SURVAY ON STAGES OF SYSTEM DEVELOPMENT LIFE CYCLE.

By

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DECLARATION

The work is described in this thesis was carried out by me at the Faculty of Applied Sciences under the supervision of Mr. Manoj Subramaniyam. A report on this has not been submitted to any other University for another degree.

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AFFECTIONATELY DEDICATED
TO MY EVERLOVING
PARENTS.

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ABSTRACT.

Systems have common life cycle. They are designed, they are introduced, they evolve, they decay, and they are replaced. In the system life cycle; there is a learning and adjustment period before it achieves optimum performance; it then operates efficiently for period; and then because of internal or external factors it begins to decay and will after a time be replaced. In parallel to the operation of the system the system development activities are carried out; the bulk of this in terms of time is devoted to maintaining the evolving system as changes are required; the smaller part in time is concerned with developing a new system to replace the one which is in decline. The system development activities which was described above can be broadly divided into system design and system maintenance, but we need the system design part into a number of stages concerned with feasibility, investigation and analysis, design, implementation and post audit.

As the system life cycle proceed by 6 steps which are preliminary study, feasibility study, system analysis, system designing, system implementation and system maintains, of any error has been occurred, the system development can do by doing the procedure again from the step where error was occurred.

As every step was reported on the system life cycle, the changes could be inspecting again if it is needed again.

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 The System Development Life Cycle

Systems have common life cycle. They are designed, they are introduced, they evolve, they decay, and they are replaced. Whilst they are operating, they are susceptible to change from their environment and so continually need to be monitored and improved; eventually a state will be reached when it is no longer fulfilling its objectives, and then it will be necessary to carry out a through redesign; at this point minor modification will decrease and a fundamental reappraisal will be carried out. In the system life cycle; there is a learning and adjustment period before it achieves optimum performance; it then operates efficiently for period; and then because of internal or external factors it begins to decay and will after a time be replaced. In parallel to the operation of the system the system development activities are carried out; the bulk of this in terms of time is devoted to maintaining the evolving system as change are required; the smaller part in time is concerned with developing a new system to replace the one which is in decline.

The life of data processing system has started to shorten considerably. This is due partly to the rapidity of change in the business environment and partly to the continuing advances in computer technology. A data processing system, which survives without major redesign for ten years, is unusual.

The system development activities which was described above can be broadly divided into system design and system maintenance, but we need the system design part into a number of stages concerned with feasibility, investigation and analysis, design, implementation and post audit. Of course the activities of any particular project may not follow this sequence but in general the picture applies to most projects. It should also be noted that the stages are iterative to the extent that it may be necessary to go back to a previous stage are further work before continuing with the current stage.

Occasionally it may be necessary to purchase new equipment in order to operate the new system; in this case, alongside the detailed design and programming stage there will be two other activities-selection/ ordering of equipment and installation of equipment.

1.2 objectives and aims

- Gaining theoretical and practical knowledge on the system development life cycle.
- Tackling and troubleshooting of different kind of problems.
- Studying methods of implementing new systems.

CHAPTER 2

LITERATURE REVIEW

2.1 PRELIMINARY ACTIVITY

Before a system development project can begin, terms of reference have to be drawn up. Ideally these terms of reference should stem from an overall computerization plan for the organization so that each development fist in with all other developments in a coordinated way. This implies that senior management of the organization is involved in decisions about compute development at an early stage and that an overall survey of requirements is carried out. Whether this is done across the organization or just in a limited area, it should be sufficient to determine the objectives of each development. For example, the terms of reference for any given project should include:

1. A description of the area of computer application and the anticipate benefits from computerization;

2. An indication of the likely impact on the organization of development in the area under consideration;

3. A suggested time-scale for the development with allocation of resources at an appropriate levels for the duration of the project; at this stage the time-scale/ resources may only cover the feasibility study;

4. A detailed statement of the scope and limitation of the study to be carried out to try to avoid wasted effort on aspects of a system, which are not to be affected.

This statement of terms of reference should come from senior management and be the guideline for the staff who will conduct the study.

2.2 FEASIBILITY STUDY

2.2.1 Introduction

The first stage in developing a computer-based system is often a feasibility study; not all projects include this stage because some managers believe that there commitment to a development is so final that there is no point in using resources to test what is already a certainty. The objects of the feasibility study are to assess whether there are good technical social and economic reasons for changing to a new system; to try to ensure that any new system which is developed will be acceptable to users, flexible in a situation of change and reasonably robust; and to produce a fairly accurate description of a proposed new system which can be used as a basis for negotiation within the organization and with manufacturers of equipment. Most experienced computer staff would emphasize that equal weight should be placed on technical, social and economic aspects of a proposed change, and that all the people affected by the change should have an opportunity to influence both the way the change is planned and the resultant system.

A project team reporting to the computer development steering committee will normally carry out the feasibility study. The team will consist usually of one or more system analysts and a representative of the user departments affected by the proposed system but the work will involve staff from user departments as much as possible because they will have the knowledge of the existing system and views on what is required from any change. At this time some effort should be devoted to educating users about the likely impact of computerization to enable them to participate.

The basis activities involved in the feasibility study are investigation of current system, outline design of possible new systems and evaluation of these alternatives.

2.2.2 The Steering Committee

This is a group of several senior managers representing various organizational units. This is the project management team. This is mainly set up to ensure that the information system function was meeting the needs the enterprise. This consists with,

IS/IT manager,
Representatives of top management including finance manager,
User manager,
System analyst/project manager/team leaders,
Consultants.

2.2.2.1 Role of the Steering Committee

1. Preparation of terms of reference.
2. Formation of feasibility study team.
3. Provide advice and answer inquiries raised by feasibility study team.
4. Communicate with top management and users to facilitate the feasibility study team.
5. Review the current position of the project with respect to time, cost, resources and quality.
6. Monitor the project i.e. analyses the deviation from the plan and terms of reference.
7. Take corrective actions or search for alternative remedial actions to eliminate such deviations.
8. Recommend modifications to the project.

2.2.3 Stages of feasibility study

1. Formation of the steering committee.
2. Setting up the terms of reference.
3. Formation of the feasibility study group.
4. Planning the feasibility study.
5. Problem definition, investigation and fact finding in brief.
6. Project identification.
7. Consider three feasibility on each alternative or the selected alternative. Considerations are the quality, formats, speed, volumes, compatibility, security audit trail etc.
8. Select the best alternative. (Recommendation)
9. Prepare the project plan.
10. Feasibility study report.

2.2.4 Issues of feasibility

The first might be described as 'problem definition'. This stage is largely concerned with investigating current procedures to determine the problems, requirements and opportunities. This involves the team in setting the boundaries of the system; In trying to predict the changes that are likely over the life of the system; in examining the system as a whole I terms of its interfaces and information flows; in assessing the possibilities for improvements in the service to all the people affected by the system; and in identifying the alternative strategies which could be adopted to meet these opportunities.

The second stage is concerned with turning these alternative strategies into outline computer-based systems, which are more concrete and capable of being evaluated. An idea has to be formed of the approaches to gathering, sorting and receiving data, the equipment and people required, the volumes and frequency of activities, the timing of both development of the system and its operations; and the sources of supply of the various elements required.

The third stage is to evaluate these outline computer-based systems against the objective set by management and to recommend one of the alternatives for detail design and development. The evaluation will normally be concerned with three aspects – whether the outline system id technically sensible and viable, whether it is socially acceptable and whether it is economically beneficial. The approach is to rank the systems in terms of their technical and social compatibility, and then to evaluate financially the most acceptable sociotechnical systems.

