions of this phase re-examine in greater detail many of the parameters addressed in previous phases. The design prepared in this phase will be the basis for the activities of the Development Phase. The overall objective is to establish a complete design for the system. The pre-requisites for this phase are the Project Plan, Functional Requirements Document, and Test Plan. A number of project approach, project execution, and project continuation decisions are made in this phase.

Project approach decisions include:

- Identifying existing or COTS components that can be used, or economically modified, to satisfy validated functional requirements.
- Using appropriate prototyping to refine requirements and enhance user and developer understanding and interpretation of requirements.
- Selecting specific methodologies and tools to be used in the later life cycle phases, especially the Development and Implementation Phases.
- Determining how user support will be provided, how the remaining life cycle phases will be integrated, and newly identified risks and issues handled.

Project execution decisions include:

- Modifications that must be made to the initial information system need.
- Modifications that will be made to current procedures.
- Modifications that will be made to current systems/databases or to other systems/databases under development.
- How conversion of existing data will occur.

Project continuation decisions include:

- The continued need of the information system to exist.
- The continued development activities based on the needs addressed by the design.
- Availability of sufficient funding and other required resources for the remainder of the systems life cycle.

The system user community shall be included in the Design ctions as needed. It is also in the Design Phase that new or further requirements might be discovered that are necessary to accommodate individuals with disabilities. If so, these requirements shall be added to the FRD.

Security Issues

The developer shall obtain the requirements from the System Security Plan and the FRD and allocate them to the specific modules within the design for enforcement purposes. For example, if a requirement exists to audit a specific set of user actions, the developer may have to add a work flow module into the design to accomplish the auditing.

Detailed security requirements provide users and administrators with instructions on how to operate and maintain the system securely. They should address all applicable computer and telecommunications security requirements, including: system access controls; marking, handling, and disposing of magnetic media and hard copies; computer room access; account creation, access, protection, and capabilities; operational procedures; audit trail requirements; configuration management; processing area security; employee check-out; and emergency procedures. Security operating procedures may be created as separate documents or added as sections or appendices to the User and Operations Manuals. This activity should be conducted during the Design Phase.

3.6 Phase Review Activity

Upon completion of all Design Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team should prepare and present a project status review for the decision maker and project stakeholders. The review should address:

(1) design Phase activities status,
(2) planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions),
(3) resource availability status, and
(4) acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy.

4.0 CONCLUSION

Though there could be several design approach depending on the type of project, system's design as a phase in the development of an information system is what translates all the conception and analysis into reality by coming up with the sample of what is needed to improve an information system.

5.0 SUMMARY

- TheobjectiveoftheDesignPhaseistotransformthedefined requirements into complete, detailed specifications for the system to guide the work of the Development Phase.
- The purpose of the system's design stage is also to architect and design a technical solution that is able to meet all the requirements of the customer, as defined in the business requirements document.
- The Project Manager and System is Proponent conduct the

critical design review and approve/disapprove the project into the Development Phase.

- The purpose of the risk assessment is to analyze threats to, and vulnerabilities of a system to determine the risks (potentiallosses), and using the analysis as a basis for identifying appropriateand cost-effective measures.
- For mainframe systems, the Operations Manual provides computer control personnel and computer operators with a detailed operational description of the information system and its associated environments, such as machine room operations and procedures.
- The decisions of the project decision issues re-examine in greater detail many of the parameters addressed in previous phases.
- Upon completion of all Design Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team should prepare and present a project status review for decision maker and project stakeholders.

In the next study unit, you will be exposed to Development, Integration and Testing of Information system.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss 5 tasks and activities associated with design phase of a system development

7.0 REFERENCES/FURTHER READINGS

Information Resources Management (2003). The Department of Justice Systems Development Lifecycle Guidance Document.

Norton, P (1995). Introduction to Computers. Macmillan/McGraw-Hill.

UNIT 3 DEVELOPMENT, INTEGRATION AND TESTING OF INFORMATION SYSTEM

CONTENTS

1.0 INTRODUCTION

This unit dwells mainly on tasks, activities, roles and responsibilities of both Development and Integration and testing phases.

2.0 OBJECTIVES

This unit is designed for you to:

- understand what constitutes system's development, integration and testing phase in designing and developing information system
- identify the tasks you need to embark on during the development, integration and testing phase of systems development
- comfortably answer the question of responsibilities and roles in executing the development, integration and testing

phase of a systems development project

- be able to know what are the deliverables from development, integration and testing to be used for subsequent phases
- identify some issues that need to be considered in development,integration and testing phase of a system.

3.0 MAIN CONTENT

3.1 Development and Integration and Testing Phases

3.1.1 Development

The objective of the Development Phase will be to convert the deliverables of the Design Phase into a complete information system. Although much of the activity in the Development Phase addresses the computer programs that make up the system, this phase also puts in place the hardware, software, and communications environment for the system and other important elements of the overall system.

The activities of this phase translate the system design produced in the Design Phase into a working information system capable of addressing the information system requirements. The development phase contains activities for building the system, testing the system, and conducting functional qualification testing, to ensure the system functional processes satisfy the functional process requirements in the Functional Requirements Document (FRD). At the end of this phase, the system will be ready for the activities of the Integration and Test Phase.

3.1.2 Integration and Testing

The objective of this phase is to prove that the developed system satisfies the requirements defined. Several types of tests will be conducted in this phase. First, subsystem integration tests shall be executed and evaluated by the development team to prove that the program components integrate properly into the subsystems and that the subsystems integrate properly into an application. Next, the testing team conducts and evaluates system tests to ensure the developed system meets all technical requirements, including performance requirements. Next, the testing team and the Security Program Manager conduct security tests to validate that the access and data security requirements are met. Finally, users participate in acceptance testing to confirm that the developed system meets all user requirements as stated. Acceptance testing shall be done in a simulated "real" user environment with the users using simulated or real target platforms and infrastructures.

3.2 Tasks and Activities

3.2.1 Development

Code and Test Software
Code each module according to established standards.

Integrate Software
Integrate the software units, components and modules. Integrate the software units and software components and test in accordance with the integration plan. Ensure that each module satisfies the requirements of the software at the conclusion of the integration activity.

Conduct Software Qualification Testing.
Conduct qualification testing in accordance with the qualification requirements for the software item. Ensure that the implementation of each software requirement is tested for compliance. Support audit(s) which could be conducted to ensure that:

- as-coded software products (such as software item) reflect the design documentation
- the acceptance review and testing requirements prescribed by the documentation are adequate for the acceptance of the software products
- test data comply with the specification
- software products were successfully tested and meet their specifications
- test reports are correct, and discrepancies between actual and expected results have been resolved
- user documentation complies with standards as specified.

The results of the audits shall be documented. If both hardwaresoftware are under development or integration, the audits maypostponed until the System Qualification Testing.

Upon successful completion of the audits, if conducted, update prepare the deliverable software product for System Integration, System Qualification Testing, Software Installation, or Software Acceptance Support as applicable. Also, establish a baseline for the design and code of the software item.

3.2.2 Integrate System

Integrate the software configuration items with hardware configuration items, manual operations, and other systems as necessary, into the system. The aggregates shall be tested, as they are developed, against their requirements. The integration and the test results shall be documented. For each qualification requirement of the system, a set of tests, test cases (inputs, outputs, test criteria), and test procedures for conducting System Qualification Testing, shall be developed and documented. Ensure that the integrated system is ready for System Qualification Testing.

Conduct System Qualification Testing

Conduct system qualification testing in accordance with the qualification requirements specified for the system. Ensure that the implementation of each system requirement is tested for compliance and that the system is ready for delivery. The qualification testing results shall be documented.

Install Software

Install the software product in the target environment as designed, and in accordance with the Installation Plan. The resources and information necessary to install the software product shall be determined and be available. The developer shall assist the acquirer with the set-up activities. Where the installed software product is replacing an existing system, the developer shall support any parallel running activities that are required. Ensure that the software code and databases initialize, execute, and terminate as specified in the contract. The installation events and results shall be documented.

Document Software Acceptance Support

Acceptance review and testing shall consider the results of the Joint Reviews, Audits, Software Qualification Testing, and System Qualification Testing (if performed). The results of the acceptance review and testing shall be documented.

The developer shall complete and deliver the software product as specified. The developer shall provide initial and continuing training and support to the acquirer as specified.

Revise Previous Documentation

Review and update previous phase documentation, as needed.

Integration and Testing

The tasks and activities actually performed depend on the nature of the project. The following tasks should be completed during the Integration and Test phase.

Establish the Test Environment

Establish the various test teams and ensure the test system(s) are ready.

Conduct Integration Tests

The test and evaluation team is responsible for creating/loading the test database(s) and executing the integration test(s). This is to ensure that program components integrate properly into the subsystems and the subsystems integrate properly into an application.

Conduct Subsystem/System Testing

The test and evaluation team is responsible for creating/loading the test database(s) and executing the system test(s). All results should documented on the Test Analysis Report, Test Problem Report, and on the Test Analysis Approval Determination. Any failed components should be migrated back to the development phase for rework, and the passed components should be migrated ahead for security testing.

Conduct Security Testing

The test and evaluation team will again create or load the database(s) and execute security (penetration) test(s). All tests will be documented, similar to those above. Failed components will be migrated back to the development phase for rework, and passed components will be migrated ahead for acceptance testing.

Conduct Acceptance Testing

The test and evaluation team will create/load the test database(s) and execute the acceptance test(s). All tests will be documented, similar to those above. Failed components will be migrated back to the development phase for rework, and passed components will migrate ahead for implementation.

Revise Previous Documentation

During this phase, the Systems Technical Lead or the Developer(s) will finalize the Software Development Document from the Development Phase. He/They will also finalize the Operations or Systems Administration Manual, User Manual, Training Plan, Maintenance Manual, Conversion Plan, Implementation Plan, Contingency Plan, and Update the Interface

Control Document from the Design Phase. The Project Manager should finalize the System Security Plan and the Security Risk Assessment from the Requirements Analysis Phase, and the Project Management Plan from the Planning Phase. The Configuration Manager should finalize the Configuration Management Plan from the Planning Phase. The Quality Assurance office/person should finalize the Quality Assurance Plan from the Planning Phase. And finally, the Project Manager should finalize the Cost Benefit Analysis and the Risk Management Plan from the System Concept Development Phase.

3.3 Roles and Responsibilities

3.3.1 Development

- Project Manager: The project Manager is responsible and accountable for the successful execution of the Development Phase. The project Manager is responsible for leading the team that accomplishes the tasks shown above. The Project Manager is also responsible for reviewing deliverables for accuracy, approving deliverables and providing status reports to management.
- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager.
- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities, and signs contract awards.
- Oversight Activities: Agency oversight activities, including the IRM office, provide advice and counsel to the project manager on the conduct and requirements of the Development Phase. Additionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews, and in support of project decision milestones.
- Developer: The developer is responsible for the development activities to include coding, testing, documenting and delivering the completed system.

3.3.2 Integration and Test

- Project Manager: The project manager is responsible and accountable for the successful execution of the Integration and Test Phase. The project manager is responsible for leading the team that accomplishes the tasks shown above. The Project Manager is also responsible for reviewing deliverables for accuracy, approving deliverables and providing status reports to management.

- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager. This includes establishing the test environment.
- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities and signs contract awards.
- Security Program Manager: The Security Program Manager is responsible for conducting security tests according to the Systems Security Plan.
- Oversight Activities: Agency oversight activities, including the IRM office, provide advice and counsel for the project manager on the conduct and requirements of the Integration and Test A dditionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews and in support of project decision milestones.
- User: Users participate in acceptance testing to ensure systems perform as expected.

3.4 Deliverables

3.4.1 Development

Thecontentofthesedeliverablesmay beexpandedordependingonthesize,scope,andcomplexityofthesystemsdev elopmenteffort. The following deliverables shall beinitiated during the Development Phase:

Contingency Plan

The Contingency Plan contains emergency response procedures; backup arrangements, procedures, and responsibilities; and post-disaster recovery procedures and responsibilities. Contingency planning is essential to ensure that organizations systems are able to recover from processing disruptions in the event of localized emergencies or large-scale disasters. It is an emergency response plan, developed in conjunction with application owners, and maintained at the primary and backup computer installation, to ensure that a reasonable continuity of support is provided if events occur that could prevent normal operations.

Contingency plans shall be routinely reviewed, updated, and tested to enable vital operations and resources to be restoredas quickly aspossibleand to keep system downtime to an absolute minimum. A Contingency Plan is synonymous with a disaster plan and an emergency plan. If the system/subsystem is to be located within a facility with an acceptable contingency plan, system-unique contingency requirements should be added as an annex to the existing facility contingency plan.

Software Development Document

Contains documentation pertaining to the development of each unit or module, including the test cases, software, test results, approvals, and any other items that will help explain the functionality of the software.

System (Application) Software

This is the actual software developed. It is used for the Test integration Phase and finalized before implementation of the system. Include all the disks (or other medium) used to store the information.

Test Files/Data

All the information used for system testing should be provided at the end of this phase. Provide the actual test data and files used.

Integration Document

The Integration Document explains how the software components, hardware components, or both are combined, and the interaction between them.

3.4.2 Integration and Testing

The following deliverables shall be initiated during the Integration and Test Phase:

Test Analysis Report

This report documents each test - unit/module, subsystem integration,system, user acceptance and security.

Test Analysis Approval Determination

Attached to the test analysis report as a final result of the test reviews and testing levels above the integration test; briefly summarizes the perceived readiness for migration of the software.

Test Problem Report Document problems encountered during testing; the form is attached to the test analysis reports.

IT Systems Security Certification and Accreditation
The documents needed to obtain certification and accreditation of an information system before it becomes operational. They include: System Security Plan; Rules of Behavior; Configuration Management Plan, Risk Assessment; Security Test & Evaluation; Contingency Plan; Privacy Impact Assessments; and the certification and accreditation memorandums. The Systems Security Plan and certification/accreditation package should be approved prior to implementation, and every three years thereafter.

3.5 Issues for Consideration

3.5.1 Development

There are threephaseprerequisitesthat shouldbe completedbeginning this phase:

- Project management plan and schedule indicating target date for completion of each module, and target date for completion of system testing.
- System design document, containing program logic flow, identifying any existing code to be used, and the subsystems with their inputs and outputs.
- Unit/module and integration test plans, containing testing requirements, schedules, and test case specifications for unit and integration testing.

3.5.2 Integration and Testing

Security controls shall be tested before system implementation to uncover all design and implementation flaws that would violate security policy. Security Test and Evaluation (ST&E) involves determining a system's security mechanisms adequacy for completeness and correctness, and the degree of consistency between system documentation and actual implementation. This shall be accomplished through a variety of assurance methods such as analysis of system design documentation, inspection of test documentation, and independent execution of function testing and penetration testing. Results of the ST&E affect security activities developed earlier in the life cycle such as security risk assessment, sensitive system security plan, and contingency plan. Each of these activities will be updated in this phase, based on the results of the ST&E. Build on the security testing recorded in the software development documents, unit testing, integration testing, and system testing.

3.6 Phase Review Activity

3.6.1 Development

Upon completion of all Development Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team, should prepare and present a project status review for the decision maker and project stakeholders. The review should address:

(1) development Phase activities status,
(2) planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions),
(3) resource availability status, and
(4) acquisition risk assessments of subsequent life cycle phases, given the planned acquisition strategy.

3.6.2 Integration and Testing

Upon completion of all Integration and Test Phase tasks and receipt of resources for the next phase, the Project Manager, together with the project team, should prepare and present a project status review for the decision maker and project stakeholders. The review should address:

(1) integration and Test Phase activities status,
(2) planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status ofpending contract actions),
(3) resource availability status, and
(4) acquisition risk assessments of subsequent life cycle phases given, the planned acquisition strategy.

4.0 CONCLUSION

Development is what converts the design model into reality. It is important phase of system's development. On the other hand, integration and testing is used to fine-tune a system to detect errors and shortcomings in systems development processes.

5.0 SUMMARY

- The objective of the Development Phase will be to convert the deliverables of the Design Phase into a complete information system.
- The objective of the integration and testing phase is to prove that the developed system satisfies the requirements defined. Several types of tests will be conducted in this phase.
- Conduct qualification testing in accordance with the qualification requirements for the software item. Ensure that the implementation of each software requirement is tested for compliance.
- The project Manager is responsible and accountable for the successful execution of the Development Phase.
- The Configuration Manager should finalize the Configuration Management Plan from the Planning Phase.
- The Contingency Plan contains emergency response procedures; backup arrangements, procedures, and responsibilities; and post-disaster recovery procedures and responsibilities.
- Security controls shall be tested before system implementation to uncover all design and implementation flaws that would violate security policy.
- Upon completion of all Development, Integration and Test Phase tasks and receipt of resources for the next phase, the Project Manger, together with the project team, should prepare and present a project status review for the decision maker and project stakeholders.

The next study unit is on implementation and disposition of system.

6.0 TUTOR-MARKED ASSIGNMENT

Compare and contrast roles and responsibilities during development phase and integration and testing phases of systems development.

7.0 REFERENCES/FURTHER READING

Information Resources Management (2003). The Department of Justice Systems Development Lifecycle Guidance Document.

Norton, P (1995). Introduction to Computers. Macmillan/McGraw-Hill.

UNIT 4 IMPLEMENTATION AND DISPOSITION OF SYSTEM

CONTENTS

1.0 INTRODUCTION

From the previous study unit, you have leant about the Development and Integration and testing phase.

This unit focuses on Implementation and Disposition of system, related tasks and activities, roles and responsibilities as they concern system implementation and disposition.

2.0 OBJECTIVES

This unit is designed for you to:

- know what constitutes system's implementation and disposition phase in designing and developing information

system
- identify the tasks you need to embark on during the implementation and disposition phase of systems development
- comfortably answer the question of responsibilities and roles in executing the implementation and disposition phase of a systems development project
- be able to know what are the deliverables, from implementation and disposition to be used for subsequent phases
- identify some issues that need to be considered in implementation and disposition phase of a system.

