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1. SYSTEM CONCEPT

The word system is widely used. It has become fashionable to attach the word system to add a contemporary flair when referring to things or processes. People speak of exercise system, investment system, delivery system, information system, education system, computer system etc. System may be referred to any set of components, which function in interrelated manner for a common cause or objective.

The term system is derived form the Greek word *systema*, which means an organized relationship among functioning units or components. A system exists because it is designed to achieve one or more objectives. We come into daily contact with the transportation system, the telephone system, the accounting system, the production system, and, for over two decades, the computer system. There are more than a hundred definitions of the word system, but most seem to have a common thread that suggests that a system is an orderly grouping of interdependent components linked together according to a plan to achieve a specific objective. The word component may refer to physical parts (engines, wings of aircraft, car), managerial steps (planning, organizing and controlling), or a system in a multi level structure. The component may be simple or complex, basic or advanced. They may be single computer with a keyboard, memory, and printer or a series of intelligent terminals linked to a mainframe. In either case, each component is part of the total system and has to do its share of work for the system to achieve the intended goal. This orientation requires an orderly grouping of the components for the design of a successful system.

The study of systems concepts, then, has three basic implications:

1. A system must be designed to achieve a predetermined objective.

2. Interrelationships and interdependence must exist among the components.

3. The objectives of the organization as a whole have a higher priority than the objectives of its subsystems. For example, computerizing personnel applications must conform to the organization's policy on privacy, confidentiality and security, as well as making selected data (e.g. payroll) available to the accounting division on request.

2. CHARACTERISTICS OF A SYSTEM

Our definition of a system suggests some characteristics that are present in all systems: organization (order), interaction, interdependence, integration and a central objective.

1. Organization

Organization implies structure and order. It is the arrangement of components that helps to achieve objectives. In the design of a business system, for example, the hierarchical relationships starting with the president on top and leading downward to the blue – collar workers represents the organization structure. Such an arrangement portrays a system – subsystem relationship, defines the authority structure, specifies the formal flow of communication and formalizes the chain of command. Like – wise, a computer system is designed around an input device, a central processing unit, an output device and one or more storage units. When linked together they work as a whole system for producing information.

2. Interaction

Interaction refers to the manner in which each component functions with other components of the system. In an organization, for example, purchasing must interact with production, advertising with sales and payroll with personnel. In a computer system, the central processing unit must interact with the input device to solve a problem. In turn, the

main memory holds programs and data that the arithmetic unit uses for computation. The interrelationship between these components enables the computer to perform.

3. Interdependence

Interdependence means that parts of the organization or computer system depend on one another. They are coordinated and linked together according to a plan. One subsystem depends on the input of another subsystem for proper functioning: that is, the output of one subsystem is the required input for another subsystem. This interdependence is crucial in systems work. An integrated information system is designed to serve the needs of authorized users (department heads, managers, etc.) for quick access and retrieval via remote terminals. The interdependence between the personnel subsystem and the organization's users is obvious.

In summary, no subsystem can function in isolation because it is dependent on the data (inputs) it receives from other subsystems to perform its required tasks. Interdependence is further illustrated by the activities and support of systems analysts, programmers, and the operations staff in a computer centre. A decision to computerize an application is initiated by the user, analyzed and designed by the analyst, programmed and tested by the programmer, and run by the computer operator. None of these persons can perform property without the required input from others in the computer center subsystem.

4. Integration

Integration refers to the holism of systems. Synthesis follows analysis to achieve the central objective of the organization. Integration is concerned with how a system is tied together. It is more than sharing a

physical part or location. It means that parts of the system work together within the system even though each part performs a unique function. Successful integration will typically produce a synergistic effect and greater total impact than if each component works separately.

5. Central objective

The last characteristic of a system is its central objective. Objectives may be real or stated. Although a stated objective may be the real objective, it is not uncommon for an organization to state one objective and operates to achieve another.