Thus the major issues at each of these stages are technical, social and economic. These will now be examined in turn.

2.2.4.1 Technical feasibility

The technical aspects of feasibility are largely concerned with answering the questions whom? Why? Where? How much? And how often? In the context of both the existing system and any proposed systems. In other words an investigation of the present procedures is needed in order to identify the volumes, trends, frequencies and cycles of activity that will specifically affect the design of any computer-based system. It is this sort of quantitative data which enable more detailed costing of the proposed system. It also forms the basis for assessing the methods of input and data storage which likely to be appropriate to the different types of systems.

Following merger factors should be considered,

The finding of the investigation, various proposals can be put together for a new system; output reports, files input methods and program requirements can be outlined, and their acceptability to the user gauged; need for specialist equipment or extra storage can be assessed; the implications for the operation of existing computer systems can be measured; and so on. For each of the alternative approaches to the problem, a system needs to be defined in outline which is technically feasible and which then can be evaluated both socially and economically.

An essential part of the technical feasibility study is the examination of different methods of developing the system and running it. The system can be developed in a variety of ways: it can be designed and programmed within the organization; it can be contracted out to a consultancy firm; it can be developed in CO-operation: with other organizations which have a similar need; or it can be produced by modification of a bought in software package. The cost of each of these approaches is of course quite different and they need to be carefully evaluated as part of the technical design considerations.

The data can also be processed in a variety of ways. It is not, for example, necessary to use one's own computer for processing; it might be more appropriate to use a computer bureau, which sells computer time. Moreover, the processing can takes place in either batch mode (i.e. transactions being grouped before submission for processing) or demand mode (i.e. each transaction being processed as it arises): the input of data can be on-line (i.e. under the control of the computer at the time of entry) or off-line (i.e. submitted to the computer having been first converted to computer acceptable media); the devices used can be either local or remote. All of these possibilities (together with the very wide range of alternative devices for input, storage and output of data) need to be taken in to account in the outline design process. Often there is not a free choice about the type of system to be developed and operated because of existing constraints will lead to a less than adequate system, they should be explained in the feasibility report.

2.2.4.2 Social Feasibility

The social aspects of feasibility are largely concerned with the attitude of staff to the proposed change and the likely impact of the various alternatives on their jobs. This is very difficult to assess and is more the concern of user management than the system analyst; it is the job of the systems analyst, however, to ensure that some attention is paid to the problem.

Some of the important things, which need to be taken into account, are as follows:

1. What is the level of knowledge of computerization among staff?

   Previous involvement in a systems project will help staff to understand what is happening and why. If this experience does not exist, then it is essential that some education is offered to staff as early as possible; this should cover computer appreciation in general and discussion of the proposed application area in detail.

2. How good are the mechanisms for consultation and discussion?

   Because a new system, if recommended by the feasibility study, is likely to lead to significant changes in the work situation of staff, it is essential that adequate channels of communication be set up if they do not exist. This is to facilitate airing of grievances but also to enable people to contribute ideas to the organization.

3. What is the organization's attitude to change?

   A major influence on individual attitudes will be his/her experience of previous changes; if consultation has been minimized in the past, then inevitably hostility will have been instilled in people's minds. This can only be eradicated by an open approach by senior management.

4. What will be the likely effect of the change on people's jobs?

   People tend to be happy with what they know and frightened of what is new. . . careful analysis has to be carried out in the feasibility study of the impact of the various alternative solution on individual jobs; need for redundancy, redeployment, retraining, removal etc. must be carefully anticipated even if only in broad terms. The introduction of a computer system should be seen as an opportunity to improve people's job satisfaction. This means attention has to be devoted to extrinsic factors like salary regarding, work environment, group relationships and social support; but equally important are the intrinsic elements of job satisfaction such as an autonomy, responsibility, challenge, and variety. The social feasibility is concerned with examining how these requirements can be built in to the new system.

Many of the points mentioned above are outside the control of the systems analyst conducting the feasibility study. Whether the needs of people are takes in to account depends to a large extent on the authority structure of the departments concerned, and the leadership style of the most senior manager involved. If his style tends to autocratic, then he is unlikely to be persuaded that staff should be either educated or consulted and he will probably dismiss the comments on job design as sociological claptrap. There is little that the systems analyst can do other than to try to persuade the line manager of the validity of the approach.

2.2.4.3. Economic aspects

The feasibility study by this stage should have identified a number of technically and socially compatible systems and the requirements now is to evaluate these financially in order that they can be ranked for management.

In the economic evaluation, the team is concerned with comparing the costs of doing things in a particular way to the benefits. The evaluation will first gather information about the costs of the present method of operation;

2.2.4.3.1 Costs

Costs are calculated so that they can be compared with the cost of the proposed system. Technically, the costs will relate to the scale of the system (volumes of data, frequency of processing cycle of activity), the response time required, the location of operating units in relation to the computer processing facilities, the method of data capture selected, the security requirements, and the extent to which running costs of new equipment or software can be shared with other systems. Social costs will relate to the staff training and development needs consultation mechanisms, salary changes, and the design of jobs.

Clearly costs will be affected by policy decisions of the organizations to choose a particular manufacturer's equipment, or a particular piece of software; similar decisions about the processing facility (bureau or in – house), the method of acquisition (purchase or rent or lease), and the approach to system development (in – house entirely or software house or package) will determine the costing.

The major part of the cost is in staffing and not hardware; the cost of producing software is rising whilst the cost of hardware is relatively reducing.

2.2.4.3.2 Benefits

The benefits of computerization tend to be broken down into two types – tangible and intangible.

2.2.4.3.2.1 Tangible (direct) benefits

These are direct savings, which can usually be easily evaluated. They included such things as reduction in staffing, accommodation and equipment, reduced stock investment, reduced maintenance costs, reduced peaking costs, avoidance of increases in numbers of staff, less staff turnover, increased capacity etc. These are clearly subject to a certain amount of guesswork but they are relatively easy to put a value on.

2.2.4.3.2.2 Intangible benefits (sometimes called gains)

These are more difficult to quantify. They include:

Better information for decision making
Better planning (because of availability of corporate information)
Better Company images
More control and discipline in systems
More flexibility
Better use of managers' skills
Quicker processing of data
Improved service to customers
Competitive advantages
Less disputes among staff and management
Time saving
Improved productivity

These are benefits of computerization but they are difficult to evaluate; for example, the availability of better information doesn't in itself make a manager a better decision – maker, and improved service to customers is only useful if it is the right service (i.e. the right products are being offered at the right place). Generally, the feasibility teams have to try to persuade managers to quantify the benefits, which feel they will gain from these improvements.

The benefits and the costs of the new systems need to be presented in the form of a cost benefit analysis. The justification for expenditure on a new system must be that it will either produce more income or reduce expenditure. The alternative systems proposed therefore not only need to be practical and useful but also cost justified. The common way of presenting the cost benefit analysis is to show management a picture of cash flows involved in the system demonstrating the return on investment. The crudest method is the pay back method where the benefits over a period are related to the cost outlay to show the profit over the period, the percentage rate of return, and the break – even point. The clear disadvantage of this method is the fact that it takes no account of the declining value of money. A pound received now is worth more than a pound received in the future. More sophisticated methods such as net present value, discounted yield and discounted cash flow apply discounting factors to the income figures to gain a more accurate picture of the value of the benefits. This type of approach allows the organization to compare all its capital projects on a similar basis.

