SYSTEM ANALYSIS
& DESIGN
MCA 204

SELF LEARNING MATERIAL

DIRECTORATE
OF DISTANCE EDUCATION

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SYSTEM ANALYSIS & DESIGN (MCA – 204)

Unit – I

System Concepts and Information Systems Environment: The System Concept: Definition, Characteristics of Systems, Elements of a System, Open and Closed System, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

Unit – II

The System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation & Maintenance.

The Role of the Systems Analyst: Historical Perspective, The War Effort, What Dues it take to do System Analysis, Academic & Personal Qualifications, The Multifaceted role of the Analyst, The Analyst/User Interface, Behavioral issues.

Unit – III

Systems Planning & Initial Investigation: Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews & Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

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Unit I

System Concepts and Information Systems Environment

1.1 INTRODUCTION

By having crystal clarity of system relevant concepts one can

1. Identify the characteristics of the system.

2. One can analyze, categorize and confirm them in order to develop a computerize system with the help of elements discussed and explained which lay down foundation for structure of built up system.

3. Types of system help you to categorize the structure of your system in appropriate format.

What is system?

The word system is derived from the Greek word “systema” which means the organized relationship among the functioning units. However the word system always comes with an adjective, whenever we talk about a system such as educational system, political system, accounting system etc. But if we carefully analyze these systems we can find that there are some features common to all the systems. These are the characteristics of the system which help us to understand the working definition of the word system.

Definition

A system is an orderly grouping of independent components linked together according to plan to achieve a specific objective.

1.2 CHARACTERISTICS OF SYSTEM

The characteristics of the system are

- Basic components
- Interaction and structure
- Goal
- Behavior
- Life cycle

Basic components

As per the definition of system the functioning units means the basic elements of the system which are interrelated, are the basic components of the system.So these basic elements are nothing but the identifiable and moving parts of the system. Following are some examples of system and its basic components.

SYSTEM	BASIC COMPONENTS
I. Educational system	Students, teachers, books, computers.
II. Computer system	Monitor, CPU, keyboard.

2. Interaction and structure

An important feature of the system is the basic components must interact among themselves. It is not only collection or grouping of elements. If an organization is considered as a system then purchase department must interact with stores and production department, production with PPC and so on. Also they are interdependent on each other. If we consider, computer as a system then if some information is keyed it gets processed by arithmetic or logic unit or both and the final result is displayed on the screen. So this interrelation activity of the components makes the system dynamic.Such a relationship among the components which define the boundary between the system and environment is called as the structure of the system.

3. Goal

In order to achieve the goal of the system we should first understand the meaning of

I. Central objective
II. Integration
III. Synergistic effect

I. Central Objective : Central objective means the common goal, because without common goal system will start moving in all directions. As a result coordination among all the parts (Components) will be lost.
II. Integration: It is combined work of all the components in order to achieve the goal of the system. There must be coordination among all parts of the system So in order to have such coordination the system must work as a' whole', integrating all its activities to achieve the desired result.

III. Synergistic effect: From the integration concept it is clear that the system has to be viewed as 'whole' rather than just as sum of its parts. This integrating effect is called as synergistic effect.

4. Behavior

Behavior is the way the system reacts to its surrounding environment. Behavior is determined by the procedures designed to make sure that components behave in ways that will allow system to achieve common goal. For example: If we touch an object which is hot, the nervous system makes our body to withdraw immediately from the hot source. So heat is input from environment, reaction is the behavior and instruction in the nervous system (how to react) is the procedure. Procedure describes what ought to be done and behavior describes what is actually done.

5. Life cycle:

Every system has life cycle and according to human life it has birth that is evolution, life, aging, repairs and finally the end of the existence of the system (death). So finally we can define system as follows

Definition:

i. System is integrated collection of the components which satisfy functions necessary to achieve the system goals and which have relationship to one another that defines structure of the system.
ii. A system is a set of elements forming an activity or scheme seeking a common goal by operating on data in time reference to yield information.

1.3 ELEMENTS OF THE SYSTEM

All the characteristics of the system are determined by the system elements, their properties and relationships. The system elements are

1. Input

2. Processor

3. Output

These elements are common to all systems. These are the elements by which all systems are described. They are set in a fixed position which helps the system analyst to design & work with system more easily.

1. Input :

It is defined as energizing or start up component on which system operates. It may be raw material, data, physical source, knowledge or any energy to decide the nature of output.

2. Processor :

It is defined as the activity that makes possible the transformation of input to output. When data is processed through computer it is processed through logical

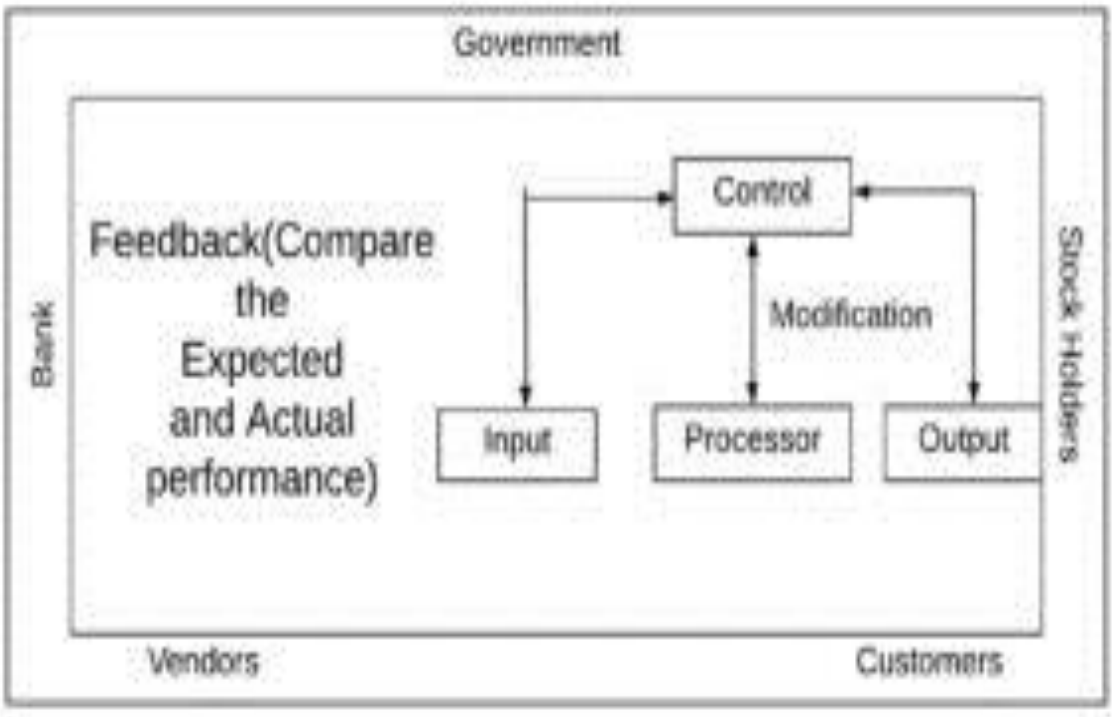
steps. However these steps are required to be instructed in series to the computer.

3. Output :

It is end result of the operation. In other words it is the purpose or the main objective for which the system is designed. Though output is largely dependent on input, its nature or format may vary vastly from the input. For example: If data keyed is in numerical form it may display output which is in form of graph or pictorial form.

The basic three elements of a system are:

1. Input
2. Processing
3. Output



In addition of this, four more elements play an important role. These are:

1. Control
2. Feedback

3. Environment

4. Boundaries & Interface

Therefore the key elements of a system are:

Output

First of all, we must determine what the objectives or goals are, what we intend to achieve. Once we know our aim, we can try to achieve it in the best possible way.

Input

Once we know the output, we can easily determine what the input should be.

Processes

Here we come to the details of how the inputs & files are converted into outputs. Processes may modify the input totally or partially depending on the specifications of the output.

Control

Control of the system is the decision-maker that controls the activities of accepting input processing and producing output.

Open and Closed and closed system

l Open system

A system that interacts freely with its environment, taking input and returning output

For example- The education system or any business process system will quickly change when the environment changes. To do this, an open system will interact with element that exist and influence from outside the boundary of the system.

l Closed system

A system that is cut off from its environment and does not interact with it

For example- Consider a 'throw-away' type sealed digital watch, which is a system, composed of a number of components that work in a cooperative fashion designed to perform some specific task. This watch is a closed system as it is completely isolated from its environment for its operation. Such closed system will finally run down or become disorganized. This movement to disorder is termed on increase in entropy.

Formal & Informal Information Systems

Formal Information System:
A formal information system is based on the organisation 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 policie

Computer Based Information System (CBIS)

A CBIS is an organized integration of hardware and software technologies and human elements designed to produce timely, integrated, accurate and useful information for decision making purposes.

For any given application the following features must be present:-

Easy to use interactive (two way) interfaces

Touch screen

GUI

Menu Driven Interface

Color Screen

Buttons

Labels

Voice Activated

Tones, on phones

Use of advanced technologies

Phone (inc WAP)

digital television

Teleconferencing (audio, video and computer)

Integration of voice, data and images through ISDN’s (integrated services digital networks)

Image transfer systems through facsimile

Fast processing

Searching (Google gives you search times)

Looking up name in a database

Rapid responses

To input

To requests

Management Information System

Many experts have defined MIS in different language. A management information system has been defined by Davis and Olson as “an integrated user-machine system designed for providing information to support operational control, management control and decision making function is an organization”.

Management
Information
Systems

Decision Support Systems – DSS (definition)

The best decision support systems provide high-level summaries and drilldowns to details.
Decision Support Systems (DSS) are a specific class of computerized information system that supports business and organizational decision-making activities. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.
Typical information that a decision support application might gather and present would be:

Accessing all of your current information assets, including legacy and relational data sources, cubes, data warehouses, and data marts

Comparative sales figures between one week and the next

Projected revenue figures based on new product sales assumptions

The consequences of different decision alternatives, given past experience in a context that is described

General Business Knowledge

For an individual that’s new to business and wants to negotiate Procurement contracts at some point their career, one of the first things they need to do is start to build their knowledge and skills.

To be a good negotiator you need knowledge and skills in a number of areas.

General business knowledge and skills.

Procurement knowledge and skills

Contracting knowledge and skills

Negotiation knowledge and skills

Interpersonal Communicational System

Interpersonal communication is usually defined by communication scholars in numerous ways, usually describing participants who are dependent upon one another. It can involve one on one conversations or individuals interacting with many people within a society. It helps us understand how and why people behave and communicate in different ways to construct and negotiate a social reality. While interpersonal communication can be defined as its own area of study, it also occurs within other contexts like groups and organizations. Interpersonal communication is the process that we use to communicate our ideas, thoughts, and feelings to another person. Our interpersonal communication skills are learned behaviors that can be improved through knowledge, practice, feedback, and reflection.

Unit – II

The System Development Life Cycle

Recognition of needs

What Is Need Recognition?

Need recognition is the first step in consumer buying behavior and is also called problem identification. It occurs when a consumer discovers an unmet need that must be fulfilled.

Let's take a moment and discuss the conceptual difference between a need and a want, since the distinction has important implications for marketing. A need is a specific requirement you have to live and function in society. Needs can be physiological, personal, or socio-economic. Examples of needs include food, shelter, transportation, wealth, power, and social status. A want, on the other hand, is a means by which needs are satisfied. A steak fulfills the need for food, a house fulfills the need for shelter, a car fulfills your transportation needs, investment products can provide you wealth, and some products indicate power and status.

Impetus for System Change

SDLC (System Development Life Cycle), just as the name implies, is defined as the process (as a whole) of developing system or software to meet certain requirements. It covers many activities; starts from understanding why the system should be built, studying the project feasibility, analyzing problems, choosing the system design and architecture, implementing and testing it, up to delivering the system as product to the user. SDLC is a process of gradual refinement, meaning that it is done through several development phases. Each phase continues and refines what's done in the previous phase. Commonly known development phases in SDLC are:

Planning. It is the process of understanding why the system should be built and defining its requirements. It also includes feasibility study from several different perspectives, technical, economic, and organization feasibility aspects.

Analysis. This phase includes activities such as problems identifying and analysis, and even predicting potential problems that may arise in the future regarding the system. The deliverables / products of this phase will drive how the system will be built and guide the developers' works.

Design. System analysis leads to design decision, which exactly determines how the system operates in terms of process, data, hardware, network infrastructures, user interface, and other important factors in the system environment.

Implementation. This is probably the most resource-, cost-, and time-consuming phase of all. This is when the system is actually built, tested, and finally installed. It also includes activities such as user training and system maintenance. Some experts like to separate them into different phases Deployment and Maintenance. However the four phases are the most commonly known and accepted steps.

Recognition of Needs

One must know what the problem is before it can be solved. The basis of candidate system is recognition of need for improving the system. The key question is:

What is the problem?

This recognition of need leads to a preliminary survey or an initial investigation of current system to determine whether an alternative system can solve the problem. If the problem is serious enough, management may have an analyst look at it.

The idea for change may originate in the environment or within the firm. Environment-based ideas originate from customers, vendors, government sources etc. When investigated each of these ideas may lead to a problem definition. Idea for change may also come from with in the organization â€“ top management, the user, the analyst. User-originated ideas also prompt initial investigation.

Impetus for System Change

The ideas for change originate 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.

Feasibility Study

Depending on the results of the initial investigation, the survey is expanded to a more detailed feasibility study. As we shall learn, 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 there major questions:

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

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

What are the likely impact of the candidate system on the organization? How will it fit within the organization's master MIS plan?

Analysis

Analysis is a detailed study of the various operations performed by a system and their relationships with in and outside of the system. A key question is: -

What must be done to solve the problem?

During analysis, data are collected from the available files, decision points and transactions handled by the current system. Tools that are used in analysis are data flow diagrams, interviews, on-site observation, and questionnaires. The interview is a commonly used tool in analysis. Training, experience and common sense are required for collection of the information needed to do the analysis. Once the analysis is completed, the analyst understands that what is to be done?

Design

The tern design describes the final system and the process by which it is developed. It also refers to the technical blue print that will be applied in implementing the candidate system. It also includes the construction of programs and program testing. The key question is: -

How should the problem solved?

The first step in designing is to determine How the output is to be produced and in what format?

The second step is input data and master files (database) have to be designed to meet the requirements of the proposed output.
The third step includes a list of programs needed to meet the systemâ€™s objectives and complete documentation.

Finally, Details related to justification of the system and the impact of the candidate system on the user and the organization. These details are documented and evaluated by management.

Implementation

The implementation phase is directly concerned with user training, site preparation and file conversion. During the final testing, user acceptance testing is followed by the user training. Conversion usually takes place at about the same time when the user is being trained. Once the program become available and data are ready for testing and the results are OK then the program is run with â€œliveâ€• data. Otherwise, a diagnostic procedure is used to locate and correct errors in the program.

Post-Implementation and Maintenance

After the installation phase is completed and the user or staff is adjusted to the changes create by the candidate system. Evaluation and Maintenance begins. If the new information is inconsistent with the design specifications then changes have to

be made. Hardware s also require periodic maintenance to keep in tune with design specifications.

Changes in organizations requirements or environmental factors also call for system enhancements. This change requires evaluation, program modifications and further testing.

What Is a Feasibility Study?

A feasibility study is an analysis that takes all of a project's relevant factors into account—including economic, technical, legal, and scheduling considerations—to ascertain the likelihood of completing the project successfully. Project managers use feasibility studies to discern the pros and cons of undertaking a project before they invest a lot of time and money into it.

Feasibility studies also can provide a company's management with crucial information that could prevent the company from entering blindly into risky businesses.

Understanding Feasibility Studies

A feasibility study is simply an assessment of the practicality of a proposed plan or project. As the name implies, these studies ask: Is this project feasible? Do we have the people, tools, technology, and resources necessary for this project to succeed? Will the project get us the return on investment (ROI) that we need and expect?

The goals of feasibility studies are as follows:

- To understand thoroughly all aspects of a project, concept, or plan
- To become aware of any potential problems that could occur while implementing the project
- To determine if, after considering all significant factors, the project is viable—that is, worth undertaking

The Importance of Feasibility Studies

Feasibility studies are important to business development. They can allow a business to address where and how it will operate. They can also identify potential obstacles that may impede its operations and recognize the amount of funding it will need to get the business up and running. Feasibility studies aim for marketing strategies that could help convince investors or banks that investing in a particular project or business is a wise choice.

When doing a feasibility study, it’s always good to have a contingency plan that you also test to make sure it’s a viable alternative in case the first plan fails.

Tools for Conducting a Feasibility Study

Suggested Best Practices

Feasibility studies reflect a project's unique goals and needs, so each is different. However, the tips below can apply broadly to undertaking a feasibility study. You may, for example, want to do the following:

- Get feedback about the new concept from the appropriate stakeholders
- Analyze and ask questions about your data to make sure that it's solid
- Conduct a market survey or market research to enhance data collection
- Write an organizational, operational, or a business plan
- Prepare a projected income statement
- Prepare an opening day balance sheet
- Make an initial "go" or "no-go" decision about moving ahead with the plan

Suggested Components

Once you have finished your basic due diligence, you might consider the elements below as a template of items to include in your study:

- Executive summary: Formulate a narrative describing details of the project, product, service, plan, or business.
- Technological considerations: Ask what will it take. Do you have it? If not, can you get it? What will it cost?
- Existing marketplace: Examine the local and broader markets for the product, service, plan, or business.
- Marketing strategy: Describe it in detail.
- Required staffing (including an organizational chart): What are the human capital needs for this project?
- Schedule and timeline: Include significant interim markers for the project's completion date.
- Project financials.
- Findings and recommendations: Break down into subsets of technology, marketing, organization, and financials.

KEY TAKEAWAYS

- A feasibility study assesses the practicality of a proposed plan or project.
- A company may conduct a feasibility study if it's considering launching a new business or adopting a new product line.
- It's a good idea to have a contingency plan in case of unforeseeable circumstances, or if the original project is not feasible.

Real-World Example of a Feasibility Study

An elite college in a wealthy suburb of Boston had long desired to expand its campus. It kept putting off the project, however, because the administration had certain reservations, including whether it could afford to expand. The college also worried about public opinion of the neighborhood—the original home of this college for more than 100 years. As in the past, the community board had rejected similar types of development proposals. Finally, the college wondered if specific legal and political issues might impinge upon its plan.

All of these concerns and unknowns are apt reasons to proceed with a feasibility study, which the college finally did undertake. As a result, the school now is forging ahead with its expansion plans without needing to leave its historic home. If it had not taken the time and effort to conduct a feasibility study, the college would never have known whether its dreamed-of expansion could become a viable reality.

Analysis

The goal of analysis is to determine where the problem is, in an attempt to fix the system. This step involves breaking down the system in different pieces to analyze the situation, analyzing project goals, breaking down what needs to be created, and attempting to engage users so that definite requirements can be defined.

Design

In systems design, the design functions and operations are described in detail, including screen layouts, business rules, process diagrams, and other documentation. The output of this stage will describe the new system as a collection of modules or subsystems.

The design stage takes as its initial input the requirements identified in the approved requirements document. For each requirement, a set of one or more design elements will be produced as a result of interviews, workshops, and/or prototype efforts.

Design elements describe the desired system features in detail, and they generally include functional hierarchy diagrams, screen layout diagrams, tables of business rules, business process diagrams, pseudo-code, and a complete entity-relationship diagram with a full data dictionary. These design elements are intended to describe the system in sufficient detail, such that skilled developers and engineers may develop and deliver the system with minimal additional input design.

Implementation

After the requirements and design activity is completed, the next phase of the SDLC is the implementation or development of the software. In this phase, developers start coding according to the requirements and the design discussed in previous phases.

Database admins create the necessary data in the database, front-end developers create the necessary interfaces and GUI to interact with the back-end all based on guidelines and procedures defined by the company.

Developers also write unit tests for each component to test the new code that they have written, review each other's code, create builds and deploy software to an environment. This cycle of development is repeated until the requirements are met.

Post Implementation Approach of XBRL in MCA

It is proposed to include all companies in a phase-wise manner to file their Balance Sheet and Profit and Loss account statements in XBRL from Financial Year 2011-12 onwards. With the development of taxonomies for Banks, Insurance, Non-Banking Finance Companies and Power sector, the companies operating in these sectors would also be filing their financial reports in XBRL. The taxonomies would be updated and maintained with applicability of revised Schedule VI from 01.04.2011. Training programs, seminars, conferences, etc would also be organized in tier-II and tier-III cities by the Ministry in association with professional institutes and industry bodies. Cost Audit Report and Compliance Report from eligible companies as per Cost Accounting Record Rules, 2011 would be captured from FY 2011-12 onwards.

Maintenance Phase

The maintenance phase involves making changes to hardware, software, and documentation to support its operational effectiveness. It includes making changes to improve a system's performance, correct problems, enhance security, or address user requirements. To ensure modifications do not disrupt operations or degrade a system's performance or security, organizations should establish appropriate change management standards and procedures.

Change management (sometimes referred to as configuration management) involves establishing baseline versions of products, services, and procedures and ensuring all changes are approved, documented, and disseminated. Change controls should address all aspects of an organization's technology environment including software programs, hardware and software configurations, operational standards and procedures, and project management activities. Management should establish change controls that address major, routine, and emergency software modifications and software patches.

Major modifications involve significant changes to a system's functionality. Management should implement major modifications using a well-structured process, such as an SDLC methodology.

Routine changes are not as complex as major modifications and can usually be implemented in the normal course of business. Routine change controls should include procedures for requesting, evaluating, approving, testing, installing, and documenting software modifications.

Emergency changes may address an issue that would normally be considered routine, however, because of security concerns or processing problems, the changes must be made quickly. Emergency change controls should include the same procedures as routine change controls. Management should establish abbreviated request, evaluation, and approval procedures to ensure they can implement changes quickly. Detailed evaluations and documentation of emergency changes should be completed as soon as possible after changes are implemented. Management should test routine and, whenever possible, emergency changes prior to implementation and quickly notify affected parties of all changes. If management is unable to thoroughly test emergency modifications before installation, it is critical that they appropriately backup files and programs and have established back-out procedures in place.

Software patches are similar in complexity to routine modifications. This document uses the term "patch" to describe program modifications involving externally developed software packages. However, organizations with in-house programming may also refer to routine software modifications as patches. Patch management programs should address procedures for evaluating, approving, testing, installing, and documenting software modifications. However, a critical part of the patch management process involves maintaining an awareness of external vulnerabilities and available patches.

Maintaining accurate, up-to-date hardware and software inventories is a critical part of all change management processes. Management should carefully document all modifications to ensure accurate system inventories. (If material software patches are identified but not implemented, management should document the reason why the patch was not installed.)

Management should coordinate all technology related changes through an oversight committee and assign an appropriate party responsibility for administering software patch management programs. Quality assurance, security, audit, regulatory compliance, network, and end-user personnel should be appropriately included in change management processes. Risk and security review should be done whenever a system modification is implemented to ensure controls remain in place.
Refer to the "Maintenance" section of this booklet and the IT Handbook's "Information Security Booklet" for additional details regarding change controls.

The Role of the Systems Analyst

Systems Analysis: History, Concepts & Theories
The analysis, as defined in the Oxford Dictionary, is the “separation of a substance into parts for study and interpretation; detailed examination”. Subsequently, Systems

Analysis could be described as the early process in the development of a new system, or the evaluation of an old one, where the analysts try to investigate a given situation, identify the main problems that need to be solved, break them up into sub-problems if needed, and finally recommend the most efficient and costless way to solve them (Yeates et al, 1994; Silver et al, 1989; Bingham et al, 1978). Plato once said: “the beginning is the most important part of work”. Nowadays, Plato’s words are proved far from wrong in the case of developing or evaluating a system. The first steps of working on a new project are probably the most important ones to guarantee any fair chance of success. This is the main reason why many organizations, companies and governments prefer to spend a significant amount of money in the early stages of development, in order to be able to minimize the risk of potential disaster later on (Daniels et al, 1981). After all, the sooner a mistake is identified, the sooner it will be fixed, saving a lot of effort, time and money.

There are many types of human-controlled systems, as previously mentioned, ranging from large-scale, complex human societies (whose boundaries are usually not so easy to define as they constantly interact with other societies near them), to small-scale computer information systems (whose boundaries are easier to define). Although each key author and researcher tried to describe his own concept of what analysis is and why it is critical to apply it in the development process, their thoughts and views share many common elements. Depending on the type of system they concentrated on, various definitions where given.

To begin with, Systems Analysis is the process of investigating a system’s boundaries, users, processes, inputs and outputs with the aim of suggesting more efficient and economical ways to solve the problems in question (Silver et al, 1989). Another, more general suggestion is that Systems Analysis “refers to an orderly, structured process for identifying and solving problems” (Gore et al, 1983). Finally, according to George Marshall in his book Systems Analysis and Design: Alternative Structured Approaches, Systems Analysis is “the process of defining precisely what a computer system should do” (Marshall, 1986).

Igor Hawryszkiewycz describes in his book Introduction to Systems Analysis and Design that analysis is mainly used in order to effectively understand the structure of a system and what its requirements are (Hawryszkiewycz, 1994). John Bingham in his book A Handbook of Systems Analysis describes the analysis in six steps: the project selection, the feasibility study, the definition phase, the design phase, the implementation phase and finally the evaluation phase (Bingham et al, 1978).

Perhaps one of the most straightforward explanations of Systems Analysis main objective is that it aims to “transform user needs into specifications for programmers” (Marshall, 1989). To achieve this, the systems analyst has to complete five tasks and responsibilities: to plan, investigate, understand, document and communicate with the rest of the team (Yeates et al, 1994). Firstly and probably most importantly too, the analyst must study the feasibility of the system. This means that he has to thoroughly search and decide if it is humanly possible to develop the system and how much effort in time and money it will cost to do so. Second step is to discuss with the system’s target group and find out their needs in order to be able to understand and elicit the requirements. Third step is to research the existing data,

human recourses and available computer procedures to find out the limitations, techniques or methods that will be used in the later stages of development. Usually from this phase and on the analyst works close together with the designers, programmers and testers in order to establish a successful communication between the team and share feedback with them (Parkin, 1980; Daniels et al, 1981; Open University, 1982).

Although the human-controllable systems are in existence ages now, Systems Analysis as a scientific field is quite more recent, and its roots can be traced back a few decades. Before computers became mainstream, the first analysts where using more traditional approaches to analyze and solve the given problems. They followed two main steps: firstly they analyzed the project's requirements and secondly they specified these requirements. Although this practice was logical and theoretically correct, it depended too much on the human factor, which means it was prone to mistakes. Among the disadvantages of the traditional approach was that it required vast amounts of written documentation, many times there was a lack of communication between the analysts and the designers and last but not least it was very time consuming. All these negatives caused a great number of system development projects to face difficulties during the analysis phase in the 1970s (Yeates et al, 1994).

Researchers in the field of Systems Analysis, in an effort to overcome all the problems caused by the traditional approach, focused their attention to develop new, more efficient methods of analysis. The result of the above efforts was a structured approach to analysis (Yourdon, 1976; DeMarco, 1979; Bansler, 1993). This approach, as described in the book Systems Analysis and Design by Don Yeates et al, follows three general principles: modeling, partitioning and iteration. Modeling is the extended use of models, diagrams, data flow charts and other graphic representations, which aim to provide a non-confusing, realistic image of the system to the rest of the development team. Partitioning is the method of dividing the system in question to sub-systems with the aim of making them more understandable to the rest of the team. Moreover, partitioning helps the analyst to decide which part of the whole problem every member of the team will be given to solve. Iteration is the method of constantly repeating the analysis stage, as many times as needed, in order to reach the best possible solution. The need for iteration arises from the fact that it is rare for a system to be represented correctly the first time, as many repetitions are usually needed, in order to achieve a standard of accuracy (Yeates et al, 1994).

Historical Perspective

All historians bring to their works their own historical perspective. That perspective might be determined by his or her political bent or by the use of social theories in the analysis.

Every historian's ideas are somewhere on the political spectrum. Historians may be described as conservative, liberal, or anywhere in between. Rarely do scholars acknowledge their political perspective in their works; however, that does not mean

that a perspective does not exist. For instance, these historians differ significantly in their political views of Columbus and his world:

"The Spain that Christopher Columbus and his crews left behind just before dawn on August 3, 1492, as they sailed forth from Palos and out into the Atlantic, was for most of its people a land of violence, squalor, treachery, and intolerance. In this respect Spain was no different from the rest of Europe." David E. Stannard, American Holocaust: Columbus and the Conquest of the New World (New York: Oxford University Press, 1992), 57.

"Columbus personified the modern spirit. A modest capitalist, he invested some of his own money in the venture. When his tiny vessels dipped below the horizon in 1492, they carried with them a transcendent faith in the individual–and a passion for wealth, power, and glory." Thomas Greer, A Brief History of Western Man, 2nd ed. (New York: Harcourt Brace Jovanovich, 1972), 210.

Some historians' works are informed by social theories. These theories most frequently include Marxism and feminism. The use of the specific vocabulary of a theory, such as "patriarchy" and "exploitation," often indicate an author's use of that social theory in his or her analysis.

For instance, feminist works often discuss patriarchy and the subordination of women:

"Historically, the generative capacity of women has been the material basis for their subordination and oppression. Men, ruling classes, and states have sought to manipulate this capacity to suit their economic and political needs at various periods. This study presents one example, that of a planter class attempting to control the reproductive capacity of slave women in order to further its economic interests." Rhoda E. Reddock, "Women and Slavery in the Caribbean: A Feminist Perspective," Latin American Perspectives 44 (Winter 1985): 76-77.

"The purpose of this article is to suggest that the burdens shouldered by slave women actually represented in extreme form the dual nature of all women's labor within a patriarchal, capitalist society: the production of goods and services and the reproduction and care of members of a future work force." Jacqueline Jones, "'My Mother Was Much of a Woman': Black Women, Work and the Family under Slavery," Feminist Studies 8 (1982): 236.