3. ELEMENTS OF A SYSTEM

In most cases, systems analysts operate in a dynamic environment where change is a way of life. The environment may be a business firm, a business application, or a computer system. To reconstruct a system, the following key elements must be considered:

1. **Outputs and inputs.**
2. **Processor(s).**
3. **Control.**
4. **Feedback.**
5. **Environment.**
6. **Boundaries and interface.**

1. Outputs and Inputs

A major objective of a system is to produce an output that has value to its user. Whatever the nature of the output (goods, services, or

information), it must be in line with the expectations of the intended user. Inputs are the elements (material, human resources, and information) that enter the system for processing. Output is the outcome of processing. A system feeds on input to produce output in much the same way that a business brings in human, financial, and material resources to produce goods and services. It is important to point out here that determining the output is a first step in specifying the nature, amount, and regularity of the input needed to operate a system. For example, in systems analysis, the first concern is to determine the user's requirements of a proposed computer system – that is, specification of the output that the computer is expected to provide for meeting user requirements.

2. Processor(s)

The processor is the element of a system that involves the actual transformation of input into output. It is the operational component of a system. Processors may modify the input totally or partially, depending on the specifications of the output. This means that as the output specifications change so does the processing. In some cases, input is also modified to enable the processor to handle the transformation.

3. Control

The control element guides the system. It is the decision – making subsystem that controls the pattern of activities governing input, processing, and output. In an organizational context, management as a decision – making body controls the inflow, handling and outflow of activities that affect the welfare of the business. In a computer system, the operating system and accompanying software influence the behaviour of the system. Output specifications determine what and how much input is needed to keep the system in balance for which a computer is being considered can make a difference between the success and failure of the installation. Management support is required for securing control and supporting the objective of the proposed change.

4. Feedback

Control in a dynamic system is achieved by feedback. Feedback measures output against a standard in some form of cybernetic procedure that includes communication and control. Output information is fed back to the input and / or to management (Controller) for deliberation. After the output is compared against performance standards, changes can result in the input or processing and consequently, the output. Feedback may be positive or negative, routing or informational. Positive feedback reinforces the performance of the system. It is routine in nature. Negative feedback generally provides the controller with information for action. In systems analysis, feedback is important in different ways.

During analysis, the user may be told that the problems in a given application verify the initial concerns and justify the need for change. Another form of feedback comes after the system is implemented. The user informs the analyst about the performance of the new installation. This feedback often results in enhancements to meet the user's requirements.

5. Environment

The environment is the "supra-system" within which an organization operates. It is the source of external elements that impinge on the system. In fact, it often determines how a system must function. For example, the organization's environment, consisting of vendors, competitors, and others, may provide constraints and, consequently, influence the actual performance of the business.

6. Boundaries and interface

System should be defined by its boundaries – the limits that identify its components, processes and interrelationship when it interfaces with another system. For example, a teller system in a commercial bank is restricted to the deposits, withdrawals and related activities of

customers checking and savings accounts. It may exclude mortgage foreclosures, trust activities, and the like. Each system has boundaries that determine its sphere of influence and control. For example, in an integrated banking – wide computer system design, a customer who has a mortgage and a checking account with the same bank may write a check through the "teller system" to pay the premium that is later processed by the "mortgage loan system." Recently, system design has been successful in allowing the automatic transfer of funds form a bank account to pay bills and other obligations to creditors, regardless of distance or location. This means that in systems analysis, knowledge of the boundaries of a given system is crucial in determining the nature of its interface with other systems for successful design.

4. TYPES OF SYSTEMS

The frame of reference within which one views a system is related to the use of the systems approach for analysis. Systems have been classified in different ways. Common classifications are:

(1) Physical or abstract,

(2) Open or closed, and

(3) "Man– made" information systems.

1. Physical or abstract systems

Physical systems are tangible entities that may be static or dynamic in operation. For example, the physical parts of the computer center are the officers, desks, and chairs that facilitate operation of the computer. They can be seen and counted; they are static. In contrast, a programmed computer is a dynamic system. Data, programs, output, and applications change as the user's demands or the priority of the information requested changes.

Abstract systems are conceptual or non-physical entities. They may be as straightforward as formulas of relationships among sets of variables or models – the abstract conceptualization of physical situations. A model is a representation of a real or a planned system. The use of models makes it easier for the analyst to visualize relationships in the system under study. The objective is to point out the significant elements and the key interrelationships of a complex system.