2.2.5 Feasibility report

The feasibility report must be reach some conclusions about the proposed system even if the conclusions are that there are two or three possible approaches to be followed. It should cover these areas:

1. Introduction
2. Terms of reference i.e. description of the area of activity under consideration, the objectives to be satisfied and the relationship of the development to the overall plans for computerization.
3. Description and specification of the existing system, its problems and advantages, and the requirements of the new system. This section should also give figures on the costs of the existing system for comparison purposes.
4. Description of alternative proposed systems in terms of how they will work, how the organization will be affected, and how much they will cost.
5. Evaluation of alternatives and recommendations.
6. Development costs and time – scale of development

The evaluation area is the key part of the report and should cover all aspects of the system alternatives and not just costs and benefits. Some discussion should be presented on the security aspects of the system (e.g. reliability, accuracy, quality control), on the usefulness period (e.g. capacity for expansion, flexibility, maintainability), on the user reaction and degree of user management support, and on the time scale of development ,implementation and operational life. In particular the benefits should be carefully analyzed, with some specific estimates of the likelihood of their being achieved.

The report will be submitted to the computer development steering committee and a decision will be made on the approach to be followed. This is the major decision point in any project because of the high expenditure on the system development, which follows the go-ahead. The whole process of feasibility is iterative, however, and it might well be that the steering committee would reject the recommendation or ask for further investigation to be made. One final point, which perhaps should have been made earlier, is that the proposed approaches do not necessarily have to involve the use of a computer. It is perfectly reasonable for the team to recommend and improvement in the system without introducing computer methods.

2.3 SYSTEM ANALYSIS

2.3.1 Investigation

2.3.1.1 Introduction

The investigation of an existing manual or computer based system will begin when the computer development steering committee has decided what the investigation is aimed to achieve. It may be that the investigation is aimed to achieve. It may be that the investigation initially will be part of a feasibility study intended to provide information to allow some assessment of the viability of a project or it may be that the investigation is to be conducted in depth as a result of the recommendations of the feasibility study. In either case, the investigation team should be provided with terms of reference. Ideally these should be negotiable so that all the participants can agree them. The terms of reference will define the scope, the objectives, the constrains and the resources of the investigation.

The scope will often be defined in departmental or procedural terms (e.g. Investigate the sales ledger activities of the accounts department); this can be awkward when the investigation of information flows inevitably needs to cross organizational boundaries, but the intention is to provide boundaries for the investigation. The objectives should be expressed (ideally) in a quantifiable way, but often they are rather vague; it is very difficult to measure the achievement of an objective such as 'to provide management information', whereas an objective such as ' to reduce the time delay in sending out invoices from one week to one day' is more concrete and measurable. It is not unusual, however, for objectives to emerge during the investigation as more knowledge is gained about the problems of the department under review. The constrains should pin-point those aspects which are not going to change; for example, if no extra equipment is to be purchased, this should be known from the start, or, if no staff are to be made redundant, this should be publicly announced; there is no point in the investigation team wasting time o possibilities that do not really exist. Finally, the terms of reference should include a statement of resources available for the investigation, i.e. how many staff for how long. The decision to investigate a particular aspect of an organization's activity will often emerge from rather vague feelings among managers that there is a problem. It may be felt that service to customers is deteriorate or that too much capital is employed or that cash flows need speeding up to improve liquidity. In each case a variety of approaches can be taken to the problem and the systems analyst may find he having to identify the most appropriate. This clearly involves a reasonably wide study of the organization as a whole and a mature experience of the nature of business policy and organization. In this type of exercise, terms of reference will be less specific.

2.3.1.2 Approach to the investigation

Once the project team has been given the terms of reference, the investigation has to be planned in some detail. The first requirement is to build up background information about the area of study to enable identification of specific problems, procedures and people that need through coverage. Once the team knows what the investigation is going to involve, it can then plan interviews with the appropriate staff to discover details of the type of information required, the current procedures and their deficiencies, and the files, documents and records used.

The approach t the investigation must always be formal – working down the hierarchy from the most senior manager. It would be discourteous to conduct interviews with junior clerks without having first sought the approval of their supervisor and his manager. The systems analyst should also deal with staff in a confidential manner so that staff feel they can trust him and talk openly about the problems as they see them without being 'reported' to their superior. Part of this atmosphere of trust needs to be created by honest and free discussion of the implications of the investigation, and by keeping people informed of the way things are developing. And, of course, the help users provide to the systems analyst must be gratefully acknowledged.

Throughout the investigation it is valuable to encourage users to participate in the assessment of requirements and problems of the system. The more they can be involved in and contribute to he systems analyst activity, the less will be their alienation from the eventual findings. In any case the users have far greater knowledge of the operation and shortcomings of the existing system than the system analyst.

2.3.1.3 Background information

It is necessary for the systems analyst to gather some background information before the investigation proper can begin. This information is required to enable the planning of the detailed investigation and also to provide talking points when interviews with user staff are under way. A lot of background information can only come from work experience in the organization and talking to other members of staff. Thus a systems analyst that has worked for an organization for a long time will need to spend much lees time picking up background information than the new recruit.

The kind of background information that is needed breaks down into four main areas:

1. First, there is information about the environment in which the organization finds itself: here one might wish to know about the competitive situation, relationships with other similar organizations position vis – a - vis customer and suppliers, impact of government policies, labor relations climate etc.

2. Second, there is information about the organization itself, its policies and the atmosphere within various parts of the organization; this information can be gathered to some extent from company reports and trade journals but mainly from informal conversations with other employees.

3. Third, there is information abut the structure of the organization, e. g. the number of departments / divisions, their location and staffing levels, and the nature of their responsibilities. Equally important some feel for the extent of planning within the organization and the style of management adopted. Detailed information is needed about the formal organization structure of the area of the organization, which is being investigated, its operational activities and terminology used.

4. Fourth, valuable background information is provided by previous investigations in the area under consideration, conducted either within the organization, or in other organizations; these might include work study, O & M and job evaluation exercises, or descriptions of packages used for particular computer applications.

This background information needs, of course, to be specific to the particular area under investigation. For example, if one is concerned with a production control system, one might be interested in knowing abut raw material supplier performance, labor relations, absenteeism, payment systems, government energy policies, trends in product demand, the structure of the production department, number and responsibilities of staff and their relationships with other departments, attitudes of managers and staff to computerization etc. This sort of information would determine the initial emphasis of the investigation. It would help the analyst to form an idea of whom he would wish to interview, in what sequence, and what he would wish to seek information about. The background information will enable him to talk reasonably intelligently to specialists and to formulate some ideas to organize a discussion with senior managers. This relative importance of different pieces of information can only be gauged as experience is gained.

2.3.1.4 Detailed information

When the system analyst begins the investigation in detail he will tend find himself gathering information at two levels – management and operational. At management level, the requirement is to discover what decisions the manager makes and what information is needed to enable the decision to be formulated and made; at operational level, the investigation will be concerned with the various procedures that are carried out, the data that is used, and the information which is created for use by management.

2.3.1.5 Management level

There are various levels of management with organizations; they are usually categorized as top or strategic, middle or tactical, and junior or supervisory. Depending on the scale of the investigation, all levels or perhaps just one level will be involved. Regardless of the level, the systems analyst needs to discover how a manager approaches his task – how he plans his work and the work of his department, how he organizes and staffs the tasks that have to be performed, and how he measures performance. He needs also to identify the decisions that he manager is required to make and the information he uses (or requires) to support the decision – making. Most importantly the analyst has to try to determine what the managers objectives are. Often these are difficult to elucidate when managers are not used to thinking in terms of objectives, but identification of objectives is very helpful in determining information needs. Information is required enabling the manager to plan to achieve his objectives and to measure the achievement.