3.0 MAIN CONTENT

3.1 Implementation and Disposition Phases

3.1.1 Implementation

Implementation phase of the system development in system's design and development is the most expensive and time consuming of the entire life cycle. Implementation is expensive because so many people are involved in the process. It is time consuming because of all the works that has to be completed; implementing a developed and new information system into an organizational context is not a mechanical process. The organizational concept has been shaped and reshaped by the people who work in the organization. The work habits, belief, interrelationships, and personal goals of an organization's members, all affect the implementation process. Although factors important to successful implementation have been identified, there are no more recipes you can follow. During implementation, you must be attuned to key aspects of the organizational context such as history, politics, and environmental demands - aspects that can contribute to implementation failure if ignored.

In this phase, the system or system modifications are installed and made operational in a production environment. The phase is initiated after the system has been tested and accepted by the user and Project Manager.

Activities in this phase include notification of implementation to end users, execution of the previously defined training plan, data entry or conversion, and post implementation review. This phase continues until the system is operating in production in accordance with the defined user requirements.

The new system can fall into three categories; replacement of a manualprocess, replacement of a legacy system, or upgrade to ansystem Regardless of the type of system, all aspects of theimplementation phase should be followed. This will ensure the smoothest possible transition to the organization's desired goal.

3.1.2 Disposition

The Disposition Phase will be implemented to eliminate a large part of a system or as in most cases, close down a system and end the life cycle process. The system in this phase has been declared surplus obsolete and will be scheduled for shutdown. The emphasis of this phase will be to ensure that data, procedures, and documentation are packaged and archived in an orderly fashion, making it possible to reinstall and bring the system back to an operational status, if necessary, and to retain all data records in accordance with policies regarding retentionelectronicrecords. The Disposition Phase represents the end ofsystem's life cycle. A Disposition Plan shall be prepared to address allfacets of archiving, transferring, and disposing of the system and data.

Particular emphasis shallbe given to proper preservation of the processed by thesystem so thatitiseffectivelymigratedtosystem, or archived in accordance with applicable records management
regulations and policies for potential future access. The system disposition activities preserve information not only about the current production system but also about the evolution of the system through its life cycle.

3.2 Tasks and Activities

3.2.1 Implementation

Tasks and activities in the implementation phase are associated with certain deliverables described in section 3.2. of Unit3. The tasks andactivities actually performed depend on the nature of the project description of these tasks and activities is provided below.

Notify Users of New Implementation

The implementation notice should be sent to all users and organizations affected by the implementation. Additionally, it is good policy to make internal organizations not directly affected by the implementation aware of the schedule, so that allowances can be made for a disruption in the normal activities of that section. Some notification methods are email, internal memo to heads of departments, and voice tree messages. The notice should include:

- the schedule of the implementation;
- a brief synopsis of the benefits of the new system;
- the difference between the old and new system;
- responsibilities of end user affected by the implementation during this phase; and
- the process to obtain system support, including contact names and phone numbers.

Execute Training Plan

It is always a good business practice to provide training before the end user uses the new system. Because there has been a previously designed training plan established, complete with the system user manual, the execution of the plan should be relatively simple. Typically what prevents a plan from being implemented is lack of funding. Good budgeting should prevent this from happening.

Perform Data Entry or Conversion

With the implementation of any system, typically there is old data which is to be included in the new system. This data can be in a manual or an automated form. Regardless of the format of the data, the tasks in this section are two fold, data input and data verification. When replacing a manual system, hard copy data will need to be entered into the automated system. Some sort of verification that the data is being entered correctly should be conducted throughout this process. This is also the case in data transfer, where data fields in the old system may have been entered inconsistently and therefore affect the integrity of the new database. Verification of the old data becomes imperative to a useful computer system.

One of the ways verification of both system operation and data integrity can be accomplished is through parallel operations. Parallel operations consist of running the old process or system and the new system simultaneously until the new system is certified. In this way, if the new system fails in any way, the operation can proceed on the old system while the bugs are worked out.

Install System

To ensure that the system is fully operational, install the system in a production environment.

Conduct Post-Implementation Review

Afterthesystemhasbeenfielded,apost-implementation review conducted to determine the successoftheproject throughit'simplementationphase.Thepurposeofthisreviewistoimplementation experiences, to recommend system enhancements, and provide guidance for future projects.

In addition, change implementation notices will be utilized to document Userrequestsforfixes toproblems thatmay havebeenduring this phase. It is important to document any user request for a change to a system to limit misunderstandings between the end user and the system programmers.

Revise Previous Documentation

During this phase, the ICD is revised from the Requirements Analysis Phase. The CONOPS, System Security Plan, Security Risk Assessment, Software Development Document, System Software and the Integration Document, are also revised and finalized during the Implementation Phase.

3.2.2 Disposition

The objectives for all tasks identified in this phase are to retire system, software, hardware, and data. The tasks and activities actually performed are dependent on the nature of the project. The disposition activities are performed at the end of the systems life cycle disposition activities ensure the orderly termination of the system, and preserve vital information about the system so that some or all of it, may be reactivated in the future, if necessary. Particular emphasis shall be given to proper preservation of the data processed by the system, so that the data are effectively migrated to another system, or disposed of in accordance with applicable records management and program area regulations and policies for potential future access. These activities may be expanded, combined or deleted, depending on the size of the system.

Prepare Disposition Plan

The Disposition Plan must be developed and implemented. The Disposition Plan will identify how the termination of the system/data will be conducted, and when, as well as the system termination date, software components to be preserved, data to be preserved, disposition of remaining equipment, and archiving of life-cycle products.

Archive or Transfer Data
The data from the old system will have to be transferred into the new system or if it is obsolete, archived.

Archive or Transfer Software Components
Similar to the data that is archived or transferred, the software components will need to be transferred to the new system, or if that is not feasible, disposed of.

Archive Life Cycle Deliverables
A lot of documentation went into developing the application or system. This documentation needs to be archived, where it can be referenced, if needed at a later date.

End the System in an Orderly Manner
Follow the Disposition Plan for the orderly breakdown of the system, its components, and the data within.

Dispose of Equipment
If the equipment can be used elsewhere in the organization, recycle. If it is obsolete, notify the property management office, to excess all hardware components.

Conduct Post-Termination Review Report
This review will be conducted at the end of the Disposition Phase and again, within 6 months after disposition of the system by the Project Manager.

3.3 Roles and Responsibilities

3.3.1 Implementation

- Project Manager: The project manager is responsible and accountable for the successful execution of the Implementation Phase. The project manager is responsible for leading the team that accomplishes the tasks shown above. The project manager is also responsible for reviewing deliverables for accuracy, approving deliverables and providing status reports to management.
- Project Team: The project team members (regardless of the organization of permanent assignment) are responsible for accomplishing assigned tasks as directed by the project manager.
- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities and signs contract awards.

- Oversight Activities: Agency oversight activities, including the IRM office, provide advice and counsel for the project manager on the conduct and requirements of the Implementation Phase. Additionally, oversight activities provide information, judgments, and recommendations to the agency decision makers during project reviews and in support of project decision milestones.

3.3.2 Disposition

- Project Manager: The Project Manager is responsible and accountable for the successful execution of the Disposition Phase activities.
- Data Administrator: The Disposition Plan may direct that only certain systems data be archived.The DataAdministrator identify the data and assisttechnicalpersonnel with thea chive process. The Data Administrator may be involved with identifying data which due to its sensitive nature must be destroyed. They would also be involved with identifying and migrating data to a new or replacement system.
- Security Managers: The security managers will need to make sure that all access authority has been eliminated for the users. Any users that only use the application should be removed from the system while others that use other applications as well as this one may still need access to the overall system, but not the application being shut-down. If there is another application that is taking the place of this application, the security managers should coordinate with the new security managers.

3.4 Deliverables

3.4.1 Implementation

The following deliverables are initiated during the Implementation Phase:

Delivered System
After the Implementation Phase Review and Approval Certification is signed by the Project Manager and the System Proponent representative, the system - including the production version of the data repository - is delivered to the customer for the Operations and Maintenance Phase.

Change Implementation Notice
A formal request and approval document for changes made during the Implementation Phase.

Version Description Document
The primary configuration control document used to track and control versions of software released to the operational environment. It is a summary of the features and contents for the software build and identify and describe the version of the software being delivered

Post-Implementation Review
The review is conducted at the end of the Implementation Phase. A post-implementation review shall be conducted to ensure that the system functions as planned and expected; to verify that the system cost is within the estimated amount; and to verify that the intended benefits are derived as projected. Normally, this shall be a one-time review, and it occurs after a major implementation; it may also occur after a major enhancement to the system. The results of an unacceptable review are submitted to the System Proponent for its review and follow-up actions. The System Proponent may decide it will be necessary to return the deficient system to the responsible system development Project Manager for correction of deficiencies.

3.4.2 Disposition

The following deliverables are initiated and finalized during the Disposition Phase

Disposition Plan
The objectives of the plan are to end the operation of the system in a planned, orderly manner, and to ensure that system components and data are properly archived or incorporated into other systems. This will include removing the active support by the operations and maintenance organizations. The users will need to play an active role in the transition. All concerned groups will need to be kept informed of the progress and target dates. The decision to proceed with Disposition will be based on recommendations and approvals from an In-Process Review or based on a date (or time period) specified in the System Boundary Document (SBD).

This plan will include a statement of why the application is no longer supported, a description of replacement / upgrade, list of tasks/activities (transition plan) with estimated dates of completion, and the notification strategy. Additionally, it will include the responsibilities for future residual support issues, such as identifying media alternatives if technology changes; new software product transition plans and alternative support issues (once the application is removed); parallel operations of retiring, and the new software product; archiving of the software product, associated documentation, movement of logs, code; and accessibility of archive, data protection identification, and audit applicability.

Post-Termination Review Report
A report at the end of the process that details the findings Disposition Phase review. It includes details of where to find products and documentation that has been archived.

Archived System
The packaged set of data and documentation containing the archived application.

3.5 Issues for Consideration

3.5.1 Implementation

Once a system has been developed, tested and deployed, it will enter the operations and maintenance phase. All development resources and documentation should be transferred to a library or the operations and maintenance staff.

3.5.2 Disposition

Update of Security plans for archiving and the contingency plans reestablish the system, should be in place.

All documentation about the application, system logs and configuration will be archived, along with the data and a copy of the Disposition Plan.

3.6 Phase Review Activity

3.6.1 Implementation

During the Implementation Phase Review, recommendations may be made to correct errors, improve user satisfaction, or improve system performance. For contractor development, analysis shall be performed to determine if additional activity is within the scope of the statement of work, or within the original contract. An

Implementation Phase Review and Approval Certification should be signed off by the Project Manager to verify the acceptance of the delivered system by the system's users/owner.

The Implementation Phase-End Review shall be organized, planned, and led by the Project Quality Assurance representative.

3.6.2 Disposition

The Post-Termination Review shall be performed after the end of this final phase. This phase-end review shall be conducted within 6 months after disposition of the system. The Post-Termination Review Report documents the lessons learned from the shutdown and archiving of the terminated system.

4.0 CONCLUSION

Most information systems have failed because of the ineffectiveness and inefficiency in the implementation of the concept and model. The right team should be put together to ensure safe and accurate implementation of systems. On the other hand, disposition of developed information system is necessary for continuity and future reference. It is particularly important for system's re-evaluation a redesign. It also ensures a perfect completion of a project cycle, to make room for other projects.

5.0 SUMMARY

- Implementation phase of the system development in system's design and development is the most expensive and time consuming of the entire life cycle. Implementation is expensive because so many people are involved in the process.
- The Disposition Phase will be implemented to eliminate a large part of a system or, as in most cases, close down a system and end the life cycle process.
- The implementation notice should be sent to all users and organizations affected by the implementation.
- One of the ways verification of both system operation and data integrity can be accomplished, is through parallel operations.
- With the implementation of any system, typically there is old data which is to be included in the new system. This data can be in a manual or an automated form.
- The Disposition Plan must be developed and implemented.
- After the Implementation Phase Review and Approval

Certification issignedbytheProjectManager and the System is representative, the system - including the production version of the data repository - is delivered to the customer for the Operations and Maintenance Phase.

- The objectives of the disposition plan are to end the operation of the system in a planned, orderly manner, and to ensure thatcomponents and data are properly archived or incorporated into othersystems.
- During the Implementation Phase Review, recommendations may be made to correct errors, improve user satisfaction or improve system performance.
- The Post-Termination Review shall be performed after the end of this final phase.

The next study unit is on operations and maintenance of system design.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss the differences between Implementation and Disposition phases based on tasks and activities.

7.0 REFERENCES/FURTHER READING

Information Resources Management (2003). The Department of Justice Systems Development Lifecycle Guidance Document.

Jeffrey, A. H. Joey, F.G. & Joseph, S.V. (2005). Pearson Prentice Hall.

Norton, P (1995). Introduction to Computers. Macmillan/McGraw-Hill.

UNIT 5 OPERATIONS AND MAINTENANCE OF SYSTEM DESIGN

CONTENTS

1.0 INTRODUCTION

This unit treats the final phase of system design which is, operations and maintenance. It also dwells on related issues on tasks and activities, roles and responsibilities, deliverables phase review activity and finally, maintenance cost.

2.0 OBJECTIVES

This unit is designed for you to:

- be able to identify the different types of maintenance
- understand what constitutes operations and maintenance phase in designing and developing information system
- identify the tasks you need to embark on during the operations and maintenance phase of systems development
- comfortably answer the question of responsibilities and roles in executing the operations and maintenance phase of a systems development project
- be able to know what are the deliverables from operations and maintenance to be used for subsequent phases
- identify some issues that need to be considered in operations and maintenance phase of a system

- explain the relationship between cost of maintenance phase compared to other phases of systems development.

3.0 MAIN CONTENT

3.1 Maintenance Phase

More than half of the life cycle costs are attributed to the operations and maintenance of systems. In this phase, it is essential that all facets of operations and maintenance be performed. The system is being used, and scrutinized, to ensure that it meets the needs initially stated in the planning phase. Problems are detected, and new needs arise. This may require modification to existing code, new code to be developed and/or hardware configuration changed. Providing user support is an ongoing activity. New users will require training, and others will require training as well. The emphasis of this phase will be to ensure that the user's needs are met and the system continues to perform as specified in the operational environment. Additionally, as operations and maintenance personnel monitor the current system, they may become aware of better ways to improve the system and therefore make recommendations. Changes will be required to fix problems, possibly add features and make improvements to the system. This phase will continue as long as the system is in use.

When a system is in maintenance phase, some persons within system's development group are responsible for collecting maintenance request from systems users and other interested parties such as systems auditors, data center, network management staff and data analysts. Once collected, each request is analyzed. To better understand it, it will alter the system and what business benefits and necessities will result from such a change. If the change request is approved, a system change is designed and then implemented. As with the initial development of the system implemented, changes are formally reviewed and tested before installation into operational systems

3.1.1 Types of Maintenance

There are several types of maintenance you can perform on an information system. By maintenance we mean, the fixing or enhancing of an information system.

1. Corrective Maintenance: this refers to changes made to repair defects in the design, coding or implementation of the system. For example, if you have just purchased

a new home, corrective maintenance would involve repairs to things that had never worked as designed, such as, faulty electrical outlet, or a misaligned door. Most corrective maintenance faults surface soon after installation. When corrective maintenance problems surface, they are typically urgent, and need to be resolved to curtail possible interruption normal business activities. Of all types of maintenance, corrective maintenance account for activities as much as 75% of all maintenance (Andrew and Leventhal). This is unfortunate because corrective maintenance adds little or no value to the organisation, it simply focuses on removing defects from an existing system without adding new functionality.

2. Adaptive Maintenance: This involves making changes to evolve its functionality, to changing business needs, or to migrate to a different operating environment. Within a home, adaptive maintenance might be adding storm windows to improve the cooling performance of an air-conditioner. Adaptive maintenance is usually less urgent than corrective maintenance because of business and technology. Changes typically occur over some period of time. Contrary to corrective maintenance, adaptive maintenance is generally a small part of an organization's maintenance effort, but it adds value to the organization.
3. Perfective Maintenance: this involves making enhancement to improve processing performance or interface usability or to add desired, but not necessarily required system's features. In our home example, Perfective maintenance would be adding a new room. Many systems professionals feel that Perfective correction is not really maintenance, but rather new development.
4. Preventive Maintenance: This involves changes made to a system to reduce the chances of future system's failure. An example of preventive maintenance might be to increase the number of records that the system process far beyond what is currently needed, or to generalize how a system sends report information to a printer so that the system can easily adapt to changes in technology. In our home example, preventive maintenance could be painting of the exterior to better protect the room from severe weather conditions. As with adaptive maintenance, both Perfective and preventive maintenance are typically a much lower priority than corrective maintenance.

Over the life of a system, corrective maintenance is most likely to occur after initial system installation or after major changes. This means that adaptive maintenance, Perfective maintenance, and preventive maintenance activities can lead to corrective maintenance activities if not carefully designed and implemented.

3.2 Tasks and Activities

Identify Systems Operations

Operations support is an integral part of the day-to-day operations of a system. In small systems, all or part of each task may be done by the same person. But in large systems, each function may be done separate individuals or even separate areas. The Operations Manual is developed in previous SDLC phases. These documents define tasks, activities and responsible parties, and will need to be updated as changes occur. Systems operations activities and tasks need to be scheduled, on a recurring basis, toensure that the production environment isfunctional, and is performing as specified. The following is a checklist of systems' operations' key tasks and activities:

- Ensure that systems and networks are running, and available during the defined hours of Operations;
- Implement non-emergency requests during scheduled Outages, as prescribed in the Operations Manual;
- Ensure all processes, manual and automated, are documented in the operating procedures. These processes should comply with the system documentation;
- Acquisition and storage of supplies (i.e. paper, toner, tapes,removable disk);
- Perform backups (day-to-day protection, contingency);
- Perform the physical security functions including ensuring adequate UPS, Personnel have proper security clearances and proper access privileges etc.;
- Ensure contingency planning for disaster recovery is currentand tested ;
- Ensure users are trained on current processes and new processes;
- Ensure that service level objectives are kept accurate and are monitored;
- Maintain performance measurements, statistics, and system logs. Examples of performance measures include volume and frequency of data to be processed in each mode, order and type of operations;
- Monitor the performance statistics, report the results and escalate problems when they occur.