Marxist works frequently describe relationships in terms of class structure and capital:

"In the Old South extensive and complicated commercial relations with the world market permitted the growth of a small commercial bourgeoisie. The resulting fortunes flowed into slaveholding, which offered prestige and was economically and politically secure in a planter-dominated society. " Eugene Genovese, "The Slave South: An Interpretation," Science and Society 25 (1961): 323.

"Similarly in Cuba slave mothers returned to work about six weeks after childbirth, at which time the child was turned over to the plantation nursery . . . . This illustration lays bare the realities of marriage and the nuclear family. In this period in Caribbean

history, this form of social organization did not meet the needs of capital." Rhoda E. Reddock, "Women and Slavery in the Caribbean: A Feminist Perspective," Latin American Perspectives 44 (Winter 1985): 68-69.

The War Effort

In politics and military planning, a war effort isacoordinated mobilization of society's resources—both industrial and human—towards the support of a military force. Depending on the militarization of the culture, the relative size of the armed forces and the society supporting them, the style of government, and the popular support for the military objectives, such war effort can range from a small industry to complete command of society.

Although many societies were retroactively perceived to be engaged in a war effort, the concept was not generally used until the last decade of the 18th century, when the leaders of the French Revolution called for the *levéeen masse* and a general mobilization of society to prevent monarchist forces from reclaiming control of the French government.

The concept was subsequently adapted and used by Russia, the United Kingdom, and the United States, especially during World War I and World War II. The term *war effort* was coined in conjunction with these efforts.

Although certain societies, especially nomadic raiders and mobile cavalry societies such as the Mongols, specialized in providing war-effort-like support for their armies, the idea of a specialized *war effort* that diverted supplies, means of production, and people to military support came into general use only with the increased specialization of the industrial revolution. Previously, most military supplies were either common elements of the economy (food, clothing, horses) or specialized instruments produced only for war purposes by industries dedicated to the task (mainly weapons and military vehicles).

Moreover, in feudal societies, peasants, the great majority of the population, often perceived war as the business of the aristocrats and did not feel especially obliged to make an extra effort to help their country's aristocracy win a war with that of another country. The modern concept of a state belonging to its "people" carried the concomitant assumption that war was everybody's business and everyone, combatant or not, was expected to contribute actively to winning it.

Crossover use of peacetime elements of society and economy for wartime uses became important because of the scarcity of manpower and the large size of armies and specialized materials used for war production (rubber, aluminum, steel, etc.). The complex decisions involved in conversion to wartime use also necessitated organization and a bureaucracy; the term *war effort* was coined to describe these collective tasks.

Implicit in the concept of *war effort* was that the entire society was expected to contribute in some way; this served the double purpose of improving morale as well as resource conservation.

What Dues it take to do System Analysis, Academic & Personal Qualifications

System Analysts are responsible for improving company IT systems while ensuring high levels of performance and security. They gather user requirements, perform tests and design software solutions that meet business needs.
For this role, look for candidates who understand the full software development life cycle and are able to integrate new and legacy systems. During your interview process, ask candidates questions about scripts and automation software that you use. If necessary, give candidates chances to showcase their problem-solving skills with written assignments.
Software documentation is an important duty of the System Analyst. Keep an eye out for candidates who can explain technical terms in simple language. These individuals also work closely with other teams that include System Engineers and Product Managers. Focus on candidates who understand design, budget and deadline requirements.

Systems Analyst Responsibilities:

Implements computer system requirements by defining and analyzing system problems; designing and testing standards and solutions.

Systems Analyst Duties:

- Defines application problem by conferring with clients; evaluating procedures and processes.
- Develops solution by preparing and evaluating alternative workflow solutions.
- Controls solution by establishing specifications; coordinating production with programmers.
- Validates results by testing programs.
- Ensures operation by training client personnel; providing support.
- Provides reference by writing documentation.
- Updates job knowledge by participating in educational opportunities; reading professional publications; maintaining personal networks; participating in professional organizations.
- Accomplishes information systems and organization mission by completing related results as needed.

Systems Analyst Skills and Qualifications:

C, COBOL, Software Design, Software Documentation, Software Testing, Software Maintenance, Software Development Process, Software Requirements, Teamwork, General Consulting Skills, Software Architecture

A Good System Analyst Must be Able to Answer Following Questions in Best Way Possible :

Operational and Situational questions

- How would you manage frequent changes in user requirements?
- How do you persuade a doubtful manager to get on board with your suggestions?
- How would you reconcile different opinions on the deployment date of a new program?

Role-specific questions

- What SAP software applications have you used?
- What is a DHCP server?
- Walk me through the process of analyzing an existing system.
- How do you explain user scenarios in a technical document?
- What's the difference between technical and functional requirements? How do you gather each?
- How do you perform a software audit on a PC or Mac

The Multifaceted role of the Analyst

Among the roles an analyst performs are change agent, monitor, architect, psychologist, salesperson, motivator and politician.

Change Agent

The analyst may be viewed as an agent of change. A candidate system is designed to introduce change and reorientation in how the user organization handles information or makes decisions. It is important, that the user accept change. Analyst can secure user acceptance is through user participation during design and implementation.

In the role of a change agent, the systems analyst may select various styles to

introduce change to the user organization. The styles range from that of persuader (the mildest form of intervention) to imposer (the most severe intervention). In between there are the catalyst and the confronter roles. When the user appears to have a tolerance for change the persuader or catalyst style is appropriate. On the other hand, when drastic changes are required, it may be necessary to adopt the confronter or even the imposer style. No matter what style is used, the goal is same: to achieve acceptance of the candidate system with a minimum of resistance.

Investigator and monitor

In defining a problem, the analyst will collect and put together all the information to determine why the present system does not work well and what changes will correct the problem. This work is similar to that of an investigator- extracting the real problems from existing systems and creating information structures that uncover previously unknown trends that may have a direct impact on the organization.

Related to the role of investigator is that of monitor. To undertake and successfully complete a project, the analyst must monitor programs in relation to time, cost, and quantity.Of these resources, time is the most important. If time “gets away”, the project suffers from increased costs and wasted human resources.Implementation will also get delayed.

Architect

As architect an analyst must create detailed physical design of candidate system. He aids users in formalizing abstract ideas and provides details to build the end product-the candidate system.

Psychologist

The analyst plays the role of a psychologist in the way he reaches people interprets their thoughts, assesses their behavior, and draws conclusions from these interactions. Understanding interfunctional relationships is important. It must be aware of people’s feelings and be prepared to get around things in a graceful way. The art of listening is important in evaluating responses and feedback.

Salesperson

Selling change can be crucial as initiating change. Selling the system actually takes place at each step in the system life cycle. Sales skills and persuasiveness are crucial to the success of the system.

Motivator

A candidate system must be well designed and acceptable to the user. The analyst role as a motivator becomes obvious during the first few weeks after implementation and during times when turn over results in new people being trained to work with the candidate system. The amount of dedication it takes to motivate users often taxes the analyst’s abilities to maintain the pace.

Politician

In implementing a candidate system, the analyst tries to appease all parties involves. Diplomacy and finesse in dealing with people can improve acceptance of the system. In as much as a politician must have the support of his or her constituency, so is the analyst’s goal to have the support of the users staff. He or she represents their thinking and tries to achieve their goals through computerization.

In summary these multiple roles require analysts to be orderly, approach a problem in a logical, methodical way and pay attention to details.

Analyzing User Interface Design

User interface (UI) design is the study of how users use a particular software application / system or product. UI design analysis analyzes users, tasks, content and work environment. This lesson will focus on user and taks analysis. As with use cases, described later in the lesson, UI design analysis focuses on the users' goals, and the tasks they perform within a system (the application or product) to achieve those goals.

User Analysis

User analysis is the process of studying what type of person might use the application or product in question. For example, are they private individuals or professionals who use it as part of their work? Additionally, it is important to define the particular uses they will make of the product and what goals they achieve by using it. These can be thought of as 'user stories' or use cases.

Task Analysis

Task analysis is the process of studying how users accomplish the tasks they set out to perform using a software system / application or other product. This type of analysis focuses on:

- What the users' goals are
- What the users do to achieve those goals
- The workflow the users follow to accomplish their tasks
- What the users' level of experience is
- How the users are affected by their physical environment

There are many ways to carry out task analysis and also many levels of detail, from general to very specific. One example of task analysis is gathering a small group of users, as a focus group of sorts, and observe them as they use a software application or website to accomplish a particular task, like searching for flights and purchasing tickets. The designers observing the group would record the users' interaction with the application or website, noting the steps they take to accomplish the task.

Use Cases

Use cases are essentially primary examples of how the proposed software application / system or product is meant to be used, from the users' point of view. A use case diagram will typically show system 'actors' (humans or other entities external to the system) and how they interact with the system. Technically, each action such a system actor can perform with the application or system, is considered to be a separate use case.

Rarely will a child under 5 years old receive a diagnosis of a serious behavioral disorder. However, they may begin displaying symptoms of a disorder that could be diagnosed later in childhood. These may include:

1. attention deficit hyperactivity disorder (ADHD)
2. oppositional defiant disorder (ODD)
3. autism spectrum disorder (ASD)
4. anxiety disorder
5. depression
6. bipolar disorder

7. learning disorders
8. conduct disorders

Many of these you've likely heard of. Others are more rare or aren't often used outside of discussions about childhood psychology.

ODD, for instance, includes angry outbursts, typically directed at people in authority. But a diagnosis is dependent on the behaviors lasting continuously for more than six months and disrupting a child's functioning. Conduct disorder is a far more serious diagnosis and involves behavior one would consider cruel, to both other people as well as to animals. This can include physical violence and even criminal activity — behaviors that are very uncommon in preschool-age children.

Autism, meanwhile, is actually a broad range of disorders that can affect children in a variety of ways, including behaviorally, socially, and cognitively. They are considered a neurological disorder and, unlike other behavioral disorders, the symptoms may begin as early as infanthood. According to the American Psychiatric Association, about one in 68 children are diagnosed with an autism spectrum disorder.

Behavior and Emotional Problems

Far more likely than one of the above clinical disorders is that your young child is experiencing a temporary behavioral and/or emotional problem. Many of these pass with time, and require a parent's patience and understanding.

In some cases, outside counseling is warranted and may be effective in helping children cope with stressors effectively. A professional could help your child learn how to control their anger, how to work through their emotions, and how to communicate their needs more effectively. For obvious reasons, medicating children at this age is controversial.

Parenting for Childhood Success

Parenting styles are rarely to blame for childhood behavioral problems. And if you're searching out solutions to help your family cope, that's a pretty good indication that you aren't causing your child's issues. Still, parents play a crucial role in treating early childhood behavioral issues.

Parenting Styles: Which One Is Right for You? »

When we talk about parenting styles, there are four main types, one of which is most effective in raising well-adjusted and well-behaved children:

1. Authoritarian parenting: Strict rules with no compromise, and no input from the children.
2. Authoritative parenting: Strict rules, but parents are willing to listen and cooperate with their children. More of a democracy than authoritarian parenting.
3. Permissive parenting: Few rules, and few demands put on children. There is little to no discipline in this home, and parents typically take on the role of friend.
4. Uninvolved parenting: No rules and very little interaction. These parents are detached and may reject or neglect their children.

Authoritative parenting is most likely to raise well-adjusted and happy children. Uninvolved parents are most likely to raise children lacking self-esteem, self-control, and general competency, say experts.

What we can learn from these parenting styles is that children need clear rules and consequences, but they also need a parent who is willing to listen and guide.

Be Patient with Your Children

Empathy, a cooperative attitude, and a calm temperament are crucial traits for

parents to adopt as their child struggles. Also, knowing when to ask for help is key.

If your child's behavior becomes disruptive to the regular running of your household or their education, or if they become violent, it's time to talk to a professional.

Raising children with behavioral problems isn't easy. But before you rush to diagnose them or turn into a strict disciplinarian, reach out for help. Your pediatrician can provide insight into whether your child's behavior is normal for their age, and provide resources for assistance.

Unit – III

Systems Planning &Initial Investigation

Strategies for Determining Information Requirement

ASKING

This strategy obtains information from users by simply asking them about the requirements. It assumes a stable system where users are well informed and can overcome biases in defining their problem. There are three key asking methods.

1. Questions: Questions may be open-ended or closed. An open-ended question allows the respondent to formulate a response. It is used when feelings or opinions are important. A closed question requests one answer from a specific set of responses. It is used when factual responses are known.

2. Brainstorming: Brainstorming is a technique used for generating new ideas and obtaining general information requirements. This method is appropriate for getting non conventional solutions to problems. A guided approach to brainstroming asks each participant to define ideal solutions and then select the best one. It works well for users who have sound system knowledge but have the difficulty of accepting new ideas.

3.Group consensus: This method asks participants for their expectations regarding specific variables. Each participant fills out a questionnaire. The results are summarized and given to participants along with a follow-up questionnaire. Participants are invited to change their responses. The results are again summarized and given back to the participants. This debate by questionnaire continues until participants responses have converged enough. This method is advantageous than brainstorming because the participants are not subjected to psychological pressure.

GETTING INFORMATION FROM EXISTING INFORMATION SYSTEM

There are two methods in extracting information from an already existing system

1. Data Analysis approach

- Determining information from an existing application is called the data analysis approach.
- It simply asks the user what information is currently received and what other information is required.
- It depends on the user for getting accurate information.
- The analyst examines all reports, discusses each piece of information with the

user, and determines unfulfilled information needs by interviewing the user.

- The analyst is primarily involved in improving the existing flow of data to the user.

- The data analysis method is ideal for making structured decisions, although it requires that users articulate their information requirements.

- A major drawback is a lack of established rules for obtaining and validating information needs that are not linked to organizational objectives.

2. Decision Analysis

- This method breaks down a problem into parts, which allows the user to focus separately on the critical issues.

- It also determines policy and organizational objectives relevant to complete each major decision.

- The analyst and the user then refine the decision process and the information requirements for a final statement of information requirements.

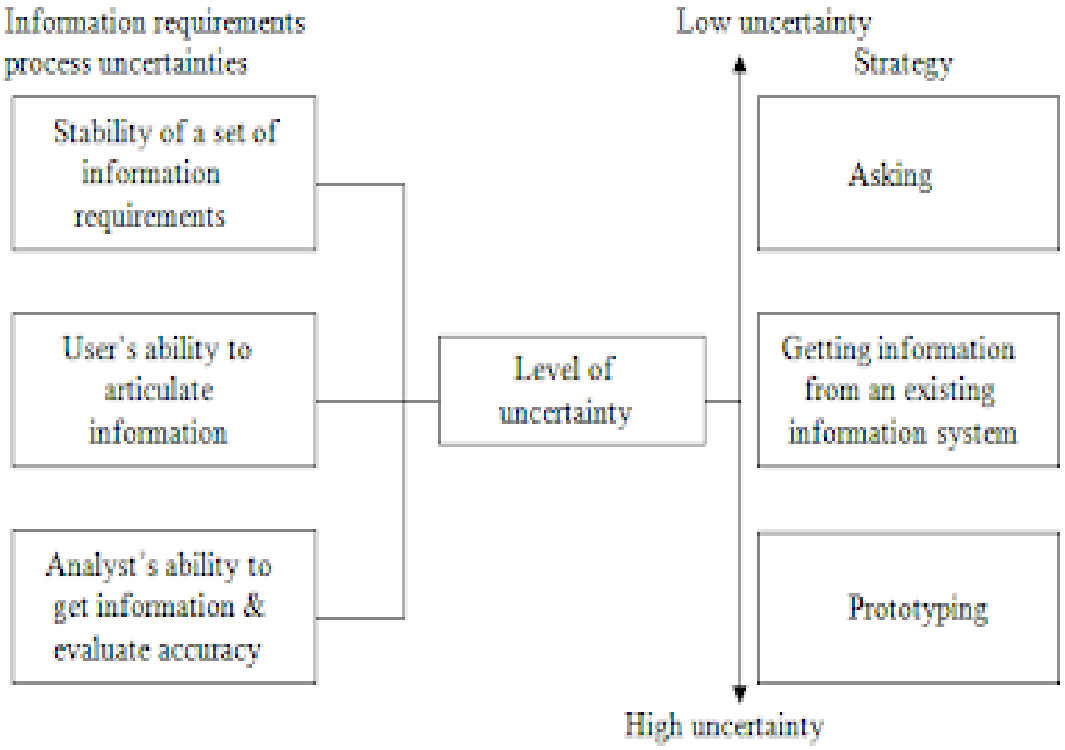
- In this method information needs are clearly linked to decision and organizational objectives.

- It is useful for unstructured decisions and information tailored to the user's decision-making style.

- The major drawback is that information requirements may change when the user is promoted or replaced

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 on which to decide requirements or a difficulty in visualizing candidate system. In this case the user need to consider real life systems from which adjustments can be made. This iterative approach first set up the initial requirements and builds a system to meet these requirements. As users gain experience, they request additional requirements or modifications and the process continues. Prototyping is suitable for environments where it is difficult to formulate a concrete model for defining information requirements. Prototyping strategy is appropriate for determining high uncertainty information requirement.



Problem Definition & Project initiation

The analysis, as defined in the Oxford Dictionary, is the “separation of a substance into parts for study and interpretation; detailed examination”. Subsequently, Systems Analysis could be described as the early process in the development of a new system, or the evaluation of an old one, where the analysts try to investigate a given situation, identify the main problems that need to be solved, break them up into sub-problems if needed, and finally recommend the most efficient and costless way to solve them (Yeates et al, 1994; Silver et al, 1989; Bingham et al, 1978). Plato once said: “the beginning is the most important part of work”. Nowadays, Plato’s words are proved far from wrong in the case of developing or evaluating a system. The first steps of working on a new project are probably the most important ones to guarantee any fair chance of success. This is the main reason why many organizations, companies and governments prefer to spend a significant amount of money in the early stages of development, in order to be able to minimize the risk of potential disaster later on (Daniels et al, 1981). After all, the sooner a mistake is identified, the sooner it will be fixed, saving a lot of effort, time and money.

There are many types of human-controlled systems, as previously mentioned, ranging from large-scale, complex human societies (whose boundaries are usually not so easy to define as they constantly interact with other societies near them), to small-scale computer information systems (whose boundaries are easier to define). Although each key author and researcher tried to describe his own concept of what analysis is and why it is critical to apply it in the development process, their thoughts

and views share many common elements. Depending on the type of system they concentrated on, various definitions where given.

To begin with, Systems Analysis is the process of investigating a system's boundaries, users, processes, inputs and outputs with the aim of suggesting more efficient and economical ways to solve the problems in question (Silver et al, 1989). Another, more general suggestion is that Systems Analysis "refers to an orderly, structured process for identifying and solving problems" (Gore et al, 1983). Finally, according to George Marshall in his book Systems Analysis and Design: Alternative Structured Approaches, Systems Analysis is "the process of defining precisely what a computer system should do" (Marshall, 1986).

Igor Hawryszkiewycz describes in his book Introduction to Systems Analysis and Design that analysis is mainly used in order to effectively understand the structure of a system and what its requirements are (Hawryszkiewycz, 1994). John Bingham in his book A Handbook of Systems Analysis describes the analysis in six steps: the project selection, the feasibility study, the definition phase, the design phase, the implementation phase and finally the evaluation phase (Bingham et al, 1978).

Perhaps one of the most straightforward explanations of Systems Analysis main objective is that it aims to "transform user needs into specifications for programmers" (Marshall, 1989). To achieve this, the systems analyst has to complete five tasks and responsibilities: to plan, investigate, understand, document and communicate with the rest of the team (Yeates et al, 1994). Firstly and probably most importantly too, the analyst must study the feasibility of the system. This means that he has to thoroughly search and decide if it is humanly possible to develop the system and how much effort in time and money it will cost to do so. Second step is to discuss with the system's target group and find out their needs in order to be able to understand and elicit the requirements. Third step is to research the existing data, human recourses and available computer procedures to find out the limitations, techniques or methods that will be used in the later stages of development. Usually from this phase and on the analyst works close together with the designers, programmers and testers in order to establish a successful communication between the team and share feedback with them (Parkin, 1980; Daniels et al, 1981; Open University, 1982).

Although the human-controllable systems are in existence ages now, Systems Analysis as a scientific field is quite more recent, and its roots can be traced back a few decades. Before computers became mainstream, the first analysts where using more traditional approaches to analyze and solve the given problems. They followed two main steps: firstly they analyzed the project's requirements and secondly they specified these requirements. Although this practice was logical and theoretically correct, it depended too much on the human factor, which means it was prone to mistakes. Among the disadvantages of the traditional approach was that it required vast amounts of written documentation, many times there was a lack of

communication between the analysts and the designers and last but not least it was very time consuming. All these negatives caused a great number of system development projects to face difficulties during the analysis phase in the 1970s (Yeates et al, 1994).

Researchers in the field of Systems Analysis, in an effort to overcome all the problems caused by the traditional approach, focused their attention to develop new, more efficient methods of analysis. The result of the above efforts was a structured approach to analysis (Yourdon, 1976; DeMarco, 1979; Bansler, 1993). This approach, as described in the book Systems Analysis and Design by Don Yeates et al, follows three general principles: modeling, partitioning and iteration. Modeling is the extended use of models, diagrams, data flow charts and other graphic representations, which aim to provide a non-confusing, realistic image of the system to the rest of the development team. Partitioning is the method of dividing the system in question to sub-systems with the aim of making them more understandable to the rest of the team. Moreover, partitioning helps the analyst to decide which part of the whole problem every member of the team will be given to solve. Iteration is the method of constantly repeating the analysis stage, as many times as needed, in order to reach the best possible solution. The need for iteration arises from the fact that it is rare for a system to be represented correctly the first time, as many repetitions are usually needed, in order to achieve a standard of accuracy (Yeates et al, 1994).

Background Analysis

An analysis of the working environment reveals what questions, factors, problems and solutions to focus upon. The background analysis ensures that planning is based on current information and experience. Knowledge of the working environment is imperative to select suitable and sustainable methods of work.

Background analysis that clarifies the elements of the working environment is necessary before entering into the planning stage of a project. It is a process of gathering necessary information for a sustainable and suitable working approach in a specific environment. When a preliminary project idea is found, it is normally time for a proper background analysis. It is advisable to study the preliminary idea in relation to the national development plans or the local on-going development processes. The specification of the analysis varies from case to case but in general it is good to reserve sufficient time for the background work.

In a human rights-based approach, the initial step of planning is to have an overall assessment of the human rights situation in a selected sector - for instance food security, legal aid or HIV/AIDS - in the region or country where you operate. On the basis of this assessment, you will be able to define i) the vulnerable groups; ii) the groups and problems which are not dealt before by any other development actors; and iii) the area where your organisation has a comparative advantage? Once the core problems are chosen and the vulnerable groups are identified, you may analyse

problems and actors in detail. Under each problem the questions and potential violations of human rights are identified. After this in a stakeholder analysis you will have a closer look at the right-holders and duty-bearers including their relation to each other. Further, it is required to define the special features, advantages and expectations of those groups and individuals involved in the project. This way you will notice who needs what, who benefits from the current situation, who may resist change and which groups in the society should be empowered during the process.

It is important that the key stakeholders participate in the working environment analysis, for example, by taking part in interviews and meetings with other stakeholders. They are the best ones to describe their problems and set them in an order of priority. By engaging the duty-bearers at an early stage, you get an opportunity to remind them of their obligations. During the analysis stage make sure that the issues which various stakeholders inform you will be taken into consideration later in the decision making.

Fact Analysis

Definition of Fact-finding Techniques

Fact finding is process of collection of data and information based on techniques which contain sampling of existing documents, research, observation, questionnaires, interviews, prototyping and joint requirements planning. System analyst uses suitable fact-finding techniques to develop and implement the current existing system. Collecting required facts are very important to apply tools in System Development Life Cycle because tools cannot be used efficiently and effectively without proper extracting from facts. Fact-finding techniques are used in the early stage of System Development Life Cycle including system analysis phase, design and post implementation review. Facts included in any information system can be tested based on three steps: data- facts used to create useful information, process- functions to perform the objectives and interface- designs to interact with users.

Fact-finding techniques

There are seven common fact-finding techniques

Sampling of existing documentation, forms and databases

Research and Site visits

Observation of the work environment

Questionnaires

Interviews

Prototyping

Joint requirements planning

Sampling of existing documentation, forms and databases

The best way to analyse the existing system is to collect facts from existing documentation rather than from human sources.

There are various kinds of documents to collect facts from existing documents. These include:

e-mails, customer complaints, suggestion box notes and reports that document the problem area

problem performance reviews, samples of completed manual forms and reports and samples of completed computerized forms and reports

various types of flowcharts and diagrams, program documentation and user training manuals

System analyst uses sampling techniques in order to organize the above documentation. Sampling technique is the process of combing a representative sample of documents, form and records (Bentley, Whitten, 2007). According to these authors there are two commonly used sampling techniques namely randomization and stratification. Randomization is the process of selecting sample data randomly. Stratification is the systematic process to deduct the variance of sampling data. We can have better understanding of the system due to the analysis of existing documents, forms, files related to the current system.

Research and Site visits

Research and site visits, second technique, is the process of examining the problems which had previously solved by other sources that can be either human or documents. To solve the requirements of problem, the analyst visits to other organization that had previously experienced for similar problems. In addition, the analyst can also find the information from database, reference books, case studies and Internet.

Advantages of Research and Site visits

It can save the time if the problem is already solved. Researcher can know how different person previously solved the same problems. Researchers always know the

details information about the current development system.

Disadvantages of Research and Site visits

Need authority to access the appropriate source of information. As documentation of problem is not recorded, there is difficult to solve the problem.

Observation of the work environment

Another fact finding technique is observation. In this technique, system analyst participates in the organization, studies the flow of documents, applies the existing system, and interacts with the users. Observation can be a useful technique when the system analyst have user point of view. Sampling technique called work sampling is useful for observation. By using this technique, system analyst can know how employees spend their days.

Questionnaires

Questionnaires are also one of useful fact-finding technique to collect information from large number of users. Users fill up the questions which are given by the system analyst and then give the answers back to the system analyst. Questionnaires can save time because system analyst does not need to interview each of users and if the time of interview is short, questionnaires are more useful. To fulfil the requirements of the system objective, system analyst should have the ability to clearly define the design and frame of questionnaires.

There are two types of questionnaires:

Free-format questionnaires

In free-format questionnaires, users are allowed to answer questions freely without immediate response. The results are also useful in learning about feelings, opinions, and experiences of the respondents.

Fixed-format questionnaires

The purpose of fixed-format questionnaires is to gather information from predefined format of questions. Users are allowed to choose the result from the given answers. There are three types of fixed-format questions: multiple-choice questions (Yes or No type), rating questions (Strongly agree, Agree, No opinion, Disagree, Strongly disagree), ranking questions (numbering according to the preferences).

Advantages of Questionnaires

People can fill the forms and give answers freely to the analyst. This technique is inexpensive. Users are more willing to response real answer as they do not need to give their personal information. Responses can be calculated and analysed quickly.

Disadvantages of Questionnaires

Incomplete answers will be received from users. Analyst cannot observe the body language of user responses. Analyst has no chance to define vague or incomplete responses. Good questionnaires are difficult to prepare.

Interviews

Interview is the most commonly used technique to collect information from the face-to-face interviews. The purpose of interview is to find, verify, clarify facts, motivate end-users involved, identify requirements and gather ideas and opinions. The role of interview includes interviewer who is system analyst and interviewee who are system owner or user. Interviewing technique needs good communication skills for interaction between system analyst and user.

There are two types of interviews.

Unstructured interviews

An interview that is conducted with only a general goal or subject in mind and with few, if any, specific questions (Bentley, Whitten, 2007). Open-ended questions type is used in unstructured interview that allows user to answer freely in an appropriate way.

Structured interviews

Structured interview is an interview which contains predefined set of questions. In structured interview, close-ended questions type is used to limit answers to specify choices, short and direct responses from the interviewees.

Advantages of Interviews

By motivating interviewees, they have confident to answer the questions more effectively. System analyst can examine the more feedbacks from the interviewees. System analyst can prepare questions for interviewees to be more suitable or change the questions for every individual. System analyst can know the nonverbal communications of interviewees by perceiving the body movements and facial

expression.

Disadvantages of Interviews

Interviewing is time consuming and costly mechanism in fact-finding technique. Moreover, the communication skills of the system analyst affect the success of interview.

Prototyping

Another fact-finding technique is known as prototyping which collects the requirement facts of the system. Prototyping is sampling a small working model and it is more related to pre-design of the information system. The implementation of prototyping can be developed in earlier stage of system development life cycle when analyzing the facts. The process of prototyping facts in order to specify the userâ€™s requirements is also known as discovery prototyping.

Advantages of Prototyping

Users and developers are able to test and understand the system in advance before final implementation. It also can make and determine development of the system before applying high development costs in the information system. In addition, it is a kind of training mechanism. Prototyping require less time on fact-finding and it is useful in defining the constant and consistent requirements.

Disadvantages of Prototyping

Training of developers is a requirement in prototyping. Sometimes users can misunderstand the performance, reliability and features of prototype as real results. Therefore, users need to train to know that prototype only covers system functionality and it is not a complete system. Development cost and schedule may change in prototyping.

Joint requirements planning

JRP is the structured group work meeting to identify, analyze problems and define the requirements of system. JRP is becoming increasingly common in systems planning and systems analysis to obtain group consensus on problems, objectives and requirements (Bentley and Whitten; 2007). JRP can tabulate the facts efficiently in a short time and it can also replace in the place of numerous and separate interviews. JRP contains different participants with each specialized roles to perform structured meeting. JRP participants include sponsor, facilitator, users and managers, scribes and IT staff. Sponsor is an individual in top management, who has full authority to decide who will be participants, time and location of JRP session. The

role of facilitator is to lead JRP session, motivate participants, solve conflicts and meet the requirements of meeting during the JRP session. Users in JRP session are responsible for rules and requirement of business, prototype, and satisfactory decisions. And Managers are responsible for projects, schedules and costs and training requirements. Scribes job is to record everything discussed in the meeting. IT staff responsible for models and documentation concerning with facts during the discussion.