2.3.1.6 Operational level

At operational level, the system analyst must attempt to find out the detailed procedures of a department i. e. who does what, when, where, how and why? This information needs to be comprehensive and thorough, covering all the different types of activity. Accommodation supplies equipment all need to be examined to assess their contribution to be procedures. In particular, the system analyst needs to discover the difference between routine, control and exception procedures.

Often the clerical staff forgets the exceptional procedures when describing their system; and usually the exceptional procedures, which are relatively simple to build in to clerical systems, are relatively simple to build into computer – based systems. Problems, which emerge from the investigation, should be thoroughly examined to ensure that the analyst understands them.

Each procedure will make use of lots of data and the analyst has to identify the data involved. It may be in the form of documents, verbal massages, or information kept in the user's head. Files of documents, which have accumulated over a lengthy period, are useful to the analyst, and master files (e.g. customer records, supplier records) are extremely important as the reference points around which procedures are built. In particular the analyst will want to discover the volumes of documents over a particular period (and the rate of growth), the frequency of usage, and the size of master files. This quantitative information is essential to the job of sizing a new system.

2.3.2 Analysis

The analysis of findings is not a separate stage or the overall activities but integral part of the investigation process. The analyst is continually thinking over the implications of what he has discovered and trying to assess the possibilities of changing the existing system. All the time he is trying to measure his findings against the original objectives set for the investigation. He doesn't have a completely free hand in designing a new system; there are considerable constraints of time and money and user acceptance. In particular the analysis has to take place within the given organizational framework of policies, objectives, structure etc. but despite this, the analyst has an obligation to question to question everything, which he is told, and to test its validity.

The approach to analysis is normally to examine what happens in a system and to ask why this happens in this way and whether it could be improved by happening a different way. The analyst will discover symptoms of problems which will point him in the right direction in looking for improvements, but essentially he must take a wider approach, often seeking more fundamental and radical solutions than come immediately to light.

A basis for analyzing a system can be found in systems theory. The analyst begins by assessing the objectives of the system under study; often the objectives are difficult to identify because the managers concerned are happier talking about what they do than why they do it; when they are identified they may be very complex and not easily quantified. Once the objectives are established, then the various parts of the system can be examined. What actions are required to achieve the objectives and are they correctly made? What information is needed to enable the decisions to be made? What procedures are required to produce information? What input data is available to these procedures? As each of these are considered, the systems analyst has to look in painstaking details at the elements of the system, their interrelationships and their usefulness.

In this way, the analyst is building up an understanding of the current system, and more importantly, formulating ideas must about a proposed new system. These ideas must reflect his own objective appraisal of what is needed and the stated requirements of the user departments. The output of the analysis stages is a statement of user requirements, usually in the form of a series of alternatives, which can be debated by the steering committee. At this stage the emphasis is on logical requirements and has no regard to the physical implementation of the requirements. This comes in next stage.

2.3.3 Requirements for specification

2.3.3.1. Modeling the users' requirements

The main output of the investigation and analysis stage is a model of user requirements. In recent years, with the advent of structured approaches to systems analysis and design, the main tool for modeling has been the data flow or activity diagram. A data flow diagram is intended to provide a unified approach to analysis and design by concentrating in structured way on the logical requirements of the system. Its perspective is the flow of data between the processes, which transform the data rather than the location, control or physical implementation aspects. It is based on a hierarchical, top-down decomposition of the logic of functions of the system. The structured approach can be taken through to the design stage because the lowest level processes can be defined as logically independent of each other and of the mode of physical implementation.

2.4 SYSTEM DESIGN

2.4.1 Introduction

The investigation and analysis stage of a system project will result in an outline of user requirements for the new system possibly modeled in the form of a data flow diagram. In order to produce this, some design activity have taken place; so the division into stages is somewhat artificial. At some point, however, the systems analyst has to document his ideas about what the new system is going to look like. It is generally agreed nowadays that this should be done in two stages-logical system design and physical system design. The logical system is the system as the users require it and the physical system is the system as it is designed for a particular physical environment. The rationale behind the split is to acknowledge that there are several physical ways of achieving the user's logical requirements and to ensure the users and not vice versa.

The logical system design stage involves the systems analyst in identifying the good points in the existing system, the requirements of management and the flows of information related to decision-making and overall corporate objectives, and in developing ideas about how the system could be improved to meet these needs. These ideas will be documented in the form of a specification of requirements. The physical system design stage takes the specification of requirements and produces detailed specifications of inputs, outputs, files records, codes, procedures, dialogues, forms, controls, security etc. from which programs can be written and new user procedures devised. Both of these design stages are, of course, constrained by the overall system objectives and by the resources available to the project. Thus the design must be both expedient and purposeful. The overall system objectives will vary from project to project but they are concerned with such thing as:

1. Accuracy and reliability:
   The system must have an appropriate level of accuracy.

2. Integration:
   It is important to know the system's links with other subsystems of the organization.

3. Expandability:
   The system must be capable of handling all envisaged expansion during its life.

4. Acceptability:
   The system must be capable of being operated and be acceptable to the people required to operate it.

5. Security and control:
   The system must ensure confidentiality of stored data, prevent invasions of privacy, and minimize accidental or deliberate destruction or loss of information.

6. Cost:
   The system must be designed in a realistic way to meet the cost guidelines laid down by management and to ensure that the system is economically viable.

Clearly the emergent system will be designed as a compromise between these various objectives and principles.

2.4.2 Logical system design

The design of the logical system will take as its starting-point an outline model of user requirements. Assuming that this is in form of a flow diagram, the process of logical design involves successive refinement of the model until it meets all of the user requirements. The refinement normally starts with the outputs of the system and works back via files to inputs and procedures, taking into account the objectives and constraints that the system has to accommodate.

Inputs and outputs need to be outlined and discussed with the user staff. The stock status report, for example, might be outlined. This would be discussed with the users and amended unit it was felt to be satisfactory. It would then be documented to give a formal idea of its layout, content and the medium to be used for its production. This would be influenced by the frequency and rapidity of response required; it might be a printed output or it might be displayed. Fine detail is not too important at this stage. The same process has to be followed for each of the outputs of the system. Once all of the outputs have been documented, the next step is to work out which can be stored or calculated within the system.

2.4.3 Physical system design

When the logical system has been defined to the satisfaction of the user, work can begin on detailed physical system design, i.e. detailed specification of the way the system will operate in a specific environment, using specific equipment and specific people. There are lots of tasks involved in physical system design, covering all aspects of computer-based systems. For the sake of simplicity they will be broken down here into a series of separate tasks, though in practice they would but be carried out separately or in isolation. The tasks which are described here are output design, input design, file design, program design, user procedure design, forms and dialogue design, and security and controls. Any approach to computer system design will involve all of these aspects in an integrated way. The design of files, for example, will be tied in with the design of input; input must closely relate to forms and dialogues; all data has to be considered in relation to programs, and programs in relation to user procedures. In other words, they all relate to one another and cannot be carried out without these relationships being optimized.

2.4.3.1 Output design

The outputs from a system will have been identified in outline as part of the logical system design. The task now is to fill in the details, choose the output medium and specify the outputs for the benefit of both user and programmer.

The detailed aspects of the will largely depend on the type of output. External documents will normally be printed on pre-printed stationery with great care given to the quality of layout and printing. Internal outputs may be in the form of printed reports or interactive displays. Printed reports will generally be on standard listing paper with headings etc. printed by the computer; neatness of layout is important because the user has to feel happy with the document, but it is not as crucial as with an external document.