2. Open or Closed Systems

Another classification of systems is based on their degree of independence. An open system has many interfaces with its environment. It permits interaction across its boundary; it receives inputs from and delivers outputs to the outside. An information system falls into this category, since it must adapt to the changing demands of the user.

In contrast, a closed system is isolated from environmental influences. In reality, a completely closed system is rare. In systems analysis, organizations, applications and computers are invariably open, dynamic systems influenced by their environment. A focus on the characteristics of an open system is particularly timely in the light of present – day business concerns with computer fraud, invasion of privacy, security controls, and ethics in computing. Whereas the technical aspects of systems analysis deal with internal routines within the user's application area, systems analysis as an open system tends to expand the scope of analysis to relationships between the user area and other users and to environmental factor that must be considered before a new system is finally approved. Furthermore, being open to suggestions implies that the analyst has to be flexible and the system being designed has to be responsive to the changing needs of the user and the environment.

Five important characteristics of open systems can be identified.

1. Input from outside: Open systems are self – adjusting and self-regulating. When functioning properly, an open system reaches a steady state or equilibrium. In a retail firm, for example, a steady state exists when goods are purchased and sold without being either out of stock or overstocked. An increase in the cost of goods forces a comparable increase in prices or decrease in operating costs. This response gives the firm its steady state.

2. Entropy: All dynamic systems tend to run down over time, resulting in entropy or loss of energy. Open systems resist entropy by seeking new inputs or modifying the processes to return to a steady state. In our example, no reaction to increase in cost of merchandise makes the business unprofitable which could force it into insolvency – a state of disorganization.

3. Process, output and cycles: Open systems produce useful output and operate in cycles, following a continuous flow path.

4. Differentiation: Open systems have a tendency toward an increasing specialization of functions and a greater differentiation of their components. In business, the roles of people and machines tend toward greater specialization and greater interaction. This characteristic offers a compelling reason for the increasing value of the concept of systems in the systems analyst's thinking.

5. Equifinality: The term implies that goals are achieved through differing courses of action and a variety of paths. In most systems, there is more of a consensus on goals than on paths to reach the goals.

3. Man – Made Information Systems: Ideally, information reduces uncertainty about a state or event. For example, information that the wind is calm reduces the uncertainty that the boat trip will be pleasant. An information system is the basis for interaction between the user and the analyst. It provides instruction, commands and feedback. It determines the nature of the relationships among decision-makers. In fact, it may be viewed as a decision center for personnel at all levels. From this basis, an information system may be defined as a set of devices, procedures and operating systems designed around user based criteria to produce information and communicate it to the user for planning, control and performance. In systems analysis, it is important to keep in mind that considering an alternative system means improving one or more of these criteria.

Many practitioners fail to recognize that a business has several information systems; each is designed for a purpose and works to accommodate data flow, communications, decision making, control and effectiveness. The major information systems are formal, informal and computer based.

Formal Information System:

A formal information system is based on the organization represented by the organization chart. The chart is a map of position and their authority relationship, indicated by boxes and connected by straight lines. it is concerned with the pattern of authority, communication and work flow.

Informal Information System:

The informal information system is employee based system design to meet personnel and vocational needs and to help in the solution of work-related problems. it also funnels information upward through

indirect channels. In this way, it is considered to be a useful system because it works within the framework of the business and its stated policies.

5. STAGES OF SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

The system development life cycle method is classically thought of as the set of activities that analysts, designers and users carry out to develop and implement an information system. The various stages in the business are closely related to each other, even the order of the steps in these activities is difficult to determine.

1. Project Selection

One must know what the problem is before it can be solved. The basis for a candidate system is recognition of a need for improving an information system or a procedure. For example, a supervisor may want to investigate the system flow in purchasing, or a bank president has been getting complaints about the long lines in the drive – in. This need leads to a preliminary survey or an initial investigation to determine whether an alternative system can solve the problem. It entails looking into the duplication of effort, bottlenecks, inefficient existing procedures, or whether parts of the existing system would be candidates for computerization.