Advantages of JRP

JRP is formed different individuals with various roles and covers both in users and in management levels. JRP saves time to develop systems as it is not required one-on-one interviewing of each participant within the organization. When JRP incorporates prototyping as a means for confirming requirements and obtaining design approvals, the benefits of prototyping are realized (Bentley and Whitten; 2007).

Disadvantages of JRP

Extensive training is required for JRP as it is a group form. Active participation of all individuals will results the solution of JRP sessions.

Using Questionnaires in Usage of Automated Teller Machine

In our paper we applied Questionnaires technique for problems that are found in Usage of Automated Teller Machine. The following questionnaire is designed for usage of Bank Automatic Teller Machine. We planned two parts for our questionnaire: first part is collecting the demographic characteristics of users and second part is collecting the user feed backs according to our questions.

Review of Written Documents

What is **document review?** Also known as simply review, document review is the stage of the EDRM in which organizations examine documents connected to a litigation matter to determine if they are **relevant**, **responsive**, or **privileged**. Document review is the final stage before **production**, in which a litigant provides discoverable information to its opponent. The purpose of document review, then, is to identify what information falls within the **scope** of discovery. Under **Federal Rule of Civil Procedure** 26(b)(1), that includes “any nonprivileged matter that is relevant to any party’s claim or defense and **proportional** to the needs of the case.”
This is achieved today through a combination of human review teams and technology. Reviewing lawyers must examine individual documents one at a time to determine what type of information they contain. They generally designate documents, at a minimum, as privileged, relevant, or responsive. These designations are referred to as “tags.” Depending

on the review protocol, reviewers may also apply case-specific tags concerning issues, sensitivity tags to indicate particularly “hot,” or “smoking gun,” documents, or helpfulness tags such as positive, neutral, or negative. Tags represent valuable attorney work product and should be retained whenever possible for documents that may be involved in multiple litigation matters.

Due to outsourcing and the high cost of using lawyers, document review is the most expensive stage of ediscovery. It is generally responsible for 70% to 80% of the total cost of ediscovery. The RAND Corporation has estimated that the median cost of document review is $13,600 per gigabyte.

To control those extravagant costs, litigants strive to narrow the field of documents that they must review. The **processing** stage of ediscovery is intended in large part to eliminate redundant information and to organize the remaining information for efficient, cost-effective document review.

Document review can be used in more than just ediscovery. It may also be used in regulatory investigations and in due diligence assessments for mergers and acquisitions. Wherever it is employed, it serves the same purpose of designating information for production and requires a similar approach.

On site observation

Another information gathering tool used in system studies is called the ‘on site observation’. On site observation is the process of recognising and noting people, objects and gets the information. The analyst’s role is that of an information seeker who is expected to be detached from the system being observed. The role permits participation with the user staff openly and freely.

The major objective of onsite observation is to get as close as possible to the real system being studied. For this reason, it is important that the analyst has the knowledge about the general make up and activities of the system. The following questions can provide the help in the onsite observations.

1. What is relationship with the other systems in the organisation?

2. Is it a primary or a secondary use in organisation?

3. Who runs the system? Who are the important people in it?

4. What kind of system is it? What does it do?

5. What is the history of system? How did it get to its preset stage of development?

Because, the analyst plays the role as an observer, the analyst follows a set of rules.

While making observations, he is more likely to listen than talk. Furthermore, the analyst does not concentrate with the single person and ‘show the friendliness toward others.

1. Direct and Indirect Observation:

When the analyst actually observes the subject or the system at work, this system is called direct observation. If the analyst uses mechanical devices such as cameras and videotapes to capture information, this system is called indirect observation.

2. Structured and Unstructured Observation:

When the observer looks for and records, a specific action is called a structured observation unstructured methods place the observer in a situation to observer what every might be permanent at the time.

3. Natural and Contrived Observation:

A natural observation occurs in a setting such as the employee’s place where the work is completed by the employee. A contrived observation is set up by the observers in a place like laboratory.

4. Obtrusive and Unobtrusive Observation:

An obtrusive observation takes place when the respondent known that he is being observed. Unobtrusive observation takes place in a natural or contrived way and in this the respondent does not know about the observation.

Any of these methods may be used in information gathering. Natural, direct, obtrusive and unstructured observations are frequently used for reading the system. Electronic observation and monitoring methods are becoming widely used information gathering tools because of their speed, efficiency and low cost.

For example, some truck fleets use an electronic recorder system that records analyzes and reports information (on line) about the hours and minutes a vehicle was driven, driven faster than 60 miles per hours. If the onsite observation is used for the difficult system so that on site observation takes the more time.

Interviews & Questionnaires

Introduction

We will start with a few key operational definitions. ‘*Surveying*’ is the process by which the researcher collects data through a questionnaire (O’Leary, 2014). A ‘*questionnaire*’ is the instrument for collecting the primary data (Cohen, 2013).

'*Primary data'* by extension is data that would not otherwise exist if it were not for the research process and is collected through both questionnaires or interviews, which we discuss here today (O'Leary, 2014). An '*interview*' is typically a face-to-face conversation between a researcher and a participant involving a transfer of information to the interviewer (Cresswell, 2012). We will investigate each data collection instrument independently, starting with the interview.

Interviews

Interviews are primarily done in qualitative research and occur when researchers ask one or more participants general, open-ended questions and record their answers. Often audiotapes are utilized to allow for more consistent transcription (Creswell, 2012). The researcher often transcribes and types the data into a computer file, in order to analyze it after interviewing. Interviews are particularly useful for uncovering the story behind a participant's experiences and pursuing in-depth information around a topic. Interviews may be useful to follow-up with individual respondents after questionnaires, e.g., to further investigate their responses. (McNamara, 1999). In qualitative research specifically, interviews are used to pursue the meanings of central themes in the world of their subjects. The main task in interviewing is to understand the meaning of what the interviewees say (McNamara, 2009). Usually open-ended questions are asked during interviews in hopes of obtaining impartial answers, while closed ended questions may force participants to answer in a particular way (Creswell, 2012; McNamara, 1999). An open-ended question gives participants more options for responding. For example an open-ended question may be, "How do you balance participation in athletics with your schoolwork (Creswell, 2012)". A closed-ended question provides a preset response. For example, "Do you exercise?" where the answers are limited to yes or no (Cresswell, 2012).

Must-knows before the interview

Interviewer must be:

- Knowledgeable – familiar with the topic.
- Structured – outline the procedure of the interview.
- Clear – provide simple, easy and short questions which are spoken distinctly and understandably.
- Gentle – tolerant, sensitive and patient when receiving provocative and unconventional opinions.
- Steering – controlling the course of the interview to avoid digressions from the

topic.

- Critical – testing the reliability and validity of the information that the interviewee offers.
- Remembering – retaining the information provided by the interviewee.
- Interpreting – offering interpretation of what the interviewee says (Kvalve, 1996).

Different Types of Interviews

- One-on-one: Most time consuming, costly approach, but most common in educational research. Completed one participant at a time, and suitable for interview participants who are not hesitant to speak.
- Focus Group: Typically in groups of four to six.
- Telephone: Can be easy and fast, but usually only a small number of questions can be asked.
- E-Mail: Easy to complete and allows questions and answers to be well thought out. Ethical issues may need to be addressed. For example, whether the researcher has received written permission from individuals before participating in the interview and the privacy of responses.
- Open-Ended Questions on Questionnaires (Creswell, 2012). Cresswell recommends using only open-ended questions during interviews, since they are primarily qualitative.

Structured Versus Unstructured

- Structured or semi-structured format: involve prepared sheets that allow the interviewee to choose from existing responses, resulting in a set of responses that are easy to analyse.
    - The interviewer might consider a summary column at the end or to the side of your sheet in order to fill in additional information.
    - Most interviews are a combination of structured and unstructured, allowing flexibility (Bell & Waters, 2014).
- Unstructured format: Prompts or probes that remind the interviewer about topics to discuss. Enables the researcher to produce a wealth of valuable data / insight, but requires skill.
    - The interviewer might consider recording the interview or informing the

participant that they will be taking notes before starting.

    - One type of unstructured interview is a ‘preliminary interview,’ where the interviewer is seeking areas or topics of significance for the interviewees (Bell & Waters, 2014).
- Focused interview: framework is established prior to the interview and recording / analysis are simplified. Flow between topics is uninterrupted or free flowing. (Bell & Waters, 2014).

Sequence of Questions

- Get the respondents involved in the interview as soon as possible.
- Before asking about controversial matters (such as feelings and conclusions), first ask about some facts.
- Intersperse fact-based questions throughout the interview.
- Ask questions about the present before questions about the past or future.
- The last questions might allow respondents to provide any extra information they consider to be relevant, as well as their impressions of the interview (McNamara, 1999).
- Questions must be worded with diligence.
- Questions should be asked one at a time.
- Wording should be open-ended. Respondents should have the opportunity to choose their own descriptive vocabulary while answering questions.
- Questions should be as neutral as possible.
- Questions should be worded clearly.
- Be wary of asking “why” questions. This type of question may encourage a participant to answer unnaturally or feel defensive (McNamara, 1999; Creswell, 2012).

Both Creswell and McNamara highlighted very similar points about conducting interviews. McNamara’s literature is less descriptive, but more simple and concise. Another author who has come up consistently in the interviewing literature is Kvalve, whose literature is much more intensive and broad. These three authors are all very prominent in the interview research literature.

Conducting the Interview

These are the steps that are consistent in the literature on conducting interviews in research (Creswell, 2012; McNamara, 1999):

1. Identify the interviewees.
2. Determine the type of interview you will use.
3. During the interview, audiotape the questions and responses.
4. Take brief notes during the interview.
5. Locate a quiet, suitable place for the interview.
6. Obtain consent from the interviewer to participate in the study.
7. Have a plan, but be flexible.
8. Use probes to obtain additional information.
9. Be courteous and professional when the interview is over.

Strengths

- Interviews provide useful information when participants cannot be directly observed.
- The interviewer has better control over the types of information that they receive. They can pick their own questions.
- If worded effectively, questions will encourage unbiased and truthful answers.

Weaknesses

- The interviewee may provide biased information or be unreliable if only one interviewer is interpreting the information. The best research requires many different point of views.
- The interview answers may be deceptive because the interviewee tries to respond in a way that will please the interviewer.
- Equipment may be a problem. Equipment may be costly and require a high level of technical competence to use.

- Can be time-consuming and inexperienced interviewers may not be able to keep the questions properly focused.

Questionnaires

Questionnaires have many uses, most notably to discover what the masses are thinking. These include: market research, political polling, customer service feedback, evaluations, opinion polls, and social science research (O'Leary, 2014).

Formulating a Questionnaire

Starting Out

Bell & Waters (2014) and O'Leary (2014), each offer clear checklists for creating a questionnaire from beginning to end. By comparing the two, we have created a comprehensive list. Bell starts by reminding the researcher to obtain approval prior to administering their questionnaire, then to reflect on what our question is and whether this is the best method to obtain the intended information (Bell & Waters, 2014). O'Leary (2014) suggests that you operationalize concepts in the beginning and define the measurable variables. Prior to writing your own questions, O'Leary (2014) would have you explore existing possibilities in order to adapt previous instruments rather than 'reinventing the wheel'. At this point, both authors have you write your questions.

Forming questions

Bell & Waters (2014), utilizes Youngman (1982)'s Question Types:

1. Verbal / Open
2. List
3. Category
4. Ranking
5. Quantity
6. Grid
7. Scale

Bell & Waters (2014), highlight a plethora of potential difficulties in wording your

questions, including ambiguity and imprecision, assumptions, memory, knowledge, double questions, leading questions, presuming questions, hypothetical questions, offensive questions, and questions covering sensitive issues. It is imperative that you check for jargon within your language and return to your hypothesis or objectives often to decide which questions are most pertinent (Bell & Waters, 2014).

Bell & Waters (2014) and O'Leary (2014) seem to disagree on the next step; while O'Leary would focus next on the response category, Bell would have you look further into the wording of the questions. Following O'Leary (2014)'s logic, we decide now whether to use open or closed questions, considering how the category will translate to different data types. Closed response answers include: yes/no, agree/disagree, fill in the blanks, choosing from a list, ordering options, and interval response scales. Any of the three standard scaling methods, (Likert, Guttman, and Thurstone) may be used where appropriate (O'Leary, 2014).

Bell & Waters (2014) suggest you check your wording at this point. O'Leary (2014) goes into detail to point out problems with questions such as ambiguity, leading, confronting, offensiveness, unwarranted assumptions, double-barrelled questions, or pretentiousness. Questions to avoid according to O'Leary are those that are:

- Poorly worded
- Biased, leading, or loaded
- Problematic for the respondent, including:
  - Recall-dependent questions
  - Offensive questions
  - Questions with assumed knowledge
  - Questions with unwarranted assumptions
  - Questions with socially desirable responses.

Ordering Questions / Appearance and layout

Both authors emphasize thoughtfulness about the order of questions, considering logic and ease for respondents. O'Leary (2014) goes into further detail regarding issues with organization and length; too lengthy and respondents are less likely to complete the questionnaire. He also suggests researchers avoid asking threatening, awkward, insulting, or difficult questions, especially in the beginning of the questionnaire. Bell & Waters (2014) takes a more broad view of the aesthetics of the questionnaire; leaving spaces for legibility, limiting the overall numbers of pages, and

considering the impression the document leaves, to highlight a few examples.

Write Instructions

Clear and unambiguous instructions for respondents are emphasized by both authors (O'Leary, 2014; Bell & Waters, 2014). This step is followed by a 'layout', or rearranging of questions, in both descriptions, likely because this is the best time to review once the questions and other writing is complete. O'Leary (2014) warns researchers to use professional and aesthetically-pleasing formatting, as well as to be organized in order to attract respondents and to lower the probability of making your own mistakes (in repeating questions, for example). O'Leary (2014) offers final instructions to include a cover letter that describes who you are, the aim of the project, assurances of confidentiality, etc.. Bell & Waters (2014), however, offers further steps.

SAMPLE & PILOT TESTING

Bell & Waters (2014) go into further detail regarding response rates and ensuring you have a representative or generalizable sample, which we believe is irrelevant to this article. More pertinent steps would be to pilot-test your questionnaire with preliminary respondents (even family and friends) and follow-through to preliminary data analysis in order to ensure your methods are effective, making adjustments accordingly (Bell & Waters, 2014). O'Leary (2014) lists six steps in a typical pilot test:

1. Have a run-through
2. Reflect
3. Seek feedback
4. Trial your statistics package
5. Make modifications
6. Back to the start?

Distribution

Bell & Waters (2014) briefly consider distribution methods; they emphasize the need to ensure confidentiality, to include a return date, to formulate a plan for 'bounce backs' via email, and to record data as soon as it arrives. O'Leary (2014) lists typical methods: face-to-face, snail mail, e-mail, and online. Bell & Waters (2014) highlight

the advantage to administering your questionnaire personally, as it enables the researcher to explain the purpose of the study and increases the probability of receiving completed questionnaires in return. The authors go on to emphasize the value of online methods. In particular, they mention “Survey Monkey” as the most popular and versatile survey tool available (Bell & Waters, 2014). O’Leary (2014) suggests sending out reminder letters or E-mails in order to increase response rate and the speed of response.

Analysis

Bell & Waters (2014) and O’Leary (2014) disagree once again with respect to the analysis. O’Leary (2014) suggests collecting the data as soon as possible, whereas Bell (2014) suggests the researcher merely glance through the responses prior to coding and recoding, if time allows. Both methods have merit, as the researcher must consider the time they have available, as well as the amount of data they are working with in order to make a logical decision.

Weaknesses

O’Leary (2014) offers some concerns in using questionnaires as a research tool, as they are time consuming, expensive, and sampling is difficult. O’Leary (2014) asserts that questionnaires are ‘notoriously difficult to get right’ and they often do not go as planned.

Strengths

O’Leary (2014) suggests some obvious strengths for this research method, as administering a questionnaire allows the researcher to generate data specific to their own research and offers insights that might otherwise be unavailable. In listing the additional benefits of questionnaires, O’Leary (2014) suggests that they can:

- Reach a large number of respondents
- Represent an even larger population
- Allow for comparisons
- Generate standardized, quantifiable, empirical data

- Generate qualitative data through the use of open-ended questions
- Be confidential and even anonymous

Considerations for the Method

Cohen et al. (2013, p.394) offer special considerations for administering questionnaires within an educational setting:

1. Gaining access to schools and teachers
2. Gaining permission to conduct the research
3. Resentment by principals
4. People vetting what could be used
5. Finding enough willing participants for your sample
6. Schools suffering from 'too much research' by outsiders and insiders
7. Schools/people not wishing to divulge information about themselves
8. Schools not wishing to be identifiable, even with protections guaranteed
9. Local political factors that impinge on the school
10. Teachers' fear of being identified/traceable, even with protections guaranteed
11. Fear of participation by teachers (lose their contracts)
12. Unwillingness of teachers to be involved because of their workload
13. The principal deciding on whether to involve staff, without consultation with the staff
14. Schools/institutions fears of criticism/loss of face
15. The sensitivity of the research, the issues being investigate

Performance Analysis

Performance analysis is the technique of studying or comparing the performance of a specific situation in contrast to the aim and yet executed. In Human Resource, performance analysis can help to review an employee's contribution towards a project or assignment, which they allotted him or her.

Importance of Performance Analysis

Importance-performance analysis (IPA) is an accepted method for measuring service quality well known for its simplicity and stress-free application. Thus, IPA focuses on the gap between the customer expectation on the importance and judgment on performing specific attribute of service consumed.

We distinguish three basic steps in the performance analysis process: data collection, data transformation, and data visualization. Data collection is the process by which we get data about program performance from an executing program. Data collected in a file, either during or after execution, although in these situations it is presented to the user in real time. We can distinguish three basic data collection techniques:

DATA COLLECTION

- Profiles: It records the time spent in different parts of a program. This information, though minimal, is often invaluable for highlighting performance problems. Profiles are gathered automatically.
- Counters: It records either frequencies of events or cumulative times. The insertion of counters may require programmer intervention.
- Event: It records each occurrence of various specified events, thus producing large numbers of data. It produces traces either automatically or with programmer intervention.

DATA TRNSFORMATON

· The raw data produced by profiles, counters, or traces are in the form required to answer performance questions.

· Data transformations are applied, often with the goal of reducing total data volume.

· It can use transformations to find mean values or other higher-order statistics or to extract profile and counter data from traces.

DATA VISUALIZATION

· Although data reduction techniques are used in some situations to compress performance data to scalar values.

· This process can help from the data visualization techniques. It can apply both conventional and more specialized display techniques to performance data.

· Each of the various performance tools described in later sections incorporates a set of built-in transformations; the programmer can code transformation that is more specialized.

A trace is processed to produce a histogram giving a distribution of message sizes. Parallel performance data are multidimensional, comprising execution times, communication costs, and so on, for multiple program components, on different processors, and for different problem sizes., often necessary to explore the raw multidimensional data well known in computational science and engineering,

As we shall see, a wide variety of data collection, transformation, and visualization tools are available. When selecting a tool for a particular task, we should consider the following issues:

1. Accuracy. Performance data obtained using sampling techniques are less correct than data obtained by using counters or timers. With timers, one must take the accuracy of the clock into account.
2. Simplicity. The best tools in many circumstances are those that collect data automatically, with little or no programmer intervention, and that give convenient analysis capabilities.
3. Flexibility. It extends a flexible tool to collect more performance data or to offer different views of the same data. Flexibility and simplicity are often opposing requirements.
4. Intrusiveness. Unless a computer provides hardware support, performance data collection introduces overhead. We need to know of this overhead and account for it when analysing data.
5. Abstraction. A good performance tool allows it to examine data at a level of abstraction proper for the programming model of the parallel program. For

example, when analysing an execution trace from a message-passing program, we wish to see individual messages, if someone can relate them to send and receive statements in the source program. However, this presentation is not right when studying a data-parallel program, even if the compilation generates a message-passing program. Instead, we see communication costs related to data-parallel program statements.

Web-based Performance Analytics

Performance analytics is a field with huge discrete data sets that are grouped, organized, and aggregated to understand the data structure. Synthetic and real user monitoring are the two most popular techniques to test the performance of websites; both these techniques use historical data sets to test performance.

In web performance analytics, statistical values that describe a central tendency (the odd number measure of central location) for the discrete data set under observation. We can use the statistical metric to test and analyse the data. These datasets have innumerable data points that are aggregated using different statistical approaches.

Service analysis

Service analysis is an important procedure that needs to be followed by any organization in order to understand the standard of service that is being provided by them. The service analysis documents serve as feedback from different consumers as well. This is a necessary process which allows any company to understand and improve the services provided by the company. This type of analysis is generally done in the form of a questionnaire that is provided both to the employees as well as the consumers.

The service analysis makes a study of the broad knowledge in terms of the service provided. This also studies how the customers view the service provided. The employees are tested in their know-how, technical skills as well as their competitive awareness of the services provided by other business corporations. The document sets a certain standard against which the service is judged and this is drafted accordingly, taking into consideration all necessary details:

- The name of the service provider must be mentioned clearly in the document to give it an authentic look.
- The standard criteria that is set for judging the current status of the service must also be elaborated on. The factors on which the service is judged can be salesmanship, customer relations, loyalty, sense of professionalism, punctuality etc.

- The customer feedback is very important. The document must provide adequate provisions for the recording the feedback. Against this, the service analysis will also be done.
- The service analysis also must provide proper improvement techniques for ensuring the service standard is met in the future. The document must clearly make step by step provisions on how the improvements can be implemented.
- Such an analysis document must be created with great care as it will serve for future purposes with respect to ensuring the services are up to the mark.

Unit – IV

Information Gathering

What Kind of Information do we need?

“Information is power,” as the saying goes. And in most scenarios it’s true: having critical information, at the right time, and especially knowing how to use it, can be a great source of power.

In the cybersecurity world, the security data about any target (person, company, domain name or service) is something that’s coveted by parties on all fronts, including red teams and blue teams.

Therefore, mastering the information gathering process is one of the ultimate goals of any cybersecurity researcher. That’s why today we’ll be exploring the main information gathering concept, as well as some information gathering techniques and tools that will help you boost your daily infosec tasks.

What’s information gathering?

When it comes to getting a clear information gathering concept, the simplest way to define it would be the process of collecting information about something you are interested in.

For those in the cybersecurity industry, this is the first step to take during the earlier stages of any hacking activity (both cracking and ethical hacking), when any black- or white-hat researcher needs to gain as much information as possible about the desired target.

While it’s a fun activity for some researchers, information gathering is also one of the most time-consuming tasks during the intel-recon process, and that is why time management is so important.

What are the objectives of information gathering in cybersecurity?

Any basic cybersecurity information gathering process often includes these two types of data collection goals:

1. Collecting network data: Such as public, private and associated domain names, network hosts, public and private IP blocks, routing tables, TCP and UDP running services, SSL certificates, open ports and more.

2. Collecting system-related information: This includes user enumeration, system groups, OS hostnames, OS system type (probably by fingerprinting), system banners (as seen in the banner grabbing blog post), etc.

But there's a lot more involved. Let's learn about it, by exploring the most popular techniques used during this phase.

Information gathering techniques

Ethical hackers use a big variety of techniques and tools to get this precious information about their targets, as well as locations and data collection software they'll be using towards the information gathering goal.

Let's look at the top methods used to gather information about any target.

How to gather information?

- Social engineering: This includes in-person chat, phone conversations and email spoofing attacks. What all these methods have in common is the psychology of human weakness, needed to get maximum data about the target.

- Search engines: Web crawlers can be used to fetch information about anything, and this includes companies, persons, services, and even real hacks, as seen in our previous article about Google Hacking.
- Social networks: Facebook, Twitter, LinkedIn and other social networks are great sources of information to build a profile, especially when targeting individuals.

- Domain names: These are registered by organizations, governments, public and private agencies, and people. Therefore, they're a great starting point when you want to investigate someone. Personal information, associated domains, projects, services and technologies can be found by inspecting domain name information.

- Internet servers: authoritative DNS servers are a great source of information, as they often include every single surface point exposed to the Internet—which means a direct link to related services such as HTTP, email, etc. In our previous article about passive DNS, we analyzed the importance of DNS servers, and especially passive DNS-recon services, such as the ones we offer here at SecurityTrails.

All these techniques are really useful when combined with enterprise security tools. Keep reading to discover how to maximize your information gathering results by using some really cool infosec utilities.

Information about the firms

What Is a Firm?

A firm is a for-profit business organization—such as a corporation, limited liability company (LLC), or partnership—that provides professional services. Most firms have just one location. However, a business firm consists of one or more physical establishments, in which all fall under the same ownership and use the same employer identification number (EIN).

When used in a title, "firm" is typically associated with businesses that provide professional law and accounting services, but the term may be used for a wide variety of businesses, including finance, consulting, marketing, and graphic design firms, among others.

Understanding Firms

In microeconomics, the theory of the firm attempts to explain why firms exist, why they operate and produce as they do, and how they are structured. The theory of the firm asserts that firms exist to maximize profits; however, this theory changes as the economic marketplace changes. More modern theories would distinguish between firms that work toward long-term sustainability and those that aim to produce high levels of profit in a short time.

KEY TAKEAWAYS

- A firm is a for-profit business, usually formed as a partnership that provides professional services, such as legal or accounting services.
- The theory of the firm posits that firms exist to maximize profits.
- Not to be confused with a firm, a company is a business that sells goods and/or services for profit and includes all business structures and trades.
- A business firm has one or more locations which all have the same ownership and report under the same EIN.

Firm vs. Company

Although they appear synonymous and are often used interchangeably, there is a difference between a firm and a company. A company can be any trade or business in which goods or services are sold to produce income. Further, it encompasses all business structures, such as a sole proprietorship, partnership, and corporation. On the other hand, a firm typically excludes the sole proprietorship business; it generally refers to a for-profit business managed by two or more partners providing professional services, such as a law firm. In some cases, a firm can be a corporation.

Types of Firms

A firm's business activities are typically conducted under the firm's name, but the degree of legal protection—for employees or owners—depends on the type of ownership structure under which the firm was created. Some organization types, such as corporations, provide more legal protection than others. There exists the concept of the mature firm that has been firmly established. Firms can assume many different types based on their ownership structures:

- A **sole proprietorship or sole trader** is owned by one person, who is liable for all costs and obligations, and owns all assets. Although not common under the firm umbrella, there exists some sole proprietorship businesses that operate as firms.

- A **partnership** is a business owned by two or more people; there is no limit to the number of partners that can have a stake in ownership. A partnership's owners each are liable for all business obligations, and together they own everything that belongs to the business.

- In a **corporation,** the businesses' financials are separate from the owners' financials. Owners of a corporation are not liable for any costs, lawsuits, or other obligations of the business. A corporation may be owned by individuals or by a government. Though business entities, corporations can function similarly to individuals. For example, they may take out loans, enter into contract agreements, and pay taxes. A firm that is owned by multiple people is often called a company.

- A **financial cooperative** is similar to a corporation in that its owners have limited liability, with the difference that its investors have a say in the company's operations.

Information gathering tools

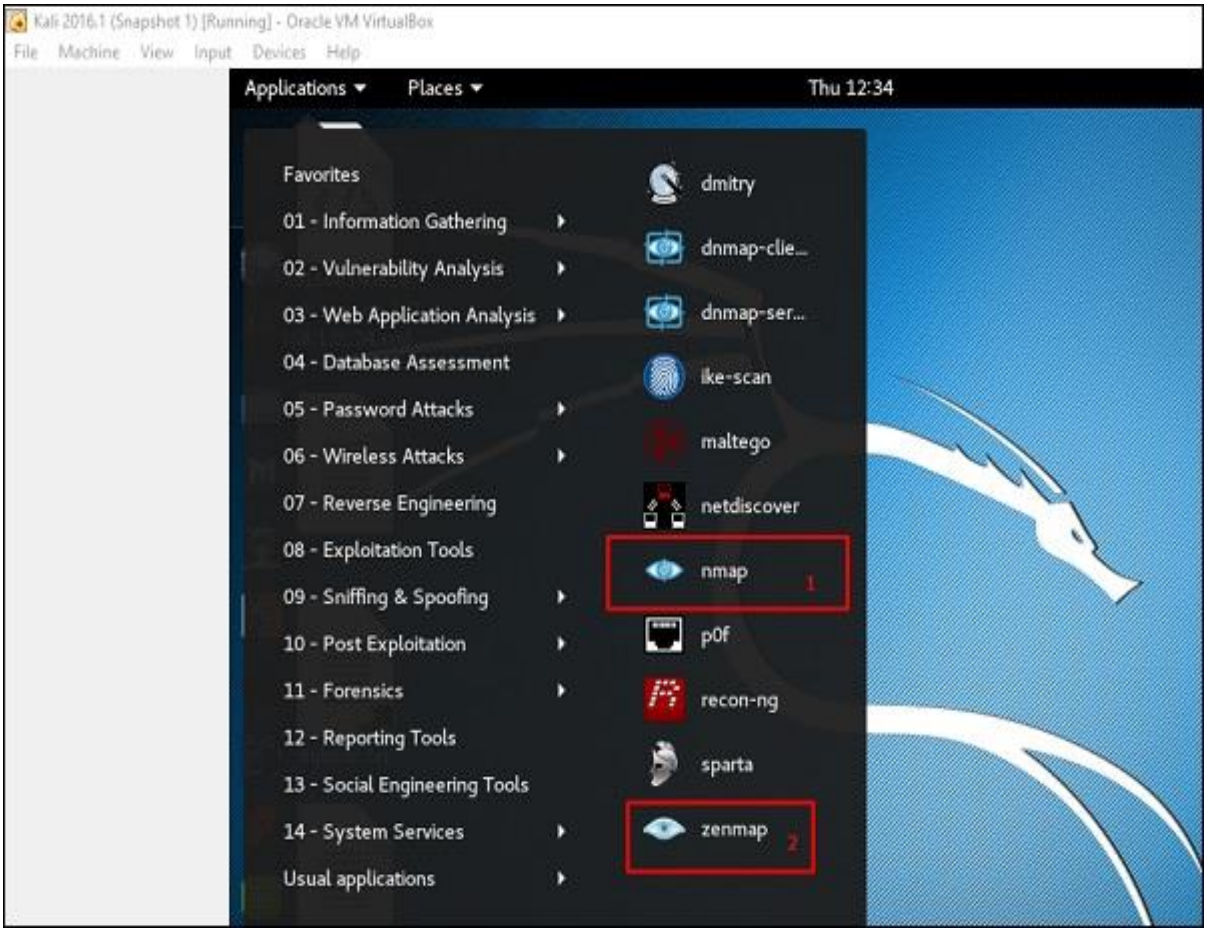
NMAP and ZenMAP are useful tools for the scanning phase of Ethical Hacking in Kali Linux. NMAP and ZenMAP are practically the same tool, however NMAP uses command line while ZenMAP has a GUI.