Interactive outputs are displayed on a visual display unit or a teletypewriter and, though they tend to have a short life, they need to be well designed to aid the terminal operator and to avoid confusion. A final, more specialized type of output is the 'turnaround' document, which is printed by computer and then has extra information added by users before being read again by the computer. Clearly the quality of paper and printing in this situation is of crucial importance and will be determined by the requirements of the document reading device.
Once the output has been determined, the next thing is to determine the output medium. The most common output devices are the line printer for documents and reports, and the visual display unit for interrogations, data entry and interactive conversations. In addition to these, the graph plotter, magnetic media and computer output microfilm should be considered. The choice of medium will depend on the nature of the output, the location of the recipients, the speed of response required, and the cost.

2.4.3.2 Input design

Input design is a major part of physical system design because the decisions involved will have a major effect on the cost of the system and its acceptability to the users. Providing input data for the computer in a relatively speedy and error free way is a major system problem. Before detailed input design begins, some idea will already have been gained about the nature or the input data; the task now is to determine detailed aspects, to choose the input medium and to specify the input data for the programmers.

2.4.3.3 File design

The design of out put and input is relatively straightforward but absolutely crucial because they are the points at which human beings come into contact with the computer system. The designing of files is more complex because it will directly affect the efficiency of the system and it is integrally linked to program design.

2.4.3.4 Program design

The system analyst's task with regard to programs is to provide to the programmer a sufficiently detailed statement of what the computer procedures are intended to achieve so that programmer can produce the programs. The extent to which the systems analyst defines each program depends on the standards used in the installation. In some comput.. department a senior programmer will be included in the project team to assist with the design of programs, and so programs may be individually specified even to the extent of outline logic. In other situations the systems analyst will define the overall requirements in terms of the outputs required and the file and inputs to be used, and the programmers will work out the combination of programs required. In this case, the analyst will provide a program suite specification to the programmers rather than a program specification. Whichever is provided, it will act as a kind of contractual document, which defines the job that the programmer has to perform for handing over to the systems analyst.

Regardless of the extent to which the systems analyst specifies individual programs, he has to have an understanding of program design because his decisions on file organization and access methods will greatly affect the programs. If, for example, a file is to be stored on magnetic tape, then it can only be processed serially; this determines the nature of the processing program.

The main tools used by the systems analyst in defining procedures are flow charts, structured English and decision tables. In program design, a computer run chart will depict an overall program suite and program logic by structured English, procedure charts or decision tables. None of these is intended to determine the structure of a program or its detailed logic; rather they are used by the systems analyst to attempt to clarify the procedures which he requires and which tend to be confusing when presented simply in narrative form.

2.4.3.5 User procedure design

User procedures are those activities carried out in the user department in the preparation of computer input and in the utilization of computer output. They are clerical procedures but, because they interface with computer-based procedures, they tend to require formal definition. Their design is closely related to forms and dialogue design, computer procedure design and input and output design.

2.5 SYSTEM IMPLEMENTATION

2.5.1 Introduction

The purpose of this it to allow the systems analyst and programmers to carry out development and documentation of programs and user procedures without fear of them being changed. Once the specifications are frozen and the analyst is quite clear about the new system and its implication, the planning of implementation can begin-indeed, must begin, because there is a lot to plan. This planning activity will go in parallel with the writing and testing of programs and the writing of user manuals and computer operations manuals. Thus it will commence early in the project.

The implementation of a computer-based system is a large-scale activity. Although the duration of the implementation is relatively short it involves large numbers of people, especially in the user departments. In fact, it can be said that the emphasis of the computerization project shifts away from the data processing department to the user departments, which face both upheavals in procedures and a greatly increased workload. Sometimes the implementation of a system is handled as a separate project in its own right, with a junior system analyst responsible for guiding the users through the time of disturbance. Clearly, if the implementation is not properly planned, the disturbance can easily result in chaos.

2.5.2 Implementation planning

The planning of this stage should not be carried out by the systems analyst in isolation. Because of the nature of implementation, in which people have to be given instructions about their duties, it is essential that those carry out the planning with executive power, i.e. the line managers and supervisors of departments. The normal practice is to set up an implementation committee, which is separate from the project team and which reports to the computer development steering committee. The *implementation committee* will consist of the developments affected, the systems analyst involved, a representative of the personal department and some representatives of user staff, and will be chaired by the most senior line manager. The systems analyst will offer advice to the committee and will assist in carrying out its decisions.

The committee will meet regularly during the planning of the implementation and very frequently during the implementation itself, when it will be trying to resolve the various problems, which arise from day to day. Initially its deliberation will be concerned with to effect the implementation; later it will be concerned with sorting out specific crises.

The issues with which the committee has to deal include methods of implementation, staff selection and allocation, resources, and time-scale, but perhaps more important than any of these is the need for it to set up clear channels of communication and opportunities for consultation so that those affected have an opportunity to their grievances.

2.5.3 Methods

Choice of methods of implementation is relevant to each of the activities shown below.

- Implementation planning
- Program testing
- System testing
- Installation
- User training
- File conversion and set up
- Acceptance testing
- Changeover
- Hand over

For example, there are different approaches to training, testing, file conversion and set-up and changeover, as will be described later. The committee has to decide which of the approaches is the most appropriate to the given circumstances.

2.5.4 Staff selection

Staff selection and allocation clearly is a critical of implementation. Some will be relocated or redeployed; most staff will have different jobs under the new system. It is no easy matter to decide who is going to do what but it has to be decided fairly early in the process and certainly before training can begin. The line manager will normally make the choices, advised by the personnel department.

Resources are a crucial of concern during the implementation because the user staffs at a time of great upheaval are often being asked to do extra duties. For example, training courses have to be attended, files have to be converted and checked, and sometimes system need to be run in parallel. All of this has to be done whilst the user staff are keeping the old system in operation.

2.5.5 Time – scale

Finally, the time – scale to be worked out. Time is invariable very precious during implementation. Files have to be not only converted but also put into use as soon as possible so that they don't become out of date. Testing has to be seen to be thorough but also swift so that other stages can be put into action. Above all, the changeover normally has to take place at a point in time to gain the maximum benefits.

All of this points to the need for excellent planning and control to ensure the optimum use of limited time. And the planning must begin sufficiently early to allow full democratic discussion of the effect of the system on individuals.

2.5.6 Training

Training must, first of all, be distinguished from education. Training is about giving people skills; education is about given them knowledge and helping them to adjust their attitudes. Education is a necessary complement to training but it should not take place at implementation time; this would be too late. Education should take place at the beginning of a project so that users informed of what is likely to happen and, more importantly, so that they can contribute to the investigation and design stages. If the users have not been so educated and have not made such a contribution, the design is not likely to be very acceptable to them. Education sessions should be in the nature of computer appreciation courses for staff at all levels; there should be lots of participation with opportunity for staff to argue about their doubts and grievances. By the time implementation arrives, the users should know more or less what the new system involves.

Training then concerned with giving the users confidence in the new system by giving them the requisite new skills. Training is required for many different staff, including users, computer operators, data control staff.

Managers and supervisors should conduct ideally training session so that people with whom there is some identity pass the message on the user's terms. The session should be short and regular rather than long and once off in order to foster assimilation and learning. They should involve plenty of practice and demonstration and only a relatively small proportion of formal teaching or lecturing. Obviously well written and readily available user manuals must support the sessions. Job aids such as wall charts. Notices, flow diagrams etc. should be made use of to provide visual assistance to the learning process.