Maintain Data /Software Administration

Data/Software Administration is needed to ensure that input data and output data and data bases are correct and continually checked accuracy and completeness. This includes ensuring that any regularly scheduled jobs are submitted and completed correctly. Software and data bases should be maintained at (or near) the current maintenance level. The backup and recovery processes for data bases are normally different than the day-to-day DASD volume backups. The backup and recovery process of the data bases should be done as a Data/SoftwareAdministration task by a data administrator. A checklist of Data/Software Administration tasks and activities are:

- Performing a periodic Verification/Validation of data, correct datarelated problems;
- Performing production control and quality control functions (Jobsubmission, checking and corrections);
- Interfacing with other functional areas for Day-to-day checking/corrections;
- Installing, configuring, upgrading and maintaining data base(s). This includes updating processes, data flows, and objects (usually shown in diagrams);
- Developing and performing data/data based backup and recovery routines for data integrity and recoverability. Ensure documented properly in the Operations Manual;
- Developing and maintaining a performance and tuning plan for online process and data bases;
- Performing configuration/design audits to ensure software, system, parameter configuration are correct.

Identify Problem and Modification Process

One fact of life with any system is that change is inevitable. Users need an avenue to suggest change and identified problems. A User Satisfaction Review which can include a Customer Satisfaction Survey can be designed and distributed to obtain feedback on operational systems, to help determine if the systems are accurate and reliable. Systems administrators and operators need to be able to make recommendations for upgrade of hardware, architecture and streamlining processes. For small in-house systems, modification requests can be handled by an in-house process. For large integrated systems, modification requests may be addressed in the Requirements document, and may take the form of a change package, or a formal Change Implementation Notice and may require justification and cost benefits analysis for approval by a review board. The requirements document for the project may call for a modification cut-off and rollout of the system as a first version, and all subsequent changes addressed as a new or enhanced version of the system. A request for modifications to a system may also generate a new project and require a new initiation plan.

Maintain System/Software

Daily operations of the system /software may necessitate that maintenance personnel identify potential modifications needed to ensure that the system continues to operate as intended and produces quality data. Daily maintenance activities for the system, takes place to ensure that any previously undetected errors are fixed. Maintenance personnel may determine that modifications to the system and databases needed to resolve errors or performance problems. Also modifications may be needed to provide new capabilities or to take advantage hardware upgrades or new releases of system software and application software used to operate the system. New capabilities may take the form of routine maintenance or may constitute enhancements to the system or database as a response to user requests for new/improved capabilities. New capabilities needs may begin a new problem modification process described above.

Revise Previous Documentation

At this phase of the systems development all security activities have been completed. An update must be made to the System Security plan; an update and test of the contingencyplanshould becontinuous vigilance should be given to virus and intruder detection. The Project Manager must be sure that security operating procedures are kept updated accordingly. Review and update documentation from the previous phases. In particular, the Operations Manual, SBD and Contingency Plan, need to be updated and finalized during the Operations and Maintenance Phase.

3.3 Roles and Responsibilities

This list briefly outlines some of the roles and responsibilities for key maintenance personnel. Some roles may be combined orending upon the size of the system to be maintained. Each system will dictate the necessity for the roles listed below:

- Systems Manager: The Systems Manager develops documents and executes plans and procedures for conducting activities and tasks of the Maintenance Process. To provide for anavenue of reporting and customer satisfaction, the Systems Manager should create and discuss communications instructions with the systems customers.

- Technical Support: Personnel which proved technical support to the program. This support may involve granting access rights to the program. Setup of workstations or terminals to access the system. Maintaining the operating system for both server and workstation. Technical support personnel may be involved with issuing user ids or login names and passwords. In a Client server environment technical support may perform systems scheduled backups and operating system maintenance during downtime.
- Operations or Operators (Turn On/Off Systems, Start Tasks, Backup etc): For many mainframe systems, technical support for a program is provided by an operator. The operator performs scheduled backup, performs maintenance during downtime, and is responsible to ensure the system is online and available for users. Operators may be involved with issuing user ids or login names and passwords for the system.
- Customers: The customer needs to be able to share with the systems manager the need for improvements or the existence of problems. Some users live with a situation or problem because they feel they must. Customers may feel that change will be slow or disruptive. Some feel the need to create work-around. A customer has the responsibility to report problems or make recommendations for changes to a system.
- Program Analysts or Programmer: Interprets user requirements, designs and writes the code for specialized programs. User changes, improvements, enhancements may be discussed in Joint Application Design sessions. Analysts programs for errors, debugs the program and tests program design.
- Process Improvement Review Board: A board of individuals may be convened to approve recommendations for changes and improvements to the system. This group may be chartered. The charter should outline what should be brought before the group for consideration and approval. The board may issue a Change Directive.
- Users Group or Team: A group of computer users who share knowledge they have gained concerning a program or system. They usually meet to exchange information, share programs and can provide expert knowledge for a system under consideration for change.

- Contracting Officer: The contracting officer is responsible and accountable for the procurement activities, and signs contract award.
- Data Administrator: Performs tasks which ensure that accurate and valid data are entered into the system. Sometimes this person creates the information systems database, maintains the databases security and develops plans for disaster recovery. The data administrator may be called upon to create queries and reports for a variety of user requests. The data administrator is responsibilities include maintaining the databases data dictionary. The data dictionary provides a description of each field in the database, thecharacteristics, and what data is maintained with the field.
- Telecommunications Analyst and Network System Analyst: Plans, installs, configures, upgrades and maintains networks as needed. If the system requires it, he ensures that external communications and connectivity are available.
- Computer Systems Security Officer (CSSO): The CSSO has a requirement to review system change requests, review and in some cases, coordinate the Change Impact Assessments, participate in the Configuration Control Board process, and conduct and report changes that may be made, that affect the security posture of the system.

3.4 Deliverables

In-Process Review Report

The In-Process Review (IPR) occurs at predetermined milestones usually quarterly, but at least once a year. The performance measures should be reviewed along with the health of the system. Performance measures should be measured against the baseline measures. Ad-hoc reviews should be called when deemed necessary by either document the results of this review in the IPR Report.

User Satisfaction Review Report

User Satisfaction Reviews can be used as a tool to determine the current user satisfaction with the performance capabilities of an existing application or initiate a proposal for a new system. This review can be used as input to the IPR Report.

3.5 Issues for Consideration

Documentation

It can not be stressed enough, that proper documentation for the duties performed by each individual responsible for system maintenance and operation should be up-to-date. For smooth day -to -day operations of any system, as well as disaster recovery, each individual's role, duties and responsibilities should be outlined in detail. A systems administrator's journal or log of changes performed to the system software or hardware is invaluable in times of emergencies. Operations manuals, journals or logs should be readily accessible by maintenance personnel.

Guidelines in determining New Development from Maintenance

Changes to the system should meet the following criteria in order for the change or modification request to be categorized as Maintenance; otherwise it should be considered as New Development:

- Estimated cost of modification are below maintenance costs
- Proposed changes can be implemented within one system year
- Impact to system is minimal or necessary for accuracy of system output

Security Re-certification

Federal IT security policy requires all IT systems to be accredited prior to being placed into operation and at least every three years thereafter, or prior to implementation of a significant change.

3.6 Phase Review Activity

Review activities occur several times throughout this phase. Each time the system is reviewed, one of three of the following decisions will be made:

- The system is operating as intended and meeting performance expectations.
- The system is not operating as intended and needs correctionsor modifications.
- The users are/are not satisfied with the operation and performance of the system.

The In-Process Review shall be performed to evaluate system performance, user satisfaction with the system, adaptability to changing business needs, and new technologies that might improve the system. This review is diagnostic in nature and can

trigger a project to re-enter a previous SDLC phase. Any major system modifications needed after thesystem has been implemented will follow the SDLC process
planning through implementation.

3.7 Maintenance Cost

Information system maintenance costs are significant expenditure. For some organizations as much as 60% to 80% of their information system budget is allocated to maintenance activities (Kaplan, 2002). This proportion has risen from roughly 50% 20 years ago, due to the fact that many organizations have accumulated more and older so called legacy systems that require more and more maintenance. More maintenance means more maintenance work for programmers. A recent opinion poll of over 20 executives revealed that on average, 52% of a company's programmers are assigned to maintain existing software (Lytton, 2001).

Only3% is assigned to new applicationdevelopment.Inwhere a company has not developed its in-house system, but licensed software, maintenance cost remains high. In many cases annualmaintenance fee can be as high as 20% of the up-front cost (Worthen,2003). In addition, about one third of the cost of establishingkeepingapresenceonthewebgoestoprogrammingLegard, 2000).

4.0 CONCLUSION

Operations and maintenance is continual through out the life of poject and thus could be the most expensive and cumbersome. In fact it is considered as the longest of all the systems development phases. It consists of making sure that developed systems run in operational use and continues to do so for as long as is required. The Centre of Software maintenance estimates that 50% and 90% of cost of computer systems over its lifetime is maintenance.

5.0 SUMMARY

- More than half of the life cycle costs are attributed to the operations and maintenance of systems. In this phase, it is essential that all facets of operations and maintenance be performed.
- When a system is in maintenance phase, some persons within the systems development group is responsible for collecting maintenance request from systems users and

other interested parties such as systems auditors, data center, network management staff, and data analysts.

- When corrective maintenance problems surface, they are typically urgent and need to be resolved to curtail possible interruption in normal business activities.
- One fact of life with any system is that change is inevitable. Users need an avenue to suggest change and identified problems.
- Daily operations of the system /software may necessitate that maintenance personnel identify potential modifications neededto ensure that the system continues to operate as intended and produces quality data.
- Operations support is an integral part of the day-to-day operations of a system. In small systems, all or part of each task may be done by the same person.
- The Systems Manager develops documents and executes plans and procedures for conducting activities and tasks of the Maintenance Process. To provide for an avenue of problem reporting and customer satisfaction.
- It can not be stressed enough, that proper documentation for the duties performed by each individual responsible for system is maintenance and operation should be up-to-date.
- Information system maintenance costs are significant expenditure.

For some organizations as much as 60% to 80% of their information system budget is allocated to maintenance activities.

The next study unit is on DSDM.

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and discuss the uniqueness of each of the form of systems development maintenance.
2. What are the activities associated with the operations and maintenance phase of systems development.

7.0 REFERENCES/FURTHER READINGS

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MODULE 3

UNIT 1 DYNAMIC SYSTEMS DEVELOPMENT METHOD

CONTENTS

1.0 INTRODUCTION

This unit introduces you to the principles, techniques, roles and phases of DSDM. Issues such as critical success factors of DSDM and comparison between DSDM and Development methods are treated.

2.0 OBJECTIVES

This unit of the course is designed for you to:

- be able to explain what is a dynamic systems development method
- identify the basic principles of dynamic systems development method
- identify and differentiate the different phases of a DSDM
- identify and differentiate the various techniques to DSDM
- be able to identify and discuss the success factors behind the operations of dynamic system development method.

3.0 MAIN CONTENT

3.1 Dynamic System Development Methods (DSDM)

Dynamic Systems Development Method (DSDM) is a framework based originally around Rapid Application Development (RAD), supported by its continuous user involvement in an iterative development and incremental approach which is responsive to changing requirements, in order to develop a system that meets the business needs on time and on budget. It is one of a number of Agile developing software and forms part of the Agile Alliance.

DSDM was developed in the United Kingdom in the 1990s by consortium of vendors and experts in the field of Information System (IS) development. The DSDM Consortium combined their best-practice experiences. The DSDM Consortium is a non-profit and vendor independent organisation which owns and administers the framework. The first version was completed in January 1995 and published Fnebruary 1995. The current version in use at this point in time (April 2006) is Version 4.2: Framework for Business Centered Development, released in May 2003.

As an extension of rapid application development, DSDM focuses on Information Systems, projects that are characterized by tight schedules And budgets. DSDM addresses the common reasons for system's project failure, including exceeding budgets, missing deadlines, and lack of user involvement, and top management commitment.

DSDM consists of 3 phases: pre-project phase, project life-cycle phase, and post project phase. The project life-cycle phase is subdivided into 5 stages: feasibility study, business study, functional model iteration, design and build iteration, and implementation.

DSDM recognizes that projects are limited by time and resources, and plans accordingly to meet the business needs. In order to achieve these goals, DSDM encourages the use of RAD with the consequent danger that too many corners are cut. DSDM applies some principles, roles, and techniques.

In some circumstances, there are possibilities to integrate practices from other methodologies, such as Rational Unified Process (RUP), Extreme Programming (XP), and PRINCE2, as complements to DSDM. Another agile method that has some similarity in process and concept to DSDM is Scrum

3.1.1 Principles of DSDM

There are nine underlying principles of DSDM consisting of four foundations and five starting-points for the structure of the method. These principles form the cornerstones of development using DSDM.

- User Involvement is the Main Key in running an efficient and effective project, where both users and developers share a workplace, so that the decisions can be made accurately.
- The Project Team must be Empowered to make decisions that are important to the progress of the project, without waiting for higherlevel approval.
- DSDM focuses on frequent delivery of products, with assumption that to deliver something "good enough" earlier is always better than to deliver everything "perfectly" in the end. By delivering product frequently from an early stage of the project, the product can be tested and reviewed where the test record and review document can be taken into account at the next iteration or phase.
- The main criteria for acceptance of deliverable in DSDM is on delivering a system that addresses the current business needs. It is not so much directed at delivering a perfect system addressing all possible business needs, but focuses its efforts on critical functionality.
- Development is Iterative And Incremental, driven by users' feedback to converge on an effective business solution.
- All changes during the development are reversible.
- The high level scope and requirements should be base-lined before the project starts.
- Testing is carried out throughout the project life-cycle.

- Communication and cooperation among all project stakeholders is required to be efficient and effective. DSDM is also supported by some other principles (or so called assumptions).
- No system is built perfectly in the first try(the paretoprinciple-80/20 rule). In the process of developing an information system, 80% of the business benefit comes from 20% of the system requirements, therefore DSDM starts implementing this first 20% of system requirements to meet 80% of the business needs, which is good enough as long as the users are intimately involved in the development process, and in a position to ensure that the missing 20% would not cause any serious business consequences. Implementing the entire requirements often causes the project to go over deadlines and budgets, therefore it is most times unnecessary to construct the perfect solution.
- Project delivery should be on time, on budget and with good quality.
- DSDM only requires each step of the development to be completed far enough for the next step to begin. This way a new iteration of the project can commence without having to wait for the previous to be completed entirely. And with every iteration system is improved incrementally. Recall that the business requirements are changing over time at any rate.
- Both Project Management and Development techniques are incorporated in DSDM.
- DSDM can also be used both in new projects and for expanding current systems.
- Risk assessment should focus on business function being delivered, not on the construction process nor on development process artifacts (such as requirements and design documents).
- Management rewards product delivery rather than task completion.
- Estimation should be based on business functionality instead of lines of code.

3.2 Prerequisites for Using DSD

In order for DSDM to be a success, a number of prerequisites need to be realized. First, there needs to be interactivity between the project team, future end users and higher management. This addresses well known failures of IS development projects due to lack of top motivation and/or user involvement.

The second important prerequisite for DSDM projects is the decomposability of the project. The possibility of decomposition into smaller parts enables the iterative approach, and activities that are hard to prioritize often cause delays--exactly the effect that DSDM developed to avoid. Another group of projects for which DSDM is not well-suited are safety-critical ones. The extensive testing and validation found in these kinds of projects conflict with DSDM goals of being on time and on budget. Finally, projects that aim at re-usable components might not be well-suited for development using DSDM, because the demands on perfection are too high and conflict with the 80%/20% principle described earlier.

3.3 The Phases of DSDM

The DSDM framework consists of three sequential phases, namely the pre-project, project life-cycle and post-project phases. The project phase of DSDM is the most elaborate of the three phases. The project life-cycle phase consists of 5 stages that form an iterative step-by-step approach in developing an IS. The three phases and corresponding stages are explained extensively in the subsequent sections. For each stage/phase, the most important activities are addressed and the deliverables are mentioned.

3.3.1 Phase 1

The Pre-Project

In the pre-project phase candidate projects are identified, project funding is realized and project commitment is ensured. Handling these issues at an early stage avoids problems at later stages of the project.

3.3.2 Phase 2

The Project Life-Cycle

The process overview in the figure above shows the project life-cycle of this phase of DSDM. It depicts the 5 stages a project will have to go through to create an IS. The first two stages, the Feasibility Study and Business Study are sequential phases that complement to each other. After these phases have been concluded, the system is developed iteratively and incrementally in the Functional Model Iteration, Design & Build Iteration and Implementation stages. The iterative and incremental nature of DSDM will be addressed further in a later section.

3.3.2.1 Stage 1

The Feasibility Study

During this stage of the project, the feasibility of the project for the use of DSDM is examined. Prerequisites for the use of DSDM are addressed by answering questions like; 'Can this project meet the required business needs?', 'Is this project suited for the use of DSDM?' and 'What are the most important risks involved?'. The most important techniques used in this phase are the Workshops. The deliverables for this stage are the Feasibility Report and the Feasibility Prototype that address the feasibility of the project at hand. It is extended with a global Outline Plan for the rest of the project and a Risk Log that identifies the most important risks for the project.