If the problem is serious enough, management may want to have an analyst look at it. Such an assignment implies a commitment, especially if the analyst is hired from the outside. In larger environments, where formal procedures are the norm, the analyst's first task is to prepare a statement specifying the scope and objective of the problem. He/She then reviews it with user for accuracy. At this stage, only a rough " ball park" estimate of the development cost of the project may be reached.

However, an accurate cost of the next phase- the feasibility study – can be produced.

Impetus for system Change

The idea for change originates in the environment or from within the firm. Environment-based ideas originate from customers, vendors, government sources, and the like. For example, new unemployment compensation regulations may make it necessary to change the restructures. Customer complaints about the delivery of orders may prompt an investigation of the delivery schedule, the experience of truck drivers, or the volume of orders to be delivered. When investigated, each of these ideas may lead to a problem definition as a first step in the system life cycle process. Ideas for change may also come from within the organization- top management, the user, and the analyst. As an organization changes its operations or faces advances in computer technology, someone within the organization may feel the need to update existing applications or improve procedures. Here are some examples:

- An organization acquires another organization.
- A local bank branches into the suburbs.
- A department spends 80 percent of its budget in one month.
- Two departments are doing essentially the same work, and each department head insists the other department should be eliminated.
- A request for a new form discloses the use of bootleg (unauthorized) forms. Serious problems in operations, a high rate of labor turnover, labor intensive activities, and high reject rates of finished goods, also prompt top management to initiate an investigation. Other examples are:

• A report reaches a senior vice president and she suspects the figures.

• The company comptroller reads an IRS audit report and starts thinking.

• An executive read about decision support systems for sales forecasting and it gives him an idea.

Many of these ideas lead to further studies by management request, often funneled downward and carried out by lower management.

User- originated ideas also prompt initial investigations. For example, a bank's head teller has been noticing long customer lines in the lobby. She wants to know whether they are due to the computers slow response to inquires, the new teller's limited training or just a sudden increase in bank business. To what extent and how quickly a user-originated idea is converted to a feasibility study depend on several factors:

- The risks and potential returns.
- Management's bias toward the user.
- Financial costs, and the funds, available for system work.
- Priorities of other projects in the firm.
- The persuasive ability of the user.

All these factors are crucial for a prompt response to a user request for change. A systems analyst is in a unique position to detect and even area of operations makes him/ her a convenient resource for ideas. The role and status of the analyst as a professional add credibility to the suggestions made.

2. Feasibility Study

Depending on the results of the initial investigation, the survey is expanded to a more detailed feasibility study. A feasibility study is a test of a system proposal according to its workability. Impact on the organization, ability to meet user needs, and effective use of resources. It focuses on **three major** questions:

1. What are the user's demonstrable needs and how does a candidate system meet them?

2. What resources are available for given candidate systems? Is the problem worth solving?

3. What is the likely impact of the candidate system on the organization? How well does it fit within the organization's master MIS plan?

Each of these questions must be answered carefully. They revolve around investigation and evaluation of the problem, identification and description of candidate systems, specification or performance and the cost of each system and final selection of the best system.

The objective of feasibility study is not to solve the problem but to acquire a sense of its scope. During the study the problem definition is crystallized and aspects of the problem to be included in the system are determined. Consequently, costs and benefits are estimated with greater accuracy at this stage.

The result of the feasibility study is a formal proposal. This is simply a report- a formal document detailing the nature and scope of the proposed solution. The proposal summarizes what is known and what is going to be done. It consists of the following:

1. Statement of the problem – a carefully worded statement of the problem that led to analysis.

2. Summary of findings and recommendations- a list of the major findings and recommendations of the study. It is ideal for the user who requires quick access to the results of the analysis of the system under study.

Conclusions are stated followed by a list of the recommendations and a justification for them.

3. Details of findings- an outline of the methods and procedures undertaken by the existing system followed by coverage of the objectives and procedures of the candidate system. Included are also discussions of output reports, file structures, and costs and benefits of the candidate system.

4. Recommendations and conclusions- specific recommendations regarding the candidate system including personnel assignments, costs, project schedules, and target dates.

After management reviews the proposal, it becomes a formal agreement that paves the way for actual design and implementations. This is a crucial decision point in the life cycle. Many project die here, whereas the more promising ones continue through implementations. Changes in the proposal are made in writing, depending on the complexity size, and cost of the project. It is simply common sense to verify changes before committing the project design.