NMAP is a free utility tool for network discovery and security auditing. Many systems and network administrators also find it useful for tasks such as network inventory, managing service upgrade schedules, and monitoring host or service uptime.

NMAP uses raw IP packets in novel ways to determine which hosts are available on the network, what services (application name and version) those hosts are offering, which operating systems (and OS versions) they are running, what type of packet filters/firewalls are in use, etc.

Now, let's go step by step and learn how to use NMAP and ZenMAP.

Step 1 − To open, go to Applications → 01-Information Gathering → nmap or zenmap.

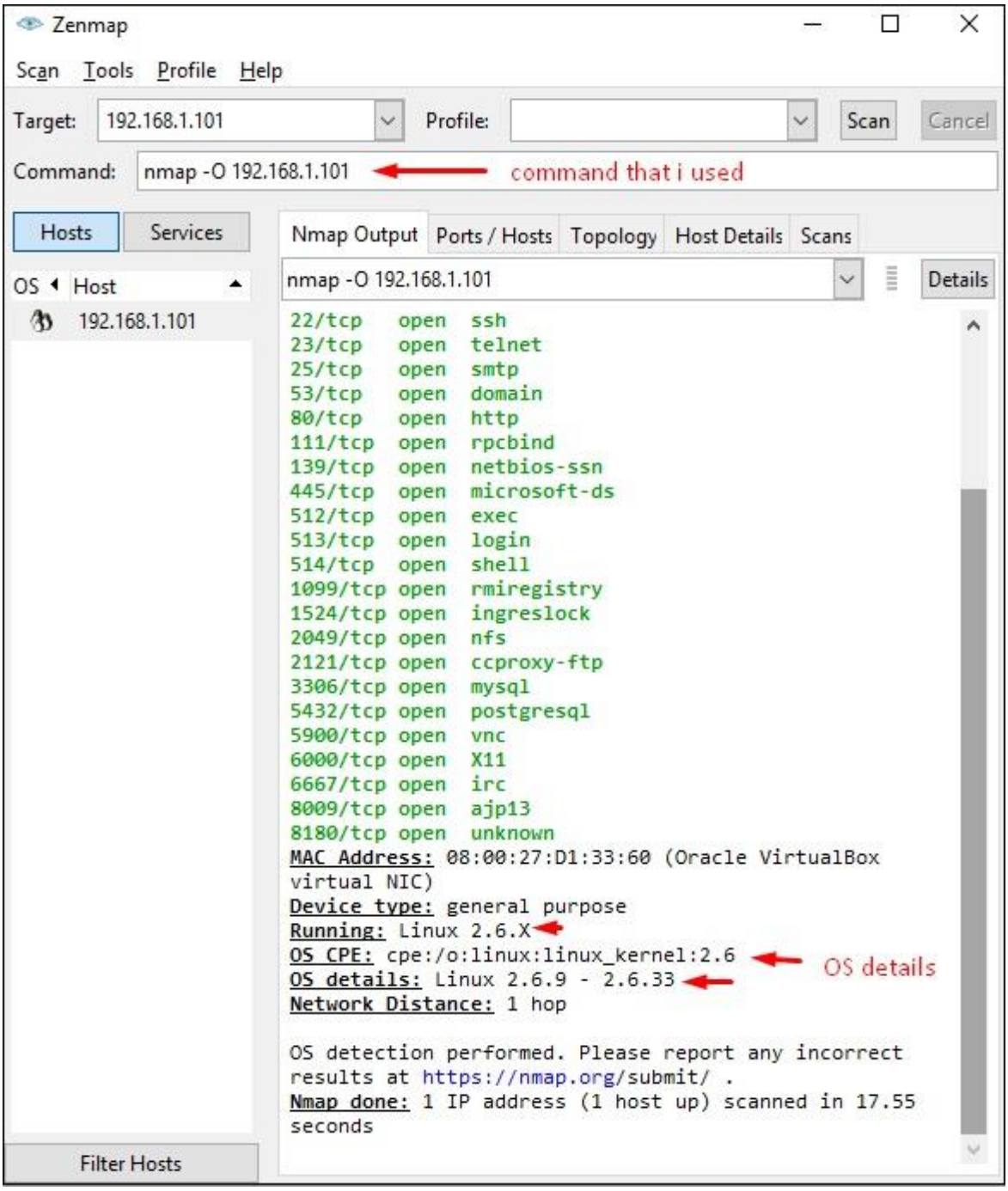


Step 2 − The next step is to detect the OS type/version of the target host. Based on the help indicated by NMAP, the parameter of OS type/version detection is variable "-O". For more information, use this link: https://nmap.org/book/man-os-detection.html

The command that we will use is −

nmap -O 192.168.1.101

The following screenshot shows where you need to type the above command to see the Nmap output –

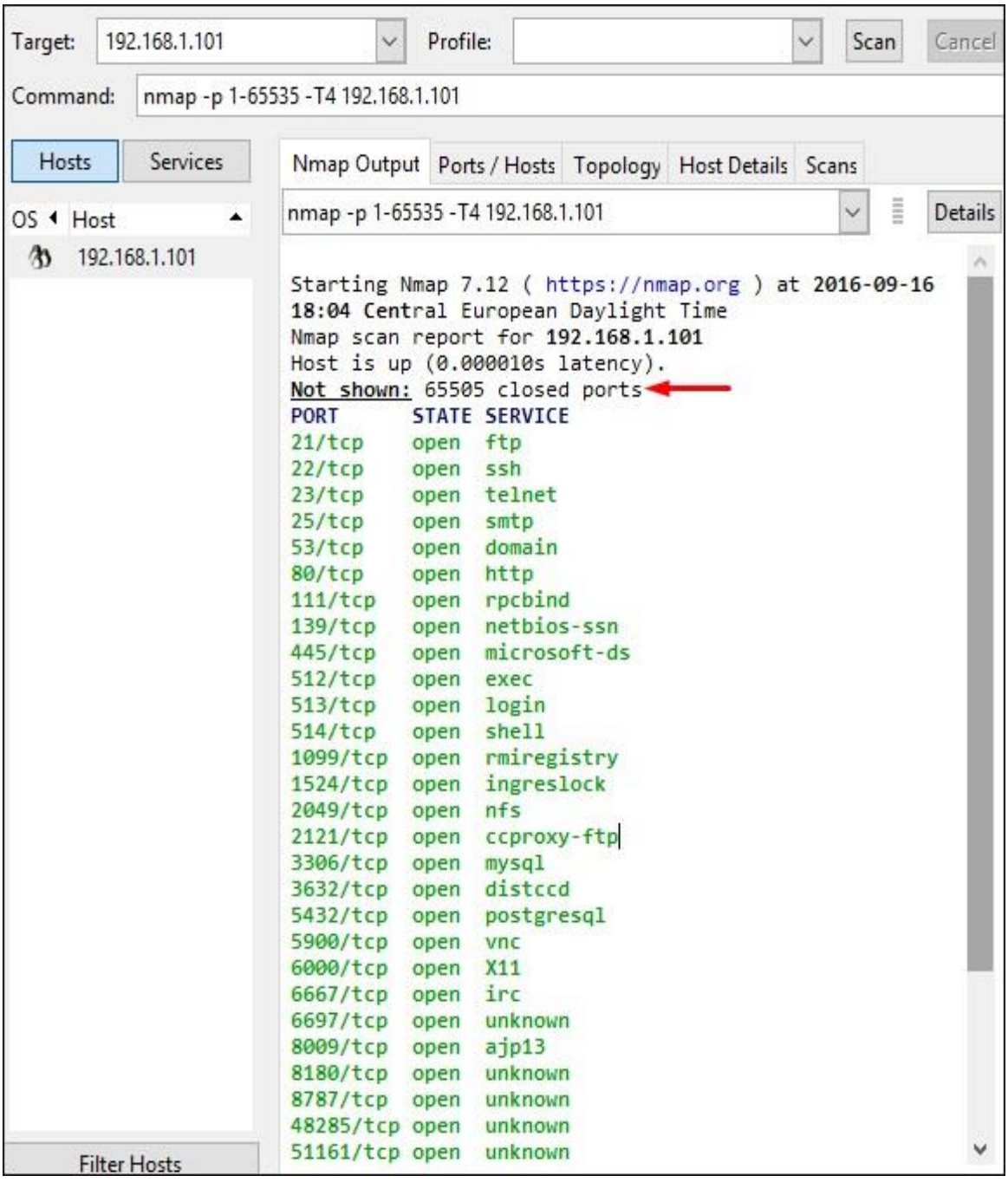


Step 3 − Next, open the TCP and UDP ports. To scan all the TCP ports based on NMAP, use the following command −

```
nmap -p 1-65535 -T4  192.168.1.101
```

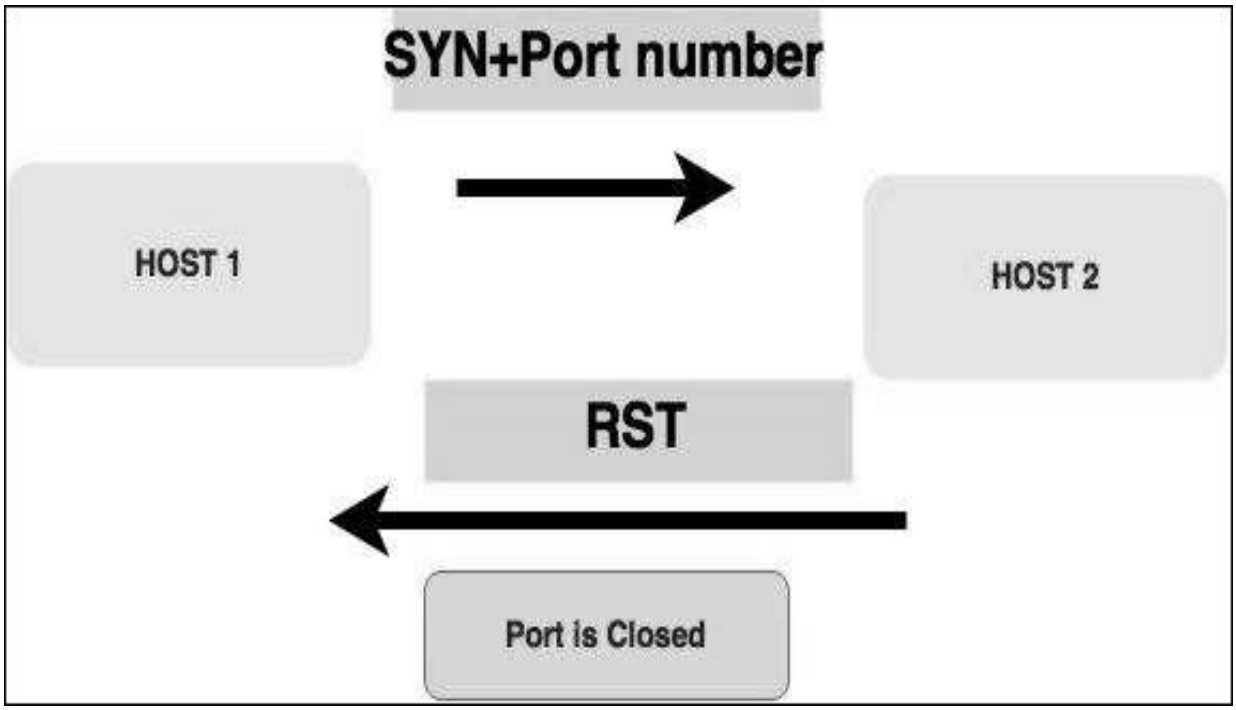
Where the parameter "–p" indicates all the TCP ports that have to be scanned. In this case, we are scanning all the ports and "-T4" is the speed of scanning at which NMAP has to run.

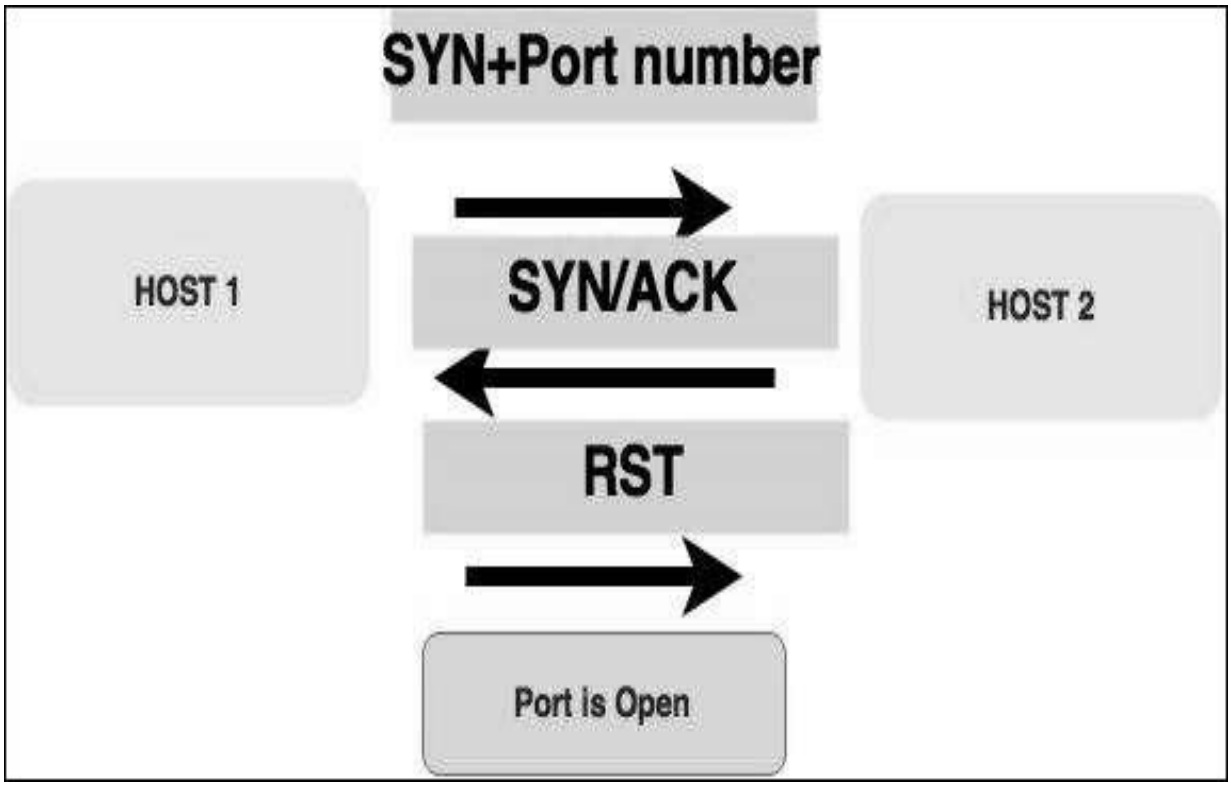
Following are the results. In green are all the TCP open ports and in red are all the closed ports. However, NMAP does not show as the list is too long.



Stealth Scan

Stealth scan or SYN is also known as **half-open scan**, as it doesn't complete the TCP three-way handshake. A hacker sends a SYN packet to the target; if a SYN/ACK frame is received back, then it's assumed the target would complete the connect and the port is listening. If an RST is received back from the target, then it is assumed the port isn't active or is closed.

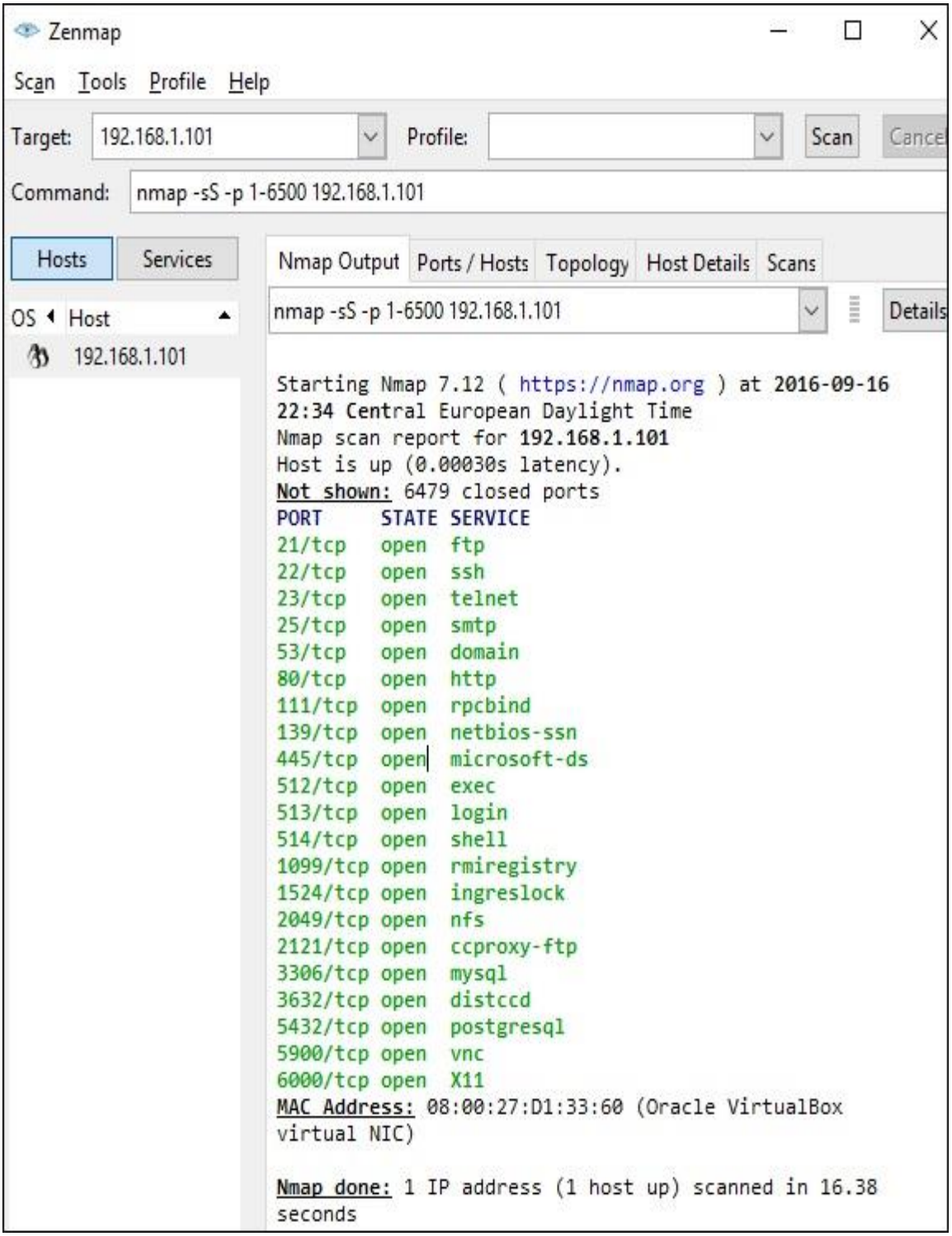




Now to see the SYN scan in practice, use the parameter **–sS** in NMAP. Following is the full command −

```
nmap -sS -T4 192.168.1.101
```

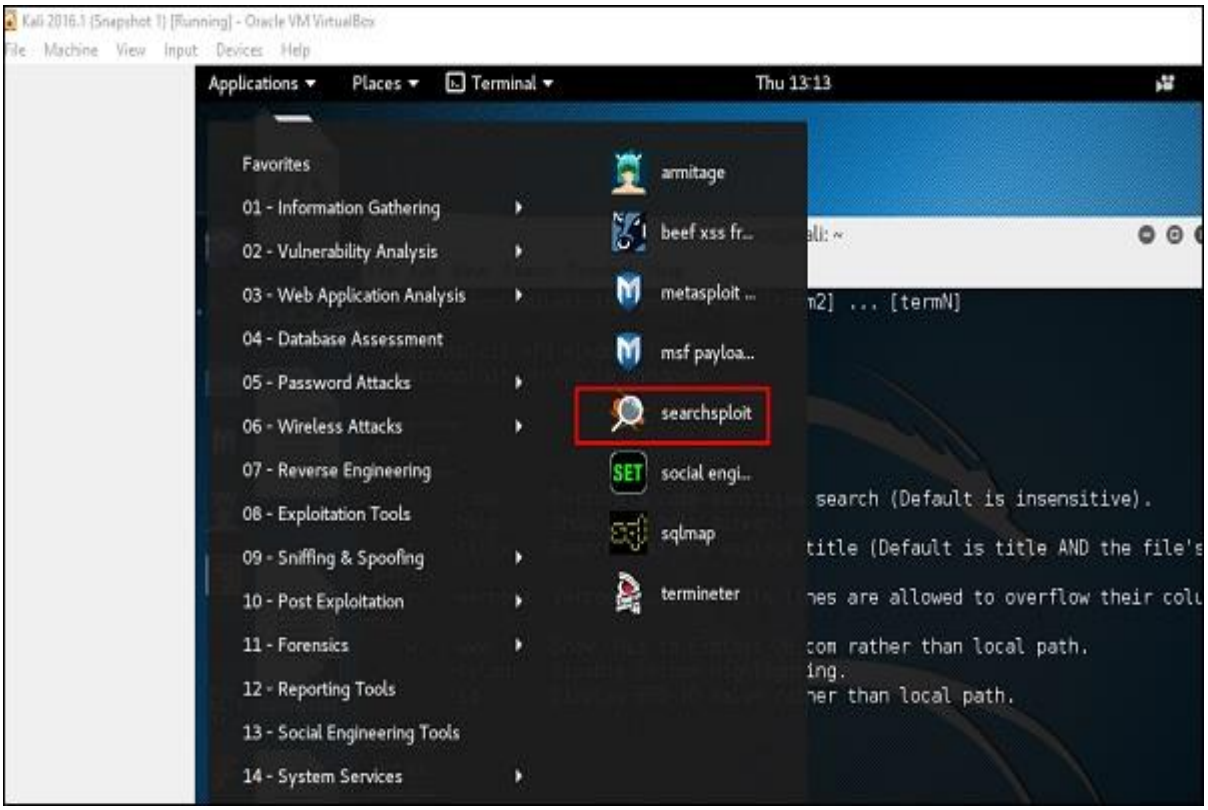
The following screenshot shows how to use this command −



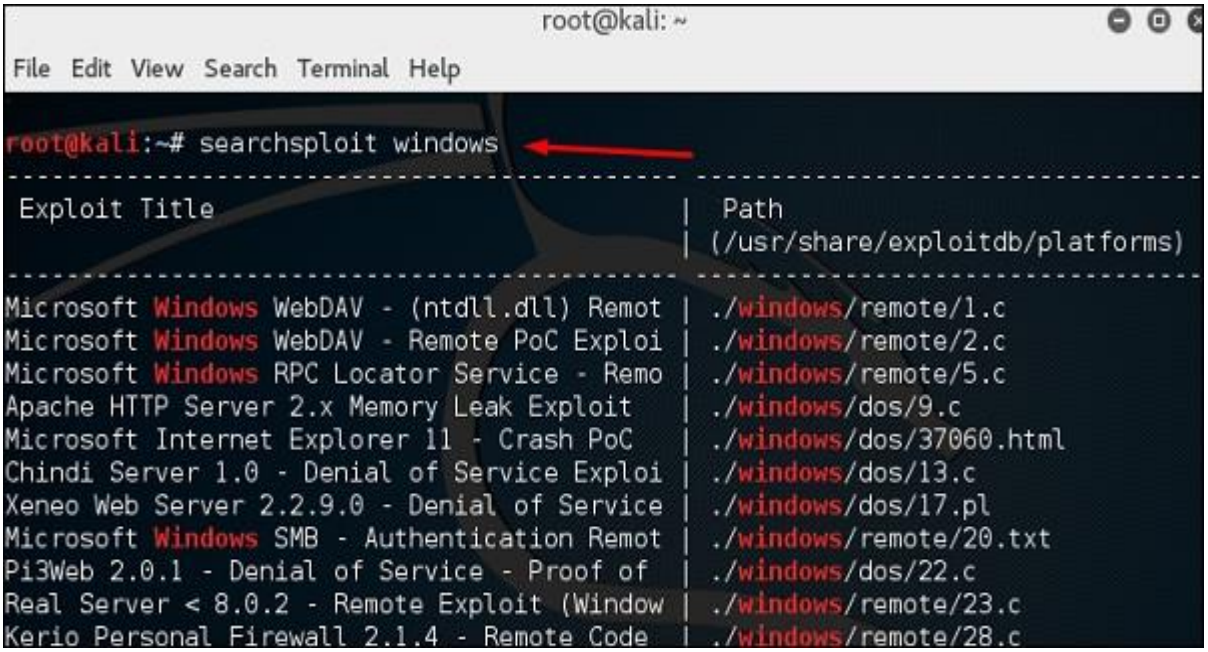
Searchsploit

Searchsploit is a tool that helps Kali Linux users to directly search with the command line from Exploit database archive.

To open it, go to Applications → 08-Exploitation Tools → searchsploit, as shown in the following screenshot.



After opening the terminal, type "**searchsploit exploit index name**".



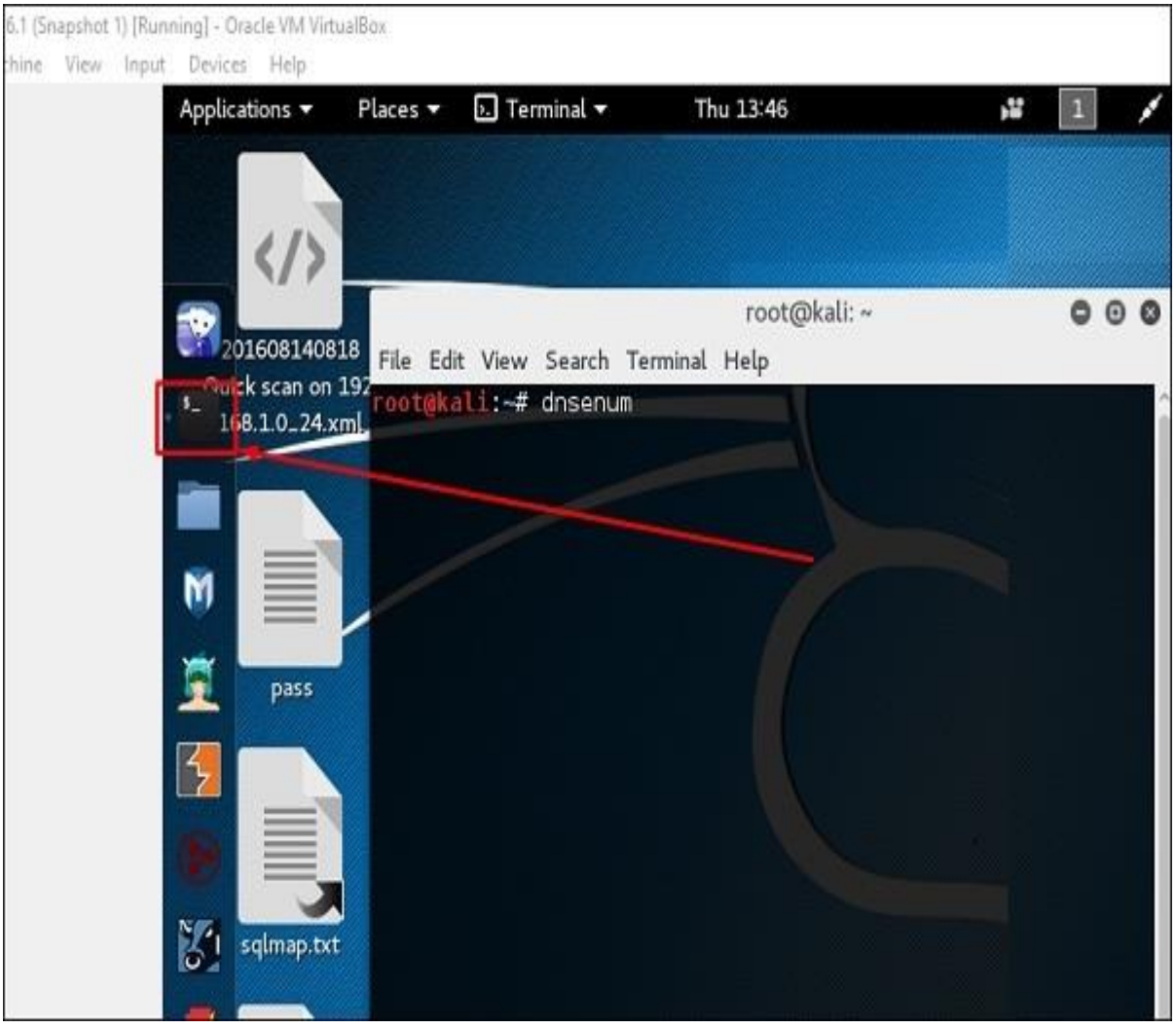
DNS Tools

In this section, we will learn how to use some DNS tools that Kali has incorporated. Basically, these tools help in zone transfers or domain IP resolving issues.

dnsenum.pl

The first tool is **dnsenum.pl** which is a PERL script that helps to get MX, A, and other records connect to a domain.

