

SDLC AND RISK MANAGEMENT

A. MUASYA

SYSTEMS DEVELOPMENT PROCESS

- In business, systems development refers to the process of examining a business situation with the intent of improving it through better procedures and methods.
- System development can generally be thought of as having two major components: **System Analysis** and **System Design**.
- **System Analysis** is the process of gathering and interpreting facts, diagnosing problems, and using the information to recommend improvements to the system.
- **System Design** is the process of planning a new business system or one to replace or complement an existing system.
- Before planning can be done, one must thoroughly understand the old system and determine how CBIS can be used (if at all) to make its operation more effective.

SYSTEMS DEVELOPMENT PROCESS

Achieving System Development Objectives

There are many reasons why organizations fail to achieve their systems development objectives. Some of them are as follows:

- *Lack of senior management support and involvement in information systems development.*
- *Shifting user needs-* User requirements for information technology are constantly changing and as these changes accelerate, there will be more requests for systems development and more development projects.
- *Development of strategic systems-* Because strategic decision making is unstructured, the requirements, specifications, and objectives for such development projects are difficult to define.
- *New technologies-* When an organization tries to create a competitive advantage by applying advance Information technology, it generally finds that attaining system development objectives is more difficult because personnel are not as familiar with the technology.

SYSTEMS DEVELOPMENT PROCESS

Cont'd

- *Lack of standard project management and systems development methodologies-* Some organizations do not formalize their project management and system development methodologies, thereby making it very difficult to consistently complete projects on time or within budget.
- *Overworked or under-trained development staff.* In many cases, systems developers often lack sufficient education background. Furthermore, many companies do little to help their development personnel stay technically sound. Currently in these organizations, a training plan and training budget do not exist.
- *Resistance to change-* People have a natural tendency to resist change, and information systems development projects signal changes - often radical - in the workplace. When personnel perceive that the project will result in personnel cutbacks, threatened personnel will resist, and the development project is doomed to failure.

SYSTEMS DEVELOPMENT PROCESS

- *Lack of user participation*- Users must participate in the development effort to define their requirements, feel ownership for project success, and work to resolve development problems. User participation also helps reduce user resistance to change.
- *Inadequate testing and user training*- New systems must be tested before installation to determine that they operate correctly. Users must be trained to effectively utilize the new system.

To overcome these and other problems, organizations must execute the systems development process efficiently and effectively.

SYSTEMS DEVELOPMENT PROCESS

SYSTEMS DEVELOPMENT METHODOLOGY

- A system development methodology is a formalized, standardized, documented set of activities used to manage a system development project.
- It refers to the framework that is used to structure, plan and control the process of developing an information system.

The methodology is characterized by the following:

- The project is divided into a number of identifiable processes, and each process has a starting point and an ending point.
- Each process comprises several activities, one or more deliverables, and several management control points. The division of the project into these small, manageable steps facilitates both project planning and project control.
- Specific reports and other documentation, called **Deliverables** must be produced periodically during system development to make development personnel accountable for effective execution of system development tasks.
- Users, managers, and auditors are required to participate in the project, which generally provide approvals, often called signoffs, at pre-established management control points. Signoffs signify approval of the development process and the system being developed.

SYSTEMS DEVELOPMENT PROCESS

- Cont'd
- The system must be tested thoroughly prior to implementation to ensure that it meets users' needs.
- A training plan is developed for those who will operate and use the new system.
- Formal program change controls are established to preclude unauthorized changes to computer programs.
- A post-implementation review of all developed systems must be performed to assess the effectiveness and efficiency of the new system and of the development process.

SYSTEMS DEVELOPMENT PROCESS

Approaches to System Development:

- Since organizations vary significantly in the way they automate their business procedures, and since each new type of system usually differs from any other, several different system development approaches are often used within an organization.
- All these approaches are not mutually exclusive, which means that it is possible to perform some prototyping while applying the traditional approach.

These approaches are as follows:

- **Waterfall, Prototyping, Incremental, Spiral, Rapid Application Development (RAD, Agile Methodologies.**
- **The Traditional / Waterfall Approach / Sequential Approach is very popular**

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

- The **System Development Life Cycle (SDLC)** framework provides system designers and developers to follow a sequence of activities.
- It consists of a set of steps or phases in which each phase of the SDLC uses the results of the previous one.
- The SDLC is document driven which means that at crucial stages during the process, documentation is produced.
- A phase of the SDLC is not complete until the appropriate documentation or artifact is produced. These are sometimes referred to as deliverables.
- The SDLC can also be viewed from a more process oriented perspective

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

The advantages of the Waterfall SDLC system are as follows:

- Better planning and control by project managers.
- Compliance to prescribed standards ensuring better quality.
- Documentation that SDLC stresses on is an important measure of communication and control.
- The phases are important milestones and help the project manager and the user for review and signoff.