3.3.2.2 Stage 2

The Business Study

The business study extends the feasibility study. After the project has been deemed feasible for the use of DSDM, this stage examines the influenced business processes, user groups involved and their respective needs and wishes. Again the workshops is one of the most valuable techniques, workshops in which the different stakeholders come together to discuss the proposed system. The information from these sessions is combined into a requirements list. An important property of the requirements list is the fact that the requirements are (can prioritized. These requirements are prioritized using the MoSCoW approach. Based on this prioritization, a development plan is constructed as a guideline for the rest of the project. An important project technique used in the development of this plan is time boxing. This technique is essential in realizing the goals of DSDM, namely being on time and on budget, guaranteeing the desired quality. A system architecture is another aid to guide the development of the IS.

The deliverables for this stage are a business area definition describes the context of the project within the company, architecture definition that provides an initial global architecture of the IS under development, together with a development plan that outlines the most important steps in the development process. At the basehese last two documents there is the prioritized requirements list. This list states all the requirements for the system, organized according to the MoSCoW principle. And last, the Risk Log is updated with the facts that have been identified during this phase of DSDM.

3.3.2.3 Stage 3

Functional Model Iteration

The requirements that have been identified in the previous stages are converted to a functional model. This model consists of both a functioning prototype and models. Prototyping is one of the key project techniques within this stage that helps to realize good user involvement throughout the project. The developed prototype is reviewed by different user groups. In order to assure quality, testing is implemented throughout every iteration of DSDM. An important part of testing is realized in the Functional Model Iteration. The Functional Model can be subdivided into four sub-stages:

- Identify Functional Prototype: Determine the functionalities to be implemented in the prototype that results from this iteration.
- Agree Schedule: Agree on how and when to develop these functionalities.
- Create Functional Prototype: Develop the prototype. Investigate, refine, and consolidate it with the combined Functional prototype of previous iterations.
- Review Prototype: Check the correctness of the developed prototype.

This can be done via testing by end-user, then use the test records and user's feedbacks to generate the functional prototyping review document.

The deliverables for this stage are a Functional Model and a Functional Prototype that together represent the functionalities that could be realized in this iteration, ready for testing by users. Next to this, the Requirements List is updated, deleting the items that have been realized and rethinking the prioritization of the remaining requirements. The Risk Log is also updated by having risk analysis of further development after reviewing the prototyping document.

3.3.2.4 Stage 4

Design and Build Iteration

The main focus of this DSDM iteration is to integrate the functional components from the previous phase into one system that satisfies user needs. It also addresses the non-functional requirements that have been set for the IS. Again testing is an important ongoing activity in this stage. The Design and Build Iteration can be subdivided into four sub-stages:

- Identify Design Prototype: Identify functional and non-functional requirements that need to be in the tested system.
- Agree Schedule: Agree on how and when to realize these requirements.
- Create Design Prototype: Create a system that can safely be handed to end-users for daily use. They investigate, refine, and consolidate the prototype of current iteration within prototyping process are also important in this sub-stage.
- Review Design Prototype: Check the correctness of the designed system. Again testing and reviewing are the main techniques used, since the test records and user's feedbacks are important to generate the user documentation.

The deliverables for this stage are a Design Prototype during the phase that end users get to test and at the end of the Design and Build Iteration the Tested System is handed over to the next phase. In this stage, the system is mainly built where the design and functions are consolidated and integrated in a prototype. Another deliverable for this stage is a User Documentation.

3.3.2.5 Stage 5

Implementation

In the Implementation stage, the tested system including user documentation is delivered to the users and training of future users is realized. The system to be delivered has been reviewed to include the requirements that have been set in the beginning stages of the project. The Implementation stage can be subdivided into four sub-stages:

- User Approval and Guidelines: End users approve the tested system for implementation and guidelines with respect to the implementation and use of the system are created.
- Train Users: Train future end user in the use of the system.
- Implement: Implement the tested system at the location of the end users.
- Review Business: Review the impact of the implemented system on the business, a central issue will be whether the system meets the goals set at the beginning of the project. Depending on this project goes to the next phase, the post-project, or loops back to one of the preceding phases for further development.

The deliverables for this stage are a Delivered System on location, ready for use by the end users, Trained Users and detailed Project Document of the system.

3.3 Phase 3

Post-project

The post-project phase ensures the system operating effectively and efficiently. This is realized by maintenance, enhancements and fixes, according to DSDM principles. The maintenance can be viewed as continuing development, based on the iterative and incremental nature of DSDM. Instead of finishing the project in one cycle usually the project can return to the previous phases or stages so that the previous step and the deliverable products can be refined.

3.4 Core Techniques of DSDM

Timeboxing

Timeboxing is one of the project techniques of DSDM. It is used to support the main goals of DSDM to realize the development of an IS on time, within budget, and with the desired quality. The main idea behind timeboxing is to split up the project in portions, each with a fixed budget and a delivery date. For each portion a number of requirements are selected that are prioritized according to the MoSCoW principle. Because time and budget are fixed, the only remaining variables are the requirements. So if a project is running out of time or money, requirements with the lowest priority are omitted. This does not mean that an unfinished product is delivered, because of the pareto, principle that 80% of the project comes from 20% of the system requirements, so as long as those most important 20% of requirements are implemented into the system, the system therefore meets the business needs, and that no system is built perfectly in the first try.

MoSCoW

MoSCoW represents a way of prioritizing items. In the context of DSDM the MoSCoW technique is used to prioritize requirements. It is an acronym that stands for:

10. MUST have this requirement to meet the business needs.

11. SHOULD have this requirement if at all possible, but the project success does not rely on this.

12. COULD have this requirement if it does not affect the

fitness of business needs of the project.

13. WOULD have this requirement at later date if there is some time left (or in the future development of the system). Prototyping

This technique refers to the creation of prototypes of the system under development at an early stage of the project. It enables the discovery of shortcomings in the system and allows future users to 'test-drive' the system. This way, good user involvement is realized, one of the key success factors of DSDM, or any System Development project for that matter.

Testing
A third important aspect of the goal of DSDM is the creation of an IS with good quality. In order to realize a solution of good quality, DSDM advocates testing throughout each iteration. Since DSDM is a tool, and technique independent method, the project team is free to choose its own test management method, for example TMap.

Workshop
One of DSDM's project techniques that aims at bringing the different stakeholders of the project together to discuss requirements, functionalities and mutual understanding. In a workshop the stakeholders come together and discuss the project.

Modelling
This technique is essential and purposely used to visualise the diagrammatic representation of a specific aspect of the system bus iness area that is being developed. Modelling gives a better understanding for DSDM project team over a business domain.

Configuration Management
A good implementation of this configuration management technique is important for the dynamic nature of DSDM. Since there is more than one thing being handled at once during the development process of the system, and the products are being delivered frequently at a very fast rate, the products therefore need to be controlled strictly as they achieve (partial) completion.

3.5 Roles of DSDM

There are some roles introduced within DSDM environment. It is important that the project members need to be appointed to different roles before they start to run the project. Each role has its responsibility. These roles are:

- Executive Sponsor: So called the "Project Champion". An important role from the user organization who has the ability and responsibility to commit appropriate funds and resources. This role has an ultimate power to make decisions.
- Visionary: The one who has the responsibility to initialize the project by ensuring that essential requirements are found early on. Visionary has the most accurate perception of the business objectives of the system and the project. Another task is to supervise and keep the development process in the right track.
- Ambassador User: Brings the knowledge of user community into the project, ensures that the developers receive enough amount of user's feedbacks during the development process.
- Advisor User: Can be any user that represents an important viewpoint and brings the daily knowledge of the project.
- Project Manager: Can be anyone from user community or IT staff who manages the project in general.
- Technical Coordinator: Responsible in designing the system architecture and control the technical quality in the project.
- Team Leader: Leads his team and ensures that the team works effectively as a whole.
- Developer: Interpret the system requirements and model; it includes developing the deliverable codes and build the prototypes.
- Tester: Checks the correctness in a technical extent by performing some testing. Tester will have to give some comments and documentation.
- Scribe: Responsible to gather and record the requirements, agreements, and decisions made in every workshop.
- Facilitator: Responsible in managing the workshop's progress, acts as a motor for preparation and communication.
- Specialist Roles: Business Architect, Quality Manager, System Integrator, etc.

3.6 Critical Success Factors of DSDM

Within DSDM a number of factors are identified as being of mportance to ensure successful projects:

- Factor 1: First there is the acceptance of DSDM by senior management and other employees. This ensures that the different actors of the project are motivated from the start and remain involved throughout the project.

- Factor 2: The second factor follows directly from this and that is the commitment of management to ensure end-user involvement. The prototyping approach requires a strong and dedicated involvement by end user to test and judge the functional prototypes.
- Factor 3: Then there is the project team. This team has to be composed of skillful members that form a stable union. An important issue is the empowerment of the project team. This means that the team (or one or more of his members) has to posses the power and possibility to make important decisions regarding the project without having to write formal proposals to higher management, which can be very time-consuming. In order for the project team to be able to run a successful project, they also need the right technology con duct the project. This means a development environment, project management tools, etc.
- Factor 4: Finally, DSDM also states that a supportive relationship between customer and vendor is required. This goes for both projects that are realized internally within companies or by outside contractors. An aid in ensuring a supporting relationship could be ISPL.

3.7 Comparison to other IS Development Methods

Over the years a great number of Information System Development methods have been developed and applied, divided in Structured Methods, RAD methods and Object-Oriented Methods. Many of these methods show similarities to each other and also to DSDM. For example eXtreme Programming, [XP] also has an iterative approach to IS development with extensive user involvement.

The Rational Unified Process is a method that probably has the most in common with DSDM in that it is also a dynamic form of Information System Development. Again, the iterative approach is used in development method.

Like XP and RUP there are many other development methods that show similarities to DSDM, but DSDM does distinguish itself from these methods in a number of ways. First, there is the fact that it provides a tool and technique independent framework. This allows users to fill in the specific steps of the process with their own techniques and software aids of choice. Another unique feature is the fact that the variables in the development are not time/resources, but the requirements. This approach ensures the main goals of DSDM, namely to stay within the deadline and the budget. And last there is the strong focus on communication between and the involvement of all the stakeholders in the system. Although this is addressed in other methods, DSDM strongly believes in commitment to the project to ensure a successful outcome.

This last paragraph is largely incorrect, most of RUP can be applied without rational tools and XP does not require any particular tools. XP shares many similarities with DSDM, notably the 'embrace change' philosophy which means requirements can be changed as well as time and resources.

4.0 CONCLUSION

As an extension of rapid application development, DSDM focuses on Information Systems, projects that are characterized by tight schedules and budgets. DSDM addresses the common reasons for information systems project failure including exceeding budgets, missing deadlines, and lack of user involvement and top management commitment.

5.0 SUMMARY

- Dynamic Systems Development Method (DSDM) is a framework based originally around Rapid Application Development (RAD) supported by its continuous user involvement in an iterative development and incremental approach which is responsive to changing requirements, in order to develop a system that meets the business needs on time and on budget.
- DSDM focuses on frequent delivery of products, with assumption that to deliver something "good enough" earlier, is always better than to deliver everything "perfectly" in the end.
- In order for DSDM to be a success, a number of prerequisites need to be realized. First, there needs to be interactivity between the project team, future end users and higher management.
- The DSDM framework consists of three sequential phases, namely, the pre-project, project life-cycle and post-project phases.
- The business study extends the feasibility study. After the project has been deemed feasible for the use of DSDM, this stage examines the influenced business processes, user groups involved and their respective needs and wishes.
- The post-project phase ensures the system operating effectively and efficiently. This is realized by maintenance, enhancements and fixes according, to DSDM principles.
- Prototyping technique refers to the creation of prototypes

of the system under development at an early stage of the project. It enables the early discovery of shortcomings in the system, and allows future users to 'test-drive' the system.

- Within DSDM a number of factors are identified as being of great importance to ensure successful projects.
- Like XP and RUP, there are many other development methods that show similarities to DSDM, but DSDM does distinguish itself from these methods in a number of ways.

The next study unit is on project management.

6.0 TUTOR-MARKED ASSIGNMENT

Identify and discuss 5 personnel and their roles in a dynamic system development method (DSDM).

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UNIT 2 PROJECT MANAGEMENT

CONTENTS

1.0 INTRODUCTION

As a discipline, Project Management developed from several different fields of application, including construction, mechanical engineering, military projects, etc. In the United States, the forefather of management is Henry Gantt, called the father of planning and control techniques, who is famously known for his use of the "bar" chart as a project management tool, for being an associate of Frederick Winslow Taylor's theories of scientific management, and for his study of the work and management of Navy ship building. His work is the forerunner to many modern project management tools, including the work breakdown structure (WBS) and resource allocation.

The 1950's mark the beginning of the modern project management era. Again, in the United States, prior to the 1950's, projects were managed on an ad hoc basis using mostly Gantt Charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed: (1) the "Program Evaluation and Review Technique" or PERT, developed as part of the United States Navy's (in conjunction with the Lockheed Corporation Polaris missile submarine program; and (2) the Critical Path Method (CPM) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant aintenance projects. These mathematical techniques quickly spread into many private enterprises.

In 1969, the Project Management Institute (PMI) was formed to serve the interest of the project management industry. The premise of PMI is that the tools and techniques of project management are common even among the widespread application of projects, from the software industry, to the construction industry. In 1981, the PMI Board of Directors authorized the development of what has become The Guide to the Project Management Body of Knowledge, containing the standards and guidelines of practice that are widely used throughout the profession.

2.0 OBJECTIVES

The objectives of this unit of the course are for you to:

- have an understanding of what project management is and how it has developed over the years
- identify the requirements for a successful project management implementation
- answer the question of the foundational stages of any project cycle
- identify the constraints to a project management initiative.

3.0 MAIN CONTENT

3.1 Overview of Project Management

Project management is defined as the discipline of organizing and managing resources in such a way that these resources deliver all the work required to complete a project within defined scope, time, and cost constraints. A project is a temporary and one-time endeavor undertaken to create a unique product or service. This property of being a temporary and a one-time undertaken, contrast with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over-and-over again. The management of these two systems is often very different and requires varying technical skills and philosophy, hence requiring the development of project management.

Project management is also a carefully planned and organized effort to accomplish a specific (and usually) one-time effort, for example, constructs a building or implements a new computer system. Project management includes developing a project plan, which includes defining project goals and objectives, specifying tasks or how goals will be achieved, what resources are need, and associating budgets imelines for completion. It also includes implementing the project plan, along with careful controls to stay on the "critical path", that ensure the plan is being managed according to plan. Project management usually follows major phases (with various titles for these phases), including feasibility study, project planning, implementation, evaluation and support/maintenance. (Program planning is usually of a broader scope than project planning, but not always.).

The first challenge of project management is ensuring that a project is delivered within the defined constraints. The second, more ambitious, challenge is the optimized allocation and integration of the needed to meet those pre-defined objectives. The project, therefore, is a carefully selected set of activities chosen to use resources, (time, money, people, materials, energy, space, provisions, communication, quality, risk, etc.) to meet the pre-defined objectives. Almost any human activity that involves carrying out a non-repetitive task can be a project. So we are all project managers! We all practice project management (PM). But there is a big difference between carrying out a very simple project involving one or two people and one involving a complex mix of people, organisations and tasks. This has been true for millennia, but large-scale projects like the Pyramids, often used rather simple control and resource techniques including brute force to 'motivate' the workforce!

The art of planning for the future has always been a human trait. In essence a project can be captured on paper with a few simple elements: a start date, an end date, the tasks that have to be carried out and when they should be finished, and some idea of the resources mpahinesetc) that will be needed during the course of the project. When the plan starts to involve different things happening at different times, some of which are dependent on each other, plus resources required at different times and in different quantities and perhaps working different rates, the paper plan could start to cover a vast area and be unreadable.

You could begin the story of modern project management from this time. But that would be unfair as project management is not only about planning but also about human attributes like leadership and motivation. Nevertheless, the idea that complex plans could be analysed by a computer to allow someone to control a project is the basis of much of the development in technology that now allow projects of any size and complexity not only to be planned but also modelled to answer 'what if?' questions. The original programs and computers tended to produce answers long after an event had taken place. Now, there are many project planning and scheduling programs that can provide real time information, as well as linking to risk analysis, time recording, costing, estimating and other aspects of project control. But computer programs are not project management: they are tools for project managers to use. Project management is all that mix of components of control, leadership, teamwork, resource management etc, which go into a successful project.

Project managers can be found in all industries. Their numbers have grown rapidly as industry and commerce has realised, that much of what it does is project work. And as project-based organisations have started to emerge, project management is becoming established as both a professional career path and a way of controlling business. So opportunities in project management now exist not only in being a project manager, but also as part of the support team in a project or programme office, or as a team leader for part of a project. There are also qualifications that can be attained through the professional associations.

One reason for the rapid growth is the need to understand how to look after complex projects, often in high tech areas, which are critical to business success but also have to use scarce resources efficiently.

3.2 Policy Requirements

There are definitely some policy requirements expected of project management principles and concepts and some of them include:

3.2.1 Accountability for projects

Sponsoring departments must establish an accountability framework for adequate definition and responsible implementation of projects. The central focus of this framework is a manager within the sponsoring department, at an appropriate level, who is appointed as the Project Leader. The project leader, for each project assigned to him or her is accountable through the normal chain of command to the deputy minister for:

- all external aspects including: the continuing interpretation of operational needs and wider government objectives, and the validation of planned project end-product in that context; interfaces with the senior management of the sponsoring department and participating departments; and serving as the spokesperson for the project; and
- all internal aspects including: general supervision of the project management framework to ensure that project managers will meet all objectives approved for the project; preparing project approval documents; vetting proposals to amend objectives due to changed external or internal factors; and acting as the authority for submission of such changes as well as for progress reporting poroject approval authorities.