Click the terminal on the left panel.

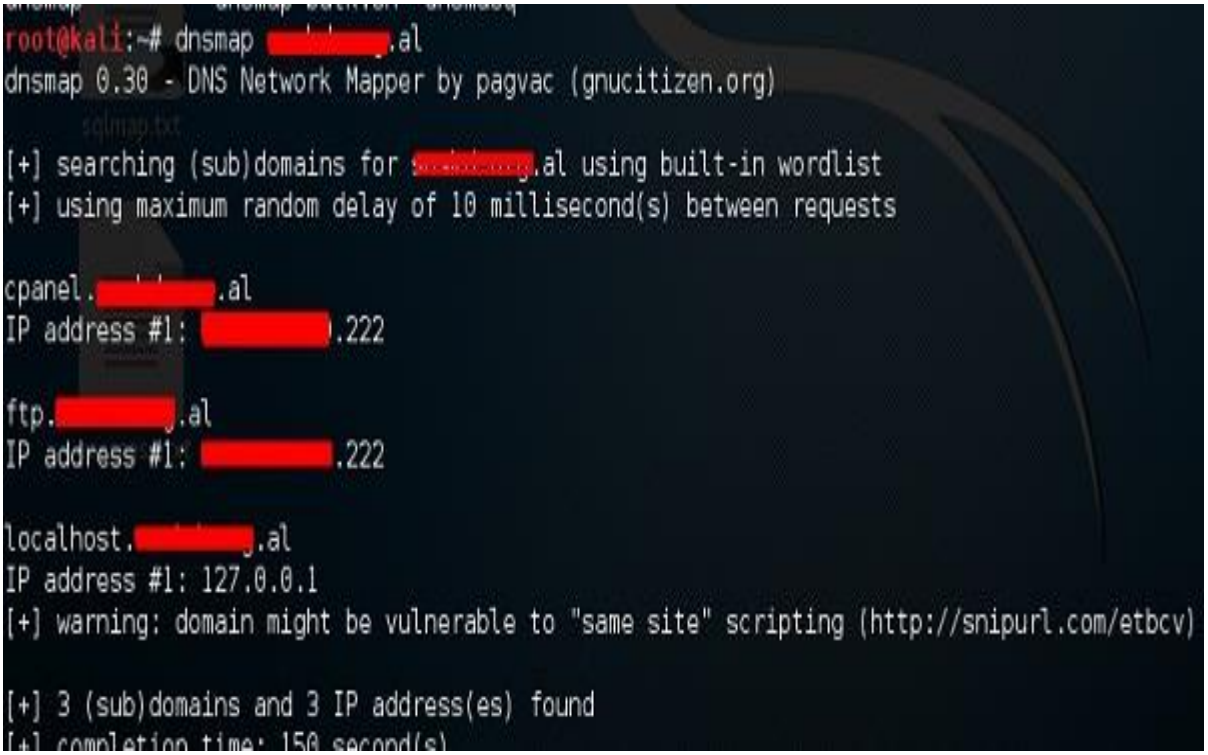


Type **"dnsenum domain name"** and all the records will be shown. In this case, it shows A records.

DNSMAP

The second tool is **DNSMAP** which helps to find the phone numbers, contacts, and other subdomain connected to this domain, that we are searching. Following is an example.

Click the terminal as in the upper section , then write **“dnsmap domain name”**



dnstracer

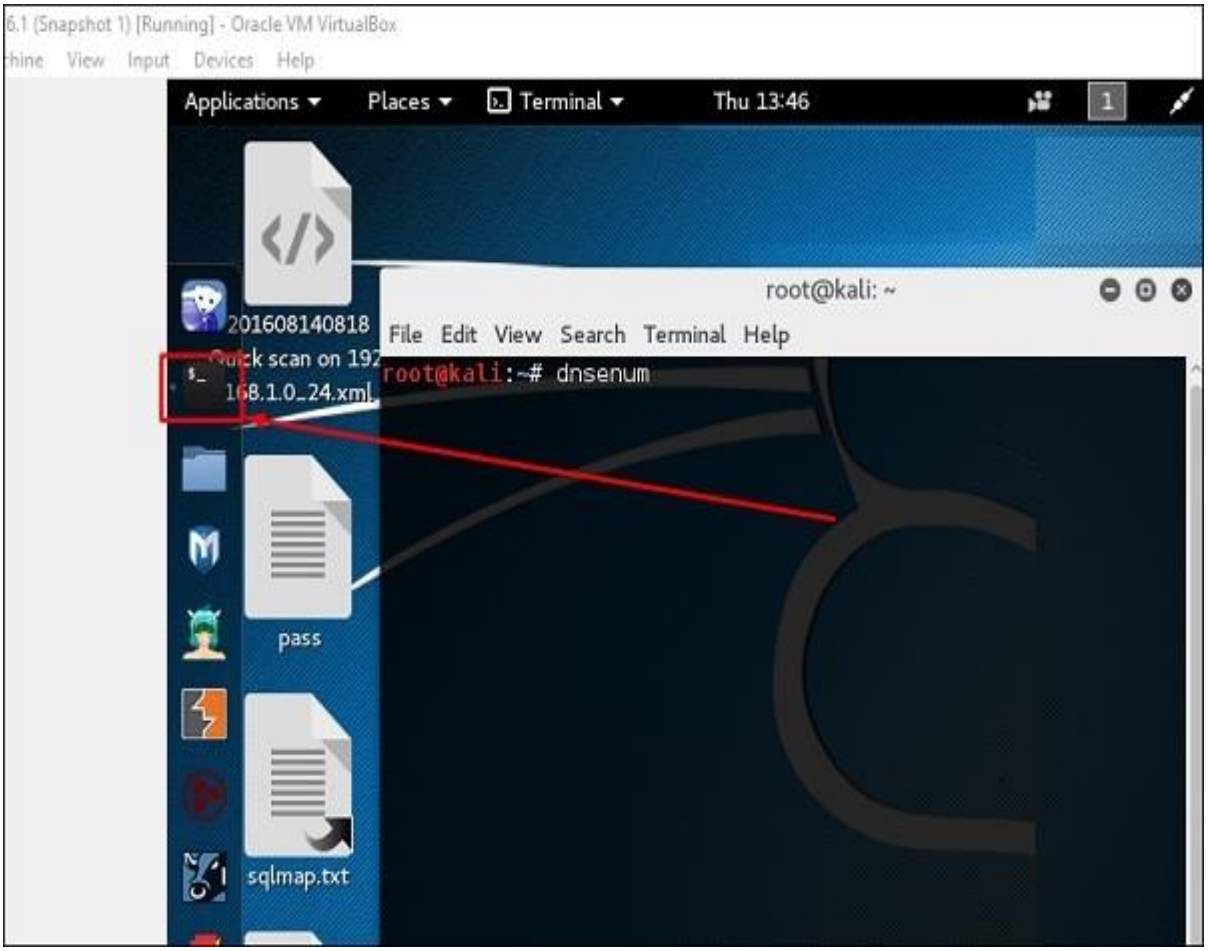
The third tool is **dnstracer**, which determines where a given Domain Name Server (DNS) gets its information from for a given hostname.

Click the terminal as in the upper section, then type **"dnstracer domain name"**.

LBD Tools

LBD (Load Balancing Detector) tools are very interesting as they detect if a given domain uses DNS and/or HTTP load balancing. It is important because if you have two servers, one or the other may not be updated and you can try to exploit it. Following are the steps to use it −

First, click the terminal on the left panel.

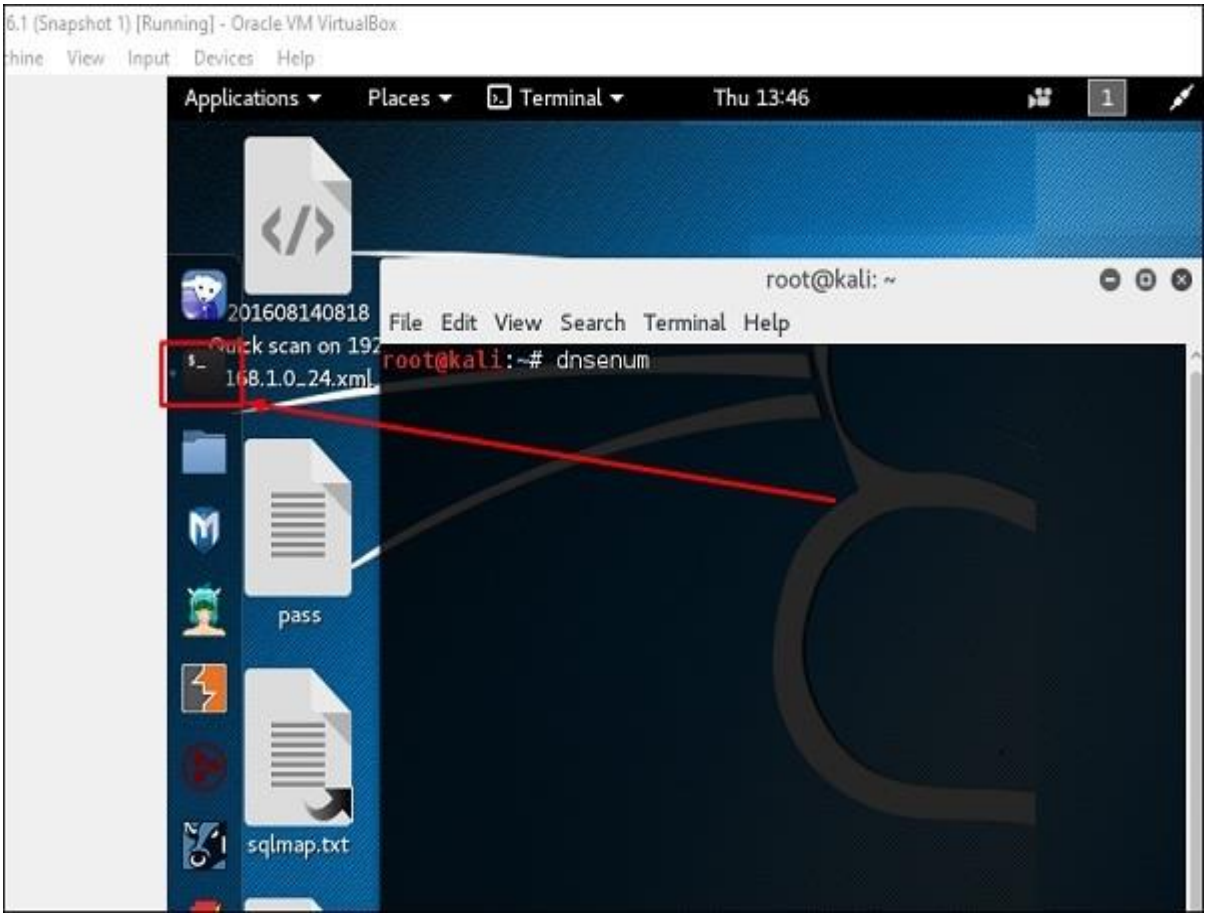


Then, type **"lbddomainname"**. If it produces a result as "FOUND", it means that the server has a load balance. In this case, the result is "NOT FOUND".

Hping3

Hping3 is widely used by ethical hackers. It is nearly similar to ping tools but is more advanced, as it can bypass the firewall filter and use TCP, UDP, ICMP and RAW-IP protocols. It has a traceroute mode and the ability to send files between a covered channel.

Click the terminal on the left panel.



Type **"hping3 –h"** which will show how to use this command.

```
root@kali:~# hping3 -h
usage: hping3 host [options]
  -h  --help      show this help
  -v  --version   show version
  -c  --count     packet count
  -i  --interval  wait (uX for X microseconds, for example -i u1000)
      --fast      alias for -i u10000 (10 packets for second)
      --faster    alias for -i u1000 (100 packets for second)
      --flood      sent packets as fast as possible. Don't show replies.
  -n  --numeric   numeric output
  -q  --quiet     quiet
  -I  --interface interface name (otherwise default routing interface)
  -V  --verbose   verbose mode
  -D  --debug     debugging info
  -z  --bind      bind ctrl+z to ttl           (default to dst port)
  -Z  --unbind    unbind ctrl+z
      --beep      beep for every matching packet received
Mode
  default mode     TCP
  -0  --rawip      RAW IP mode
  -1  --icmp       ICMP mode
  -2  --udp        UDP mode
```

The other command is **“hping3 domain or IP -parameter”**

```
root@kali:~# hping3 192.168.1.102 -V
using eth0, addr: 192.168.1.101, MTU: 1500
HPING 192.168.1.102 (eth0 192.168.1.102): NO FLAGS are set, 40 headers + 0 data
bytes
len=46 ip=192.168.1.102 ttl=64 DF id=0 tos=0 iplen=40
sport=0 flags=RA seq=0 win=0 rtt=10.6 ms
seq=0 ack=982034245 sum=c40 urp=0

len=46 ip=192.168.1.102 ttl=64 DF id=0 tos=0 iplen=40
sport=0 flags=RA seq=1 win=0 rtt=0.4 ms
seq=0 ack=1964174310 sum=dfc0 urp=0

len=46 ip=192.168.1.102 ttl=64 DF id=0 tos=0 iplen=40
sport=0 flags=RA seq=2 win=0 rtt=0.4 ms
seq=0 ack=7733565 sum=2520 urp=0
```

The art of Interviewing

To a large degree, the success of your interview will depend on your ability to discover needs and empathize with the interviewer. You can do this by asking questions that verify your understanding of what the interviewer has just said, without editorializing or expressing an opinion. By establishing empathy in this manner, you'll be in a better position to freely exchange ideas, and demonstrate your suitability for the job.

In addition to empathy, there are four other intangible fundamentals to a successful interview. These intangibles will influence the way your personality is perceived, and will affect the degree of rapport, or personal chemistry you'll share with the employer.

1. **Enthusiasm** — Leave no doubt as to your level of interest in the job. You may think it's unnecessary to do this, but employers often choose the more enthusiastic candidate in the case of a two-way tie. Besides, it's best to keep your options open — wouldn't you rather be in a position to turn down an offer, than have a prospective job evaporate from your grasp by giving a lethargic interview?

2. **Technical interest** — Employers look for people who love what they do, and get excited by the prospect of tearing into the nitty-gritty of the job.

3. **Confidence** — No one likes a braggart, but the candidate who's sure of his or her abilities will almost certainly be more favorably received.

4. **Intensity** — The last thing you want to do is come across as "flat" in your interview. There's nothing inherently wrong with being a laid back person; but sleepwalkers rarely get hired.

By the way, most employers are aware of how stressful it can be to interview for a new position, and will do everything they can to put you at ease.

Since interviewing also involves the exchange of tangible information, make sure to:

- Present your background in a thorough and accurate manner;

- Gather data concerning the company, the industry, the position, and the specific opportunity;

- Link your abilities with the company needs in the mind of the employer; and

- Build a strong case for why the company should hire you, based on the discoveries you make from building rapport and asking the right questions.

Both for your sake and the employer's, never leave an interview without exchanging fundamental information. The more you know about each other, the more potential you'll have for establishing rapport, and making an informed decision.

There are two ways to answer interview questions: the short version and the long version. When a question is open-ended, I always suggest to candidates that they say, "Let me give you the short version. If we need to explore some aspect of the answer more fully, I'd be happy to go into greater depth, and give you the long version."

The reason you should respond this way is because it's often difficult to know what type of answer each question will need. A question like, "What was your most difficult assignment?" might take anywhere from thirty seconds to thirty minutes to answer, depending on the detail you choose to give.

Therefore, you must always remember that the interviewer's the one who asked the question. So you should tailor your answer to what he or she needs to know, without a lot of extraneous rambling or superfluous explanation. Why waste time and create a negative impression by giving a sermon when a short prayer would do just fine?

Let's suppose you were interviewing for a sales management position, and the interviewer asked you, "What sort of sales experience have you had in the past?"

Well, that's exactly the sort of question that can get you into trouble if you don't use the short version/long version method. Most people would just start rattling off everything in their memory that relates to their sales experience. Though the information might be useful to the interviewer, your answer could get pretty complicated and long-winded unless it's neatly packaged.

One way to answer the question might be, "I've held sales positions with three different consumer product companies over a nine-year period. Where would you like me to start?"

Or, you might simply say, "Let me give you the short version first, and you can tell me where you want to go into more depth. I've had nine years experience in consumer product sales with three different companies, and held the titles of district, regional, and national sales manager. What aspect of my background would you like to concentrate on?"

By using this method, you telegraph to the interviewer that your thoughts are well organized, and that you want to understand the intent of the question before you travel too far in a direction neither of you wants to go. After you get the green light, you can spend your interviewing time discussing in detail the things that are important, not whatever happens to pop into your mind.

I've got a friend who's the hiring manager of an electronics company. He told me once that he brought a candidate into his office to make him a job offer. An hour later, the candidate left. I asked my friend if he had hired the candidate.

"No," he said. "I tried. But the candidate wouldn't stop talking long enough for me to make him an offer."

Don't misinterpret me. I'm not suggesting that an interview should consist of a series of monosyllabic grunts. It's just that nothing turns off an employer faster than a windbag candidate.

By using the short version/long version method to answer questions, you'll never talk yourself out of a job.

Beware: An interview will quickly disintegrate into an interrogation or monologue unless you ask some high quality questions of your own. Candidate questions are the lifeblood of any successful interview, because they:

- Create dialogue, which will not only enable the two of you to learn more about each other, but will help you visualize what it'll be like working together once you've been hired;

- Clarify your understanding of the company and the position responsibilities;

- Indicate your grasp of the fundamental issues discussed so far;

- Reveal your ability to probe beyond the superficial; and

- Challenge the employer to reveal his or her own depth of knowledge, or commitment to the job.

Your questions should always be slanted in such a way as to show empathy, interest, or understanding of the employer's needs. After all, the reason you're interviewing is because the employer's company has some piece of work which needs to be completed, or a problem that needs correcting. Here are some questions that have proven to be very effective:

    - What's the most important issue facing your department?
- How can I help you accomplish this objective?
- How long has it been since you first identified this need?
- How long have you been trying to correct it?
- Have you tried using your present staff to get the job done? What was the result?
- What other means have you used? For example, have you brought in independent contractors, or temporary help, or employees borrowed from other departments? Or have you recently hired people who haven't worked out?
- Is there any particular skill or attitude you feel is critical to getting the job done?
- Is there a unique aspect of my background that you'd like to exploit in order to help accomplish your objectives?

Questions like these will not only give you a sense of the company's goals and priorities, they'll indicate to the interviewer your concern for satisfying the company's objectives.

Here are seven of the most commonly asked interviewing questions. Do yourself and the prospective employer a favor, and give them some thought before the interview occurs.

1. Why do you want this job?
2. Why do you want to leave your present company?
3. Where do you see yourself in five years?
4. What are your personal goals?
5. What are your strengths? Weaknesses?
6. What do you like most about your current company?
7. What do you like least about your current company?

The last question is probably the hardest to answer: What do you like least about your present company?

I've found that rather than pointing out the faults of other people ("I can't stand the office politics," or, "I don't get along with my boss"), it's best to place the burden on yourself ("I feel I'm ready to exercise a new set of professional muscles," or, "The type of technology I'm interested in isn't available to me now.").

By answering in this manner, you'll avoid pointing the finger at someone else, or coming across as a whiner or complainer. It does no good to speak negatively about others.

I suggest you think through the answers to the above questions for two reasons.

First, it won't help your chances any to hem and haw over fundamental issues such as these. (The answers you give to these types of questions should be no-brainers.)

And secondly, the questions will help you evaluate your career choices before spending time and energy on an interview. If you don't feel comfortable with the answers you come up with, maybe the new job isn't right for you.

There's a good chance you'll be asked about your current and expected level of compensation. Here's the way to handle the following questions:

1. What are you currently earning?**Answer:** "My compensation, including bonus, is in the high-forties. I'm expecting my annual review next month, and that should put me in the low-fifties."

2. What sort of money would you need in order to come to work for our company?**Answer:** "I feel that the opportunity is the most important issue, not salary. If we decide to work together, I'm sure you'll make me a fair offer."

Notice the way a range was given as the answer to question [1], not a specific dollar figure. However, if the interviewer presses for a exact answer, then by all means, be precise, in terms of salary, bonus, benefits, expected increase, and so forth.

In answer to question [2], if the interviewer tries to zero in on your expected compensation, you should also suggest a range, as in, "I would need something in the low- to mid- fifties." Getting locked in to an exact figure may work against you later, in one of two ways: either the number you give is lower than you really want to accept; or the number appears too high or too low to

the employer, and an offer never comes. By using a range, you can keep your options open.

There are four types of questions that interviewers like to ask.

Resume questions require accurate, objective answers, since your resume consists of facts which tend to be quantifiable (and verifiable). Try to avoid answers which exaggerate your achievements, or appear to be opinionated, vague, or egocentric.

Second, interviewers will usually want you to comment on your abilities, or assess your past performance. They'll ask self-appraisal questions like, "What do you think is your greatest asset?" or, "Can you tell me something you've done that was very creative?"

Third, interviewers like to know how you respond to different stimuli. Situation questions ask you to explain certain actions you took in the past, or require that you explore hypothetical scenarios that may occur in the future. "How would you stay profitable during a recession?" or, "How would you go about laying off 1300 employees?" or, "How would you handle customer complaints if the company drastically raised its prices?" are typical situation questions.

And lastly, some employers like to test your mettle with stress questions such as, "After you die, what would you like your epitaph to read?" or, "If you were to compare yourself to any U.S. president, who would it be?" or, "It's obvious your background makes you totally unqualified for this position. Why should we even waste our time talking?"

Stress questions are designed to evaluate your emotional reflexes, creativity, or attitudes while you're under pressure. Since off-the-wall or confrontational questions tend to jolt your equilibrium, or put you in a defensive posture, the best way to handle them is to stay calm and give carefully considered answers.

Whenever I hear a stress question, I immediately think of the Miss Universe beauty pageant. The finalists (usually sheltered teenagers from places like Zambia or Uruguay) are asked before a live television audience of three and a half billion people to give heartfelt and earnest responses to incongruous questions like, "What would you tell the leaders of all the countries on earth to do to promote world peace?"

Of course, your sense of humor will come in handy during the entire interviewing process, just so long as you don't go over the edge. I heard of a candidate once who, when asked to describe his ideal job, replied, "To have beautiful women rub my back with hot oil." Needless to say, he wasn't hired.

Even if it were possible to anticipate every interview question, memorizing dozens of stock answers would be impractical, to say the least. The best policy is to review your background, your priorities, and your reasons for considering a new position; and to handle the interview as honestly as you can. If you don't know the answer to a question, just say so, or ask for a moment to think about your response.

At the conclusion of your interview, you can wrap up any unfinished business you failed to cover so far, and begin to explore the future of your candidacy.

During your interview wrap-up, it's a good practice to make the interviewer aware of other opportunities you're exploring, as long as they're genuine, and their timing has some bearing on your own decision making.

The fact that you're actively exploring other opportunities may affect the speed with which the company makes its hiring decision. It may even positively influence the eventual outcome, since the company may want to act quickly so as not to lose you.

However, your other activity should be presented in the spirit of assistance to the interviewer, not as a thinly veiled threat or negotiating tactic. I'd advise you to play it straight with the interviewer.

And remember to maintain a positive attitude. In today's job market, you'd be surprised how often victory is snatched from the jaws of defeat.

The better your interviewing skills, the greater your chances of getting the job.

Arranging the Interview

- **The job title or position the candidate will be interviewing for.** Perhaps it's exactly the job they applied for or maybe they were a member of your talent community and you found them the perfect role. Avoid any potential misunderstandings by clearly stating the job their interview will discuss.

- **The name of your company**. Include the name of your company, especially if it's a subsidiary of a larger organization that uses a different name. Be sure this information appears in plain text and not as an inline image to ensure it's visible in any email app.

- **Names and titles of people the candidate will be meeting with.** Whether it's you or an entire panel of team members, make sure candidates know exactly who they'll be meeting with to prevent any awkward or missed introductions.

- **The topics of discussion.** Is this a first interview where you'll review the basics of the role and get to know the candidate or an in-depth conversation that requires the candidate to prepare? The interview scheduling email presents the opportunity to paint the broad strokes of the interview's subject matter.

- **When you will be meeting and how long the meeting will last.** In the past, recruiters tended to include a few options for appointment times that triggered an email back-and-forth with the candidate in order to determine when to meet.That's changed with the advent of Yello, which automates the interview scheduling process. Yello gives candidates a link to a simple calendar interface that allows them to self-schedule an interview meeting time that works best for them. Even better, available interview times are drawn directly from an interviewer's Google or Outlook calendar, giving both recruiters and candidates as many interview choices as possible. And with Yello's forthcoming Interview Day Scheduling, recruiters will be able to schedule an entire day's worth of interviews thanks to new, sophisticated AI tools.

- **What the candidate needs to bring.** Whether it's references, copies of a resume, identifying documents or a portfolio, make sure the candidate knows exactly what they should have with them.

- **Where the interview will be located.** If it's an office, include a detailed address with general driving or transit instructions, as well as a link to a map. If it's online or over the phone, include easy-to-understand dialing instructions, download links and any other critical information to make sure your interview gets connected.

- **How to access the location.** Be sure to include information about parking and validation. If there's building security or a reception desk, include any particular steps to enter the building and the names of who they will interact with. Again, if the interview is taking place by phone or online, spell out the exact phone number, URL or app the candidate needs to participate in the interview.

Guides to a Successful Interview

How to Make the Best Interview Impression

To impress your interviewers, you'll need to be able to demonstrate that your qualifications and experience make you the best candidate for the job. This means knowing what they're looking for, understanding what you have to offer, and being able to quantify your successes. It also means coming across as a likable person who will fit in well with the team and help the company achieve its goals.

Needless to say, communicating all these things during a relatively short conversation can be challenging. Get insight into the process and set yourself up for a successful job interview.

What to Do Before the Interview

Research the Company. Gathering background information on a prospective employer is crucial to successfully preparing for an interview.

Your first step is to review the employer's website, especially the About Us section. Take a look at the company's social media presence, too. This will give you insight into how the company wants the public to perceive it. Research the company's history, its position in the market, and new developments, particularly recent or planned changes that could affect your role. Don't be afraid to request additional details about the position at hand, too.

When you demonstrate your knowledge about the organization during an interview, it shows genuine interest, which is what interviewers want to see.

The insights discovered in your research can also help you calibrate your responses to questions.

Practice Answering (and Asking!) Interview Questions. Prepare answers to commonly asked interview questions. Doing so will help you analyze your background and qualifications for the position. Plus, thinking through your responses will help you sound confident during the interview, and avoid rambling or incoherent responses.

You should also be ready for behavioral interview questions, which many of today's recruiters have adopted as a preferred method of screening candidates. Learn how to prepare for this common interviewing approach by reviewing this guide to behavioral based interviewing.

Very commonly, interviewers will ask if you have any questions for them so plan ahead, and have a list of questions ready to ask. Get even more tips to ace the interview, so you're sure you've covered all the basics.

Envision Yourself in the Role. If you can’t imagine yourself in the job, chances are that it will be hard for the hiring manager to picture it, either. So, once you’ve determined that your qualifications and the job requirements are the perfect match, devote some time to envisioning yourself in this job.

In addition to helping you gain confidence, this strategy will help you prepare for a crucial part of the job interview: explaining what you can accomplish in your first 60 or 90 days on the job. Just remember to avoid sounding as if you have a plan to

change everything about the company. Typically, hiring managers are invested in their organization, and may resent any suggestion that the company needs a top-to-bottom makeover.

Hold a Dress Rehearsal. Ask a close friend or mentor to conduct a mock interview with you—someone with insight about recruiting and hiring processes is ideal. Record the mock interview and review it to see how well you answer questions.

As well as paying attention to your responses during this practice run, take a look at your posture and eye contact. Your body language during an interview – from the initial handshake through the farewell at the end – can make a difference in how interviewers perceive you.

Don't Forget the Details. Try on your interview attire. Make sure it fits and that you feel comfortable. Assemble your interview materials, e.g. copies of your resume and a list of references, and have your portfolio, briefcase, or bag packed and ready to go.

Don't wait until the last minute to get directions to the interview location and estimate your travel time. Give yourself enough time to arrive several minutes early so you have time to decompress and relax before your meeting.

How to Handle the Interview

Listen. The best job interviews often feel like a conversation (albeit one where both parties are trying to impress one another). To achieve this, remember to focus on listening, not just waiting for your chance to speak. Not only will you be able to respond more effectively to their questions, you'll also demonstrate a valuable soft skill.

Handle Questions About Salary the Right Way. Dreading the salary negotiation portion of the interview process? You're not alone. Less than half of respondents to a CareerBuilder survey said that they negotiated salary after receiving a job offer. And 51% of those non-negotiators said that they resisted because they were uncomfortable asking for more.[1]

There are few things to keep in mind during the salary negotiation process. The first is that it's often best to let the employer raise the topic of salary first.

When they do, keep in mind that it's likely a good sign: employers typically don't broach the subject of salary requirements unless they're contemplating you coming aboard. (This differs from questions about salary requirements and salary history earlier in the process, which are intended to weed out applicants whose demands are outside the budget.)

Need help navigating the money conversation? This guide will show you how to negotiate the highest possible salary without alienating the hiring manager.

Remember that salary is only one part of your compensation. It's also important to evaluate benefits packages when you're deciding whether or not to take a job.

Avoid Typical Interview Blunders. Mistakes happen. Sometimes, a question will stump you. Or an unexpected situation will make you late. Many of the most common interview mistakes can be avoided with a bit of planning – and some awareness of interviewer pet peeves.