2.5.6.1 Methods of Training,

- Consultant and advise
- Lectures
- Courses
- Seminars and workshops
- User manuals, books etc.
- Notices, displays, computer bulletins etc.
- CBT (Computer Based Training)
- On the job training
- Job rotation
- Temporary promotions
- Participation in the system development process
- User groups
- Information center
- Help lines
- On line help

In all of this, the role 'trainer' as to urge on management the need for full and adequate training for staff affected by the system. The user needs this support and successful persuasion of management by the systems analyst would be a major contribution. The users' perception of the change will often be quite different from that of the systems analyst, and this is a good reason for encouraging user departments to be their own training.

2.5.7 System testing

The object of system testing is to ensure that the system is operating properly before the files are converted and set up on the computer in readiness for the changeover. At this stage the tests will normally be mainly carried out on the computer procedures using artificial data to attempt to check the accuracy of the programs, the testing of individual programs is the job of the programmer(s) called Unit Testing. When the programs are handed over to the systems analyst, they are combined together to form the system. The Integration Testing is carried out to test whether they are combined correctly or not. Finally they go for System Testing, they should be working exactly in accordance with the specifications provided by the analyst; in a sense, the program specification forms a contract between the analyst and programmer, and it is the latter' s responsibility to produce a program, which precisely meets the specification. Similarly the user system definition is a kind of contract between the user and the systems analyst, and the latter has the responsibility of ensuring that the system does what has been agreed.

It is good practice for the programs to be handed over to the analyst, with the entire test data and results as part of the full program documentation. The analyst then has the opportunity to examine the results and to assess whether adequate program testing has been carried out. System test data should be completely separate and should become a permanent file, which can be used to test the system after any subsequent changes to the system. System test data should test not only program logic but also volumes and working conditions.

The aim of the test should be to check all aspects of the system including the logic of the programs-although it is virtually impossible to check every possible pathway. The analyst will tend to concentrate on known error or exception conditions and examine the effect of these. Obviously he will be concerned that the standard program tests are included in his test data, but his emphasis must be more on environmental factors. It should be possible in the system tests, for example, for the users to complete input documents or to enter data at the terminal, to access files, and to handle outputs so that they can get a feel for the speed of operation, the types of problems which can arise, and the nature of their interface with the system. this is why, it is important for training of user have taken place before system testing.

2.5.8 File conversion and set-up

File conversion is the activity of changing existing files into a form whereby they can be loaded on to the computer and are acceptable to the needs of the new system. File set-up is the process of loading and then checking the new files. File conversion needs to take place as late as possible in the development cycle-it would be pointless to convert files far in advance of the changeover data, because the greater the distance between conversion and changeover the more the changes that will have to be made to the converted file when they come into operation. Because of the need for a short interval between conversion and changeover, the conversion is a very critical activity in implementation and needs to be well planned and well executed.

It is almost a system project in its own right. The existing files have to be investigated and documented and a method has to be designed to do the conversion; this may involve form design, clerical procedure design, training and even program specification and writing. Thus it can be an expensive activity. In addition, because the files have to be converted at the same time as the existing system is in operation, it is usually necessary to pay for part-time staff or for overtime for full-time staff to do the actual conversion. This will involve, normally, taking the existing file and transferring the relevant data from the records in it on to special forms which can then be punched for punching to be carried out directly from the existing records because of changes in codes, formats etc. in the new system. Thus, if one estimate the average size of customer file or product file at about 10000 records, the size of the conversion task becomes clear; allowing half an hour for the transcription of each record on to the punching form, there are approximately 700 man-days of work involved and that doesn't include punching, computer time or checking.

In addition to the mere size of the exercise, file conversion is fraught with other difficulties, which can be very awkward to overcome. For example, manual records tend it be not very accurate; this is because the users often hold the correct information in their heads and they do not bother to correct the written record. For the computer system, if the conversion process retains inaccuracies, errors will be magnified by the computer's inability to judge the accuracy of a particular piece of data.

Another problem is the need to edit existing records into the form required by the new system. If the customer code format is changed, then the entire customer codes on all the records need to be changed. If the name and address are to be restricted to four lines of thirty characters, then someone has to decide on the format for each name and address.

If the data of birth of each employee is to be recorded in a personnel system, it may be found that this was not the case in the old system and that several dates are missing which have to be collected. Lost of similar examples could be quoted.

A third problem is the location of the records, which are to be converted. In certain situations, the records may be located in several different places. The convention of customer records for several different branches is a common of this type of situation. Here, it may be necessary to bring the records together for the conversion process: if this is not done, then there is a danger that small differences will creep into the conversion process at each location. A slightly different problem occurs when the new records are to be a unitary combination of several previous records.

The most difficult problem of all is the accessibility of live files. An existing file, which is in constant use, such as a car-hire file, is required to be available for the purposes of the existing system. This means that two difficulties have to be tackled. First, time has to be found to do the conversion; and second, all the changes to the file which take place after the conversion and before the changeover need to be retained to be acted upon as soon as the new file is in operation. This can involve a lot of work and problems of control.

Once the conversion has taken place, the new file can be created. This is done using either the file amendment programs written for the new system or specially written one-off programs. Here the major problem is ensuring the accuracy of the conversion. Errors can occur at any of three points-at the transcription stage when data from existing records is written on to the file conversion forms, at the punching stage, or at the file creation stage. There is a clear need for careful validation of input, thorough control mechanisms to check that no records are lost, and checking by user staff of a printed version of the computerized record. Ideally each record, once set up, should be inspected for accuracy.

The accuracy of the conversion cannot be overemphasized. If the system is to work correctly, obviously its files need to be set up and maintained correctly; 'clean' files are one of the prerequisites of effective data processing system. Users will always believe that the files used in the manual system were perfect; they must feel equally. Confident about the new files. If errors occur, invariably the users will say 'well, they were always all right in our department. The success of a system can often depend on the confidence, which the users feel they can place on the files. The analyst should therefore try to ensure that thorough system testing takes places once the new files have been set up.

2.5.9 Changeover

Once the files have been converted the changeover from the old to the new system can commence, but this presupposes that various other preparations are also complete. For example, the users must have been trained in the changeover procedures as well as the new system procedures; all tests must have completed to the satisfaction of users, management and computer staff; the various manuals about the system must be available to the relevant staff; all new equipment must have been commissioned and accepted; and the coordinating committee must be happy that the time-scale is operable. If all of this can be achieved by the target date and the new files have been cleared, then the changeover begins. Changeover can be achieved in a variety of ways but the most common are 'immediate', 'parallel' and 'stepped'.

2.5.9.1 Immediate changeover

Immediate changeover is the name given to the method, which leads to the complete replacement of the old system, by the new at a point in time. The old system operates until the end of a week or a month, say and at the beginning of the next week or month the new system begins. There is on fall-back position of the new system should be found to have unforeseen errors or problems after a few weeks or months, because the old system has not been in operation over that period. Thus, which immediate changeover is the simplest and least expensive method, it is also the most risky. It requires absolute confidence in the new system on the part of both users and computer staff and is better employed when the users have some previous experience of computerization than when they are complete novices. It tends to be used when the new system is not directly comparable with the old, or when the time-scale of changeover is very tight, or when resources prevent parallel running provides a more thorough checking exercise such as. It is obviously essential with an immediate changeover that prior testing of the system has been exhaustive.