3.2.2 Project Management Principles

Departments are expected to establish and approve sound internal policies, guidelines and practices to be followed by project project managers and other staff responsible for identifying, planning, approving/budgeting, defining, and implementing projects; and for participating in projects sponsored by other departments. Project leaders are to preserve the integrity of the accountability framework by ensuring that the requirement to follow standard project management principles, such as those set out in Appendix B together with those found in the Project Management Institute's project management book of knowledge are included in all pertinent project agreements.

3.2.3 Authorities and Resources

From project inception, sponsoring departments must delegate authorities and allocate adequate resources appropriate to the scope, complexity and risk of the project, enabling the project leader to:

- represent the sponsoring department on matters pertaining to the project;

- fully define objectives for each phase of the project; and
- be accountable for the achievement of each approved objective.

3.2.4 Project scope

Project leaders are accountable for the full definition of the scope for all projects including the wider interests of the government. This definition of scope is to be accomplished with early consultation with departments or central agencies affected by the project. In addition to other elements, the project scope must describe all the project objectives as identified in other chapters of this volume. Project scope may also be affected by procurement review or other environmental considerations.

3.2.5 Management Framework

Project leaders are accountable for the establishment of an adequate project management framework, for detailed project definition and to complete project implementation. For certain projects, the regime may be relatively simple with an internal, essentially self-contained management office headed by a project manager responsible for all details of the project. However, other projects may require a quite complex management framework involving several significant parallel activities and external agencies, each with its own manager or project officer. In all cases, the project leader must maintain the integrity of his or her accountability through written agreements with any previous project leaders, project managers, and any external agencies that carry out activities essential to the accomplishment of the project. These agreements are to define details of the task to be accomplished, as well as financial and progress reporting arrangements.

3.2.6 Project Risk, Complexity and Economy

Project leaders must ensure that project managers perform adequate project planning that addresses the size, scope, complexity, risk, visibility and administrative needs of specific projects. Project leaders must ensure that the proposed project management framework and allocation of project management resources are based and optimized on the complexity and the assessed risk for the individual phases of a project. The selected project management framework is to describe risk, and complexity will be managed and reduced in each phase and throughout the life of the project.

3.2.7 Project Profile and Risk Assessment (PPRA)

Early in the life of a project, the project leader is to prepare a Project Profile and Risk Assessment (PPRA), in consultation with the contracting authority and, when appropriate, with participating departments and common service organizations, as part of the process of developing the management framework within, for the Treasury Board approval submissions. Guidance for the preparation and documentation of the PPRA is provided in Appendix C. When appropriate, the project leader should use the PPRA document for systematic dialogue with project participants and with Treasury Board Secretariat, regarding the management framework and reporting baseline for the project.

3.2.8 Project Management Practices

Guidance for project management practices and the preparation of risk assessments, PPRAs, supporting documentation, and progress and evaluation reports is to be.

3.3 Responsibilities

Project Leaders

Project Leaders must notify other federal government departments or agencies who may be affected by a specific project, inviting them to participate in an active or coordinative role as appropriate. The project leader is also responsible for ensuring that all relevant project submissions and approvals have been obtained prior to initiating any part of the project. It also includes the submission of updated project information to appropriate authorities for significant changes beyond the reporting baseline established in the original or amended approvals.

The project leader should consult as early as possible, with Treasury Board Secretariat, particularly for larger projects of higher risk complexity, proposing a suitable management framework for staff concurrence. Project leaders are to ensure that a specific project managed in accordance with the approved management framework. updated project documentation may also propose a change in management framework should the risk assessment inducted in accordance with the guidelines in Appendix C demonstrate a decrease (or increase) in project risk.

Project Managers

Project Managers are responsible for the day-to-day management of the project as set out in the charter or agreement with the project leader.

Participating Departments

Participating departments are to determine the nature and degree of the effect of the proposed project on their operations, asset base or other interests. They then respond to the project leader defining the nature and extent of proposed participation in the project. Joint commitment to any project and specific activity to be carriedout by a department that is deemed essential to the success of the project, must be documented in an appropriate interdepartmental agreement.

Participating departments are to select their project officers based upon an established human resources management profile, project management experience and abilities, and in consideration of the significance, scope, complexity, risk, and visibility of the project.

Contracting Authority

The Contracting Authority is responsible:

- for participating in the project as a participating department (as per paragraph 3 above);
- to ensure the legal soundness of any contract, and to maintain the government standards of prudence, probity and equity, when dealing with the private sector;
- to support the project in accordance with any existing legislation or general interdepartmental arrangements;
- to provide any project-specific services (such as procurement) as described in any agreement or MOU concluded with the sponsoring department; and
- to make submissions to the Treasury Board for authority to enter into contracts and to amend contracts as set out in the Contracting volume of the Treasury Board Manual.

Monitoring

The Treasury Board Secretariat will monitor departmental compliance with this policy through review of the quality of the Project Management Framework and other relevant sections of project approval submissions, and by reviewing adherence to the content of Treasury Board decisions.

3.4 The Traditional Project Management Constraints

Most people still want their projects to be on time, meet quality objectives, and not cost more than the budget. These form the classic time, quality, cost triangle.

In fact if you have an unlimited budget and unlimited time, project management becomes rather easy. For most people, however, time and money are critical, and that is what makes project management so important today. Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as: scope, time, and cost. This is also referred to as the Project Management Triangle where each side represents a constraint. One side of the triangle cannot be changed without impacting the others. A further refinement of the constraints separates product 'quality' or 'performance' from scope, and turns quality into a fourth constraint.

The time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time educed scope.

The discipline of project management is about providing the tools and techniques that enable the project team (not just the project manager) to organize their work to meet these constraints.

3.4.1 Time

This often broken down for analytical purposes into the time required to complete the components of the project, which is then further broken down into the time required to complete each task contributing to the completion of each component. When performing tasks using project management, it is important to cut the work into smaller pieces so that it is easy to follow.

3.4.2 Cost

Cost to develop a project depends on several variables including (chiefly): labor rates, material rates, risk management, plant (buildings, machines, etc.), equipment, and profit. When hiring an consultant for a project, cost will typically be determined by consultant's or firm's per diem rate multiplied by an estimated quantity for completion.

3.4.3 Scope

Requirements specified for the end result: The overall definition of what the project is supposed to accomplish, and a specific description of what the end result should be or accomplish. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. Some tasks require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a project, quality can have a significant impact on time and cost (or vice versa).

3.5 Project Management Activities

Project Management is composed of several different types of activities such as:

- Planning the work or objectives
- Analysis & Design of objectives
- Assessing and controlling risk (or Risk Management)
- Estimating resources
- Allocation of resources
- Organizing the work
- Acquiring human and material resources
- Assigning tasks
- Directing activities
- Controlling project execution
- Tracking and Reporting progress
- Analyzing the results based on the facts achieved
- Defining the products of the project
- Forecasting future trends in the project
- Quality Management
- Issues Management.

3.6 Project Development Stages

Regardless of the methodology used, the project development process will have the same major stages: initiation, development, production or execution, and closing/maintenance.

3.6.1 Initiation

The initiation stage determines the nature and scope of the development. If this stage is not performed well, it is unlikely that the project will be successful in meeting the business's needs. The key project controls needed here is an understanding of the business environment, and making sure that all necessary controls are incorporated into the project. Any deficiencies should be reported and a recommendation should be made to fix them.

The initiation stage should include a cohesive plan that encompasses the following areas:

- Study analyzing the business needs in measurable goals.
- Review of the current operations.
- Conceptual design of the operation of the final product.
- Equipment requirement.
- Financial analysis of the costs and benefits including a budget.
- Select stake holders, including users, and support personnel for the project.
- Project charter including costs, tasks, deliverables, and schedule.

3.6.2 Planning and design

After the initiation stage, the system is designed. Occasionally, a small prototype of the final product is built and tested. Testing is generally performed by a combination of testers and end users, and can occur after the prototype is built or concurrently. Controls should be in place s that ensure that the final product will meet the specifications of the project charter. The results of the design stage should include a product design that:

- Satisfies the project sponsor, end user, and business requirements.
- Functions as it was intended.
- Can be produced within quality standards.
- Can be produced within time and budget constraints.

Production or Execution

The execution stage includes the actual implementation of the design or plan. In software systems, this includes conversion (transfer of data from an old system to a new system), documentation, and training. From an auditor's perspective, training is also important because it helps users use the software correctly. The bulk of the project's work and largest capital expenditure is realized in this stage.

Closing and Maintenance

Closing includes the formal acceptance of the project and the ending thereof. Administrative activities include the archiving of the files and documenting lessons learned. Maintenance is an ongoing process, and it includes:

- Continuing support of end users
- Correction of errors
- Updates of the software over time

In this stage, auditors should pay attention to how effectively quickly user problems are resolved.

Over the course of any construction project, the work scope changes.

Change is a normal and expected part of the construction process.

Changes can be the result of necessary design modifications, differing site conditions, material availability, contractor-requested changes, value engineering and impacts from third parties, to name a few. Beyond executing the change in the field, the change normally needs to be documented to show what was actually constructed. Hence, the owner usually requires a final record to show all changes or, more specifically, any change that modifies the tangible portions of the finished work. The record is made on the contract documents - usually, but not necessarily limited to, the design drawings. The end product of this effort is what the industry terms as-built drawings, or more simply, “asbuilts.”The requirement for providing them is a norm in construction contracts.

4.0 CONCLUSION

Project management actually manages the production of projects with schedules and tasks associated with the project. It often involves detailed expertise in many of the following areas: planning, cost management, contract negotiations/procurement, technical writing (proposals, etc.), research, technical development, information/computer management, business development, corporate/administrative management, time management, and others. Adhering strictly to the project phases, requirements and taking care of the constraints ensures a successful implementation of project management. Indeed, a properly managed project is a prided of an effective project management. We need to also remind ourselves there are several definitions of project management, but basically have commons traits.

5.0 SUMMARY

- As a discipline, Project Management developed from several different fields of application, including construction, mechanical engineering, military projects, etc
- The 1950's mark the beginning of the modern project management era.
- Project management is defined as the discipline of organizing and managing resources in such a way that these resources deliver all the work required to complete a project within defined scope, time, and cost constraints.
- The first challenge of project management is ensuring that a project is delivered within the defined constraints.
- Project leaders are accountable for the establishment of an adequate project management framework, for detailed project definition and to complete project implementation.
- In fact if you have an unlimited budget and unlimited time, project management becomes rather easy. For most people, however, time and money are critical and that is what makes project management so important today.
- When performing tasks using project management, it is important to cut the work into smaller pieces so that it is easy to follow.
- Regardless of the methodology used, the project development process will have the same major stages: initiation, development, production or execution, and closing/maintenance.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the traditional constraints to project management.
2. List 10 common tasks in project management.

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UNIT 3 PROJECT PLANNING

CONTENTS

1.0 INTRODUCTION

The success of a project will depend critically upon the effort, care and skill you apply in its initial planning.

MIS projects can be expensive in terms of both time and money. An organizational MIS may take a decade or more to bring on-line at a cost of tens or hundreds of millions of dollars. Careful planning at the outset, as well as during the project, can help to avoid costly mistakes. It also provides assurance that a MIS will accomplish its goals on schedule and within budget.

There is a temptation, when a new technology becomes available, to improvise a solution to its use, that is to get started without considering where the project will lead. The greatest danger is that decisions made in haste or on the spur of the moment will have to be reversed later, or will prove too costly to implement, meaning an MIS project may have to be abandoned. To avoid disappointing experiences like these, MIS professionals have developed a well-defined planning methodology often referred to as project planning lifecycle. Lifecycle planning involves setting goals, defining targets, establishing schedules, and estimating budgets for an entire project.

The original impetus for developing effective lifecycle planning was cost containment. For many decades, the rationale for implementing new information technologies was that, in the long run, such projects would reduce the cost of business operations.

It is generally recognized that, for the foreseeable future, most information technologies projects will have to be justified on the basis of a "do more, pay more" philosophy. This means that effective lifecycle planning is all the more important. In the past, projected existing costs could be used as a baseline against which improvements could be measured. If the cost curve for new information technologies is always above the baseline, then greater care must be exerted in setting goals, establishing targets, and estimating budgets. There is far too great a danger that, in the absence of such checks and balances, a project may grow out of control.

2.0 OBJECTIVES

This unit is designed for the students to:

- be able to explain what is project planning
- understand why it is necessary to write a project specification
- identify the components of a project planning based on structure put in place
- be able to know how to establish control in project execution
- understand the intricacies and skills of project planning.

3.0 MAIN CONTENT

3.1 The Project Specification

A specification is the definition of your project: a statement of the problem, not the solution. Normally, the specification contains errors, ambiguities, misunderstandings and enough rope to hang you and your entire team. Thus before you embark upon the next six months of activity working on the wrong project, you must assume that a numbly was the chief author of the specification you received and you must read, worry, revise and ensure that everyone concerned with the project (from originator, through the workers, to the end-customer) is working with the same understanding. The outcome of this deliberation should be a written definition of what is required, by when; and this must be agreed by all involved. There are no short-cuts to this; if you fail to spend the time initially, it will cost you far more later on.

The agreement upon a written specification has several benefits:

- the clarity will reveal misunderstandings
- the completeness will remove contradictory assumptions
- the rigour of the analysis will expose technical and practical details which numbties normally gloss over through ignorance or fear
- the agreement forces all concerned to actually read and think about the details

The work on the specification can be seen at the first stage of Quality Assurance since you are looking for and countering problems in the very foundation of the project - from this perspective the creation of specification clearly merits a large investment of time.

From a purely defensive point of view, the agreed specification also affords you protection against the numbties who have second thoughts, or new ideas, half way through the project. Once the project usnderway, changes cost time (and money). The existence of a demonstrably-agreed specification enables you to resist or to charge for (possibly in terms of extra time) such changes. Further, people tend to forget what they originally thought; you may need proof that you have been working as instructed.

The places to look for errors in a specification are:

- the global context: numbties often focus too narrowly on the work of one team and fail to consider how it fits into the larger picture. Some of the work given to you may actually be undone or duplicated by others. Some of the proposed work may be incompatible with that of others; it might be just plain barmy in the larger context.

- the interfaces: between your team and both its customers and suppliers, there are interfaces. At these points something gets transferred. Exactly what, how and when should be discussed and agreed from the very beginning. Never assume a common understanding, because you will be wrong. All it takes for habiual understandings to evaporate is the arrival of one member, in either of the teams. Define and agree your interfaces and maintain a friendly contact throughout the project.

- time-scales: numbties always underestimate the time involved for work. If there are no time-scales in the specification, you can assume that one will be imposed upon you (which will be impossible). You must add realistic dates. The detail should include a precise understanding of the extent of any intermediate stages of the task, particularly those which have to be delivered.
- external dependencies: your work may depend upon that of others. Make this very clear so that these people too will receive warning of your needs. Highlight the effect that problems with these would have upon your project so that everyone is quite clear about their importance. To be sure, contact these people yourself and ask if they are able to fulfill the assumptions in your specification.
- resources: the numbty tends to ignore resources. The specification should identify the materials, equipment and manpower which are needed for the project. The agreement should include a commitment by your managers to allocate or to fund them. You should check that the actual numbers are practical and/or correct. If they are omitted, add them - there is bound to be differences in their assumed values.

This seems to make the specification sound like a long document. It should not be. Each of the above could be a simple sub-heading followed by either bullet points or a table -you are not writing brochure, you are stating the definition of the project in clear, concise and unambiguous glory.

Of course, the specification may change. If by circumstances your knowledge changes then the specification will be out of date. You should not regard it as cast in stone but rather as a display board where everyone involved can see the current, common understanding of the project. If you change the content everyone must know, but do not hesitate to change it as necessary.

3.2 Providing Structure

Having decided what the specification intends, your next problem is to decide what you and your team actually need to do, and how to do it. As a manager, you have to provide some form of framework both to plan and to communicate what needs doing. Without a structure, the work is a series of unrelated tasks which provides little sense of achievement and no feeling of advancement. If the team has no grasp of ndividual tasks fit together towards an understood goal, then the work will seem pointless and they will feel only frustration.

To take the planning forward, therefore, you need to turn the specification into a complete set of tasks with a linking structure. Fortunately, these two requirements are met at the same time since the derivation of such a structure is the simplest method of arriving at a list of tasks.

Work Breakdown Structure

Once you have a clear understanding of the project, and have eliminated the vagaries of the numbties, you then describe it as a set of simpler separate activities. If any of these are still too complex for you to easily organise, you break them down also into another level of descriptions, and so on until you can manage everything. Thus your one complex project is organised as a set of simple tasks which together achieve the desired result.

The reasoning behind this is that the human brain (even yours) can only take in and process so much information at one time. To get a real grasp of the project, you have to think about it in pieces rather than trying to process the complexity of its entire details all at once. Thus each level of the project can be understood as the amalgamation of a few described smaller units.

In planning any project, you follow the same simple steps: if an item is too complicated to manage, it becomes a list of simpler items. People call this producing a work breakdown structure to make it sound more formal and impressive. Without following this formal approach you are unlikely to remember all the niggling little details; with this procedure, the details are simply displayed on the final lists.

One common fault is to produce too much detail at the initial planning stage. You should be stop when you have a sufficient description of the activity to provide a clear instruction for the person who will actually do the work, and to have a reasonable estimate for the total involved. You need the former to allocate (or delegate) the task; you need the latter to finish the planning.

Task Allocation

The next stage is a little complicated. You now have to allocate the tasks to different people in the team and, at the same time, order these tasks so that they are performed in a sensible sequence.

Task allocation is not simply a case of handing out the various tasks on your final lists to the people you have available; it is far more subtle (and powerful) than that. As a manager you have to look far beyond the single project; indeed any individual project can be seen as merely a single step in your team's development. The allocation of tasks should thus be seen as a means of increasing the skills and experience of your team - when the project is done, the team should have gained.