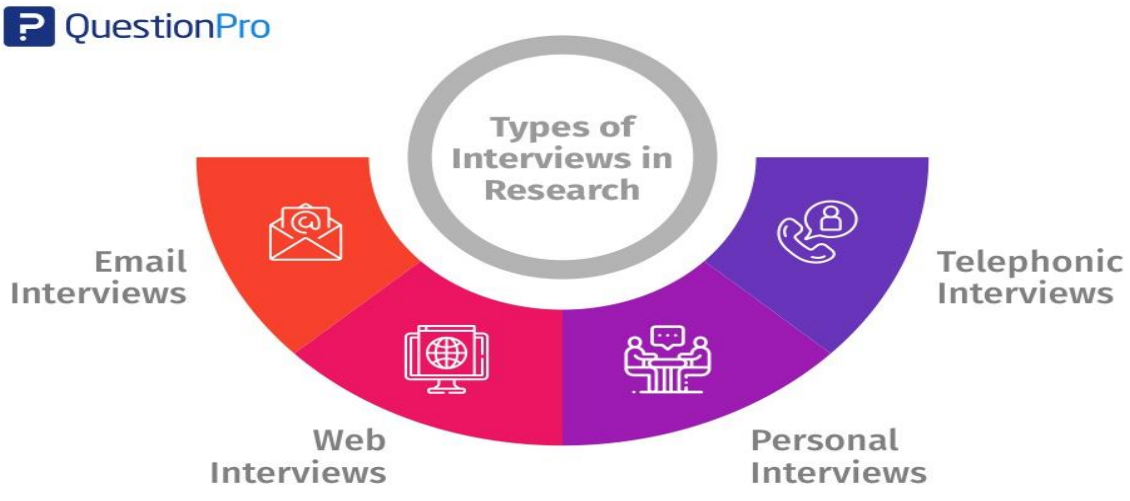
Before you go into the interview, make sure your phone is turned off or is on silent. The last thing you need is your phone going off in the middle of a job interview!

What to Do After the Interview

Send a Thank-You Note. One of the most important parts of the job interview happens after you leave the building: sending a thank-you note. How important is it? According to an Accountemps survey, 80% of hiring managers say that they consider thank-you notes when deciding which candidates to hire. The same survey found that only 24% of candidates actually sent a post-interview note, though, so if you take the time to say thanks, you'll stand out from the competition.[2]

Follow Up the Right Way. What if you send your thank-you note and don't hear anything back? If a week or more has gone by— or you've waited the amount of time specified by the hiring manager—it's a good idea to send a follow-up email to check in and reiterate your interest in the job. After that, let it go.

Types of Interviews and Questionnaires



An interview is generally a qualitative research technique which involves asking open-ended questions to converse with respondents and collect elicit data about a subject. The interviewer in most cases is the subject matter expert who intends to understand respondent opinions in a well-planned and executed series of questions and answers. Interviews are similar to focus groups and surveys when it comes to garnering information from the target market but are entirely different in their operation – focus groups are restricted to a small group of 6-10 individuals whereas surveys are quantitative in nature. Interviews are conducted with a sample from a population and the key characteristic they exhibit is their conversational tone.

Fundamental Types of Interviews in Research

A researcher has to conduct interviews with a group of participants at a juncture in the research where information can only be obtained by meeting and personally connecting with a section of their target audience. Interviews offer the researchers with a platform to prompt their participants and obtain inputs in the desired detail. There are three fundamental types of interviews in research:

- **Structured Interviews:**

Structured interviews are defined as research tools that are extremely rigid in their operations are allows very little or no scope of prompting the participants to obtain and analyze results. It is thus also known as a standardized interview and is significantly quantitative in its approach. Questions in this interview are pre-decided according to the required detail of information.

Structured interviews are excessively used in survey research with the intention of maintaining uniformity throughout all the interview sessions.

They can be closed-ended as well as open-ended – according to the type of target population. Closed-ended questions can be included to understand user preferences from a collection of answer options whereas open-ended can be included to gain details about a particular section in the interview.

Advantages of structured interviews:

- Structured interviews focus on the accuracy of different responses due to which extremely organized data can be collected. Different respondents have different type of answers to the same structure of questions – answers obtained can be collectively analyzed.

- They can be used to get in touch with a large sample of the target population.

- The interview procedure is made easy due to the standardization offered by structured interviews.

- Replication across multiple samples becomes easy due to the same structure of interview.

- As the scope of detail is already considered while designing the interview, better information can be obtained and the researcher can analyze the research problem in a comprehensive manner by asking accurate research questions.

- Since the structure of the interview is fixed, it often generates reliable results and is quick to execute.

- The relationship between the researcher and the respondent is not formal due to which the researcher can clearly understand the margin of error in case the respondent either degrees to be a part of the survey or is just not interested in providing the right information.

Disadvantages of structured interviews:

- Limited scope of assessment of obtained results.

- The accuracy of information overpowers the detail of information.

- Respondents are forced to select from the provided answer options.

- The researcher is expected to always adhere to the list of decided questions irrespective of how interesting the conversation is turning out to be with the participants.

- A significant amount of time is required for a structured interview.

Semi-Structured Interviews:

Semi-structured interviews offer a considerable amount of leeway to the researcher to probe the respondents along with maintaining basic interview structure. Even if it is a guided conversation between researchers and interviewees – an appreciable flexibility is offered to the researchers. A researcher can be assured that multiple interview rounds will not be required in the presence of structure in this type of research interview.

Keeping the structure in mind, the researcher can follow any idea or take creative advantage of the entire interview. Additional respondent probing is always necessary to garner information for a research study. The best application of semi-structured interview is when the researcher doesn't have time to conduct research and requires detailed information about the topic.

Advantages of semi-structured interviews:

- Questions of semi-structured interviews are prepared before the scheduled interview which provides the researcher with time to prepare and analyze the questions.
- It is flexible to an extent while maintaining the research guidelines.
- Researchers can express the interview questions in the format they prefer, unlike the structured interview.
- Reliable qualitative data can be collected via these interviews.
- Flexible structure of the interview

Disadvantages of semi-structured interviews:

  - Participants may question the reliability factor of these interviews due to the flexibility offered.
  - Comparing two different answers becomes difficult as the guideline for conducting interviews is not entirely followed. No two questions will have the exact same structure and the result will be an inability to compare are infer results.

- **Unstructured Interviews:**

Also called as in-depth interviews, unstructured interviews are usually described as conversations held with a purpose in mind – to gather data about the research study. These interviews have the least number of questions as they lean more towards a normal conversation but with an underlying subject.

The main objective of most researchers using unstructured interviews is to build a bond with the respondents due to which there are high chances that the respondents will be 100% truthful with their answers. There are no guidelines for the researchers to follow and so, they can approach the participants in any ethical manner to gain as much information as they possibly can for their research topic.

Since there are no guidelines for these interviews, a researcher is expected to keep their approach in check so that the respondents do not sway away from the main research motive. For a researcher to obtain the desired outcome, he/she must keep the following factors in mind:

- Intent of the interview.

- The interview should primarily take into consideration the participant's interest and skills.

- All the conversations should be conducted within permissible limits of research and the researcher should try and stick by these limits.

- The skills and knowledge of the researcher should match the purpose of the interview.

- Researchers should understand the do's and don'ts of unstructured interviews.

Advantages of Unstructured Interviews:

- Due to the informal nature of unstructured interviews – it becomes extremely easy for researchers to try and develop a friendly rapport with the participants. This leads to gaining insights in extreme detail without much conscious effort.

- The participants can clarify all their doubts about the questions and the researcher can take each opportunity to explain his/her intention for better answers.

- There are no questions which the researcher has to abide by and this usually increases the flexibility of the entire research process.

Disadvantages of Unstructured Interviews:

- As there is no structure to the interview process, researchers take time to execute these interviews.

- The absence of a standardized set of questions and guidelines indicates that the reliability of unstructured interviews is questionable.

- In many cases, the ethics involved in these interviews are considered borderline upsetting.

Methods of Research Interviews:

There are three methods to conduct research interviews, each of which is peculiar in its application and can be used according to the research study requirement.

Personal Interviews:

Personal interviews are one of the most used types of interviews, where the questions are asked personally directly to the respondent. For this, a researcher can have a guide online surveys to take note of the answers. A researcher can design his/her survey in such a way that they take notes of the comments or points of view that stands out from the interviewee.

Advantage:

- Higher response rate.
- When the interviewees and respondents are face-to-face, there is a way to adapt the questions if this is not understood.
- More complete answers can be obtained if there is doubt on both sides or a particular information is detected that is remarkable.
- The researcher has an opportunity to detect and analyze the interviewee's body language at the time of asking the questions and taking notes about it.

Disadvantages:

- They are time-consuming and extremely expensive.
- They can generate distrust on the part of the interviewee, since they may be self-conscious and not answer truthfully.
- Contacting the interviewees can be a real headache, either scheduling an appointment in workplaces or going from house to house and not finding anyone.
- Therefore, many interviews are conducted in public places, such as shopping centers or parks. There are even consumer studies that take advantage of these sites to conduct interviews or surveys and give incentives, gifts, coupons, in short; There are great opportunities for online research in shopping centers.
- Among the advantages of conducting these types of interviews is that the respondents will have more fresh information if the interview is conducted in the context and with the appropriate stimuli, so that researchers can have data from their experience at the scene of the events, immediately and first hand. The interviewer can use an online survey through a mobile device that will undoubtedly facilitate the entire process.

Telephonic Interviews:

Telephonic interviews are widely used and easy to combine with online surveys to carry out research effectively.

Advantages:

- To find the interviewees it is enough to have their telephone numbers on hand.
- They are usually lower cost.

- The information is collected quickly.

- Having a personal contact can also clarify doubts, or give more details of the questions.

Disadvantages:

- Many times researchers observe that people do not answer phone calls because it is an unknown number for the respondent, or simply already changed their place of residence and they cannot locate it, which causes a bias in the interview.

- Researchers also face that they simply do not want to answer and resort to pretexts such as they are busy to answer, they are sick, they do not have the authority to answer the questions asked, they have no interest in answering or they are afraid of putting their security at risk.

- One of the aspects that should be taken care of in these types of interviews is the kindness with which the interviewers address the respondents, in order to get them to cooperate more easily with their answers. Good communication is vital for the generation of better answers.

Email or Web Page Interviews:

Online research is growing more and more because consumers are migrating to a more virtual world and it is best for each researcher to adapt to this change.

The increase in people with Internet access has made it popular that interviews via email or web page stand out among the types of interviews most used today. For this nothing better than an online survey.

More and more consumers are turning to online shopping, which is why they are a great niche to be able to carry out an interview that will generate information for the correct decision making.

Advantages of email surveys:

- Speed in obtaining data

- The respondents respond according to their time, at the time they want and in the place they decide.

- Online surveys can be mixed with other research methods or using some of the previous interview models. They are tools that can perfectly complement and pay for the project.
- A researcher can use a variety of questions, logics, create graphs and reports immediately.

Undoubtedly, the objective of the research will set the pattern of what types of interviews are best for data collection. Based on the research design, a research can plan and test the questions, for instance, if the questions are the correct and if the survey flows in the best way.

In addition there are other types of research that can be used under specific circumstances, for example in the case of no connection or adverse situations to carry out surveyors, in these types of occasions it is necessary to conduct a field research, which can not be considered an interview if not rather a completely different methodology.

To summarize the discussion, an effective interview will be one that provides researchers with the necessary data to know the object of study and that this information is applicable to the decisions researchers make.

1. Structured data is clearly defined and searchable types of data, while unstructured data is usually stored in its native format.

2. Structured data is quantitative, while unstructured data is qualitative.

3. Structured data is often stored in data warehouses, while unstructured data is stored in data lakes.

4. Structured data is easy to search and analyze, while unstructured data requires more work to process and understand.

5. Structured data exists in predefined formats, while unstructured data is in a variety of formats.

Data is fundamental to business decisions. A company's ability to gather the right data, interpret it, and act on those insights is often what will determine its level of success. But the amount of data accessible to companies is ever increasing, as are the different kinds of data available. Business data comes in a wide variety of formats, from strictly formed relational databases to your last tweet. All of this data, in all its different formats, can be divided into two main categories: structured data and unstructured data.

In this article, we'll take a closer look at these concepts and the differences between them.

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1. What is Structured Data?
2. What is Unstructured Data?
3. What is Semistructured Data?
4. Structured vs Unstructured Data: 5 Key Differences
5. Conclusion

What is Structured Data?

The term structured data refers to data that resides in a fixed field within a file or record. Structured data is typically stored in a relational database (RDBMS). It can consist of numbers and text, and sourcing can happen automatically or manually, as long as it's within an RDBMS structure. It depends on the creation of a data model, defining what types of data to include and how to store and process it.

The programming language used for structured data is SQL (Structured Query Language). Developed by IBM in the 1970s, SQL handles relational databases. Typical examples of structured data are names, addresses, credit card numbers, geolocation, and so on.

What is Unstructured Data?

Unstructured data is more or less all the data that is not structured. Even though unstructured data may have a native, internal structure, it's not structured in a predefined way. There is no data model; the data is stored in its native format.

Typical examples of unstructured data are rich media, text, social media activity, surveillance imagery, and so on.

The amount of unstructured data is much larger than that of structured data. Unstructured data makes up a whopping 80% or more of all enterprise data, and the percentage keeps growing. This means that companies not taking unstructured data into account are missing out on a lot of valuable business intelligence.

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What is Semistructured Data?

Semistructured data is a third category that falls somewhere between the other two. It's a type of structured data that does not fit into the formal structure of a relational database. But while not matching the description of structured data entirely, it still employs tagging systems or other markers, separating different elements and enabling search. Sometimes, this is referred to as data with a self-describing structure.

A typical example of semistructured data is smartphone photos. Every photo taken with a smartphone contains unstructured image content as well as the tagged time, location, and other identifiable (and structured) information. Semi-structured data formats include JSON, CSV, and XML file types.

Structured vs Unstructured Data: 5 Key Differences

1) Defined vs Undefined Data

Structured data is clearly defined types of data in a structure, while unstructured data is usually stored in its native format. Structured data lives in rows and columns and it can be mapped into pre-defined fields. Unlike structured data, which is organized and easy to access in relational databases, unstructured data does not have a predefined data model.

2) Qualitative vs Quantitative Data

Structured data is often quantitative data, meaning it usually consists of hard numbers or things that can be counted. Methods for analysis include regression (to predict relationships between variables); classification (to estimate probability); and clustering of data (based on different attributes).

Unstructured data, on the other hand, is often categorized as qualitative data, and cannot be processed and analyzed using conventional tools and methods. In a business context, qualitative data can, for example, come from customer surveys, interviews, and social media interactions. Extracting insights from qualitative data requires advanced analytics techniques like data mining and data stacking.

3) Storage in Data Houses vs Data Lakes

Structured data is often stored in data warehouses, while unstructured data is stored in data lakes. A data warehouse is the endpoint for the data's journey through an ETL pipeline. A data lake, on the other hand, is a sort of almost limitless repository where data is stored in its original format or after undergoing a basic "cleaning" process.

Both have the potential for cloud-use. Structured data requires less storage space, while unstructured data requires more. For example, even a tiny image takes up more space than many pages of text.

As for databases, structured data is usually stored in a relational database (RDBMS), while the best fit for unstructured data instead is so-called non-relational, or NoSQL databases.

4) Ease of Analysis

One of the most significant differences between structured and unstructured data is how well it lends itself to analysis. Structured data is easy to search, both for humans and for algorithms. Unstructured data, on the other hand, is intrinsically more difficult to search and requires processing to become understandable. It's challenging to deconstruct since it lacks a predefined data model and hence doesn't fit in in relational databases.

While there are a wide array of sophisticated analytics tools for structured data, most analytics tools for mining and arranging unstructured data are still in the developing phase. The lack of predefined structure makes data mining tricky, and developing best practices on how to handle data sources like rich media, blogs, social media data, and customer communication is a challenge.

5) Predefined Format vs Variety of Formats

The most common format for structured data is text and numbers. Structured data has been defined beforehand in a data model.

Unstructured data, on the other hand, comes in a variety of shapes and sizes. It can consist of everything from audio, video, and imagery to email and sensor data. There is no data model for the unstructured data; it is stored natively or in a data lake that doesn't require any transformation.

In Conclusion

There are mainly two categories of data: structured data and unstructured. Structured data resides in predefined models and formats, while unstructured data is stored in its native format until it's extracted for analysis. There is also semistructured data; a category that falls between the other two. It refers to data that has some kind of tagging structure but still doesn't fit into the formal structure of a relational database.

In this article, we've looked at five important differences between structured and unstructured data:

1. Defined vs Undefined Data
2. Qualitative vs Quantitative Data
3. Storage in Data Houses vs Data Lakes
4. Easy vs Hard to Analyze
5. Predefined format vs a variety of formats

While structured data is much easier for Big Data programs to process, it's paramount not to forget about the unstructured and semistructured data. Analyzing unstructured data does present a more significant challenge. But considering that more than 80% of all enterprise data adheres to this category, leaving it out will create large blind spots. Luckily, as technology evolves, the insights that are hidden in unstructured data are becoming more accessible.

How Xplenty Can Help

We believe that everyone should be able to manage their data, regardless of their tech experience. That's why we offer no-code and low-code options so that you can add Xplenty to your data solution stack with ease.

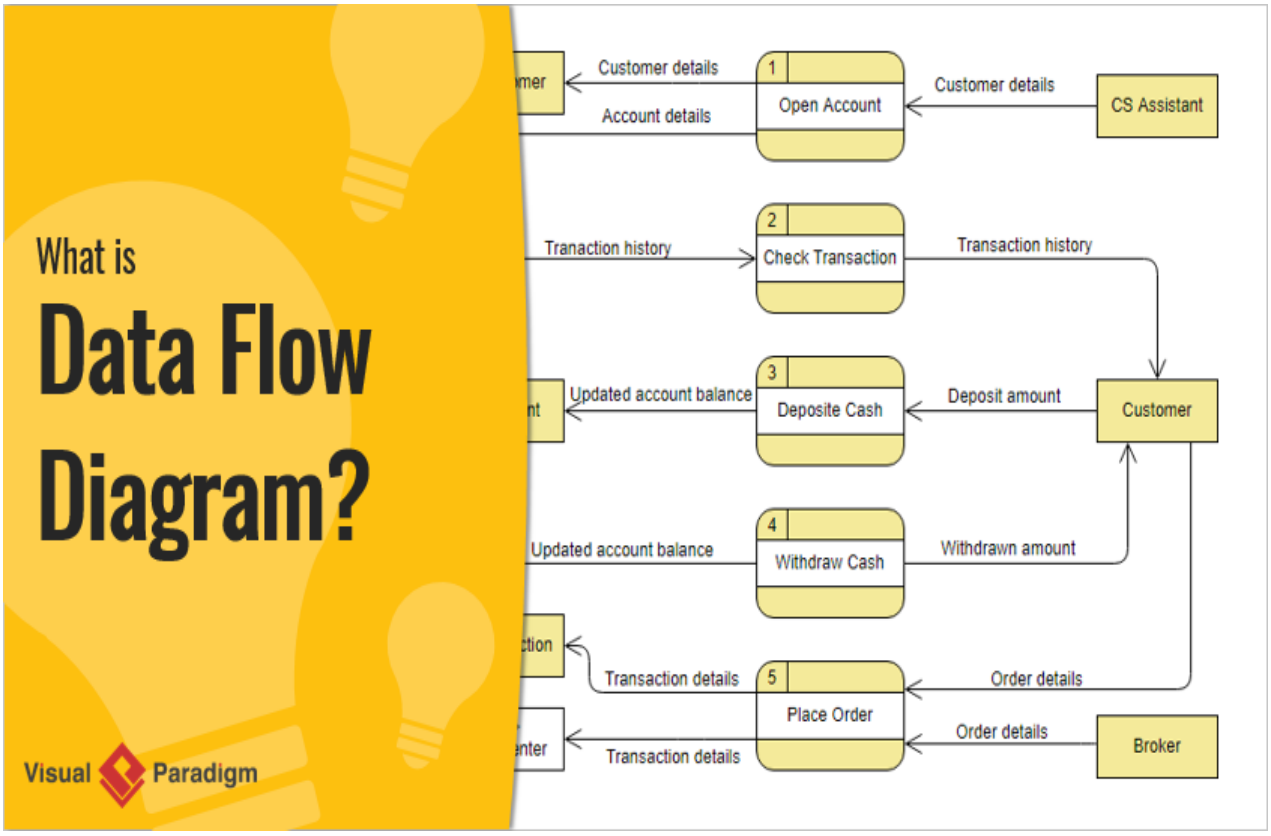
Xplenty offers a complete toolkit for building ETL data pipelines, making it easy to implement an ETL or ELT solution to extract unstructured data and transform it into the format you need.

With Xplenty's workflow engine, you can orchestrate and schedule data pipelines. With our rich expression language, you can implement complex data preparation functions and integrate with other data repositories and applications.

With Xplenty, you can spend less time processing your data, so you have more time for analyzing it. Schedule a demo and learn how our low-code platform can help you turn your unstructured data into valuable business intelligence!

The Tools of Structured Analysis

The Dataflow Diagram (DFD)



Also known as DFD, Data flow diagrams are used to graphically represent the flow of data in a business information system. DFD describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation.

Data flow diagrams can be divided into logical and physical. The logical data flow diagram describes flow of data through a system to perform certain functionality of a business. The physical data flow diagram describes the implementation of the logical data flow.

Draw DFD with the Best DFD tool

Need to create Data Flow Diagram? Visual Paradigm features a professional DFD editor that enables you to create DFDs faster, easier and better. It is an international award-winning modeler, and yet it is easy-to-use.

Why DFD?

DFD graphically representing the functions, or processes, which capture, manipulate, store, and distribute data between a system and its environment and between components of a system. The visual representation makes it a good communication tool between User and System designer. Structure of DFD allows starting from a broad overview and expand it to a hierarchy of detailed diagrams. DFD has often been used due to the following reasons:

- Logical information flow of the system
- Determination of physical system construction requirements
- Simplicity of notation
- Establishment of manual and automated systems requirements

DFD Symbols

There are **four basic symbols** that are used to represent a data-flow diagram.

Process

A process receives input data and produces output with a different content or form. Processes can be as simple as collecting input data and saving in the database, or it can be complex as producing a report containing monthly sales of all retail stores in the northwest region.

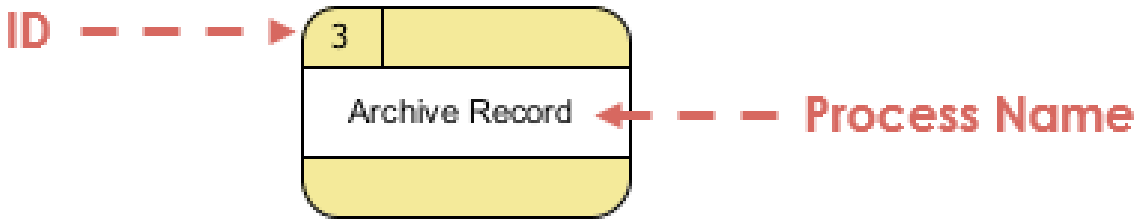
Every process has a name that identifies the function it performs.
The name consists of a verb, followed by a singular noun.

Example:

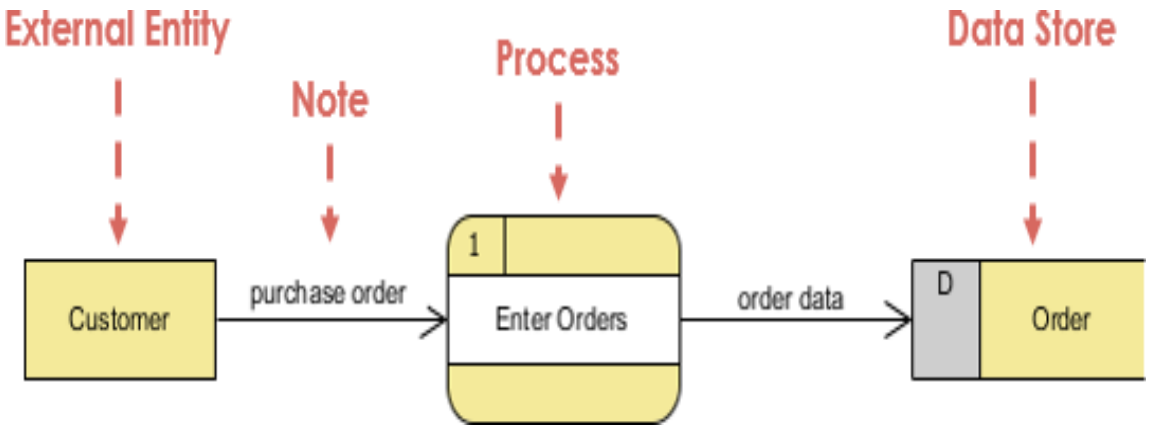
- Apply Payment
- Calculate Commission
- Verify Order

Notation

- A rounded rectangle represents a process
- Processes are given IDs for easy referencing



Process Example



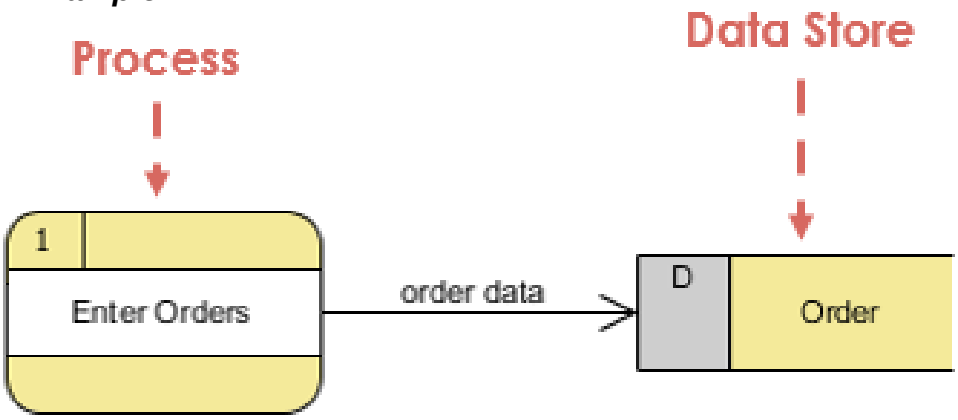
Data Flow

A data-flow is a path for data to move from one part of the information system to another. A data-flow may represent a single data element such the Customer ID or it can represent a set of data element (or a data structure).

Example:

- Customer_info (LastName, FirstName, SS#, Tel #, etc.)
- Order_info (OrderId, Item#, OrderDate, CustomerID, etc.).

Data flow Example:



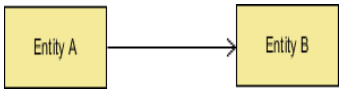
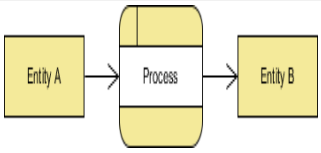
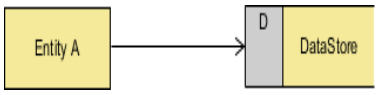
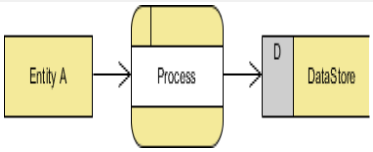
Notation

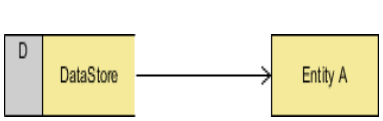
- Straight lines with incoming arrows are input data flow
- Straight lines with outgoing arrows are output data flows Note that:

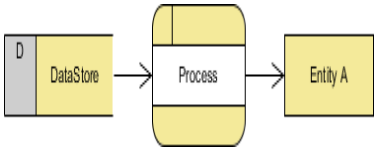
Because every process changes data from one form into another, at least one data-flow must enter and one data-flow must exit each process symbol.

Rule of Data Flow

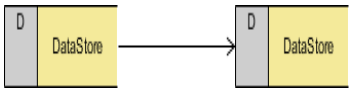
One of the rule for developing DFD is that all flow must begin with and end at a processing step. This is quite logical, because data can't transform on its own with being process. By using the thumb rule, it is quite easily to identify the illegal data flows and correct them in a DFD.

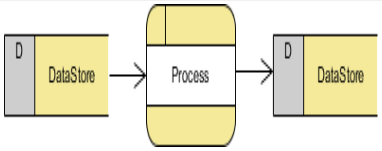
Wrong	Right	Description
		An entity cannot provide data to another entity without some processing occurred.
		Data cannot move directly from an entity to a data story without being processed.





Data cannot move directly from a data store without being processed.