The process of system development starts when management or sometimes system development personnel realize that a particular business system needs improvement.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

SDLC cont'd

- The System Development Life Cycle method can be thought of as a set of activities that analysts, designers and users carry out to develop and implement an information system.
- In most business situations, these activities are all closely related, usually inseparable and even the order of the steps in these activities may be difficult to determine.
- Different parts of a project can be in various phases at the same time, with some components undergoing analysis while others are at advanced design stages

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Stages of Waterfall SDLC

Preliminary Investigation

- Determining and evaluating the strategic benefits of the system and ensure that the solution fits the business strategy. This includes cost-benefit analysis of the proposed system.
- Situations that may necessitate the need for a new information system during SDLC
 - High failure rates in the existing system
 - Complaints from the customers
 - Decline in the profit levels
 - Government policies e.g. the introduction of electronic tax registers(ETR)
 - Slow processing and being unable to beat deadlines
 - Constant system errors and breakdowns
 - High cost of maintenance

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Feasibility study-

This stage assesses the current system by identifying its inadequacies and deciding if the system can be improved and the problems resolved. If they can, an assessment is then made to determine:

- If it is affordable and economically viable,
- The benefits, effect and impact on the users and organization of introducing the system,
- If the technical expertise to build and support it is available
- If any changes need to be made to the current infrastructure

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Systems Requirements Analysis

- This deals with analyzing the type of the system on the basis of the users' requirements.
- In this stage the system analyst uses the facts obtained from the investigation stage to determine why the problems exist, why where the current methods of operation adopted and what the alternatives are.

Systems Design

- Designing the system in terms of user interface data storage and data processing functions on the basis of the requirement phase by developing the system flowcharts, system and data flow diagrams, screens and reports.

Systems Development/Programming

- Programming the system as designed and conducting the continuous testing and debugging.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Systems Testing

- Various kinds of testing is conducted before the developed system is implemented. This includes Unit
- Testing, Integration Testing and System Testing etc.

Systems Implementation

Final Testing and quality of controls audit, acceptance by management and user before migration of the system to the live environment and data conversion from legacy system to the new system. The activities involved in System Implementation are as follows:

- Conversion of data to the new system files.
- Training of end users.
- Completion of user documentation.
- System changeover.
- Evaluation of the system a regular intervals.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Post Implementation Review and Maintenance

- Continuous evaluation of the system as it functions in the live environment and its update

Some of the Systems maintenance activities are as follows:

- Adding new data elements; Modifying reports; Adding new reports;
- Maintenance includes continuous evaluation of the system as it functions in the live environment and its update.

A **Post Implementation Review** answers the question “Did we achieve what we set out to do in business terms?”

- Some of the purposes served a Post Implementation Review ascertains the degree of success from the project, the extent to which it met its objectives, delivered planned levels of benefit, and if the specific requirements were addressed as originally defined.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

- **Post Implementation Review** examines the efficacy of all elements of the working business solution to see if further improvements can be made to optimize the benefit delivered.

System Maintenance

- Maintaining the system is an important aspect of SDLC.
- As key personnel change positions in the organization, new changes will be implemented, which will require system updates.
- Most information systems require at least some modification after development.
- The need for modification arises from a failure to anticipate all requirements during system design and/or from changing organizational requirements.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Maintenance cont'd

Maintenance can be categorized in the following ways:

Corrective Maintenance

- Regardless of how well designed, developed, and tested a system or application may be, errors will inevitably occur.
- This type of maintenance deals with fixing or correcting problems with the system.
- This usually refers to problems that were not identified during the implementation phase. An example of remedial maintenance is the lack of a user-required feature or the improper functionality of it.

Adaptive (Customized) Maintenance

- This type of maintenance refers to the creation of new features or adapting existing ones as required by changes in the organization or by the users, e.g., changes on the organization's tax code or internal regulations.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Perfective (Enhancement) Maintenance

- It deals with enhancing or improving the performance of the system either by adding new features or by changing existing ones.
- An example of this type of maintenance is the conversion of text-based systems to GUI (Graphical User Interface).

Preventive (Routine) Maintenance

- This type of maintenance may be one of the most cost effective, since if performed timely and properly, it can avoid major problems with the system.
- An example of this maintenance is the Replacing hard disk motor rubber belts after routine tests and finding

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Information system implementation strategies

Direct changeover-The old system ceases its operation and the new system commences operation the next day.

The advantages of a direct changeover are:

- Relatively cheap
- Prevents the weaknesses of the old system from being passed over to the new system
- Reduces system implementation duration

Its disadvantages are:

- It is very risky especially if the new system fails. The cost of switching back to the old system will be high
- If not properly planned, it may interrupt user organization operations and bring confusion amongst staff members

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Parallel changeover

This is a method where new and old systems are allowed to run side by side or simultaneously until it is proved beyond reasonable doubt that the new system is working and all the benefits are realized.

Its advantages are:

- Users become familiar with the new system prior to the actual changeover which may enhance their efficiency
- The organization is exposed to less risks in case the new system fails
- There would be less interruption and inconveniences in the organization operations during the changeover period.