3. Analysis

Analysis is a detailed study of the various operations performed by a system and their relationships within and outside of the system. A key question is, what must be done to solve the problem? One aspect of analysis is defining the boundaries of the system and determining

whether or not a candidate system should consider other related systems. During analysis, data are collected on the available files, decision points, and transactions handled by the present system. Data flow diagrams interviews, on – site observations, and questionnaires are examples of the analysis tools. The interviews is a commonly used tool in analysis, it requires special skills and sensitivity to the subjects being interviewed. Bias in data collection and interpretation can be a problem. Training, experience, and common sense are required for collection of the information needed to do the analysis. Once analysis is completed the analyst has a firm understanding of what is to be done. The next step is to decide how the problem might be solved. Thus, in systems, design we move from the logical to the physical aspects of the life cycle.

4. Design

The most creative and challenging phase of the system life cycle is system design. The term design describes a final system and the process by which it is developed. It refers to the technical specifications (analogous to the engineer's blueprints) that will be applied in implementing the candidate system. It also includes the construction of programs and program testing. The key questions here is: How should the problem be solved?

The first step is to determine how the output is to be produced and in what format. Samples of the output (and input) are also presented. Second, input data and master files (database) have to be designed to meet the requirements of the proposed output. The operational (processing) phases are handled through program construction and testing including a list of the programs needed to meet the system's objectives and complete documentation. Finally, details related to justification of the system and an estimate of the impact of the

candidate system on the user and the organization are documented and evaluated by management as a step toward implementation.

The final report prior to the implementation phase includes procedural flowcharts, record layouts, report layouts, and a workable plan for implementing the candidate system. Information on personnel, money, hardware, facilities, and their-estimated cost must also be available. At this point, projected costs must be close to actual costs of implementation.

In some firms, separate groups of programmers do the programming, whereas other firms employ analyst- programmers who do analysis and design as well as code programs. For this discussion, we assume that two separate persons carry out analysis and programming. There are certain functions, though, that the analyst must perform while programs are being written. Operating procedures must also be developed.

5. Implementation

The implementation phase is less creative than system design. It is primarily concerned with user training site preparation, and file conversion. When the candidate system is linked to terminals or remote sites, the telecommunication network and tests of the network along with the system are also included under implementation. During the final testing, user acceptance is tested, followed by user training. Depending on the nature of the system, extensive user training may be required. Conversion usually takes place at about the same time the user is being trained or later. In the extreme, the programmer is falsely viewed as someone who ought to be isolated from other aspects of system development. Programming is itself design work, however. The initial parameters of the candidate system should be modified as a result of programming efforts. Programming provides a " reality test"

for the assumptions made by the analyst. It is therefore a mistake to exclude programmers from the initial system design.

System testing checks the readiness and accuracy of the system to access, update and retrieve data from new files. Once the programs become available, test data are read into the computer and processed against the file(s) provided for testing. If successful, the program(s) is then run with " live" data. Otherwise, a diagnostic procedure is used to locate and correct errors in the program. In most conversions, parallel run is conducted where the new system runs simultaneously with the "old" system. This method, though costly, provides added assurance against errors in the candidate system and also gives the user staff an opportunity to gain experience through operation. In some cases, however, parallel processing in not practical. For example, it is not plausible to run parallel two online point-of-sale (POS) systems for a retail chain. In any case, after the candidate system proves itself, the old system is phased out.

6. Post – Implementation and Maintenance

After the installation phase is completed and the user staff is adjusted to the changes created by the candidate system, evaluation and maintenance begin. Like any system there is an aging process that requires periodic maintenance of hardware and software. If the new information is inconsistent with the design specifications, then changes have to be made. Hardware also requires periodic maintenance to keep in tune with design specifications. The importance of maintenance is to continue to bring the new system to standards.

User priorities, changes in organizational requirements, or environmental factors also call for system enhancements. To contrast maintenance with enhancement, if a bank decided to increase its service charges on checking accounts from Rs 3.00 to Rs 4.50 for a

minimum balance of Rs 300, it is maintenance. However, if the same bank decided to create a personal loan on negative balances when customers overdraw their account, it is enhancement. This change requires evaluation program modifications, and further testing.