In simple terms, consider what each member of your team is capable of and allocate sufficient complexity of tasks to match that (and to slightly stretch). The tasks you allocate are not the ones on your finals lists, they are adapted to better suit the needs of your team's development; tasks are moulded to fit people, which is far more effective than the other way around. For example, if Arthur is to learn something new, the task may be simplified with responsibility given to another to guide and check the work; if Brenda is to develop, sufficient tasks are combined so that her responsibility increases beyond what she has held before; if Colin lacks confidence, the tasks are broken into smaller units which can be completed (and commended) frequently.

Sometimes tasks can be grouped and allocated together. For instance, some tasks which are seemingly independent may benefit from being done together since they use common ideas, information, and talents. One person doing them both removes the start-up time for one of them; two people (one on each) will be able to help each other.

The ordering of the tasks is really quite simple, although you may find that sketching a sequence diagram helps you to think it through (and to communicate the result). Pert charts are the accepted outcome, but sketches will suffice. Getting the details exactly right, however, can be a long and painful process, and often it can be futile. The degree to which you can predict the future is limited, so too should be the detail of your planning. You must have the broad outlines by which to monitor progress, and sufficient detail to assign each task when it needs to be started, but beyond that - stop and do something useful instead.

Guesstimation

At the initial planning stage the main objective is to get a realistic estimate of the time involved in the project. You must establish this not only to assist higher management with their planning, but also to protect your team from being expected to do the impossible. The most important technique for achieving this is known as: guesstimation.

Guesstimating schedules is notoriously difficult but it is helped by two approaches:

- make your guesstimates of the simple tasks at the bottom of the work break down structure and look for the longest path through the sequence diagram
- use the experience from previous projects to improve your guesstimating skills

The corollary to this is that you should keep records in an accelssible form of all projects as you do them. Part of your final project review should be to update your personal data base of how long various activities take. Managing this planning phase is vital to your success as a manager.

Some people find guesstimating a difficult concept in that if you have no experience of an activity, how can you make a worthwhile estimate? Let us consider such a problem: how long would it take you to walk all the way to the top of the Eiffel Tower or the Statue of Liberty? Presuming you have never actually tried this (most people take the elevator part of the way), you really have very little to go on. Indeed if you have actually seen one (and only one) of these buildings, think about the other. Your job depends upon this, so think carefully. One idea is to start with the number of steps - guess that if you can. Notice, you do not have to be right, merely reasonable. Next, consider the sort of pace you maintain while climbing a flight of steps for a long time. Now imagine yourself at the base of a flight of steps you do know, and estimate a) how many steps there are, and b) how long it takes you to climb them (at that steady pace). To complete, apply a little mathematics.

Now examine how confident you are with this estimate. If you won a free flight to Paris or New York and tried it, you would probably (need your head examined) be mildly surprised if you climbed to the top in less than half the estimated time and if it took you more than double you would be mildly annoyed. If it took you less than a tenth the time, or ten times as long, you would extremely be surprised/annoyed. In fact, you do not currently believe that that would happen (no really, do you?). The point is that from very little experience of the given problem, you can actually come up with a working estimate - and one which is far better than no estimate at all when it comes to deriving a guesstimating does take a little practice, but it is a very useful skill to develop.

There are two practical problems in guesstimation. First, you are simply too optimistic. It is human nature at the beginning of a new project to ignore the difficulties and assume best case scenario - in producing your estimates (and using those of others) you must inject a little realism. In practice, you should also build-in a little slack to allow yourself some tolerance against mistakes. This is known as defensive scheduling. Also, if you eventually deliver ahead of the agreed schedule, you oved.

Second, you will be under pressure from senior management to deliver quickly, especially if the project is being sold competitively. Resist the temptation to rely upon speed as the only selling point. You might, for instance, suggest the criteria of: fewer errors, history of adherence to initial schedules, previous customer satisfaction, "this is how long ittakes, so how can you trust the other quotes".

3.3 Establishing Controls

When the planning phase is over (and agreed), the "doing" phase begins. Once it is in motion, a project acquires a direction and momentum which is totally independent of anything you predicted. If you come to terms with that from the start, you can then enjoy the roller-coaster which follows. To gain some hope, however, you need to establish at the start (within the plan) the means to monitor and to influence the project's progress.

There are two key elements to the control of a project

- milestones (clear, unambiguous targets of what, by when)
- established means of communication

For you, the milestones are a mechanism to monitor progress; for your team, they are short-term goals which are far more tangible than the foggy, distant completion of the entire project. The milestones maintain the momentum and encourage effort; they allow the team to judge their own progress and to celebrate achievement throughout the project rather than just at its end.

The simplest way to construct milestones is to take the timing information from the work breakdown structure and sequence diagram. When you have guesstimated how long each sub-task will take and have strung them together, you can identify by when each of these tasks will actually be completed. This is simple and effective; however, it lacks creativity.

A second method is to construct more significant milestones. These can be found by identifying stages in the development of a project which are recognisable as steps towards the final product. Sometimes these are simply the higher levels of your structure; for instance, the completion of a market-evaluation phase. Sometimes, they cut across many parallel activities; for instance, a prototype of the eventual product or a mock-up of the new brochure format.

If you are running parallel activities, this type of milestone is particularly useful since it provides a means of pulling together the people on disparate activities, and so:

- they all have a shared goal (the common milestone)
- their responsibility to (and dependence upon) each other is emphasised
- each can provide a new (but informed) viewpoint on the others' work
- the problems to do with combining the different activities are highlighted and discussed early in the implementation phase
- you have something tangible which senior management (and numbties) can recognise as progress
- you have something tangible which your team can celebrate and which constitutes a short-term goal in a possibly long-term project
- it provides an excellent opportunity for quality checking and for review

Of course, there are milestones and there are mill-stones. You will have to be sensitive to any belief that working for some specific milestone is hindering rather than helping the work forward. If this arises then either you have chosen the wrong milestone, or you have failed to communicate how it fits into the broader structure.

Communication is your everything. To monitor progress, to early warning of danger, to promote cooperation, to motivate through team involvement, all of these rely upon communication. Regular reports are invaluable - if you clearly define what information is needed and if you teach your team how to provide it in a rapidly accessible form. Often these reports merely say "progressing according to schedule". These you send back, for while the message is desired the evidence is missing: you need to insist that your team monitor their own progress with concrete, tangible, measurements and if this is done, the figures should be included in the report. However, the real value of this practice comes when progress is not according to schedule - then your communication system is worth all the effort you invested in planning.

3.4 The Artistry in Planning

At the planning stage, you can deal with far more than the mere project at hand. You can also shape the overall pattern of your team's working, using the division and type of activities you assign.

3.4.1 Who Knows Best?

Ask your team. They too must be involved in the planning of projects, especially in the lower levels of the work breakdown structure. Not only will they provide information and ideas, but also they will feel ownership in the final plan.

This does not mean that your projects should be planned by committee - rather than you, as manager, plan the project based upon all the available experience and creative ideas. As an initial approach, you could attempt the first level(s) of the work breakdown structure to help you communicate the project to the team and then ask for comments. Then, using these, the final levels could be refined by the people to whom the tasks will be allocated. However, since the specification is so vital, all the team should vet the penultimate draft.

3.4.2 Dangers in Review

There are two pitfalls to avoid in project reviews:

- they can be too frequent
- they can be too drastic

The constant trickle of new information can lead to a vicious cycle of planning and revising which shakes the team's confidence in any particular version of the plan and which destroys the very stability which the structure was designed to provide. You must decide the balance. Pick a point on the horizon and walk confidently towards it. Decide objectively, and explain beforehand, when the review phases will occur and make this a scheduled milestone in itself.

Even though the situation may have changed since the last review, it is important to recognize the work which has been accomplished during the interim. Firstly, you do not want to abandon it since the team will be demotivated feeling that they have achieved nothing. Secondly, this work itself is part of the new situation: it has been done, it should provide a foundation for the next step or at least the basis of a lesson well learnt. Always try to build upon the existing achievements of your team.

3.4.3 Testing and Quality

No plan is complete without explicit provision for testing and quality. As a wise manager, you will know that this should be part of each individual phase of the project. This means that no activity is completed until it has passed the (objectively) defined criterion which establishes its quality, and these are best defined (objectively) at the beginning as part of the planning.

When devising the schedule therefore you must include allocated time for this part of each activity. Thus your question is not only: "how long will it take", but also: "how long will the testing take". By asking both questions together you raise the issue of "how do we know we have done it right" at the very beginning and so the testing is more likely to be done in parallel with the implementation. You establish this philosophy for your team by including testing as a justified (required) cost.

3.4.4 Fitness for Purpose

Another reason for stating the testing criteria at the beginning is that you can avoid futile quests for perfection. If you have motivated your team well, they will each take pride in their work and want to do the best job possible. Often this means polishing their work until it is shines; often this wastes time. If it is clear at the onset exactly what is needed, then they are more likely to stop when that has been achieved. You need to avoid generalities and to stipulate boundaries; not easy, but essential.

The same is also true when choosing the tools or building-blocks of your project. While it might be nice to have use of the most modern versions, or to develop an exact match to your needs; often there is an old/existing version which will serve almost as well (sufficient for the purpose), and The difference is not worth the time you would need to obtaining or developing the new one. Use what is available whenever possible unless the difference in the new version is worth the money and the initial, teething pains.

A related idea is that you should discourage too much effort on aspects of the project which are idiosyncratic to that one job. In the specification phase, you might try to eliminate these through negotiation with the customer; in the implementation phase you might leave these parts until last. The reason for this advice is that a general piece of work can be tailored to many specific instances; thus, if the work is in a orm, you will be able to rapidly re-use it for other projects. On the other hand, if you produce something which is cut to fit exactly one specific case, you may have to repeat the work entirely even though the next project is fairly similar. At the planning phase, a manager should bare in mind the future and the long-term development of the team as well as the requirements of the current project.

3.4.5 Fighting for Time

As a manager, you have to regulate the pressure and work load which is imposed upon your team; you must protect them from the unreasonable demands of the rest of the company. Once you have arrived at what you consider to be a realistic schedule, fight for it. Never let the world deflect you from what you know to be practical. If they impose a deadline upon you which is impossible, clearly state this and give your reasons. You will need to give some room for compromise, however, since a flat NO will be seen as obstructive. Since you want to help the company, you should look for alternative positions.

You could offer a prototype service or product at an earlier date. This might, in some cases, be sufficient for the customer to start the next stage of his/her own project on the understanding that your project would be completed at a later date and the final version would then replace the prototype.

The complexity of the product, or the total number of units, might be reduced. This might, in some cases, be sufficient for the customer's immediate needs. Future enhancements or more units would then be the subject of a subsequent negotiation which, you feel, would be likely to succeed since you will have already demonstrated your ability to deliver on time.

You can show on an alternative schedule that the project could be delivered by the deadline if certain (specified) resources are given to you or if other projects are rescheduled. Thus, you provide a clear picture of the situation and a possible solution; it is up to your manager then to decide how he/she proceeds.

3.4.6 Planning for Error

The most common error in planning is to assume that there will be no errors in the implementation: in effect, the schedule is derived on the basis of "if nothing goes wrong, this will take ...". Of course, recognising that errors will occur is the reason for implementing a monitoring strategy on the project. Thus when the inevitable does happen, you can react and adapt the plan to compensate. However, by carefully considering errors in advance you can make changes to the original plan to enhance its tolerance. Quite simply, your planning should include time where you stand back from the design and ask: "what can go wrong?"; indeed, this is an excellent way of asking your team for their analysis of your plan.

You can try to predict where the errors will occur. By examining the activities' list you can usually pinpoint some activities which are risky (for instance, those involving new equipment) and those which are quite secure (for instance, those your team has done often before). The risky areas might then be given a less stringent time-scale - actually planning-in time for the mistakes. Another possibility is to apply a different strategy, or more resources, to such activities to minimise the disruption. For instance, you could include training or consultancy for new equipment, or you might parallel the work with the foundation of a fall-back position.

3.4.7 Post-Mortem

At the end of any project, you should allocate time to reviewing the lessons and information on both the work itself and the management of that work: an open meeting, with open discussion, with the whole team and all customers and suppliers. If you think that this might be thought a waste of time by your own manager, think of the effect it will have on future communications with your customers and suppliers.

3.5 Planning for the Future

With all these considerations in merely the "planning" stage of a project, it is perhaps surprising that projects get done at all. In fact projects do get done, but seldom in the predicted manner and often as much by brute force as by carefree delivery, staff are demotivated by constant pressure for impossible goals, corners get cut which harm your reputation, and each project has to overcome the same problems as the last.

With planning, projects can run on time and interact effectively with both customers and suppliers. Everyone involved understands what is wanted and emerging problems are seen (and dealt with) long before they cause damage. If you want your projects to run this way - then you must invest time in planning.

4.0 CONCLUSION

It is commonly said that if you fail to plan you have planned to fail. This goes a long way to portray the significance of planning of any project. A poorly planned project will be poorly executed and poorly in otutcome. Planning project is a skill that needs to be learned, unfortunately most people do not want to learn this all-important act. In fact there is reported history of poor planning of projects globally.

5.0 SUMMARY

- The success of a project will depend critically upon the effort, care and skill you apply in its initial planning.
- Planning involves setting goals, defining targets, establishing schedules, and estimating budgets for an entire project.
- A specification is the definition of your project: a statement of the problem, not the solution.
- Having decided what the specification intends, your next problem is to decide what you and your team actually need to do, and how to do it.
- Once you have a clear understanding of the project, and have eliminated the vagaries of the numbties, you then describe it as a set of simpler separate activities.
- When the planning phase is over (and agreed), the "doing" phase begins. Once it is in motion, a project acquires a direction and momentum which is totally independent of anything you predicted.
- At the planning stage, you can deal with far more than the mere project at hand. You can also shape the overall pattern of your team's working using the division and type of activities you assign.
- Even though the situation may have changed since the last review, it is important to recognize the work which has been accomplished during the interim.
- As a manager, you have to regulate the pressure and work load which is imposed upon your team; you must protect them from the unreasonable demands of the rest of the company.
- The most common error in planning is to assume that there will be no errors in the implementation: in effect, the schedule is derived on the basis of "if nothing goes wrong, this will take ...".
- At the end of any project, you should allocate time to reviewing the lessons and information on both the work itself and the management of that work

In the next study unit, you will be exposed to risk assessment and management

6.0 TUTOR-MARKED ASSIGNMENT

Explain the term Guesstimation and discuss its application in project planning

7.0 REFERENCES/FURTHER READING

Norton, P (1995). Introduction to Computers. Macmillan/McGraw-Hill.

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UNIT 4 RISK ASSESSMENTS AND MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Risk management is basically a process of assessing risk and development of strategies to curb such identified risk in management.

This unit examines processes, cost estimates areas and activates of risk management. Its limitations are also treated.

2.0 OBJECTIVES

This unit of the course was designed for you to:

- understand risk assessment and management in context of management information system as a project
- learn the processes to assessing and managing information system projects risks
- answer the question of how to assess project risk
- identify the levels of risk
- understand the limitations that follows the process of risk identification in information system management
- identify the activities that constitutes risk assessment and management.

3.0 MAIN CONTENT

3.1 Definition

Generally, Risk Management is the process of measuring, or assessing risk and then developing strategies to manage the risk. In general, the strategies employed include transferring the risk to another party, avoiding the risk, reducing the negative affect of the risk, and accepting some or all of the consequences of a particular risk. Traditional risk management, which is discussed here, focus on risks stemming from physical or legal causes (e.g. natural disasters or fires, accidents, death, and lawsuits). Financial risk management, on the other hand, focuses on risks that can be managed using traded financial instruments. Regardless of the type of risk management, all large corporations have risk management teams and small groups and corporations practice informal, if not formal, risk management.

In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled later. In practice the process can be very difficult, and balancing between risks with a high probability of occurrence but lower loss vs. a risk with high loss but lower probability of occurrence can often be mishandled.

Risk management also faces a difficulty in allocating resources properly. This is the idea of opportunity cost. Resources spent on risk management could be instead spent on more profitable activities. Again, ideal risk management spends the least amount of resources in the process while reducing the negative effects of risks as much as possible.

3.2 Risk Management Process

3.2.1 Identification

A first step in the process of managing risk is to identify potential risks. Risks are about events that, when triggered, will cause problems. Hence, risk identification can start with the source of problems, or with problem itself.

- Source Analysis: Risk sources may be internal or external to the system that is the target of risk management. Examples of sources are: stakeholders of a project, employees of a company or the weather over an airport.
- Problem Analysis: Risks are related to fear. For example: the fear of losing money, the fear of abuse of privacy information or the fear of accidents and casualties. The fear may exist with various entities, most important with shareholder, customers and legislative bodies such as the government.

When either source or problem is known, the events that a source may trigger or the events that can lead to a problem can be investigated. For example: stakeholders withdrawing during a project may endanger funding of the project; privacy information may be stolen by employees even within a closed network; lightning striking a B747 during takeoff may make all people onboard immediate casualties.

The chosen method of identifying risks may depend on culture, industry practice and compliance. The identification methods are formed by templates or the development of templates for identifying source, problem or event. Common risk identification methods are:

3.2.1.1 Objectives-Based Risk Identification

Organizations and project teams have objectives. Any event that may endanger achieving an objective partly or completely is identified as risk.

3.2.1.2 Scenario-Based Risk Identification

In scenario analysis different scenarios are created. The scenarios may be the alternative ways to achieve an objective, or an analysis of the interaction of forces in, for example, a market or battle.

Any event that triggers an undesired scenario alternative is identified as risk.

3.2.1.3 Taxonomy-Based Risk Identification

The taxonomy in taxonomy-based risk identification is a breakdown of possible risk sources. Based on the taxonomy and knowledge of best practices, a questionnaire is compiled. The answers to the questions reveal risks.

