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The Systems Analysis LECTURE

SA

The Systems Life Cycle & The steps in a System Project
Background about the steps involved in a Systems Project

The Systems Life Cycle

Reasons for initiating a Project

The idea of the Systems Life Cycle

Commercial systems (payroll, accounts, stock control and soon) all share a common life cycle pattern. One method of doing things may work well for a period of time (maybe several years), and then, owing to expansion or changes in the nature of the business, the economic environment, the need to keep up with new technology or other factors, the system may start to deteriorate or seem inadequate.

At this point investigations are made, requirements are analysed, a new system is proposed, developed and implemented and the cycle starts all over again.

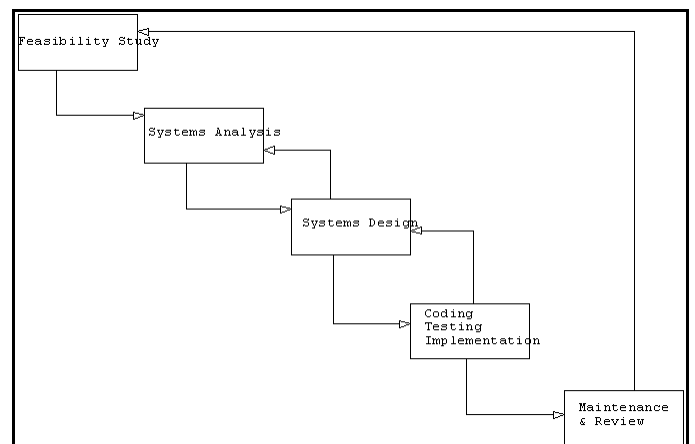
The stages in systems development

There are six phases or major steps in the a system development project:

- A Feasibility Study (involves minor Systems Analysis and Systems Planning)
- Systems Analysis, (involves in depth Systems Analysis)
- Replacement System Design, (involves Systems Analysis and Systems Design)
- Replacement System Implementation (involves Systems Design + Programming and testing)

- replacement system Maintenance. (involves Systems Re-Design and debugging / Programming)

Many of these steps though listed chronologically, are in fact carried out concurrently and iteratively as the diagram below illustrates



Reasons for initiating a Systems Project

There may be several reasons why a business decides to introduce computers. Often, one particular area of the business is selected initially for computerisation, for one or more of the following reasons:

- large volumes of data require repetitive processing

- there is a need for better access to up-to-date information on, say, stock levels or sales
- high clerical costs could be reduced by computerisation
- better service to customers could result
- more control over certain areas such as customer accounts could result in an improved cash flow

An additional consideration in selecting what area to computerise first might be the complexity of the project it is usually better to cut your teeth on a relatively simple task and then apply the experience gained to something more complex.

System decay and Maintenance

Every system appears to have a life cycle of creation, operation and decay. This fact applies to everything from the universe itself down to say a brand new motor car which over time will break down and be repaired until it no longer becomes cost effective to repair it. Eventually it will be beyond repair and will become sold or scrapped.

Computer systems are very similar. They are created in a process called systems development, used in a process called operation, maintained as things go wrong, and eventually discarded in favour of a replacement system.

Knowing when to consider upgrading a system

Since all systems decay, this means that all systems must be maintained and eventually replaced. Sometimes we can put a time limit on the life of a system, and this will influence the way we design and construct it

Starting with a new system, over a period of time the system is operated and maintained. For the average computer system this period would be about four to six years. All the time change is taking place within the systems environment.

Eventually a time will arrive when the systems must be replaced, so the systems requirements are analysed and a system project set up, leading eventually to another new system.

When is the time to replace the system ?

One answer to this question is that company management will recognize a situation when things go wrong so often that people begin to lose faith in the system. However, this is not really systematic enough. Computer systems must be provided with planned maintenance.

Since maintenance is essential, the manager will budget each year for so much time or money to be allocated to its maintenance, then the time has come to replace the system. As mentioned earlier, it's the same principle as involved in running an old car. If you can afford the repair bills you keep it going, otherwise you cut your losses and get a replacement.

Sources of project requests

Naturally the situation is different if you have an existing computer system from that if you do not. A business manager who does not use computer systems may want one to solve a particular problem. Often, in manual systems, for example, information cannot be obtained fast enough to be really useful. Consider a very common situation in an office.

A customer rings to ask when their work order will be completed. You ask for the order number, and are told "sorry, I don't have it with me, but the name's green".

Your non computerised work-in-progress card file is in order number, and since it contains about two hundred cards, it might be some time before you found the right one to answer the enquiry. By putting this work-in-progress file on a computer, you could find all the greens instantly, and be able to answer the enquiry over the phone.