2.5.9.2 Parallel running

Parallel running is the direct alternative to an immediate changeover and involves a period during which the new system is run with the old. Until everyone involved is happy that the new system is operating efficiently and effectively and the old system can be dropped. Obviously this is an expensive approach to changeover because more staff are needed to operate the systems in parallel and to investigate any discrepancies between the results of the two systems, but it does provide a fall-back position if the new system has problems.

The advantages of parallel running lie in this delay in commitment and the extended opportunity for training staff and building up their confidence in the new system. It can however be difficult to persuade users that the old system is in error if differences in results between the systems arise. In any case, more and more computer-based systems are radically different from their clerical predecessors and so comparison between the two is often invalid.

2.5.9.3 Stepped changeover

The stepped changeover consists of a series of separate immediate changeovers on a small scale covering part of the system rather than the whole of it. The division into parts will normally be made on the basis of location or subsystem or sub-file. This method obviously affects the approach taken to file conversion. The benefits of a stepped changeover is reduced and spread over a longer period, and, more importantly, there is an opportunity to learn from the previous changeover and its problems before the next one takes place. The difficulties, however, lie in the need to control one system, which is working in two different modes at any given point of the changeover period. It is also true to say that this approach tends to lead to a more protracted time-scale for changeover because subsequent 'steps' can be postponed until the previous ones have all been resolved.

2.5.9.4 Pilot running

A method of changeover, which is often described but is strictly an extended testing situation, is pilot running. The concept here is that data from a previous cycle of the old system is taken and run on the new system and the go-ahead to change to the new system is dependent on the approval of result of the pilot run. In practice this is a large-scale system test being carried out as a preliminary to an immediate changeover.

2.5.10 Hand over

When the changeover is complete and the new systems is in full operation, there should be a formal point of hand over when support for the new system transfers from the systems analyst who has developed it to a maintenance group. At this point in practice the users acknowledge that the system fully meets their requirements, and the systems analyst is able to withdraw to start a new project. The time from changeover to hand over should be as short as possible because an idle systems analyst is a wasted resource. The hand over should be formal so that those involved clearly understand the implication and so that the users can take on responsibility for their system; it should also be planned in advance and not allowed to be delayed. The users, however, must be satisfied that all is well.

2.6 SYSTEM REVIEW AND MAINTENANCE

2.6.1 System evolution

As soon as a system is in full operation, it becomes subject to requirement for change. Computer-based systems, are dynamic, open systems that have to adapt to changes in their environment. The changes can arise from a deliberate investigation of the performance of a system as measured against its objectives or from the discovery of errors or faults in the normal running of the system. The formal investigation of performance tends to be called a system review; and the making of changes to the system as result of the recommendations of a review or as part of the everyday running of the system is known as system maintenance. Maintenance of a system is part of the natural evolution of a dynamic, open system.

2.6.2 Sources of change

The basic reason why computer-based systems need to be changed is that they are concerned with processing data about the would which is constantly changing, Businesses, for example, grow and expand or decline and contract; as the workload increases or decline it directly affects the volume of transactions to be handled, the timing of events, the resource requirements, the quality of work in the data processing systems. Governments enact laws or dictate regulations; for example, sales order processing and invoicing systems had to be radically change when the government changed from BTT to GST; organizational policies change; a new product line may be introduce, requiring an entirely different costing system, or a payment system may be altered. People change; different managers have different ideas about the information they require for decision-making and as a result data processing systems have to be amended. Technology advances; as devices become more viable and less expensive, and as economic factors change, the technology on which a system is based can become obsolete; the growth of distributed processing, for example, has been facilitated by technological advances in telecommunications and microprocessors. All of these factors lead to changes in the data processing systems of organizations.

The required changes will tend to be identified in one of two ways-either as part of the normal operation of the system or a result of specific formal review. In the former case, the people involved in operating the system may experience, over time, problems with or complaints about the system. It may be that timing is beginning to slip, or that output report formats are no longer appropriate, or that the response time is inadequate.

On the other hand, there may be no problems but recognition of a need for change because of direct external influences. In either case, those involved in operating the system will initiate the various, changes, With the system review. The changes are initiated from a variety of sources.

2.6.3 System review

The system review is a formal study of a system, which covers similar ground to the feasibility study, but in retrospect rather than prospect. The system review has three main aims: to assess whether the benefits of the system which were identified at the feasibility stage have been achieved; to bring to light areas within a system which can be improved by system modification; and to provide information about system development and design which may be beneficial to future projects. The system review as a by-product should offer concrete evidence to management and users that the computer-based system does offer direct benefits to the organization. This will assist in diluting the general hostility towards computerization.

The system review should ideally be carried out on a regular basis to establish whether the system continues to meet the needs of the organization. If may be carried out by a systems analyst or a user-occasionally it will be carried out by a external consultant, perhaps from of computer auditors but it should of course involve users as much as possible because they are the people who can best assess the extent to which a system meets their needs. Normally the system review will result in a formal report to management and will cover the following aspects of the system:

1. The objectives of the system.
   Do these remain the same? If they have changed, what is the impact on system requirements? Does the system meet the stated objectives?

2. System effectiveness.
   Does the system do what is required? Are the various output reports useful and used? Is there sufficient responsiveness to change? Are error rates reasonable and contained? Is the response rate/turnaround of the system adequate? How have increases in volume been handled?

3. System efficiency.

   Is the system operating efficiently in terms of resource utilization? Have all amendments been expeditiously and correctly implemented? Is the documentation up to date and accurate? Is the equipment fully utilized? Is the service provided to users at the level expected?

4. System acceptability.

   Are the users happy with the operation of the system? Has the old system been completely superseded? Is the level of absenteeism/staff turnover reasonable? Do staffs approve of the changes made? Is the system easy to use?

5. System technology.

   Has advantage been taken of technological advances? Would significant improvements in efficiency result from adoption of new equipment or methods? How does the system fit into the corporate computer development plan?

6. System security.

   Are the quality assurance standards of the installation fully observed? Is the monitoring and control procedure sufficiently tight? Are the validation procedures sufficiently thorough? Are the auditors happy with system security?

7. Costs and benefits.

   The major concern of the system review is to assess whether the cost and benefit estimates that were produced in the feasibility study were accurate and whether, therefore, the system remains economically viable. The review provides an excellent opportunity to try to evaluate the intangible benefits that were identified at the feasibility stage.

In the light of all these factors the system review will draw some conclusions about whether the system is satisfactory. Particular emphasis will be placed on the relationship between expected costs and actual and between planned and unplanned benefits. The requirement is for a system that remains viable and which, hopefully, is more beneficial than was anticipated. The report will also make specific recommendations about desirable changes. These will be debated by computer development steering committee and may result in proposals either for a complete investigation in to the feasibility of a new system or for a minor modification will take their place in the queue of amendments to the system.

2.6.4 Implementing the changes

Normally a system maintenance team that is distinct from the system development staff carries out the implementation of changes to a system (i.e. system maintenance). Often the maintenance team (which will consist largely of programmers) reports to the computer operation manager; this avoids the conflict of priorities that might occur if the same members of staff were involved in developing new systems and amending existing ones. The responsibility for maintenance activity should be clearly established in advance of it being required and certainly after the hand over point, the responsibility should no longer be with the analyst who originally designed the system. Maintenance work is often heavy on resources and most data processing departments would expect to employ at least as many staff purely on maintenance as they do on development of systems.

The amendments should follow certain steps,

- Authorization for amendment
- Design & development of amendment
- Testing
- Ensure compatibility with the main system
- Document the amendment
- Educate & train staff about it
- Get approval to implement
- Implement it.