3.2.1.4 Common-Risk Checking

In several industries lists with known risks are available. Each risk in the list can be checked for application to a particular situation. An example of known risks in the software industry is the Common Vulnerability and Exposures list found at http://cve.mitre.org.

3.2.2 Assessment

Once risks have been identified, they must then be assessed as to their potential severity of loss and to the probability of occurrence. These quantities can be either simple to measure, in the case of the value of a lost building, or impossible to know for sure in the case of probability of an unlikely event occurring. Therefore, in the assessment process it is critical to make the best educated guesses possible in order to properly prioritize the implementation of the risk management plan.

3.2.3 Potential Risk Treatments

Once risks have been identified and assessed, all techniques to manage the risk fall into one or more of these four major categories: (Dorfman, 1997)

- Transfer
- Avoidance
- Reduction (aka Mitigation)
- Acceptance (aka Retention)

Ideal use of these strategies may not be possible. Some of them may involve trade offs that are not acceptable to the organization or person making the risk management decisions.

3.2.3.1 Risk Avoidance

This includes not performing an activity that could carry risk. An example would be not buying a property or business in order to not take on the liability that comes with it. Another would be not flying in order to not take the risk that the airplane was to be hijacked. Avoidance may seem the answer to all risks, but avoiding risks also means losing out on the potential gain that accepting (retaining) the risk may have allowed.

Not entering a business to avoid the risk of loss also avoidsp ossibility of earning the profits.

3.2.3.2 Risk Reduction

This involves methods that reduce the severity of the loss. Examples include sprinklers designed to put out a fire to reduce the risk of loss by fire. This method may cause a greater loss by water damage therefore may not be suitable. Halon fire suppression systems mtigate that risk, but the cost may be prohibitive as a strategy.

Modern software development methodologies reduce risk by developing and delivering software incrementally. Early methodologies suffered from the fact that they only delivered software in the final phase development; any problems encountered in earlier phases meant costly rework and often jeopardized the whole project. By developing increments, software projects can limit effort wasted to a single increment. A current trend in software development, spearheaded by the Extreme Programming community, is to reduce the size of increments to the smallest size possible, sometimes as little as one week is allocated to an increment.

3.2.3.3 Risk Retention

This involves accepting the loss when it occurs. True self insurance falls in this category. Risk retention is a viable strategy for small risks where the cost of insuring against the risk would be greater over time than the total losses sustained. All risks that are not avoided or transferred are retained by default. This includes risks that are so large or catastrophic that they either cannot be insured against or the premiums would be infeasible. War is an example, since most property and risks are not insured against war, so the loss attributed by war is retained by the insured. Also any amounts of potential loss (risk) over the nsured are retained risk. This may also be acceptable if the chance of a very large loss is small or if the cost to insure for greater amounts is so great it would hinder the goals of the organization too much.

3.2.3.4 Risk Transfer

This means causing another party to accept the risk, typically contract or by hedging Insurance is one type of risk transfer that uses contracts. Other times it may involve contract language that transfers a risk to another party without the payment of an insurance premium. Liability among construction or other contractors is very often transferred this way. On the other hand, taking offsetting positions in derivatives is typically how firms use hedging to financial risk management: financially managed risk.

Some ways of managing risk fall into multiple categories. Risk retention pools are technically retaining the risk for the group, but spreading it over the whole group involves transfer among individual members of the group. This is different from traditional insurance, in that no premium is exchanged between members of the group up front, but instead losses are assessed to all members of the group.

3.2.4 Create the Plan

Decide on the combination of methods to be used for each risk

3.2.5 Implementation

Follow all of the planned methods for mitigating the effect of the risks. Purchase insurance policies for the risks that have been decided to be transferred to an insurer, avoid all risks that can be avoided without sacrificing the entity's goals, reduce others, and retain the rest.

3.1.6 Review and Evaluation of the Plan

Initial risk management plans will never be perfect. Practice, experience, and actual loss results, will necessitate changes in the plan and contribute information to allow possible different decisions to be made in dealing with the risks being faced.

3.3 Risk Assessment and Cost Estimates

Project leaders should ensure that cost estimates, including their classification, reflect the assessed risk for the various phases of projects, and that they have been developed using appropriate and comprehensive risk estimating practices, in conjunction with other cost impact assessments. Commercial risk assessment software packages are available to assist the project leader in determining internal project risk.

3.3.1 Project Risk Assessment

External risk factors are circumstances over which project management cannot exert a controlling influence. These factors include such elements as externally imposed deadlines, cooperative development obligations or statutory requirements.

Internal risk factors are circumstances that project management can control. These factors include such elements as the allocation of adequate resources and the reliability of cost estimates.

Both internal and external risk factors should always be considered in the overall risk assessment. Internal risk factors may be more tangible, and their impacts on cost estimated with a greater degree of confidence.

For external risk factors, it may not always be possible to provide cost impacts. However, these external risks must be identified and sufficiently detailed in project management and project approval documents to apprise approval authorities of their existence and potential impacts on the success of the project.

3.3.2 Levels of Risk

The risk assessment should indicate an overall project risk level as high, medium or low. As project definition progresses, the risk assessment should be periodically updated to reflect the additional information available.

3.3.3 Assessment of Risk

The following is a list of the type of factors that should be considered when assessing risk. These factors are only indicators of the possibility of risk. The assessment should consider the significance of these indicators for a specific project:

- the department's allocation of resources to the project may be affected by changes in government priorities;
- the schedule is externally imposed or the project is susceptible to time delays resulting from: relatively minor changes in technology; requirements of participating departments; available windows of opportunity with international partners; seasonal considerations (for example, access to the Arctic); the need for regulatory approvals (such as environmental assessments), or other similar factors;
- at the time of the assessment, the private sector does not have the requisite capability in terms of the technology, expertise, industrial practices, management techniques or skilled and stable labour force required to undertake the project;
- the sponsoring department is not experienced in managing and developing cost estimates for a project of a particular magnitude or type (for example, international cooperation including the effect of exchange rates), or cannot assign sufficient in-house expertise;
- the project is particularly large in scale and complexity, involving more participating departments or contractors than similar projects previously sponsored by the department;
- there are no feasibility studies, test or user trial programs, pre-production appraisals, similar production items, reliable construction estimates, or they are similar data upon which they base a risk assessment;
- project deliverables require research, development and testing of unproven technology or assemblies of products;
- the project requires that work critical to the end-product be done in several different locations, particularly when the locations are isolated or environmentally sensitive;
- the project involves inherent hazards of a biological, chemical, environmental, radiological, explosive, toxic or other similar nature;
- the continuity or availability of a portion of project funding or other project activity is contingent upon the ability of other participants, especially non-federal government participants, to meet their obligations when and as defined in project agreements; and
- the impact of potential contingent or residual liabilities arising from participation in joint or shared funded projects including liabilities caused by withdrawal from the project by one or more participants.

Examples of arrangements addressed by the last two factors include sharing of financial responsibilities in federal/provincial or government/ private sector joint projects. To the extent the private sector is involved in the project, the assessment of these risk factors must involve a review of the technical and financial stability of the firm and of the industry or environment the firm operates within. Where there are third-party financial backers, the assessment of these risk factors must examine the stability of these companies in view of the security they have offered the Crown.

3.3.4 Assessment of High Risk

A project (or element of a project) may be assessed as high risk if one or more of the above hazards exist in a significant way and, unless mitigated, would result in probable failure to achieve project objectives. Project management should prepare approaches to reduce this risk through strategies such as phased development, funded system design by private industry, prototyping, pilot systems and user trials. Project management should ensure that senior departmental management is kept fully briefed regarding these plans as well as project progress, and be prepared to quickly request access to sources of expertise within the sponsoring and any participating departments as well as the contracting authority.

3.3.5 Assessment of Medium Risk

A project (or element of a project) may be assessed as medium risk if some of the above hazards exist but have been mitigated to the point that allocated resources and focused risk management planning should prevent significant negative effect on the attainment of project objectives.

3.3.6 Assessment of Low Risk

A project (or element of a project) should be assessed as low risk if the above hazards do not exist or have been reduced to the point where routine project management control should be capable of preventing any negative effect on the attainment of project objectives.

3.3.7 Management of Project Risk

Project leaders should ensure that project management:

- initiates, during the project planning phase, a continuing process for assessing project risk;
- includes, during the project definition phase (when applicable), formal steps to reduce project risk;
- prepares outline plans for dealing with actual project contingencies;
- prepares a Project Profile and Risk Assessment as defined in this Guideline and keeps it up-to-date;
- specifies these measures in the project management framework sections of project approval documentation;
- prepares revised project approval documentation when the project risk assessment changes significantly; and
- prepares an outline of a communications plan for high risk activities that may attract media or public attention, including the appointment of a spokesperson.

3.4 Limitations

If risks are improperly assessed and prioritized, time can be wasted in dealing with risk of losses that are not likely to occur. Spending too much time assessing and managing unlikely risks can divert resources that could be used more profitably. Unlikely events do occur, but if the risk is unlikely enough to occur, it may be better to simply retain the risk, and deal with the result if the loss does in fact occur.

Prioritizing too highly the Risk management processes itself could potentially keep an organization from ever completing a project or even getting started. This is especially true if other work is suspended until the risk management process is considered complete.

3.5 Areas of Risk Management

As applied to corporate finance, risk management is a technique for measuring, monitoring and controlling the financial or operational risk on a firm's balance sheet. See value at risk.

Enterprise Risk Management

In Enterprise Risk Management, a risk is defined as a possible event or circumstance that can have negative influences on the Enterprise in question. Its impact can be on the very existence, the resources (human and capital), the products and services, or the customers of the Enterprise, as well as external impacts on Society, Markets or the Environment. ((Author's Note Amazingly whenever Risk is considered this is often the last Risk to be formally evaluated with such things as Project Risk receiving much higher attention.

Project Management

In project management, a risk is more narrowly defined as a possible event or circumstance that can have negative influences on a project. Its influence can be on the schedule, the resources, the scope and/or the quality.

In project management parlance, when a risk escalates, it becomes a liability. A liability is a negative event or circumstance that is hindering the project.

Some of the processes for assessing risk include the following p arentheses contain some of the jargon used to refer to them).

- Choosing unique identifiers for referring to the same risk in company or project documents (identification).
- Describing the risk and how it could become a liability (description).
- Assessing the consequences of that (effect).
- Considering what precautions could be taken to prevent it (precaution).
- Drawing up contingency plans or procedures for handling it (contingency).
- Categorizing the risk as new, ongoing or closed (risk status)
- Estimating the probability of the risk becoming a liability (Risk escalation probability, P)
- Estimating the consequences in terms of time for the project (Schedule impact, S)

In addition, every probable risk can have a pre-formulated plan to deal with it to deal with its possible consequences (to ensure contingency if the risk becomes a liability).

Risk in a project or process can be due either to speci equivalent in the list immediately above.

3.6 Risk Management Activities

In management information management project management, risk management includes the following activities:

- Planning how risk management will be held in the particular project. Plan should include risk management tasks, responsibilities, activities and budget.
- Assigning risk officer - a team member other than a project manager who is responsible for foreseeing potential project problems. Typical characteristic of risk officer is a healthy skepticism.
- Maintaining live project risk database. Each risk should have the following attributes: opening date, title, short description, probability and importance. Optionally risk can have assigned person responsible for its resolution and date till then risk still can resolved.
- Creating anonymous risk reporting channel. Each team member should have possibility to report risk that he foresees in the project.
- Preparing mitigation plans for risks that are chosen to be mitigated.

The purpose of the mitigation plan is to describe how this particular risk will be handled what, when, by who and how will be done to avoid it or minimize consequences if it becomes a liability.

- Summarizing planned and faced risks, effectiveness of mitigation activities and effort spend for the risk management.

4.0 CONCLUSION

Adequate risk assessment and management is important for all projects regardless of dollar value. An adequate risk assessment usually requires the contribution and expertise of the contracting authority as well as any participating departments. This is particularly important during the initial assessment, which necessarily would be based upon early project planning data.

5.0 SUMMARY

- Generally, Risk Management is the process of measuring, or assessing risk and then developing strategies to manage the risk. In general, the strategies employed include transferring the risk to another party, avoiding the risk, reducing the negative affect of the risk, and accepting some or all of the consequences of a particular risk.
- A first step in the process of managing risk is to identify potential risks. Risks are about events that, when triggered, will cause problems.

- Once risks have been identified, they must then be assessed as to their potential severity of loss and to the probability of occurrence.
- Project leaders should ensure that cost estimates, including their classification reflect the assessed risk for the various phases of projects and that they have been developed using appropriate and comprehensive risk estimating practices in conjunction with other cost impact assessments.
- External risk factors are circumstances over which project management cannot exert a controlling influence.
- The risk assessment should indicate an overall project risk level as high, medium or low. As project definition progresses, the assessment should be periodically updated to reflect the additional information available.
- A project (or element of a project) may be assessed as high risk if one or more hazards exist in a significant way and, unless mitigated, would result in probable failure to achieve project objectives.
- If risks are improperly assessed and prioritized, time can be wasted in dealing with risk of losses that are not likely to occur.
- In Enterprise Risk Management, a risk is defined as a possible event or circumstance that can have negative influences on the Enterprise in question.
- In project management parlance, when a risk escalates, it becomes a liability. A liability is a negative event or circumstance that hsindering the project.
- In project management, risk management includes planning how risk management will be held in the particular project.

The next study unit which is the finally study unit for this course bsasically on design and planning for GIS.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss how to initiate and execute a information system risk assessment
2. In what way can a risk be managed on identification?

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UNIT 5 DESIGN AND PLANNING FOR GIS

CONTENTS

1.0 INTRODUCTION

This final unit of the course material dwells extensively on design and planning for Geographic Information systems (GIS).

2.0 OBJECTIVES

The objective of this unit is for you to:

- specifically understand the process of developing a geographic information system
- compare the lifecycle of GIS to other project models

- understand he key aspects and issues in GIS project planning
- identify and understand compromises in system selection.

3.0 MAIN CONTENT

3.1 Geography Information System

GIS projects are expensive in terms of both time and money. Municipal GIS and facilities management projects developed by utilities may take a decade or more to bring on-line at a cost of tens or hundreds mfillions of dollars. Careful planning at the outset, as well as during the project, can help to avoid costly mistakes. It also provides assurance that a GIS will accomplish its goals on schedule and within budget.

There is a temptation, when a new technology like GIS becomes available, to improvise a solution to its use, that is, to get started without considering where the project will lead. The greatest danger is that decisions made in haste or on the spur of the moment will have to be reversed later or will prove too costly to implement, meaning a GIS project may have to be abandoned. To avoid disappointing experiences like these, GIS professionals have developed a well-defined planning methodology often referred to as project lifecycle. Lifecycle planning involves setting goals, defining targets, establishing schedules, and estimating budgets for an entire GIS project.

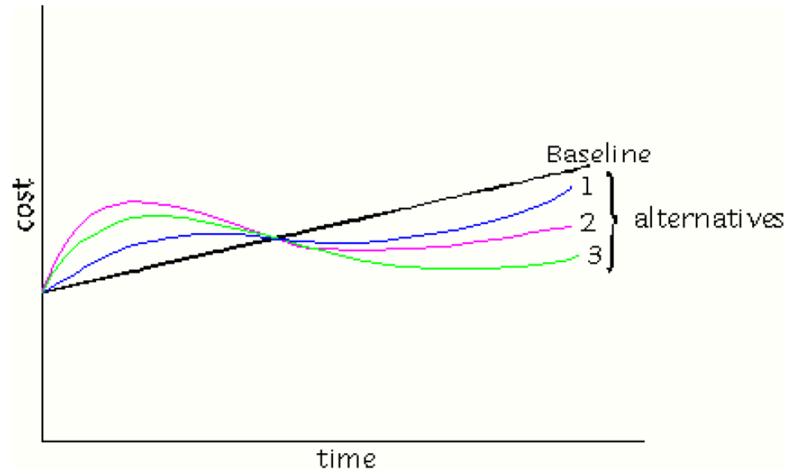
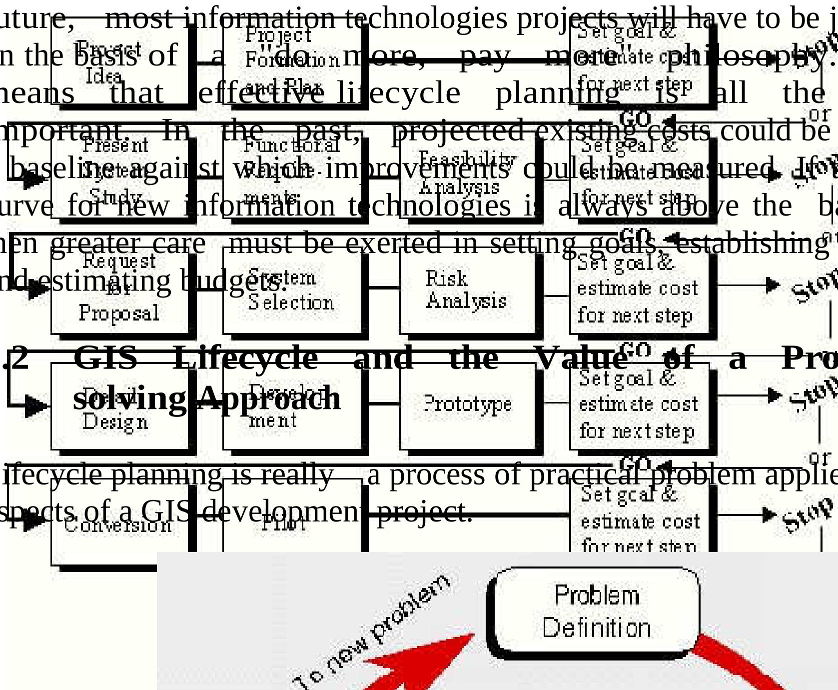


Figure 1: Cost -Time Analysis of Information Technology projects

The original impetus for developing effective lifecycle planning was cost containment. For many decades, the rationale for implementing new information technologies was that, in the long run, such projects would reduce the cost of business operations.