7. Project Termination

A system project may be dropped at any time prior to implementation although it becomes more difficult (and costly) when it goes past the design phase. Generally, projects are dropped if, after a review process, it is learned that:

• Changing objectives or requirements of the user cannot be met by the existing design.

• Benefits realized from the candidate system do not justify commitment to implementation.

• There is a sudden change in the user's budget or an increase in design costs beyond the estimate made during the feasibility study.

• The project greatly exceeds the time and cost schedule.

In each case, a system project may be terminated at the user's request. In contrast project termination is new system failure. There are many reasons a new system does not meet user requirements:

• User requirements were not clearly defined or understood.

• The user was not directly involved in the crucial phases of system development.

• The analyst, programmer, or both were inexperienced.

• The systems analyst (or the project team) had to do the work under stringent time constraints. Consequently not enough thought went into the feasibility study and system design.

- User training was poor.
- Existing hardware proved deficient to handle the new application.
- The new system left users in other departments out of touch with information that the old system had provided.
- The new system was not user-friendly.
- Users changed their requirements.
- The user staff was hostile.

The list can be expanded to include many more causes. The important point is that although advances in computer systems and software make life easier for the analyst, the success of a system project depends on the experience, creative ability, and knowledge of the analyst and the support from the user staff. This suggests that the analyst be skilled in the state of the art (hardware and software) as well as in dealing with people.

Considerations for candidate system

In today's business, there is more demand for computer services than there are resources available to meet the demand. The demand is made up of the following:

1. Operations of existing system.

2. Maintenance that focuses on "patching" programs – often representing over 50 percent of maintenance.

3. Enhancements that involve major modifications in program structure or equipment.

4. Requests for candidate systems.

All these demands require resource – human, financial, and technological. On the human side, the computer department has to provide the following:

- ✓ Computer operators to run equipment.
- ✓ Data entry personnel.
- ✓ Systems analysts to define and design specifications.
- ✓ Application programmers to convert system specifications to computer programs
- ✓ Maintenance programmers to repair errors.
- ✓ Supervisors, project leaders, and managers to coordinate the jobs with the users.

Thus, the basic problem is to match the demands for service with the available resources. How much one project is favored over another depends on technical, behavioral, and economic factors.

The technical factor involves the system department's ability to handle a project. Much depends on the availability of qualified analysts, designers, and software specialists to do the work. This is especially true in designing databases and implementing complex systems for large concerns. The alternative to abandoning a project because of limited talent on the inside is free – lancing it to an outside consulting firm. The cost of developing the project has to be weighed against the total benefits expected. The behavioral factor involves (1) the user's past experience with an existing system (2) the success record of the analyst, and (3) the influence the user can exert on upper management to finance a candidate system. Political considerations that subjectively favor one project over another, the status of the department, and its performance record are additional factors that bear on funding a candidate system. Perhaps the most important criterion in selecting a project is the economic factor. It focuses on the system's potential return

on investment. What is considered an acceptable rate varies with different formulas, the variables chosen, and the like. System consultants suggest an annual rate of return of just over 20 percent.

6. PLANNING AND CONTROL FOR SYSTEM SUCCESS

What can the analyst do to ensure the success of a system? First, a plan must be devised, detailing the procedure, some methodology, activities, resources, costs, and timetable for completing the system. Second, in larger projects, a project team must be formed of analysts, programmers, a system consultant, and user representatives. Shared knowledge, interaction, and the coordination realized through team effort can be extremely effective in contrast with individual analysts doing the same work. Finally, the project should be divided into manageable modules to reflect the phases of system development – analysis, design, and implementation.

Most of this work falls under project management and control. The main idea behind the system development life cycle is to formalize a means structured at three major levels for effective control of the project. At the lowest level, work assignments are broken down into small manageable tasks. A task is usually a well – defined, structured work unit that can be carried out by one individual. The task can be easily budgeted and scheduled and its quality measured. It can be easily completed independent of other tasks and other project team members. If rework is necessary, there is minimal loss or impact on other tasks, except where time is critical.