But when the manager already has a computer system, why does it become necessary to replace it? what needs repair? There seem to be a number of reasons, such as-

- Systems get replaced because of defects in their design.
- Perhaps the system doesn't do something that proves later to be necessary. Perhaps it's clumsy and difficult to use, and people start looking for easier ways to get what they want.

- Systems are replaced because technology is changed so rapidly that there is soon a cheaper and better way of doing whatever it is they do. Most technological products, including computer systems, tend to become obsolete before they become too unreliable to use.

Perhaps the most common reason is environmental change. Again, you'll remember earlier in the course, that we talked about systems interacting with their environment, and if their environment changed, then the system would probably have to as well.

Usually all three reasons apply to cause a system to be replaced, but it's most often environmental change that is the strongest. However well a system is maintained, there will come a time when its environment has changed to such a degree that it's cheaper to start again with a new system than to keep changing the old one.

The System Project

Computer systems are created by an organised process of analysis and design called a System Development Project. To achieve effective results, while minimising risks and costs, the project proceeds by well-defined logical stages. The following sequence of notes aim to give you an insight into the following areas:

1. Understanding how a project starts from a systems need, and the idea of the "System Life Cycle".
2. Describing the stages of system development, including project organisation, procedures, and documents.
3. Knowing how system developments need to be justified, both technically and economically.
4. Using various different techniques for recording and analysing system information.
5. Understanding the use of lists and diagrams to analyse, describe and structure data.

The user request (The terms of reference/Initial problem definition)

This will be the first formal step in the systems development cycle, but may well be preceded by informal discussions between users and the data processing department. It is, however, essential

that before any analysis work begins, the initial requirements of any new replacement system are written down as the terms of reference for any future work. This document is often produced with the assistance of the systems analyst. The terms of reference may contain

1. **Objectives:** what the new system must achieve; for example, cost reductions, better service to customers, better management information, ability to handle increased volumes of business.
2. **Constraints:** any restrictions on cost, equipment to be used, areas of business which are to be left unchanged and so on.
3. **Timescale** : when a solution is required.
4. The content and layout of required Reports or output that is required from you.
5. Problems that have already been identified with the current system.
6. Suggested solutions considered by management.

Exercise

1. Why is it essential for the systems analyst to have written terms of reference before beginning any analysis?
2. Why might people be resistant to the introduction of a new computer system?

The Feasibility Study

In the first stage of the system project (The Feasibility Study) the project must be justified or deemed to be feasible. Clearly, this is sensible before starting off on a long and expensive exercise.

The feasibility study is usually commissioned if the way the system functions currently is causing problems. It is carried out by Systems Analysts to determine if it is feasible to undertake a longer costly more detailed study of how to improve or replace the existing system.

The feasibility/planning phase involves the analyst recognising, diagnosing and defining the existing system and in particular its problems. During this phase the analysts may conduct a study to assess

the overall scope of the problem and determine whether more money and time should be expended in solving it.

The Analyst needs to prepare a plan of attack and select the individuals who will direct a project or serve on a committee. This phase lays the groundwork for further study in the Analysis phase that would follow.

The target document (i.e the report that is usually produced on completion) of the Feasibility / Planning Stage is the **Feasibility Study Report** which we will discuss in detail later.

Systems Analysis

Following the feasibility/planning stage the new system project is now established. If, as a result of the first stage it is decided that the project is justified, then the aim of the second stage (which consists of three co-related activities **Systems Analysis, Requirements Analysis** and **System Specification**) is to say as clearly as possible what the needs of the system are seen to be.

Systems Analysis is the process of clarifying the nature of existing information systems, the requirements for changes and additions, and how the new can be synthesized with the old to produce a system that meets the user needs. In English this simply means that the major objective is to learn and understand in fine detail how the existing system works currently.

As this understanding is established an analyst must concurrently begin to establish why the system doesn't perform satisfactorily by identifying the processes that are no longer needed or are causing problems.

We will during this course look at the way that an Analyst goes about the Systems Analysis stage of system development. This course presents both the tools for systems analysis and the procedures to be followed.

Systems Analysis is the stage in the System Development project where Analysts observe or talk to the users. They Analyse their Requirements (hence the name Requirements Analysis), and find out what they (the users) want from a new system, and integrate their desires into a 'model' of what the

final system will be like. This 'model' takes the form usually of a written report (stating the users identified requirements at that point) which is commonly known as the Requirements specification..

You must appreciate that all the notes in the world will not provide the experience to be gained from contact with users. Hence all we can do during lectures is focus on the tools, methods and techniques that you will use to build the system model rather than on the interactions with the users and existing systems that in real-world situations will provide the data you need.

We aim to use lectures to teach you what information you need to get to build a system model. It will not teach you how to get that information from the end users; that knowledge can only ever come from real life experiences.