The disadvantages of this method are:

- It is an expensive method
- It might delay system implementation schedule or period

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Implementation strategies cont'd

Phased changeover

- The method involves implementation of a system on step-by-step approach. This implies that only a portion of the system is implemented initially. Other portions are implemented in phases.

Advantages:

- Very structured, each phase can be fully evaluated before moving onto the next one.
- Lower risk, a well planned and controlled introduction of the new system.
- Easy to train staff by letting them learn new skills on each phase as it is introduced.

Disadvantages:

- Slower than direct implementation.
- Although each phase is easy to evaluate, you have to wait until all the phases are complete before you can evaluate the whole change over

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Pilot changeover

- It involves installation of new system but using it only in one part of the organization on an experimental basis. E.g. a bank wishing to computerize its operations may install a computerized system on one branch on experimental basis.

Advantages are:

- Allows a new system to be implemented quickly with minimum costs
- Allows training of personnel on the new system during implementation
- They cause minimum interruption to company operations during system's implementation.

The disadvantages include:

- Interfacing both the old and new system may usually bring problems
- There may be additional costs associated with running both systems at the same time

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

How can you measure success of a system after implementation?

- High levels of system usage: question users, monitor system.
- User satisfaction: ask users, needs attended, enhanced job performance, quality of service, etc.
- Favorable attitude: system accepted by users.
- Achieved objectives: meet performance goals.
- Financial payoff: reduce costs, increase profit margin. But benefits are not always quantifiable.

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

Problems encountered with project goals

- Project sponsor/ client has an inadequate idea of what the project is about at the start
- Failure of communication between the client and the project manager due to;
- Lack of technical knowledge on the part of the client
- Over-use of jargon by the project manager
- Specifications may be subject to change due to;
 - Problems with individual clients
 - Decision making processes at the client end
 - Environmental changes
- The project goals are unrealistic and unachievable, (may be this is only realized when the project is under way)
- The client may become carried away with the idea of the project and may be unable to see clearly what can be achieved
- Projects may be highly complex and may have a number of objectives that actually contradict each other

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

WHY PROJECTS FAIL

- An unrealistic Deadline is established
- Changing Customer Requirements
- An honest underestimation of effort
- Predictable and/ or unpredictable risks
- Miscommunication among project staff
- Failure in Project Management practice

AVOIDING PROJECT FAILURE

Project Managers and Software Engineers must:-

- Heed a set of common warning signs
- Understand the Critical Success Factor (CFS) that lead to good Project Management
- Develop a common sense approach for Planning, Monitoring and controlling a Project

RISK MANAGEMENT

- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.
- A risk is a probability that some adverse circumstance will occur
- Project risks affect schedule or resources
- Product risks affect the quality or performance of the software being developed
- Business risks affect the organisation developing or procuring the software.

RISK MANAGEMENT

The risk management process

- Risk identification- Identify project, product and business risks;
- Risk analysis- Assess the likelihood and consequences of these risks; Probability maybe very low, low, moderate, high or very high. Risk effects maybe catastrophic, serious, tolerable or insignificant.
- Risk planning- Draw up plans to avoid or minimise the effects of the risk;
- Risk monitoring- Monitor the risks throughout the project; Assess each identified risk regularly to decide whether or not it is becoming less or more probable. Assess whether effects of risks have changed and mitigate the risks

RISK MANAGEMENT

The risk mitigation step involves development of mitigation plans designed to manage, eliminate, or reduce risk to an acceptable level.

RISK MITIGATION STRATEGIES

- **Assume/Accept:** Acknowledge the existence of a particular risk, and make a deliberate decision to accept it without engaging in special efforts to control it. Approval of project or program leaders is required.
- **Avoid:** Adjust program requirements or constraints to eliminate or reduce the risk. This adjustment could be accommodated by a change in funding, schedule, or technical requirements.
- **Control:** Implement actions to minimize the impact or likelihood of the risk.
- **Transfer:** Reassign organizational accountability, responsibility, and authority to another stakeholder willing to accept the risk.
- **Watch/Monitor:** Monitor the environment for changes that affect the nature and/or the impact of the risk.

RISK MANAGEMENT

Possible risks that can be identified in the risk management process of project management.

- Technology risk- The database used in the system cannot process as many transactions as expected. Software components that should be re used contain defects that limit their functionality
- People risk- It is impossible to recruit staff with skills required. Key staffs are all ill and unavailable at critical times. Required training for staff is not available.
- Organizational risks- The organization is restructured so that different management are responsible for the project. Organizational financial problems force reductions in the project budget.
- Tools risks- The code generated by the CASE tools is inefficient. CASE tools cannot be integrated.
- Requirements risks- Changes to requirements that need major design rework are not proposed. Customers fail to understand the impact of requirements changes.
- Estimation- The time required to develop the software is under estimated. The rate of defect repair is under estimated. The size of the software is under estimated.