The second level at which work units are structured involves activities that have larger scope and are designed to produce substantial results. An activity is a group of logically related tasks that serve one phase of the system development life cycle.

A phase, a third level of control, is a set of activities that bring the project to a critical milestone. Milestones are steppingstones that make up the entire project.

In planning a project, the following steps should be taken:

1. Identify the activities in each phase and the tasks within each activity.

2. Calculate the budget for each phase and obtain agreement to proceed.

3. Review, record, and summarize progress on activities periodically.

4. Prepare a project progress report at the end of a reporting month.

In summary, system development should not be regarded merely as some procedure that deals with hardware and software. The original assumptions upon which system specifications were based should be tested and re-evaluated with the user in mind.

Managing system projects includes the important responsibility of seeing to it that all features of the candidate system – technological, logical, and behavioral – are considered before implementation and maintenance.

7. PROTOTYPING:

The third strategy for determining user information requirements is used when the user cannot establish information needs accurately before the information system is built. The reason could be the lack of an existing model n which to base requirements or a difficulty in visualizing candidate systems. In this case, the user needs to anchor on real life systems from which adjustments can be made. Therefore, the iterative discovery approach captures an initial set of information requirements and builds a system to meet these requirements. As user gain experience in its use, they request additional requirements or

modifications (iterations), in the system in essence, information requirements are discovered by using the system. Prototyping is suitable in environments where it is difficult to formulate a concrete model for defining information requirements and where the information needs of the user are evolving, such as in DSS. Which of the three strategies is selected depends on uncertainties in the process of determining information requirements – that is, uncertainly with respect to the stability of information requirements, the user's ability to articulate information requirements, and the ability of the analyst to elicit requirements and evaluate their accuracy. Thus, the asking strategy is appropriate for low- uncertainty information requirements determinations, whereas the prototyping strategy is appropriate for high uncertainty information requirements determination.

8. ROLE OF SYSTEM ANALYST

The role of the analyst has however changed with time. Now a system analyst is seen more as a change agent responsible for delivering value to an organization on its investments in management information systems.

An organization requires system analysts as line managers normally do not have an understanding of the kind of information-based solutions that are possible for their business problems. A system analysts bridges this gap as he/she is has a thorough knowledge of both the business systems and business processes. A system analyst is therefore in a position to provide information system based solutions to organizations after having studied the problem that the organization is facing. They understand both business and technology. They study a business problem or opportunity and devise an information system enabled solution for it by detailing the information system specifications. This set of specification that the analyst delivers is in a technical format which is easily understandable to a technical (IT) specialist. The

technical specialist might not understand the business issue, if it comes directly from the line managers as he has very little knowledge of business processes. The system analyst then bridges the gap between the two by translating and transforming the business problem/opportunity into a information systems solution and supplying the specification of such a system to the technologist who can then take up the task and build the actual system.

The role of the analyst encompasses both the business and technology domain. In addition, the analyst also works, as a change agent hence the work of an analyst not only requires very good understanding of technical knowledge but also of business and interpersonal skills.

Interpersonal Skills: required by a system analyst are:

1. **Communication:** The analyst needs to be a very good communicator to understand and communicate to the user group as well as to the1echnical specialists. Sometimes the users may not be able to communicate their needs fully to the analyst, but the analyst must be able to understand their needs from incomplete communication of the users.
2. **Foresightedness and vision:** The analyst must have foresight and vision, so that they can factor in the future requirement of the users even if they have not factored that in the design. The analyst must also have vision with regard to the technological changes. He/she must be able to predict where the business needs and technological capabilities/constraints will be in the future. They should also clearly communicate that the design holds good not only for the short term but also the long term.
3. **Adaptability and flexibility skills:** The analyst may be new to the environment of the particular business but he/she has to be quick on the uptake and adapt fast to the culture and

environment of the organization. Some flexibility in the understanding of problems is also required along with the flexibility to come up with alternative solutions.

4. **Selling:** The analyst needs to have flair to sell their ideas and solutions to the users. Sometimes this may be difficult as the users and clients might not know what solution will serve them best. The analyst needs to employ his selling skills to convince the users on the suitability of a solution.