The results of the analyst's work will be presented in a written report to both user and information systems management who consider the alternatives and the resources, such as time, people and money, of the organisation. If a decision is made to proceed, the project enters the design phase.

System Design

In the third stage of the project, the system is designed in detail . The design stage involves a number of tasks such as designing the output, input, files, database if applicable, system controls and test plan. Input forms must be designed, clerical procedures laid down and all aspects of the design must be documented.

It is important to appreciate that much of this third phase is in fact carried out at the same time as the systems analysis phase, that is the process of deciding and designing better ways to do things is carried out at the same time as the understanding of the existing systems is undertaken.

This happens because the human mind cannot retain too much information in one go, therefore a small piece of the current system is studied in full and then while this understanding is fresh new improved ways of performing this part of the system are envisaged and thought out and documented.

In the design phase, the analyst identifies and considers alternatives. The information gathered in the preceding phases allows an analyst to put down on paper the elements of a new or improved system. As well as designing the system processes in this phase, a major aspect of the design phase will be the derivation of the structure, organisation and format of the information that will be contained in the database used by the system.

Having mapped out the general aims and procedure of the new system, the next step in this phase involves deciding exactly how the system will be built. To do this you will need to determine what hardware and software you intend to build the system with. The analyst/designer may decide to build the system themselves, and/or if the project is a major one they may concentrate on identifying potential vendors and suppliers who will be able to provide the necessary equipment or facilities at a reasonable price.

Development (Coding, Implementation and Testing)

The latter phases of the System Design Project include Coding, implementation, testing and maintenance. Any new equipment and machines are ordered and set up, computer programs are purchased or written internally, and communication lines are leased and installed.

Coding

The system needs to be coded and the databases built to produce a working prototype based on the design. This prototyping approach allows users to access and use a dummy system so that their views on its merits and drawbacks can be gauged in order to fine tune the system to their exact needs before the system goes on-line.

Implementation

This is the phase of the systems development when the new system becomes operational. It is a critical phase of the project, requiring careful timing and the coordination and training of all the user departments involved.

There are however slightly different ways of implementing a new system which include direct changeover where one system stops being used, and the new one implemented, though normally a system will be implemented piece by piece.

Testing

It will be tested thoroughly as each part is implemented. Then as the system becomes complete full implementation will more than likely only occur after a period of running both systems in tandem until all the bugs are ironed out.

Final changes and modifications are incorporated in the new system at this stage. The objective is to optimize and fine tune the system. During this final step, systems documentation, which was begun early on is now completed and reports, paperwork and diagrams are prepared describing the system now in place.

There are two aspects to development: program development and equipment acquisition. The systems analyst or sometimes a senior programmer will write program specifications to describe what each program in the system will do and how it will do it. Programmers will then code, test and document the programs.

Maintenance

All systems need to be maintained; that is, performance monitored, modifications made if required, errors corrected, documentation kept up-to-date.

Nobody has yet ever written a computer system that was one hundred per cent correct and effective. Nobody ever will! With this in mind as the new system goes on line Designers and Programmers will be called back at intervals to iron out any bugs or breakdowns until the system appears to run correctly to everyone's satisfaction.

Once operational the system may well need to receive upgrades, and perhaps attention when hardware (or even software) breaks down.

Practical Class Activity

Q1: What circumstances might lead to modifications to a system becoming necessary?

Q2: Stage 3 above describes the development of programs. What alternative approaches could be considered here?

Practical Class Activity

1. The proposed introduction of a computer based system into an organisation can sometimes be a source of concern to employees.

- a) State one possible area of concern. (1 mark)
- b) For the area of concern you have stated
- c) Explain why such a concern might arise (2 marks)
- d) What steps can be taken in the organisation to alleviate this concern ? (3 marks)

2. Explain by means of a diagram, or otherwise, what is meant by the system life cycle. (5 marks)

3. Computer systems are often introduced into a business in an attempt to improve efficiency, both in terms of staff productivity and customer services. However, unforeseen circumstances, both organisational and social, can limit the effectiveness of any new system. Discuss briefly why a good technical specification alone may not be sufficient to ensure the successful implementation of a computer based system. (4 marks)

4. People responsible for acquiring computer systems for particular applications are often faced with a choice between a number of different systems. Outline in general terms the criteria which might be applied when making the selection of the most appropriate system.(5 marks)

5. Imagine you are a systems analyst working for a large company with its own computing facilities. Your company has just taken over a smaller company. You are asked to examine the suitability of a computerised system developed by the smaller company with a view to making general use of the system throughout the larger company. Describe briefly FIVE factors you would take into account in your evaluation of the system. (5 marks)