The major consideration during the maintenance phase of systems is to ensure that amendments are made correctly and at the right time and this involves the establishment of a rigorous set of amendment procedures. The first requirement is for a formal document, which identifies the need for and nature of any proposed amendment. Normally a member of the data processing department at the request of a user will complete this form. Clearly only certain users will be allowed to initiate amendments to a system and each amendment request should be authorized by a senior manager. The purpose of the amendment and its detailed specification should be completed on the form so that it can be carefully scrutinized before authorization. Amendments may affect forms of procedures or inputs or outputs, and so the specification must be perfectly clear and unambiguous. It should be at the same level of detail as the original system specification.

A very important aspect of amendment procedures is the allocation of priority to amendments. Normally a distinction will be made between routine and mandatory changes; the latter are changes which are required because something has gone wrong and processing cannot continue without the amendment. In this situation, a programmer may have to work on the problem immediately but steps should be taken to specify and authorize the amendment in the usual way; otherwise there is a danger that no record will be made of what has been done.

Routine amendments tend to have a longer time scale and can be fitted into a long-term schedule. They still need some further definition into date priority-to ensure that, where date is critical, amendments are done on time. Another aspect of this sequencing is the handling of concurrent amendments. There is no objection to this so long as one person is responsible for implementing all the changes to the given program.

Once the amendment has been documented it will be handed over to the appropriate person to be carried out. Part of this procedure is the updating of all the documentation affected. This may include program specification s, user manuals, and computer operations instructions- often in several copies. It is essential that documentation is kept up it date so that those who are using manuals are not misled about the system with which they are dealing. Particular care must be taken over dating the amendments and making clear when they replace the old version of the system.

The amendment procedure must include very careful testing arrangements not only to ensure that the amendment has been done correctly but also to check that other parts of the system have not been corrupted during the amendment. This means that the original pack of test data, which was used to test the system when it first went into operation, should be available to test the amended system. Thus will help to ensure that the system retains its overall integrity. Often auditors will expect to see copies of amendments including the before- and after- copies of programs and files, and the test pack should be run show the correctness of the changed program.

When all involved are happy that the amendment has correctly completed, the new version of the program or file or form etc. can begin to be used. Good security procedures cannot be overemphasized. Using the right file of program at the right time is crucial to system integrity and steps have to be taken to control the versions in use. This equally applies at earlier stages, of course, when amendments are being made.

A final aspect of maintenance is the cost of maintenance activity and where this should be allocated. If the users are to be educated about the cost of computer usage, then they should be charge with the cost of changes. Not only will this cut out unnecessary amendments, but also it will provide some incentive for the users to ensure that everything is done accurately and expeditiously. This philosophy to a certain extent depends on the overall system of changing used by the data processing department-if the users are not charged for the original development of a system it is slightly unrealistic to introduce charges at the maintenance stage. There are many arguments for and against charging for computer services.

One final comment. If will be seen from what has been said that maintenance is a costly part of the data processing function; it is therefore desirable that the work of maintenance should be made as easy to achieve as possible. This means that systems should be designed flexibly with maintenance in mind and the maintenance staff should have the opportunity to influence the design of system to facilitate this.

CHAPTER 3

MATERIALS & METHODS

- Information were obtained by using Internet, referring books, the system development projects reports done by Mr. Manoj Subramaniyum and also achieved by observing the activities done by Mr. Manoj Subramaniyum and his staff about the problems when regarding this activity.

CHAPTER 4

DISCUSSION.

4.1 General.

As the system life cycle proceed by 6 steps, of any error has been occurred, the system development can do by doing the procedure again from the step where error was occurred.

As every step was reported on the system life cycle, the changes could be inspecting again if it is needed again.

By using system life cycle, resources such as time, labor and money can be handle efficiently.

4.2 Problems

As this is a huge process, it is difficult to study completely within 4 months. To observe results that obtain by following the system life cycle need a lot of time. Also the problems that arouse at each step of the system life cycle can state as follows.

4.2.1 Preliminary study: -

As this study carried out on the knowledge of the group selected, the study limit to the knowledge of them.

4.2.2 Feasibility study: -

The most obvious problem of studying the feasibility a system is that the study is concerned with the future. Some times with forecasting ten years ahead. This is very difficult, especially in a rapidly changing environment, and yet any proposed system has to be evaluated in terms of its usefulness in the future rather than its immediate value. After all it will take quite a time to design and develop the system and after implementation, there will be a period of learning when the system is not at its full potential. It might be as long as two years after the feasibility study before the new system is totally operational. A lot will have changed even in that period.

A second problem is deciding exactly how the feasibility is to be assessed. Normally senior management should identify certain objectives for the new system to fulfill; the difficulty here is whether the objectives can be measured, whether they are conflict, whether they will change

over a period of time etc. The criteria for measuring the achievement of objectives can be very subjective if they exist at all, for example, improved control, or better customer service or increased job satisfaction are the notoriously difficult to measure.

The third problem is even more difficult for the feasibility team to resolve and that is the problem of which people should be considered to be affected by the system.

4.2.3 System analysis: -

As system analysis carried out in detail it takes considerable time.

4.2.4 System designing: -

Here some alternative plans should be developed. That is somewhat difficult task.

4.2.5 System implementation: -

Appointing the working staff that needed for the activation of system is a problem.

4.2.6 System maintains: -

The system become out of date with the time is a problem.

4.2.7 In small system: -

Although system life cycle use for the development of large-scale systems; nowadays, the most popular method for development of small-scale systems are prototyping method.

4.3 Prototyping.

Prototyping is the production of a working model of a system. Working models are used in many areas of business, from the production of new cars to the training 0f pilot to fly new aeroplanes. The use of prototypes minimizes the risk that the item being designed will not fit the needs of the organization and allows experimentation without the high cost of failure.

Under the traditional methods of system development, users specified their requirements to the analyst and project team, who then developed the system, based on those requirements with little or no further user involvement. Prototyping lets the user view the system during development and to make amendments or corrections as required.

4.3.1 Tools of Prototyping:

1. Integrated data dictionaries
2. Very high level languages
3. End user query languages
4. Report generators
5. Screen pointers
6. Application packages

4.3.2 Methods of prototyping

4.3.2.1 Throw-away Prototyping

The throw-away model acts as a communications devices between user and developer and aids in the learning process. The user is better able to explain his requirements from the model developed by the prototyper and the prototyper is better able to demonstrate how the proposed system is intended to operate. This kind of prototype is usually built very quickly and would not include aspects of the system such as security, performance, error handling procedures etc.

An example of a throw-away prototype is one developed for screen based dialogues. There would not be any underlying database, nor would there be facilities and codes for storage or data manipulation. Screen based dialogue simulation enables the analyst to lead the user through a series of screens and explain how each screen is used. He user is able to relater to the system and is in a better position to say whether the system meets his requirements and expectations. This kind of system may be a simple shell and contain no working capacity.

4.3.2.2 Working prototype

The working prototype is an extension of the throw-away model and will incorporate and implement some of the system's important features.

The prototype will be constructed using similar tools to those used in the construction of an actual system. The user interface style will be similar to that of the final implementation, thus enabling batter evaluation of the system. As the data dictionary screen and data definitions will have been preserved, these can be used for the final construction. A sub-system is taken and developed into a working prototype, which is in turn used to form the basis of the new system.

CHAPTER 5

C0NCLUSION.

The best method that can be used for system development is system life cycle. But significant time period, labor and money have to be spending for this process. Therefore this is suitable for the development of the large-scale systems.

When system life cycle use to develop small-scale systems the cost to be spend is larger than the benefit that gets from it.

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