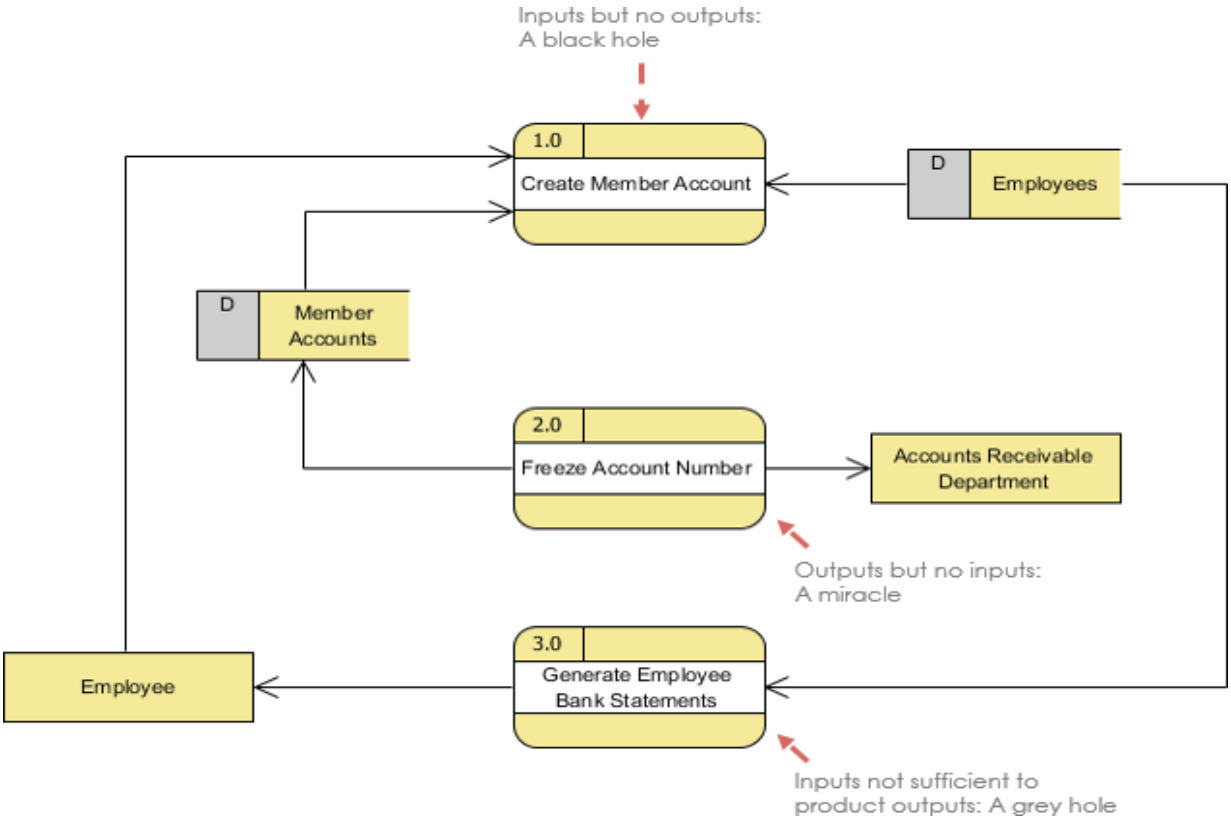


Data cannot move directly from one data store to another without being processed.

Other frequently-made mistakes in DFD

A second class of DFD mistakes arise when the outputs from one processing step do not match its inputs and they can be classified as:

- Black holes - A processing step may have input flows but no output flows.
- Miracles - A processing step may have output flows but no input flows.
- Grey holes - A processing step may have outputs that are greater than the sum of its inputs

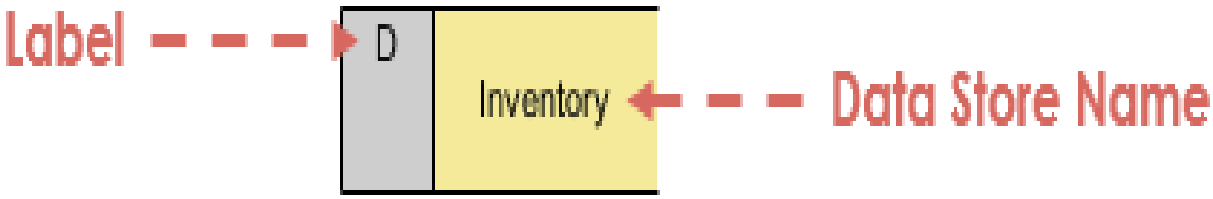


Data Store

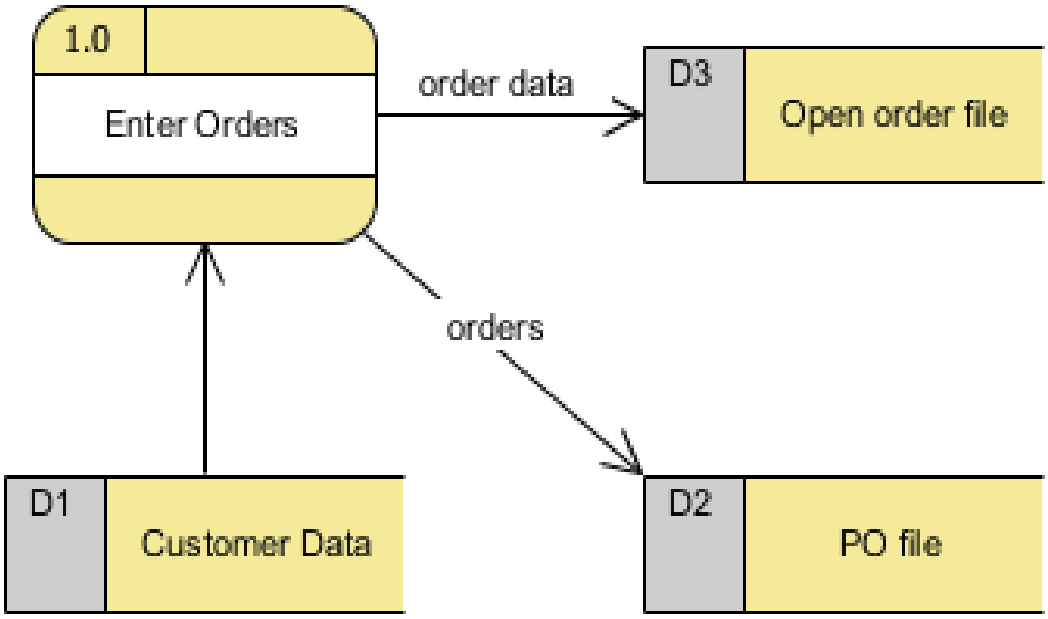
A data store or data repository is used in a data-flow diagram to represent a situation when the system must retain data because one or more processes need to use the stored data in a later time.

Notation

- Data can be written into the data store, which is depicted by an outgoing arrow
- Data can be read from a data store, which is depicted by an incoming arrow.
- Examples are: inventory, Accounts receivables, Orders, and Daily Payments.



Data Store Example



Note that:

- A data store must be connected to a process with a data-flow.
- Each data store must have at least one input data-flow and at least one output data-flow (even if the output data-flow is a control or confirmation message).

External Entity

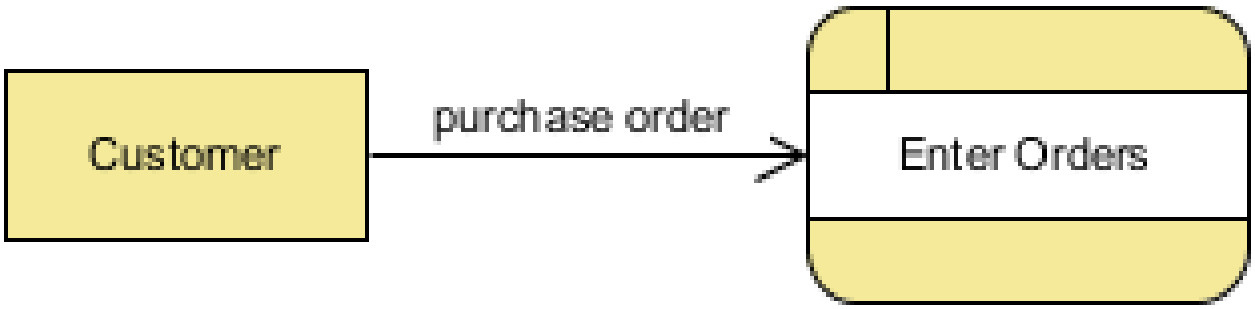
An external entity is a person, department, outside organization, or other information system that provides data to the system or receives outputs from the system. External entities are components outside of the boundaries of the information systems. They represent how the information system interacts with the outside world.

- A rectangle represents an external entity
- They either supply data or receive data
- They do not process data

Notation

- A customer submitting an order and then receive a bill from the system
- A vendor issue an invoice

External Entity Example



Note that:

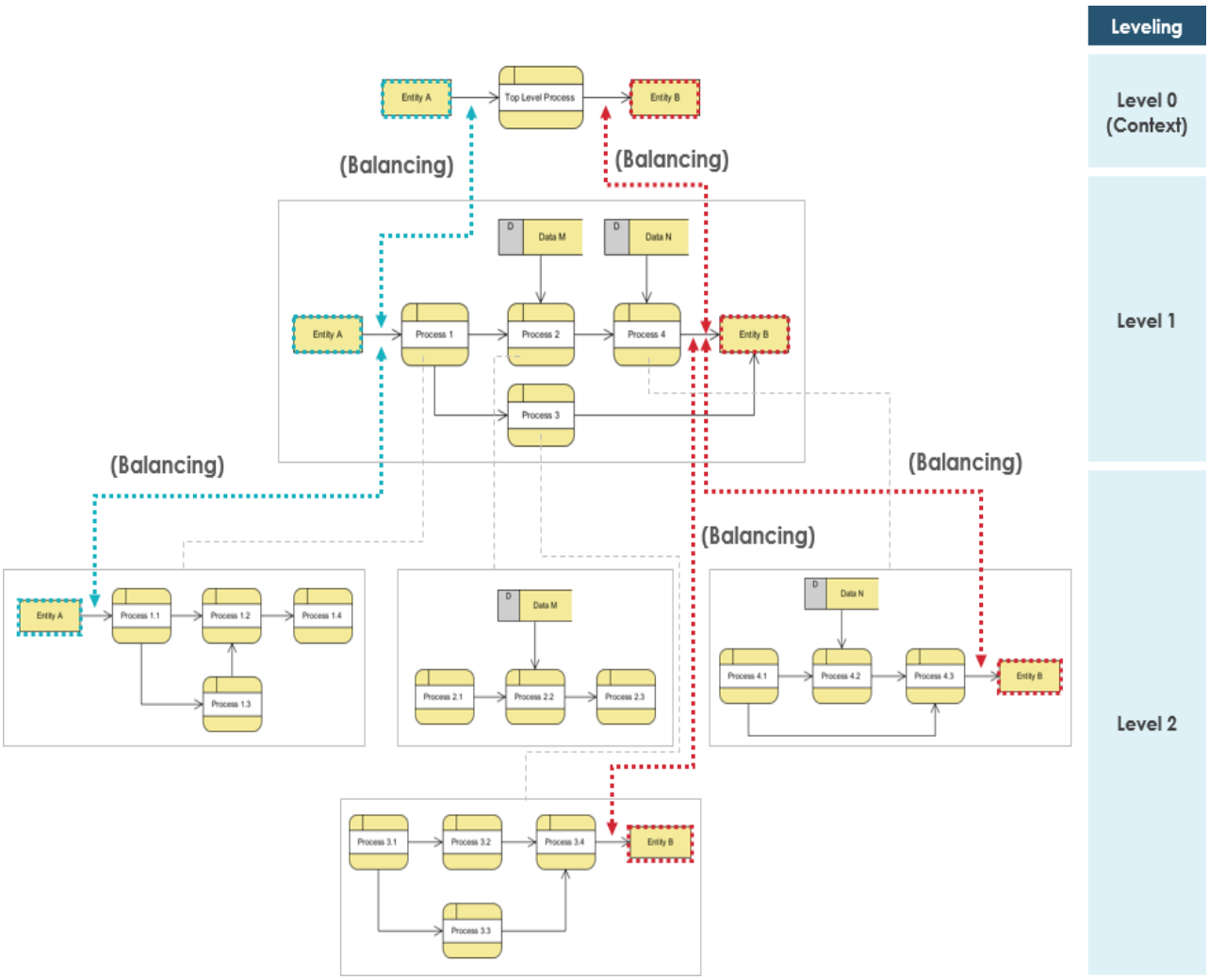
- External entities also are called terminators because they are data origins or final destinations.
- An external entity must be connected to a process through a data-flow.

Top-Down Decomposition Techniques

Top-down decomposition, also called **leveling**, is a technique used to show more detail in lower-level DFDs. Leveling is done by drawing a series of increasingly detailed diagrams until the desired degree of detail is reached. As shown in the Figure, DFD Leveling is first displaying the targeted system as a single process, and then showing more detail until all processes are functional primitives.

Balancing DFD

When performing top-down decomposition to a DFD to lower level DFDs, the inputs and outputs must be conserved between levels of DFDs. For example, level n & n+1 must have the same inputs and outputs



Guideline for Developing Data-Flow Diagram

Context Diagram - Level 0

- The context diagram must fit in one page.

- The process name in the context diagram should be the name of the information system.
    - For example, Grading System, Order Processing System, Registration System.
- The context level diagram gets the number 0 (level zero).

Unique Name for Levels

- Use unique names within each set of symbols.
    - For example, there can be only one entity CUSTOMER in all levels of the data-flow diagrams; or here can be only one process named CALCULATE OVERTIME among all levels of data-flow diagrams.

No Cross Line in DFD

- One way to achieve this is to restrict the number of processes in a data-flow diagram.

Right Complexity for Human Mind - 7 + / - 2 Symbols

- On lower-level data-flow diagrams with multiple processes, one should not have more than nine process symbols.
- Another way to avoid crossing lines is to duplicate an external entity or data store. Use a special notation such as an asterisk, to denote the duplicate symbol.

Numbering Convention

- Use a unique reference number for each process symbol.
- Other process numbers are in the hierarchy of:
    - (1, 2, 3,...);
    - (1.1, 1.2, 1.3, ..., 2.1, 2.2, 2.3,...);
    - (1.1.1, 1.1.2, 1.1.3,...).

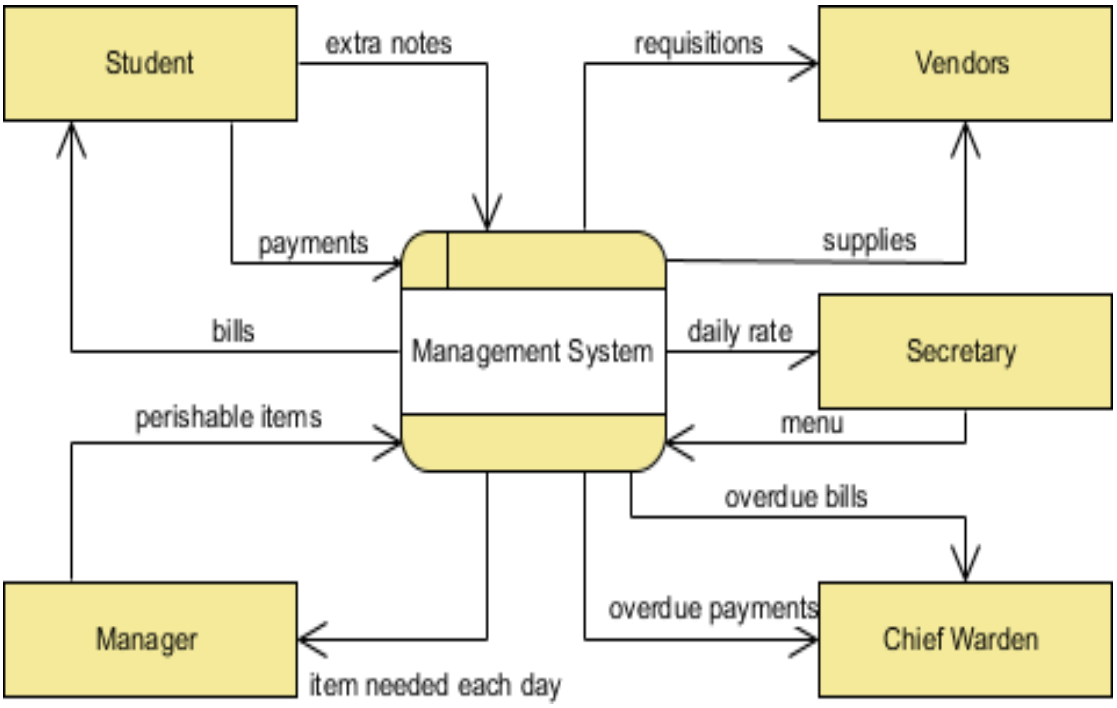
Context-Level Diagram

A context diagram gives an overview and it is the highest level in a data flow diagram, containing only one process representing the entire system. It should be split into major processes which give greater detail and each major process may further split to give more detail.

- All external entities are shown on the context diagram as well as major data flow to and from them.

- The diagram does not contain any data storage.

- The single process in the context-level diagram, representing the entire system, can be exploded to include the major processes of the system in the next level diagram, which is termed as diagram 0.

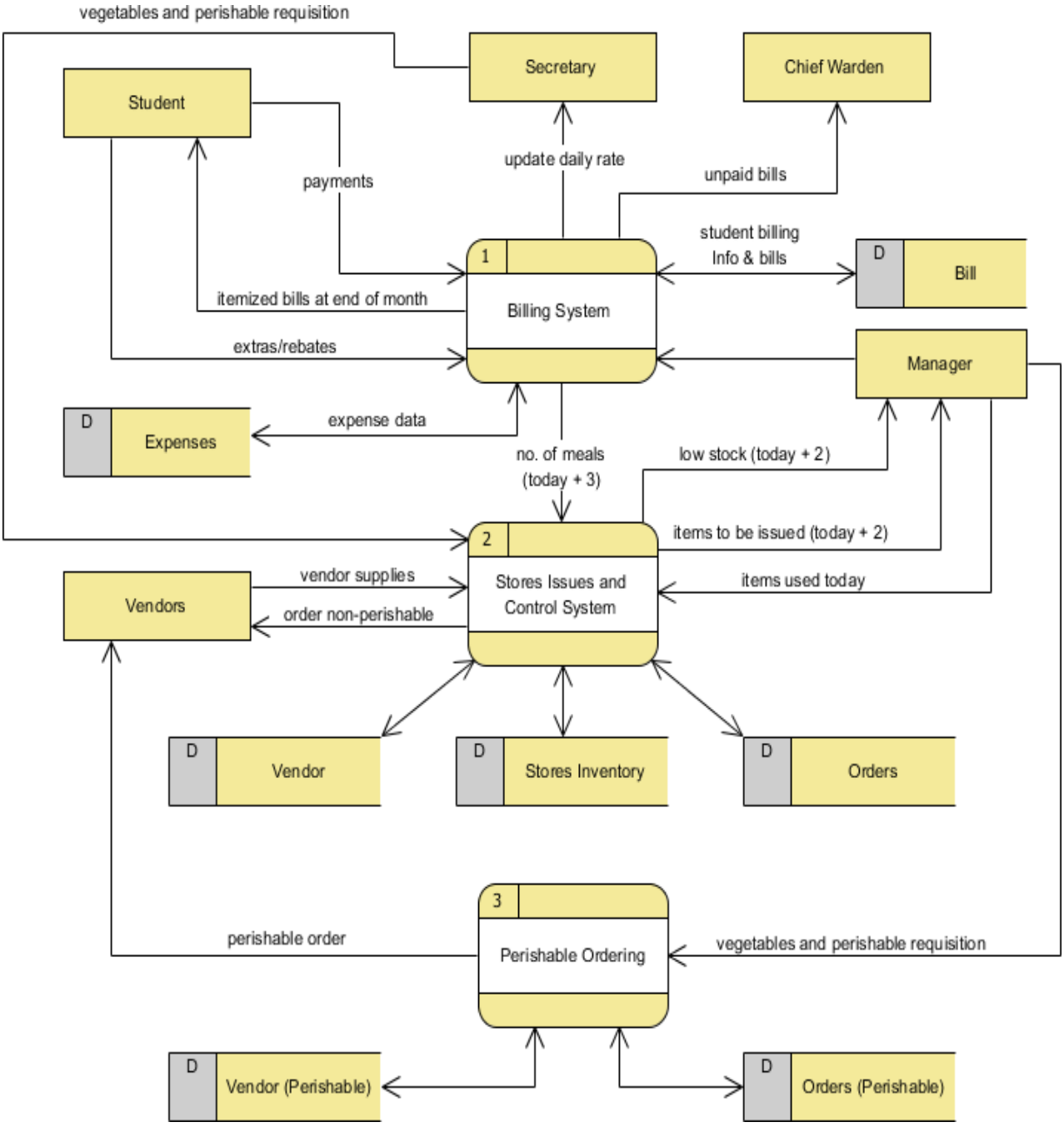


Level 1 DFD

Processes in diagram 0 (with a whole number) can be exploded further to represent details of the processing activities. Example below shows the next level ((Diagram 1) of process explosion.

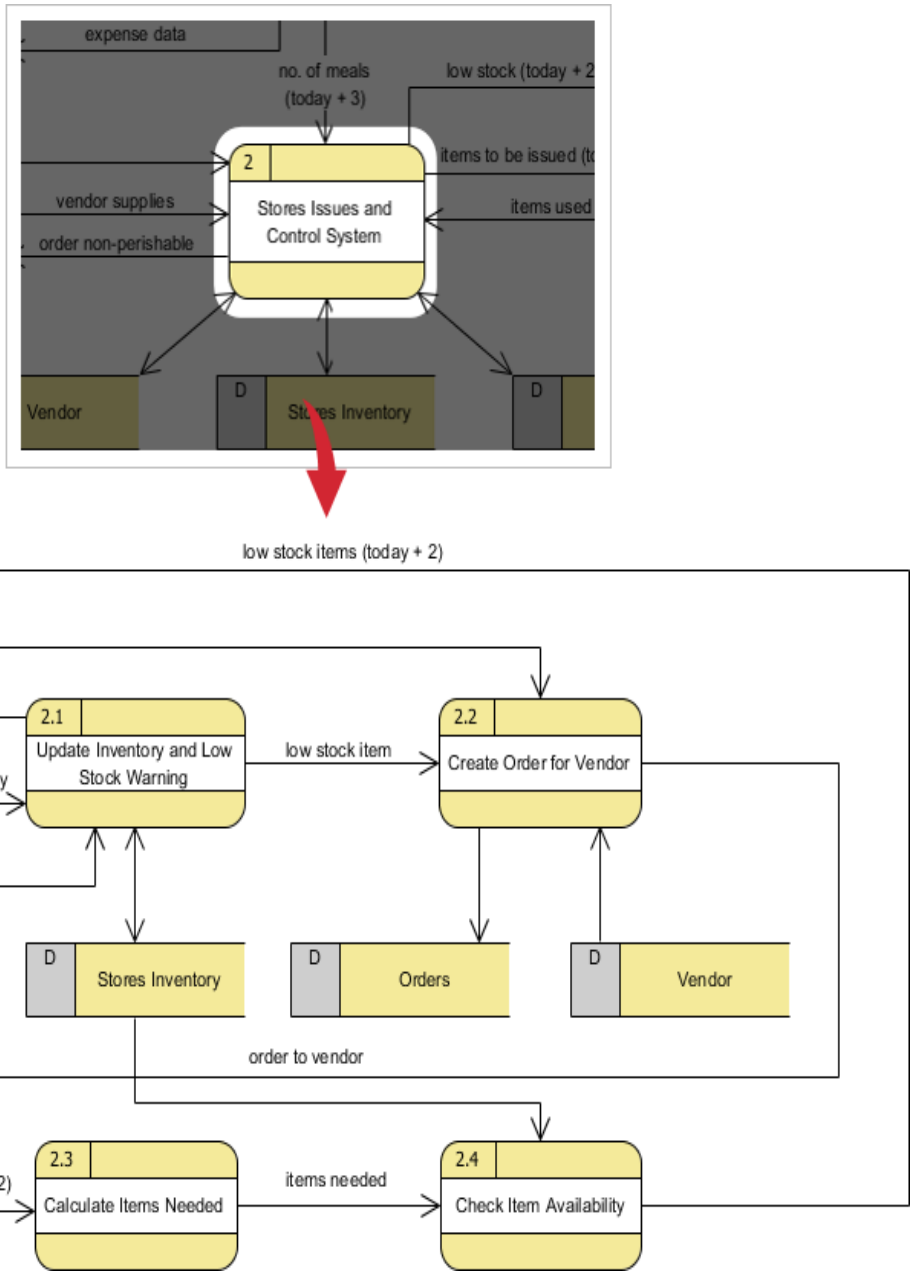
Note that:

Although the following level 1 DFD only has three processes, there are quite a few input and input from the processes to the external entities and that could end up to be a few cross lines among them in the diagram; to avoid this problem, we could use (master and auxiliary view) multiple views of the same external entity in the DFD.



Level 2 DFD

If a process with a lot of data flow linking between a few external entities, we could first extract that particular process and the associated external entities into a separate diagram similar to a context diagram, before you refine the process into a separate level of DFD; and by this way you can ensure the consistency between them much easier.



Logical vs Physical Data Flow Diagrams

Data flow diagrams are categorized as either logical or physical. A logical data flow diagram focuses on the business and how the business operates. It is not concerned with how the system will be constructed. We can ignore implementation specifics such as, computer configuration, data storage technology, communication or message passing methods by focusing on the functions performed by the system, such as, data collection, data to information transformation and information reporting.

A physical data flow diagram shows how the system will be implemented, including the hardware, software, files, and people in the system. It is developed such that the processes described in the logical data flow diagrams are implemented correctly to achieve the goal of the business.

Benefits of Logical Data Flow Diagram

- A logical diagram is drawn present business information and centered on business activities, which makes it an ideal communication tool when use in communicating with project users.

- Logical DFD is based on business events and independent of particular technology or physical arrangement, which makes the resulting system more stable.

- Logical DFD allows analyst to understand the business being studied and to identify the reason behind implementation plans.

- Systems implemented based on logical DFD will be easier to maintain because business functions are not subject to frequent change.

- Very often, logical DFD does not contain data stores other than files or a database, making less complex than physical DFD and is easier to develop.

- Physical DFD can be easily formed by modifying a logical DFD.

Benefits of Physical Data Flow Diagram

- Clarifying which processes are manual and which are automated: Manual processes require detailed documentation and automated process require computer programs to be developed.

- Describing processes in more detail than do logical DFDs: Describes all steps for processing of data.

- Sequencing processes that have to be done in a particular order: Sequence of activities that lead to a meaningful result are described. For example, update must be performed before a producing a summary report.

- Identifying temporary data storage: Temporary storage such as a sales transaction file for a customer receipt (report) in a grocery store, are described.

- Specifying actual names of files and printouts: Logical data flow diagrams describes actual filenames and reports, so that the programmers can relate those with the data dictionary during the developmental phase of the system.

- Adding controls to ensure the processes are done properly: These are conditions or validations of data that are to be met during input, update, delete, and other processing of data.

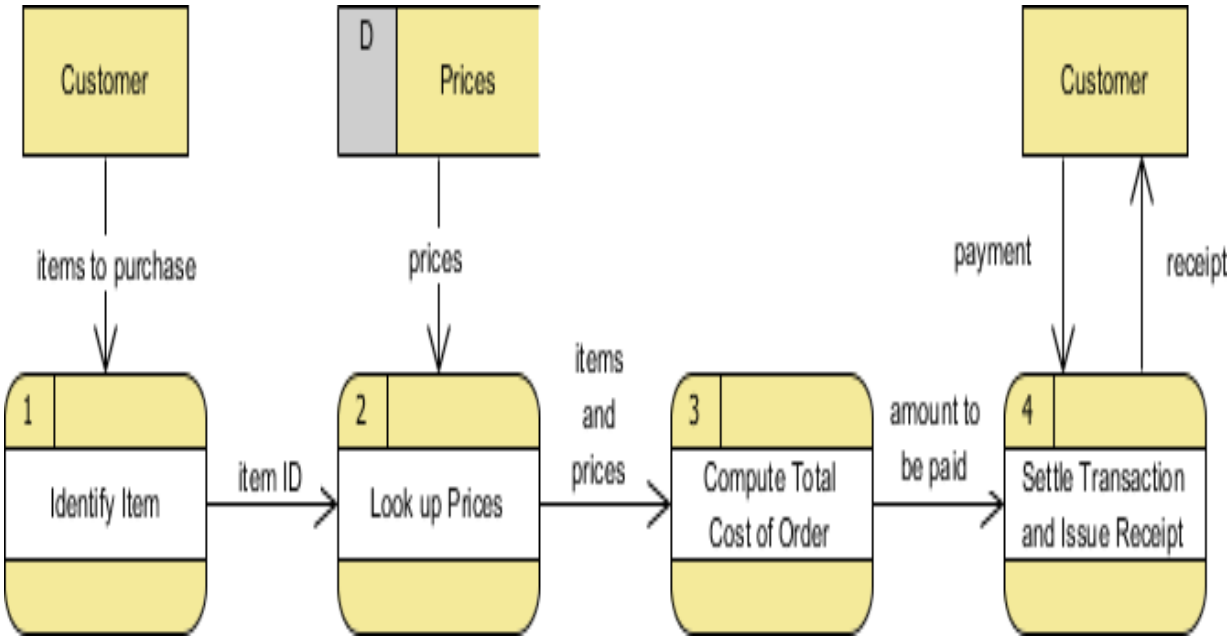
Refining Physical DFD for Logical DFD

The example below shows a logical DFD and a physical DFD for a grocery store cashier:

- The CUSTOMER brings the ITEMS to the register;
- PRICES for all ITEMS are LOOKED UP, and then totaled;
- Next, PAYMENT is given to the cashier finally, the CUSTOMER is given a receipt.