It is generally recognized that, for the foreseeable future, most information technologies projects will have to be justified on the basis of a "do more, pay more" philosophy. This means that effective lifecycle planning is all the more important. In the past, projected existing costs could be used as a baseline against which improvements could be measured. If the cost curve for new information technologies is always above the baseline, then greater care must be exerted in setting goals, establishing targets, and estimating budgets.

3.2 GIS Lifecycle and the Value of a Problem-solving Approach

Lifecycle planning is really a process of practical problem applied to all aspects of a GIS development project.

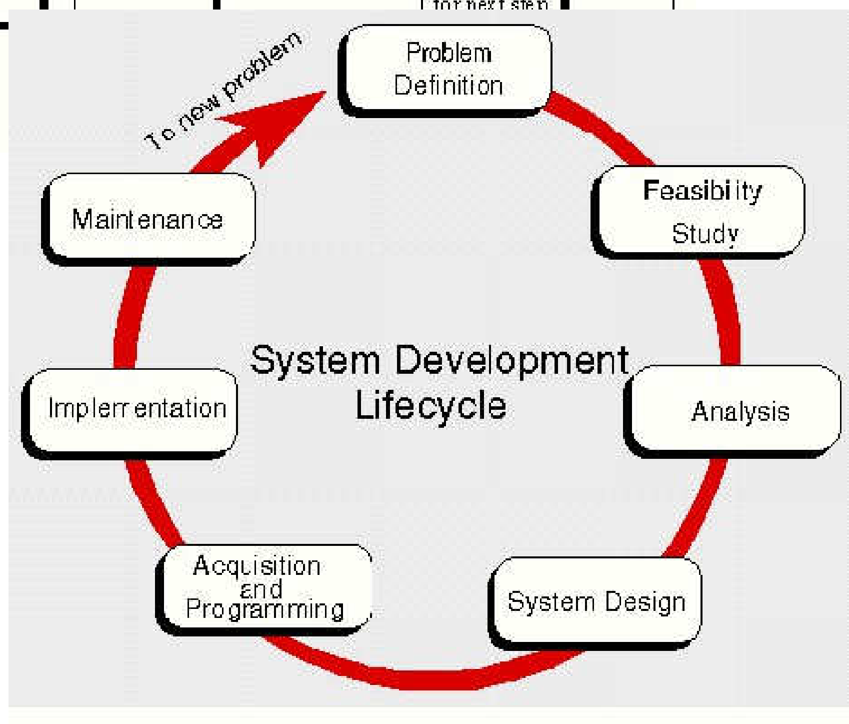


Figure 2: A Project Life Cycle

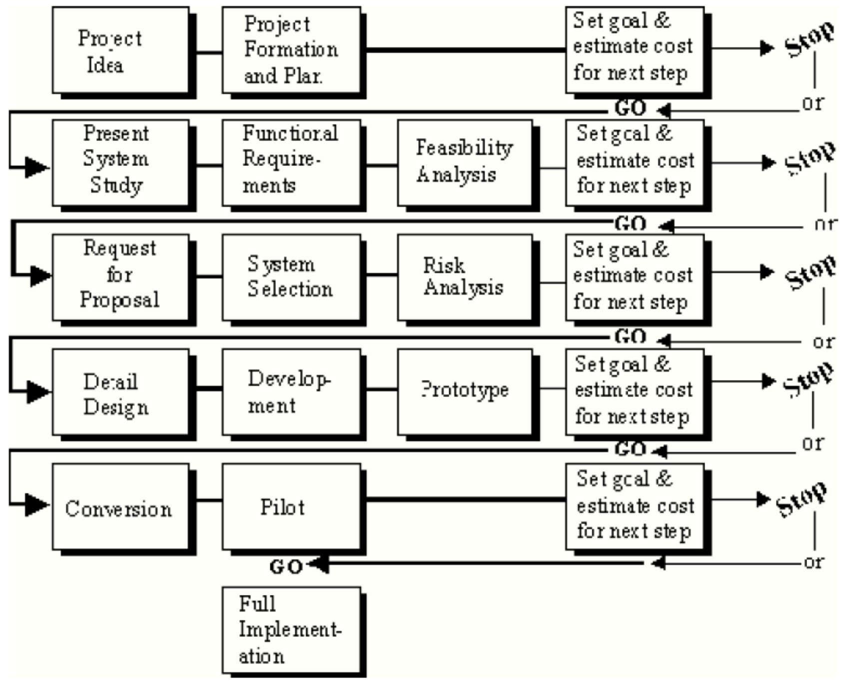


Figure 3: GIS Project Life Cycle

Particular care is exerted in defining the nature of a problem or new requirement, estimating the costs and feasibility of proceeding, and developing a solution. This process should not be abridged; each step is important to the overall process. If this problem solving approach is applied to the design and creation of an entire GIS project additional subtasks must be addressed, as in the diagram below

3.3 Key Aspects of GIS Project LifeCycle

Three aspects of this planning process merit special attention.

3.3.1 Setting Goals and Estimating Costs

Each stage of the project lifecycle process involves setting clear goals for the next step and estimating the cost of reaching those goals. If the necessary funds or time are unavailable, it is better to stop the process than to continue and see the project fail. The process can begin again when funds are available.

3.3.2 The Functional Requirements Study

The functional requirements study is arguably the most important single step in the planning process. Here, careful study is devoted to information is required for a project, how it is to be used, and what final products will be produced by the project. For a large organization, this amounts to a "map" of how information flows into, around, and out of each office and agency. The FRS also specifies how often particular types of information are needed and by whom. Furthermore, the FRS can look into the future to anticipate types of data processing tasks that expand upon or enhance the organization's work.

By assessing information flows so carefully, the FRS allows an organization to set goals for all of the subsequent steps in the lifecycle planning process. The FRS also allows an organization to information flows across all the domains of its work, forcing consider how different systems will be integrated. Without taking an encompassing view of information flows, a project implemented in one unit may be of no use to another. It is important to take this broad view of information flows to avoid stranding projects between incompatible systems.

3.3.3 The Creation of a Prototype

By the time a project has moved into the development stage, the greatest temptation is to jump forward to full implementation. This is a very risky path, for it leaves out the rototyping stage. Prototypes critical step because they allow the system to be tested and calibrated to see whether it meets expectations and goals. Making adjustments at the prototype stage is far easier than later, after full implementation. The prototype also allows users to gain a feel for a new system estimate how much time (in training and conversion) will be required to move to the pilot and full implementation stages. Finally, a successful prototype can help enlist support and funding for the remaining steps in the lifecycle planning process.

As is noted in the module on managing error, the prototype provides a good opportunity for undertaking sensitivity analysis--testing to see how variations in the quality of inputs affect outputs of the system. These tests are essential for specifying the accuracy, precision, and overall quality of the data that will be created during the conversion process. If these analyses are not performed, there is a chance that much time and effort will be wasted later.

3.4 System Selection as a Compromise

In selecting a software and hardware combination, users are often faced with a number of compromises. For a given price, a system cannot be expected to do everything. A thoughtful choice is required in order to select the system that will best meet the principal aims of a project. Figure 1, helps to show how users might attempt to balance four of the many characteristics of a given system. In these cases, the compromises involve:

Speed: The speed with which a system can respond to queries and achieve solutions.

Functional richness: The analytical capabilities of the system and its flexibility in addressing a wide range of spatial and statistical problems.

Database Size: The ability to handle large quantities of spatial and statistical data. Training: The amount of time required to bring users up to speed on a system and to use the database on a regular basis.

A. Some applications, such as emergency vehicle dispatch (911 systems), require high performance speed. Lives are at stake and the system must be able to match telephone numbers to addresses and dispatch vehicles instantly. At the same time, an emergency dispatch system will only be used to serve this single function and the database will contain only a street grid, address ranges, and links to telephone numbers.

B. Some applications, such as those undertaken by water, gas, and power utilities, involve storing vast quantities of information about huge service territories. Some utilities serve hundreds or thousands of square miles of territory. Detailed information must be maintained about all facilities within these territories. Managing these quantities of information is a key to selecting the right GIS system. At the same time, speed of response may be less of a concern since a given piece of information may only have to be accessed once a month or even once a Furthermore, functional richness may be useful, but many tasks (such as maintenance and planning) will require a limited range of analytical capabilities.

C. Some applications, such as those related to urban planning and environmental management may benefit most from great functional richness. Planning and management tasks may be many and varied, meaning that users must have access to a wide range of spatial and statistical functions. These may not be used often but, when used, may be essential to the success of a project.

Figure 4: Criteria for system Selection

D. Some GIS may be used frequently by users with little training or in situations where there will be high staff turnover. This is a consideration for GIS that are used as part of management or executive information systems. Upper-level managers who can benefit greatly from the information provided by a GIS may have limited time inclination) for training. It is important in these situations to consider the time it takes to bring new users up to speed with a new system.

Of course, these are only a few of the factors and scenarios that arise in GIS system selection. Compromises may have to be achieved with other system features.

Too often, users imagine that they can find the "perfect" or "best" GIS. The best GIS is always the one that gets a job done at the right price and on schedule.

3.5 Planning Schedules and the Scope of Prototype and Pilot Projects

There is nothing wrong with being cautious during the process of project planning. Rushing through the procedure exposes an organization to potentially costly mistakes. Large AM/FM projects typically take many years to reach the prototype or pilot stages.

Once a prototype or pilot has been approved, even more time will elapse before full implementation is achieved. Some municipal GIS projects have been underway for over a decade and still have far to go before complete implementation and compilation of a full dataset.

Table 1: Examples of AM/FM Pilot Size

Examples of AM/FM Pilot Size

Name	Dates Started	Dates Ended	Sq. Mi.	# of Maps	% of final project area
Michigan Consolidated			36		>1
Philadelphia Electric			50		>2
Mountain Fuel Supply	(1 year)		100	2.5	
TransAlta Utility Corp	1977	1979	8	23	1
Houston Light and Power	1978	1978	108		2
Wisconsin Gas	1977	1981	160		10
Pacific Gas and Electric	1979	1984	480		1.3
Southern Bell	6/81	9/82		154	>1
United Tel. of Florida	5/83	10/83	450	440	3
Wisconsin Public Service	6/83	12/83	175		1.8
San Diego Gas and Electric	12/83	5/85	900	1500	20

Data adapted from the NCGIA Core Curriculum, Application Issues in GIS, Lecture 54.

Prototype and pilot projects are kept small, as is indicated in the following table. Remember, prototypes and pilots are intended to demonstrate functions and interfaces. What works best is a carefully selected test area that presents examples of common workflows. It's a real size of little consequence in most applications.

3.6 Applying the Insights of Project Lifecycle to Research Projects

The concepts of lifecycle planning can be applied to projects of lesser scale and scope, particularly to those pursued in undergraduate and graduate research. This does not mean that every project will move through every step outlined above. Some steps such as benchmarking and system selection may be irrelevant in a setting where the researcher must make do with whatever equipment and software is on hand. But lifecycle planning should not be viewed as a series of boxes on checklist; it is a process of careful planning and problem solving. It is this process of careful planning that should be emulated regardless of the scope or scale of a project.

1. Think Ahead to How the GIS will be Used, But Keep in Mind Available Sources

Designing an effective GIS involves setting clear goals. The temptation Is to rush ahead and begin digitizing and converting data establishing how the system will be used. Even for small GIS projects, it is wise to engage in a modest functional requirements study. This allows the user to gain an idea of exactly what data sources are required, how they will be processed, and what final products are expected. Without clear-cut goals, there is too great a danger that a project will omit key features or include some that are irrelevant to the final use.

2. Exert Special Care in Designing and Creating the Database

Again, it is easy to rush ahead with the creation of a database, and then find later that it has to be reorganized or altered extensively. It is far more economical to get things right the first time. This means that the researcher should chart out exactly how the database is to be organized and to what levels of accuracy and precision. Attention to (and testing) of symbolization and generalization will also pay off handsomely.

3. Always Develop a Prototype or Sample Database to Test the Key Features of the System

No matter the size of a project, the researcher should aim to create a prototype first before moving toward full implementation of a GIS. This allows the researcher move through all of the steps of creating and using the system to see that all procedures and algorithms work as expected. The prototype can be a small area or may be confined to one or two of the most critical layers. In either case, testing a prototype is one step that should not be overlooked.

3.7 Planning and Database Issues

The project planning cycle outlines a process, but the issues that must be addressed at each stage of this process will vary considerably 0rganization to organization. Some topics are of critical importance to large municipal, state, and private AM/FM applications, but less so for research applications of limited scope. Among the issues that must be addressed in large GIS projects are:

3.7.1 Security

The security of data is always a concern in large GIS projects. But there is more to security than protecting data from malicious tampering or theft. Security also means that data is protected from system crashes, major catastrophes, and inappropriate uses. As a result, security must be considered at many levels and must anticipate many potential problems. GIS data maintained by government agencies often presents difficult challenges for security. While some sorts of data must be made publicly accessible under open records laws, other types are protected from scrutiny. If both types are maintained within a single system, managing appropriate access can be difficult. Distribution of data across open networks is always a matter of concern.

3.7.2 Documentation

Most major GIS datasets will outlive the people who create them. Unless all the steps involved in coding and creating a dataset are documented, this information will be lost as staff retire or move to new positions. Documentation must begin at the very start of GIS project and continue through its life. It is best, perhaps, to actually assign a permanent staff to documentation to make sure that the necessary information is saved and revised in a timely fashion.

3.7.3 Data Integrity and Accuracy

When mistakes are discovered in a GIS database, there must be a well-defined procedure for their correction (and for documenting these corrections). Furthermore, although many users may have to use the information stored in a GIS database, not all of these users should be permitted to make changes. Maintaining the integrity of the different layers of data in a comprehensive GIS database can be a challenging task. A city's water utility may need to look at GIS data about right-of-ways for power and cable utilities, but it should not be allowed to change this data. Responsibility for changing and correcting data in the different layers must be clearly demarcated among different agencies and offices.

3.7.4 Synchronization of Usage

GIS datasets employed in government or by utilities will have many users. One portion of the dataset may be in demand simultaneously by several users as well as by staff charged with updating and adding new information. Making sure that all users have access to current data whenever they need it can be a difficult challenge for GIS design. Uncontrolled usage may be confusing to all users, but the greatest danger is that users may actually find themselves interfering with the project workflow or even undoing one another's work.

3.7.5 Update Responsibility

Some GIS datasets will never be "complete." Cities and utility territories keep growing and changing and the database must be constantly updated to reflect these changes. But these changes occur on varying schedules and at varying speeds. Procedures must be developed to record, check, and enter these changes in the GIS database. Furthermore, it may be important to maintain a record of the original data.

3.7.6 Minimization of Redundancy

In large GIS projects, every byte counts. If a database is maintained for 30-50 years, every blank field and every duplicated byte of information will incur storage costs for the full length of the project. Not only will wasted storage space waste money, it will also slow performance. This is why in large, long-term GIS projects, great attention to devoted to packing data as economically as possible and reducing duplication of information.

3.7.7 Data Independence and Upgrade Paths

A GIS database will almost always outlive the hardware and software that is used to create it. Computer hardware has a useable life of 2-5 years; software is sometimes upgraded several times a year. If a GIS database is totally dependent on a single hardware platform or a single software system, it too will have to be upgraded just as often. Therefore, it is best to create a database that is as independent as hadware and software. Through careful planning and design, data can be transferred as ASCII files or in some metadata or exchange format from system to system. There is nothing worse than having data held in a proprietary vendor-supported format and then finding that the vendor has changed or abandoned that format.

In this way, GIS designers should think ahead to possible upgrade paths for their database. It is notoriously difficult to predict what will happen next in the world of computers and information technology.

3.7.8 Privacy

Safeguards on personal privacy have become a great concern over the past decade, particularly with the rise of the internet and web. These concerns arise to two principal situations. The first is the hacking into, accidentally release, or inappropriate disclosure of privileged information which can compromise an individual's privacy with respect to medical conditions, financial situation, sexual, political, religious beliefs & values and other privileged personal information. The second is the ease with which information and computer technologies permit the creation of information "mosaics" or personal profiles from small pieces of seemingly innocuous, non-confidential data.

4.0 CONCLUSION

Though geographic information systems could be unique in itself, its project planning cycle still follow the fundamental stages of every project, be it mall or large. And irrespective of the extent complexity of GIS project, by sticking closely with the life cycle such project will be successfully implemented. This project lifecycle of GIS is adaptable to other project, even if it is a small project.

5.0 SUMMARY

- GIS projects are expensive in terms of both time and money.
- The original impetus for developing effective lifecycle planning was cost containment. For many decades, the rationale for implementing new information technologies was that, in the long run, such projects would reduce the cost of business operations.
- Designing an effective GIS involves setting clear goals.
- Particular care is exerted in defining the nature of a problem or new requirement, estimating the costs and feasibility of proceeding, and developing a solution.
- By assessing information flows so carefully, the FRS allows an organization to set goals for all of the subsequent steps in fecycle planning process.
- In selecting a software and hardware combination, users are often faced with a number of compromises.
- There is nothing wrong with being cautious during the process of project planning; rushing through the procedure exposes an organization to potentially costly mistakes.
- The concepts of lifecycle planning can be applied to projects of lesser scale and scope, particularly to those pursued in undergraduate and graduate research.

- The project planning cycle outlines a process, but the issues that must be addressed at each stage of this process will vary considerably from organization to organization.
- In large GIS projects, ever y byte counts. If a database is maintained for 30-50 years, every blank field and every duplicated byte of information will incur storage costs for the full length of the project.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the major system criteria needed for a GIS.
2. Outline some of the planning and database issues for successful implementation of a GIS.

7.0 REFERENCES/FURTHER READINGS

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