5. **Patience and rationality:** The analyst needs to be patient and rational so that he/she do not rush to a solution. If they make haste then they might miss critical information about the problem/opportunity and end up promoting a wrong solution for the users. Rationality is also a virtue for the system analyst, as this will help them in analyzing the problem/opportunity with a clear mind without prejudice.

6. **Sound temperament:** The analyst needs to remain calm in the face of adverse situations. Most of the time the critical data that the analyst seeks is hard to come by and may be late in coming. The analyst will have to put up with all this and be clam in such situations. Thus, the temperament that he exhibits will help him in devising an appropriate solution for the client.

Management skills: These skills are an absolute necessity for any analyst. The system analyst has to deliver in spite of several constraints hence they must have good management skills to manage time and resources at their disposal. The particular management skills that they need to have ,are:

1. **Time management skills.** This will help them adhere to the strict schedules of the task.

2. **Project management skills.** This will help them manage the project within the boundaries of time and cost.
3. **Man management skills**. The analyst will need human resource skills so that they can manage people working under him. This skill will also help them to connect to people in the client organization so that there is greater acceptability for their solutions.
4. **Team management skills**. The analyst must be a team player. They have to work in a team and they should ensure smooth team functioning.
5. **Organizing and directing skills**. These are basic managerial skills that the analyst must have to conduct the analysis properly.
6. **Negotiation skills.** The analyst should be a good negotiator to get his way around for the purposes of selling his solution and to get the relevant data from the client.
7. **Leadership quality:** The analyst must exhibit leadership and take initiative to understand issues pertaining to the organization and its line of business in a proactive manner so that they are well aware of the associated issues of the problem/opportunity as well.
8. **Training and documentation capability**: The analyst needs to be a good trainer as they may be called upon to enhance the capacities of the users. Their documentation skills will also have to be good, as without those skills the communication with the technical team will remain incomplete.
9. **Presentation skills:** The analyst must have good presentation skills that will help him to communicate better.

Technical Skills required by the system analyst are:

1. **Creativity:** This skill will ensure that the analyst can give the users novel technical solutions for the same problem.
2. **Problem solving:** This skill will help the analyst form a systems approach to problem solving so that they are able to structure a problem even when there is none.
3. **Technical knowledge**: The analyst needs to have concrete knowledge in the technical domain so that they are able to generate alternative solutions to problem. Without the technical know how they will not be able to develop the solution. The analyst must also have a broad knowledge of the entire technical domain. The broad spectrum of knowledge will help them be flexible in their solution approach and will ensure that they have a better understanding of the future of technologies.

9. DIMESNIONS OF SYSTEM PLANNING:

The following conditions dictate today's business strategies:

a) **High interest rates** make it more important that business realizes a good return on investment.
b) **Inflation** puts pressure on profit when it occurs.
c) The **growing trends** towards guaranteed employment suggestes that costs are becoming fixed and the commitment to business expansion may not be easily changed.
d) **Resource shortages** impede expansion.
e) **Regulatory constraints** slow entry into the market.
f) **Increased productivity** paves the way for expansion.

QUESTIONS (2-2 MARKS)

1. Define system.

2. List various characteristics of a system.

3. Differentiate between physical and abstract system

4. Differentiate between open and closed system.

5. List out various elements of a system.

6. Define prototyping

7. Differentiate between formal and informal information system.

8. Define system entropy.

9. Differentiate between system analysis and system design.

10. Define feasibility study.

11. What are dimensions of system planning?

12. Differentiate between physical and abstract system.

13. Differentiate between open and closed system.

14. What do you understand by man-made information system?

15. Who is system analyst?

16. List any four duties of system analyst.

17. List out various interpersonal skills required in system analyst.

SHORT NOTES (4-4 MARKS)

1. **Characteristics of a system**
2. **Elements of system**
3. **System prototyping**
4. **Characteristics of system analyst**
5. **Dimensions of system planning**
6. **Types of systems**

QUESTIONS (8 – 8 MARKS)

1. **What is system? Explain various types of system.**
2. **What is SDLC? Explain various phases of SDLC.**
3. **Explain various roles and responsibilities of system analyst.**
4. **Explain characteristics and elements of a system.**