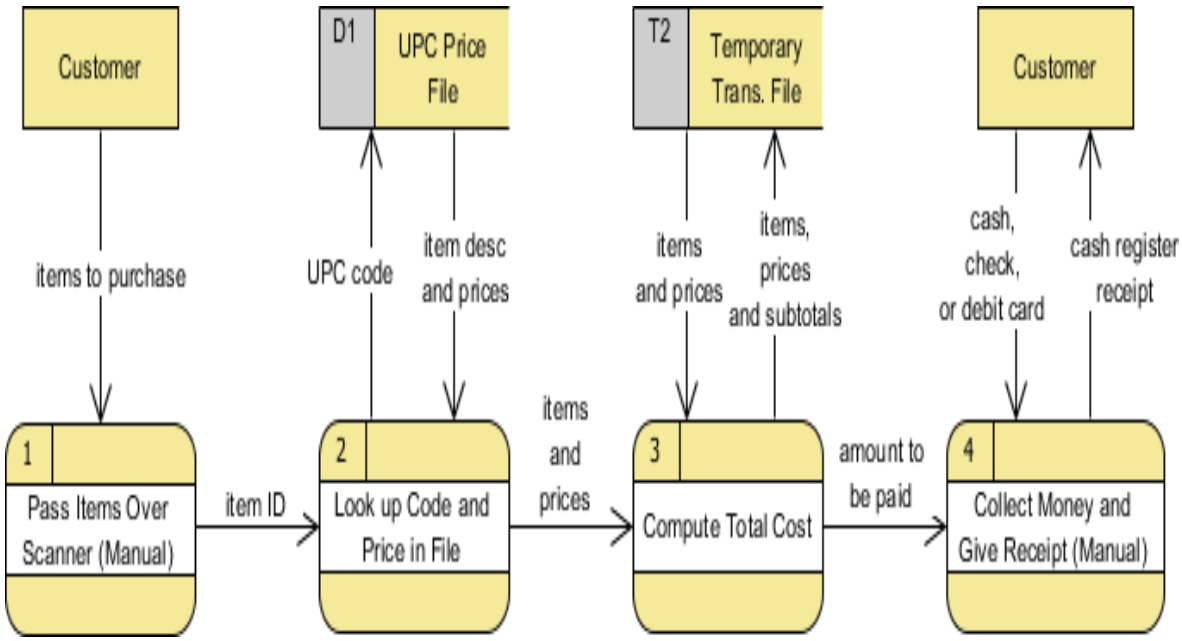
Logical DFD Example - Grocery Store

The logical DFD illustrates the processes involved without going into detail about the physical implementation of activities.



Physical DFD Example - Grocery Store

- The physical DFD shows that a bar code-the UPC PRICE code found on most grocery store items is used
- In addition, the physical DFD mentions manual processes such as scanning, explains that a temporary file is used to keep a subtotal of items
- The PAYMENT could be made by CASH, CHECK, or DEBIT CARD
- Finally, it refers to the receipt by its name, CASH REGISTER RECEIPT



Data Dictionary

A data dictionary contains metadata i.e data about the database. The data dictionary is very important as it contains information such as what is in the database, who is allowed to access it, where is the database physically stored etc. The users of the database normally don't interact with the data dictionary, it is only handled by the database administrators.

The data dictionary in general contains information about the following −

- Names of all the database tables and their schemas.
- Details about all the tables in the database, such as their owners, their security constraints, when they were created etc.
- Physical information about the tables such as where they are stored and how.
- Table constraints such as primary key attributes, foreign key information etc.
- Information about the database views that are visible.

This is a data dictionary describing a table that contains employee details.

Field Name	Data Type	Field Size for display	Description	Example
Employee	Integer	10	Unique ID of each	1645000001

Field Name	Data Type	Field Size for display	Description	Example
Number			employee	
Name	Text	20	Name of the employee	David Heston
Date of Birth	Date/Time	10	DOB of Employee	08/03/1995
Phone Number	Integer	10	Phone number of employee	6583648648

The different types of data dictionary are −

Active Data Dictionary

If the structure of the database or its specifications change at any point of time, it should be reflected in the data dictionary. This is the responsibility of the database management system in which the data dictionary resides.

So, the data dictionary is automatically updated by the database management system when any changes are made in the database. This is known as an active data dictionary as it is self updating.

Passive Data Dictionary

This is not as useful or easy to handle as an active data dictionary. A passive data dictionary is maintained separately to the database whose contents are stored in the dictionary. That means that if the database is modified the database dictionary is not automatically updated as in the case of Active Data Dictionary.

So, the passive data dictionary has to be manually updated to match the database. This needs careful handling or else the database and data dictionary are out of sync.

Decision Trees and Structured English.

Structured English is the use of the English language with the syntax of structured programming to communicate the design of a computer program to non-technical users by breaking it down into logical steps using straightforward English words. Structured English gives aims to get the benefits of both the programming logic and

natural language: program logic helps to attain precision, whilst natural language helps with the familiarity of the spoken word.[1]

It is the basis of some programming languages such as SQL (Structured Query Language) "for use by people who have need for interaction with a large database but who are not trained programmers".[2]

Elements

Structured English is a limited-form "pseudocode" and consists of the following elements:

1. Operation statements written as English phrases executed from the top down
2. Conditional blocks indicated by keywords such as IF, THEN, and ELSE
3. Repetition blocks indicated by keywords such as DO, WHILE, and UNTIL

The following guidelines are used when writing Structured English:

1. All logic should be expressed in operational, conditional, and repetition blocks
2. Statements should be clear and unambiguous
3. Logical blocks should be indented to show relationship and hierarchy
4. Use one line per logical element, or indent the continuation line
5. Keywords should be capitalized
6. Group blocks of statements together, with a capitalized name that describes their function and end with an EXIT.
7. Underline words or phrases defined in a data dictionary
8. Mark comment lines with an asterisk

Example of Structured English

APPROVE LOAN

```
IF customer has a Bank Account THEN
  IF Customer has no dues from previous account THEN
    Allow loan facility
  ELSE
```

```
    IF Management Approval is obtained THEN
      Allow loan facility
    ELSE
      Reject
    ENDIF
  ENDIF
ELSE
  Reject
ENDIF
EXIT
```

Criticism

Though useful for planning programs, modules and routines, or describing algorithms it is less useful when numerous decisions need to be made.[4]

Other specification tools

System processes at a lower level involve lot of computations and require more precision and clarity. This can be achieved with tools such as decision trees or decision tables.

Unit – V

Feasibility Study

System performance

In computing, **computer performance** is the amount of useful work accomplished by a computer system. Outside of specific contexts, computer performance is estimated in terms of accuracy, efficiency and speed of executing computer program instructions. When it comes to high computer performance, one or more of the following factors might be involved:

- Short response time for a given piece of work.
- High throughput (rate of processing work).
- Low utilization of computing resource(s).
- Fast (or highly compact) data compression and decompression.
- High availability of the computing system or application.
- High bandwidth.
- Short data transmission time.

Technical and non-technical definitions

The performance of any computer system can be evaluated in measurable, technical terms, using one or more of the metrics listed above. This way the performance can be

- Compared relative to other systems or the same system before/after changes
- In absolute terms, e.g. for fulfilling a contractual obligation

Whilst the above definition relates to a scientific, technical approach, the following definition given by Arnold Allen would be useful for a non-technical audience:

The word performance in computer performance means the same thing that performance means in other contexts, that is, it means "How well is the computer doing the work it is supposed to do?"[1]

As an aspect of software quality

Computer software performance, particularly software application response time, is an aspect of software quality that is important in human–computer interactions.

Performance engineering

Performance engineering within systems engineering encompasses the set of roles, skills, activities, practices, tools, and deliverables applied at every phase of the systems development life cycle which ensures that a solution will be designed, implemented, and operationally supported to meet the performance requirements defined for the solution.

Performance engineering continuously deals with trade-offs between types of performance. Occasionally a CPU designer can find a way to make a CPU with better overall performance by improving one of the aspects of performance, presented below, without sacrificing the CPU's performance in other areas. For example, building the CPU out of better, faster transistors.

However, sometimes pushing one type of performance to an extreme leads to a CPU with worse overall performance, because other important aspects were sacrificed to get one impressive-looking number, for example, the chip's clock rate (see the megahertz myth).

Application performance engineering

Application Performance Engineering (APE) is a specific methodology within performance engineering designed to meet the challenges associated with application performance in increasingly distributed mobile, cloud and terrestrial IT environments. It includes the roles, skills, activities, practices, tools and deliverables applied at every phase of the application lifecycle that ensure an application will be designed, implemented and operationally supported to meet non-functional performance requirements.

Aspects of performance

Computer performance metrics (things to measure) include availability, response time, channel capacity, latency, completion time, service time, bandwidth, throughput, relative efficiency, scalability, performance per watt, compression ratio, instruction path length and speed up. CPU benchmarks are available.[2]

Availability

Availability of a system is typically measured as a factor of its reliability - as reliability increases, so does availability (that is, less downtime). Availability of a system may also be increased by the strategy of focusing on increasing testability and maintainability and not on reliability. Improving maintainability is generally easier than reliability. Maintainability estimates (Repair rates) are also generally more accurate. However, because the uncertainties in the reliability estimates are in most

cases very large, it is likely to dominate the availability (prediction uncertainty) problem, even while maintainability levels are very high.

Response time

Response time is the total amount of time it takes to respond to a request for service. In computing, that service can be any unit of work from a simple disk IO to loading a complex web page. The response time is the sum of three numbers:[3]

- Service time - How long it takes to do the work requested.
- Wait time - How long the request has to wait for requests queued ahead of it before it gets to run.
- Transmission time – How long it takes to move the request to the computer doing the work and the response back to the requestor.

Processing speed

Most consumers pick a computer architecture (normally Intel IA32 architecture) to be able to run a large base of pre-existing, pre-compiled software. Being relatively uninformed on computer benchmarks, some of them pick a particular CPU based on operating frequency (see megahertz myth).

Some system designers building parallel computers pick CPUs based on the speed per dollar.

Channel capacity

Channel capacity is the tightest upper bound on the rate of information that can be reliably transmitted over a communications channel. By the noisy-channel coding theorem, the channel capacity of a given channel is the limiting information rate (in units of information per unit time) that can be achieved with arbitrarily small error probability.[4][5]

Information theory, developed by Claude E. Shannon during World War II, defines the notion of channel capacity and provides a mathematical model by which one can compute it. The key result states that the capacity of the channel, as defined above, is given by the maximum of the mutual information between the input and output of the channel, where the maximization is with respect to the input distribution.[6]

Latency

Latency is a time delay between the cause and the effect of some physical change in the system being observed. Latency is a result of the limited velocity with which any physical interaction can take place. This velocity is always lower or equal to speed of light. Therefore, every physical system that has spatial dimensions different from zero will experience some sort of latency.

The precise definition of latency depends on the system being observed and the nature of stimulation. In communications, the lower limit of latency is determined by the medium being used for communications. In reliable two-way communication systems, latency limits the maximum rate that information can be transmitted, as

there is often a limit on the amount of information that is "in-flight" at any one moment. In the field of human-machine interaction, perceptible latency (delay between what the user commands and when the computer provides the results) has a strong effect on user satisfaction and usability.

Computers run sets of instructions called a process. In operating systems, the execution of the process can be postponed if other processes are also executing. In addition, the operating system can schedule when to perform the action that the process is commanding. For example, suppose a process commands that a computer card's voltage output be set high-low-high-low and so on at a rate of 1000 Hz. The operating system may choose to adjust the scheduling of each transition (high-low or low-high) based on an internal clock. The latency is the delay between the process instruction commanding the transition and the hardware actually transitioning the voltage from high to low or low to high.

System designers building real-time computing systems want to guarantee worst-case response. That is easier to do when the CPU has low interrupt latency and when it has deterministic response.

Bandwidth

In computer networking, bandwidth is a measurement of bit-rate of available or consumed data communication resources, expressed in bits per second or multiples of it (bit/s, kbit/s, Mbit/s, Gbit/s, etc.).

Bandwidth sometimes defines the net bit rate (aka. peak bit rate, information rate, or physical layer useful bit rate), channel capacity, or the maximum throughput of a logical or physical communication path in a digital communication system. For example, bandwidth tests measure the maximum throughput of a computer network. The reason for this usage is that according to Hartley's law, the maximum data rate of a physical communication link is proportional to its bandwidth in hertz, which is sometimes called frequency bandwidth, spectral bandwidth, RF bandwidth, signal bandwidth or analog bandwidth.

Throughput

In general terms, throughput is the rate of production or the rate at which something can be processed.

In communication networks, throughput is essentially synonymous to digital bandwidth consumption. In wireless networks or cellular communication networks, the system spectral efficiency in bit/s/Hz/area unit, bit/s/Hz/site or bit/s/Hz/cell, is the maximum system throughput (aggregate throughput) divided by the analog bandwidth and some measure of the system coverage area.

In integrated circuits, often a block in a data flow diagram has a single input and a single output, and operate on discrete packets of information. Examples of such blocks are FFT modules or binary multipliers. Because the units of throughput are the reciprocal of the unit for propagation delay, which is 'seconds per message' or

'seconds per output', throughput can be used to relate a computational device performing a dedicated function such as an ASIC or embedded processor to a communications channel, simplifying system analysis.

Relative efficiency

Scalability

Scalability is the ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth

Power consumption

The amount of electricity used by the computer. This becomes especially important for systems with limited power sources such as solar, batteries, human power.

Performance per watt

System designers building parallel computers, such as Google's hardware, pick CPUs based on their speed per watt of power, because the cost of powering the CPU outweighs the cost of the CPU itself.[7]

Compression ratio

Compression is useful because it helps reduce resource usage, such as data storage space or transmission capacity. Because compressed data must be decompressed to use, this extra processing imposes computational or other costs through decompression; this situation is far from being a free lunch. Data compression is subject to a space–time complexity trade-off.

Size and weight

This is an important performance feature of mobile systems, from the smart phones you keep in your pocket to the portable embedded systems in a spacecraft.

Environmental impact

The effect of a computer or computers on the environment, during manufacturing and recycling as well as during use. Measurements are taken with the objectives of reducing waste, reducing hazardous materials, and minimizing a computer's ecological footprint.

Transistor count

The transistor count is the number of transistors on an integrated circuit (IC). Transistor count is the most common measure of IC complexity.

Benchmarks

Because there are so many programs to test a CPU on all aspects of performance, benchmarks were developed.

The most famous benchmarks are the SPECint and SPECfp benchmarks developed by Standard Performance Evaluation Corporation and the Certification

Mark benchmark developed by the Embedded Microprocessor Benchmark Consortium EEMBC.

Software performance testing

In software engineering, performance testing is in general testing performed to determine how a system performs in terms of responsiveness and stability under a particular workload. It can also serve to investigate, measure, validate or verify other quality attributes of the system, such as scalability, reliability and resource usage.

Performance testing is a subset of performance engineering, an emerging computer science practice which strives to build performance into the implementation, design and architecture of a system.

Profiling (performance analysis)

In software engineering, profiling ("program profiling", "software profiling") is a form of dynamic program analysis that measures, for example, the space (memory) or time complexity of a program, the usage of particular instructions, or frequency and duration of function calls. The most common use of profiling information is to aid program optimization.

Profiling is achieved by instrumenting either the program source code or its binary executable form using a tool called a *profiler* (or *code profiler*). A number of different techniques may be used by profilers, such as event-based, statistical, instrumented, and simulation methods.

Performance tuning

Performance tuning is the improvement of system performance. This is typically a computer application, but the same methods can be applied to economic markets, bureaucracies or other complex systems. The motivation for such activity is called a performance problem, which can be real or anticipated. Most systems will respond to increased load with some degree of decreasing performance. A system's ability to accept a higher load is called scalability, and modifying a system to handle a higher load is synonymous to performance tuning.

Systematic tuning follows these steps:

1. Assess the problem and establish numeric values that categorize acceptable behavior.

2. Measure the performance of the system before modification.

3. Identify the part of the system that is critical for improving the performance. This is called the bottleneck.

4. Modify that part of the system to remove the bottleneck.

5. Measure the performance of the system after modification.

6. If the modification makes the performance better, adopt it. If the modification makes the performance worse, put it back to the way it was.

Perceived performance

Perceived performance, in computer engineering, refers to how quickly a software feature appears to perform its task. The concept applies mainly to user acceptance aspects.

The amount of time an application takes to start up, or a file to download, is not made faster by showing a startup screen (see Splash screen) or a file progress dialog box. However, it satisfies some human needs: it appears faster to the user as well as providing a visual cue to let them know the system is handling their request.

In most cases, increasing real performance increases perceived performance, but when real performance cannot be increased due to physical limitations, techniques can be used to increase perceived performance.

Performance Equation

The total amount of time (**t**) required to execute a particular benchmark program is

Which is "the performance" in terms of time-to-execute

- is the number of instructions actually executed (the instruction path length). The code density of the instruction set strongly affects **N**. The value of **N** can either be determined **exactly** by using an instruction set simulator (if available) or by estimation—itself based partly on estimated or actual frequency distribution of input variables and by examining generated machine code from an HLL compiler. It cannot be determined from the number of lines of HLL source code. N is not affected by other processes running on the same processor. The significant point here is that hardware normally does not keep track of (or at least make easily available) a value of N for executed programs. The value can therefore only be accurately determined by instruction set simulation, which is rarely practiced.

- is the clock frequency in cycles per second.

- is the average cycles per instruction (CPI) for this benchmark.

- is the average instructions per cycle (IPC) for this benchmark.

Even on one machine, a different compiler or the same compiler with different compiler optimization switches can change N and CPI—the benchmark

executes faster if the new compiler can improve N or C without making the other worse, but often there is a trade-off between them—is it better, for example, to use a few complicated instructions that take a long time to execute, or to use instructions that execute very quickly, although it takes more of them to execute the benchmark?

A CPU designer is often required to implement a particular instruction set, and so cannot change N. Sometimes a designer focuses on improving performance by making significant improvements in f (with techniques such as deeper pipelines and faster caches), while (hopefully) not sacrificing too much C—leading to a speed-demon CPU design. Sometimes a designer focuses on improving performance by making significant improvements in CPI (with techniques such as out-of-order execution, superscalar CPUs, larger caches, caches with improved hit rates, improved branch prediction, speculative execution, etc.), while (hopefully) not sacrificing too much clock frequency—leading to a brainiac CPU design.[9] For a given instruction set (and therefore fixed N) and semiconductor process, the maximum single-thread performance (1/t) requires a balance between brainiac techniques and speedracer techniques.[8]

Internal and External Factors Affecting Computer Performance

Many factors can a affect computer performance including:[10]

- Background Processes
- Foreground Processes
- Malware
- Physical age
- Hardware

Many other factors are also potentially in play. All of these factors lower performance from it's base value and most importantly to the user lowers Perceived Performance.

- Algorithmic efficiency
- Computer performance by orders of magnitude
- Network performance
- Latency oriented processor architecture
- Optimization (computer science)
- RAM update rate
- Complete instruction set
- Hardware acceleration
- Speedup
- Cache replacement policies

Economic Feasibility

Once the technical feasibility and market studies are complete, it is time to determine **Business Feasibility**. The first purpose of this effort is to financially model the venture opportunity and achieve a break-even analysis. In other words, based upon the costs of goods sold, capital costs, and management and administration, how much revenue generated from units sold is required to break-even and over what period of time.

Once a break-even analysis is developed, the entrepreneurs can develop realistic financial projections for best case and worst case scenarios. These scenarios will be critical in strategic planning, milestone development and venture valuation analysis. The simple objective is to determine what level of revenue is required to satisfy the return on investment demanded by the founder and/or the investors.

Definition: The economic feasibility step of business development is that period during which a break-even financial model of the business venture is developed based on all costs associated with taking the product from idea to market and achieving sales sufficient to satisfy debt or investment requirements.

Objective: The objective of the economic feasibility is to develop a financial model of the business venture.

Product: The product of this step is a complete integration of the technical product information and the market study into one or more break-even financial models.

Business Activities

The business activities common to this step are those necessary to develop a conceptual plan for a business venture based upon one or more financial scenarios.

During the economic feasibility step, the following activities must be completed:

- Develop a financial analysis that identifies break-even scenarios based upon unit prices, volume of sales, and costs
- Determine whether the business opportunity presents sufficient profit margins to justify a business venture
- Assess the merits of licensing the opportunity compared to venturing

Milestones: A financial model accurately representing the business opportunity

Funding Sources: Personal finances, Friends and family

Business Information: Completion of the economic feasibility step will usually result in a go/no-go decision concerning the business venture, and if the decision is positive, identification of sources and uses of seed capital for the development phase.

Technical Feasibility

A technical feasibility study assesses the details of how you intend to deliver a product or service to customers. Think materials, labor, transportation, where your business will be located, and the technology that will be necessary to bring all this together. It's the logistical or tactical plan of *how* your business will produce, store, deliver, and track its products or services.

A technical feasibility study is an excellent tool for both troubleshooting and long-term planning. It can serve as a flowchart of how your products and services evolve and move through your business to physically reach your market.

Begin—or End—With an Executive Summary

The word "summary" is key here. Highlight the key points of each section you'll include in your technical feasibility study. You can do this in advance to provide yourself with a sort of guideline or skeleton to follow as you prepare your study. It is often easier and more concise to write it after you've finished, so you have the information you want to include right in front of you.

In either case, the summary should appear at the beginning of your technical feasibility study.

Prepare an Outline

Even if you decide to write your executive summary last, you can begin with an outline that will serve a similar purpose in guiding you through the remainder of the study.

The order in which you present technical information isn't as important as making sure you have all the components in place to show how you can run your business. You don't have to include specific financial information in the technical portion of your feasibility study. However, all information in this component should support financial data represented elsewhere.

Basic areas you'll want to cover include materials, labor, transportation or shipping, physical location, and technology. Be sure to include a thorough description of the services or products you'll be offering. How will your business benefit consumers? Give investors a reason to choose you over your competitors.

Calculate Material Requirements

List the materials you'll require to produce a product or service. This section is where you'll indicate where you'll get those materials. Include information such as whether volume discounts will be available as your business grows or if you plan to manufacture your parts at some point in time.

Include what parts and supplies you'll need to produce a product, including things like glue and nails. Mention all materials that will be involved in producing or manufacturing what you're selling.

You don't have to include actual financial data in this portion of the study either. However, financial data that supports your narrative assessment should be included as an attachment in a separate spreadsheet.

Calculate Labor Requirements

You can't run a business, offer services, or manufacturer products without the help of others and that help will cost you. Even if you start your business as its only employee, you'll have to add to your labor pool at some point if you plan to grow.

In most cases, labor will be one of your biggest small business expenses, if not the biggest. List the number and types of employees you need to run your business now and that you might have to employ in the future as your business grows.

You can break labor into categories if necessary, such as senior-level management, office, and clerical support, production or distribution staff, professional staff including lawyers, accountants, engineers, and marketing, and fulfillment employees—those in the mailroom or shipping department.

If you plan to outsource order fulfillment, fundraising, or other aspects of your company’s business, be sure to list what functions you're targeting and to whom you'll send these tasks.

Transportation and Shipping Requirements

How will you transport items if you must send them from one place to another? Smaller items can be shipped via local carriers, DHL, or USPS, but heavy or bulk items must be transported via a freight or trucking company.

If you're shipping perishable items, you'll need special overnight handling. You might also need special permits to ship certain items, and nonprofit organizations should consider applying for discounted postal rates. These are all things that affect the “how” of moving your goods from one place to another.

If you offer services, how will trainers, educators, consultants, and sales personnel get to customers and clients? You will need a licensed distributor or pharmacy to ship on your behalf if you offer a product that's governed by state or federal law such as medications or prescription medical supplies,

Calculate Marketing Requirements

How will you reach consumers? It is a crucial consideration because your business will fail without them. It's something investors will be keen to know.

Go beyond simple advertising plans, although this is important, too. Exactly what type of advertising campaign do you plan to launch? Will you lean more heavily on print media or other options and what consumers will you target? Explain why they would want to buy from you rather than any of your competitors.

The Physical Location of Your Business

Where you run your business will have an effect on your success. If you're starting in a home-based office, determine when and if you'll need a “brick and mortar” office at some point in the future—office space outside your home. Will you eventually need warehouse facilities, your factory, or your trucking facility? Will you require a retail storefront or any other purchased or rented facilities to conduct your business?

Discuss the pros and cons of where these facilities will be located in the physical location component of your feasibility study. Should they be in one central location or across state lines? Do you need special parking considerations for customers or trucks? Do you have to be near other facilities such as an airport, a commerce center, or a shopping mall?

Technology Requirements to Run Your Business

Every business needs at least some kind of technology to operate. The technology component of your feasibility study should include discussions about telephone answering systems, computer hardware and software, and inventory management.

Don't overlook items like cash registers and potentially the ability to accept credit cards and process checks. You might need special devices to accommodate the disabled, or teleconferencing equipment and facilities. Cellphones and PDAs are almost a must for most businesses, and you might need alarm or camera systems and manufacturing equipment as well.

Include Target Dates

Tell investors when you plan to do what to bring your concept to fruition. Don't neglect to mention the small steps. Cover it all, from initial organizational meetings to

when you'll purchase equipment or facilities and when and how you'll open your doors for business.

Be reasonable. You don't want to promise that you'll perform by a miraculous deadline then fail to do so.

Support Your Financial Information

Don't make the mistake of trying to entice investors with your staggering growth projections and a potential return on their investment. There's always an increase in expenses with an increase in revenue.

Don't rely strictly on feasibility study conclusions to impress an investor. An experienced investor or lending institution will read your entire report and come to their conclusions. It's therefore critical that the technical and financial data in your study reconcile. If other parts of your feasibility study show growth, you'll also have to project labor and other costs and the technical ability to support that growth.

The technical component should serve as the written explanation of your financial data because it offers you a place to include detailed information as to why an expense has been projected high or low. You can explain why it's even necessary. It demonstrates to potential investors and lenders—and in some cases, potential clients—that you've thought about the long-term needs your business will have as it grows.

Behavioral Feasibility

A requirement is a vital feature of a new system which may include processing or capturing of data, controlling the activities of business, producing information and supporting the management.

Requirements determination involves studying the existing system and gathering details to find out what are the requirements, how it works, and where improvements should be made.

Major Activities in requirement Determination

Requirements Anticipation

- It predicts the characteristics of system based on previous experience which include certain problems or features and requirements for a new system.
- It can lead to analysis of areas that would otherwise go unnoticed by inexperienced analyst. But if shortcuts are taken and bias is introduced in conducting the investigation, then requirement Anticipation can be half-baked.

Requirements Investigation

- It is studying the current system and documenting its features for further analysis.
- It is at the heart of system analysis where analyst documenting and describing system features using fact-finding techniques, prototyping, and computer assisted tools.

Requirements Specifications

- It includes the analysis of data which determine the requirement specification, description of features for new system, and specifying what information requirements will be provided.
- It includes analysis of factual data, identification of essential requirements, and selection of Requirement-fulfillment strategies.

Information Gathering Techniques

The main aim of fact finding techniques is to determine the information requirements of an organization used by analysts to prepare a precise SRS understood by user.

Ideal SRS Document should −

- be complete, Unambiguous, and Jargon-free.
- specify operational, tactical, and strategic information requirements.
- solve possible disputes between users and analyst.
- use graphical aids which simplify understanding and design.

There are various information gathering techniques −

Interviewing

Systems analyst collects information from individuals or groups by interviewing. The analyst can be formal, legalistic, play politics, or be informal; as the success of an interview depends on the skill of analyst as interviewer.

It can be done in two ways −

- **Unstructured Interview** − The system analyst conducts question-answer session to acquire basic information of the system.
- **Structured Interview** − It has standard questions which user need to respond in either close (objective) or open (descriptive) format.

Advantages of Interviewing

- This method is frequently the best source of gathering qualitative information.

- It is useful for them, who do not communicate effectively in writing or who may not have the time to complete questionnaire.
- Information can easily be validated and cross checked immediately.
- It can handle the complex subjects.
- It is easy to discover key problem by seeking opinions.
- It bridges the gaps in the areas of misunderstandings and minimizes future problems.

Questionnaires

This method is used by analyst to gather information about various issues of system from large number of persons.

There are two types of questionnaires −

- **Open-ended Questionnaires** − It consists of questions that can be easily and correctly interpreted. They can explore a problem and lead to a specific direction of answer.
- **Closed-ended Questionnaires** − It consists of questions that are used when the systems analyst effectively lists all possible responses, which are mutually exclusive.

Advantages of questionnaires

- It is very effective in surveying interests, attitudes, feelings, and beliefs of users which are not co-located.
- It is useful in situation to know what proportion of a given group approves or disapproves of a particular feature of the proposed system.
- It is useful to determine the overall opinion before giving any specific direction to the system project.
- It is more reliable and provides high confidentiality of honest responses.
- It is appropriate for electing factual information and for statistical data collection which can be emailed and sent by post.

Review of Records, Procedures, and Forms

Review of existing records, procedures, and forms helps to seek insight into a system which describes the current system capabilities, its operations, or activities.

Advantages

- It helps user to gain some knowledge about the organization or operations by themselves before they impose upon others.

- It helps in documenting current operations within short span of time as the procedure manuals and forms describe the format and functions of present system.
- It can provide a clear understanding about the transactions that are handled in the organization, identifying input for processing, and evaluating performance.
- It can help an analyst to understand the system in terms of the operations that must be supported.
- It describes the problem, its affected parts, and the proposed solution.

Observation

This is a method of gathering information by noticing and observing the people, events, and objects. The analyst visits the organization to observe the working of current system and understands the requirements of the system.

Advantages

- It is a direct method for gleaning information.
- It is useful in situation where authenticity of data collected is in question or when complexity of certain aspects of system prevents clear explanation by end-users.
- It produces more accurate and reliable data.
- It produces all the aspect of documentation that are incomplete and outdated.

Joint Application Development (JAD)

It is a new technique developed by IBM which brings owners, users, analysts, designers, and builders to define and design the system using organized and intensive workshops. JAD trained analyst act as facilitator for workshop who has some specialized skills.

Advantages of JAD

- It saves time and cost by replacing months of traditional interviews and follow-up meetings.
- It is useful in organizational culture which supports joint problem solving.
- Fosters formal relationships among multiple levels of employees.
- It can lead to development of design creatively.
- It Allows rapid development and improves ownership of information system.

Secondary Research or Background Reading

This method is widely used for information gathering by accessing the gleaned information. It includes any previously gathered information used by the marketer from any internal or external source.

Advantages

- It is more openly accessed with the availability of internet.
- It provides valuable information with low cost and time.
- It act as forerunner to primary research and aligns the focus of primary research.
- It is used by the researcher to conclude if the research is worth it as it is available with procedures used and issues in collecting them.

Feasibility Study

Feasibility Study can be considered as preliminary investigation that helps the management to take decision about whether study of system should be feasible for development or not.

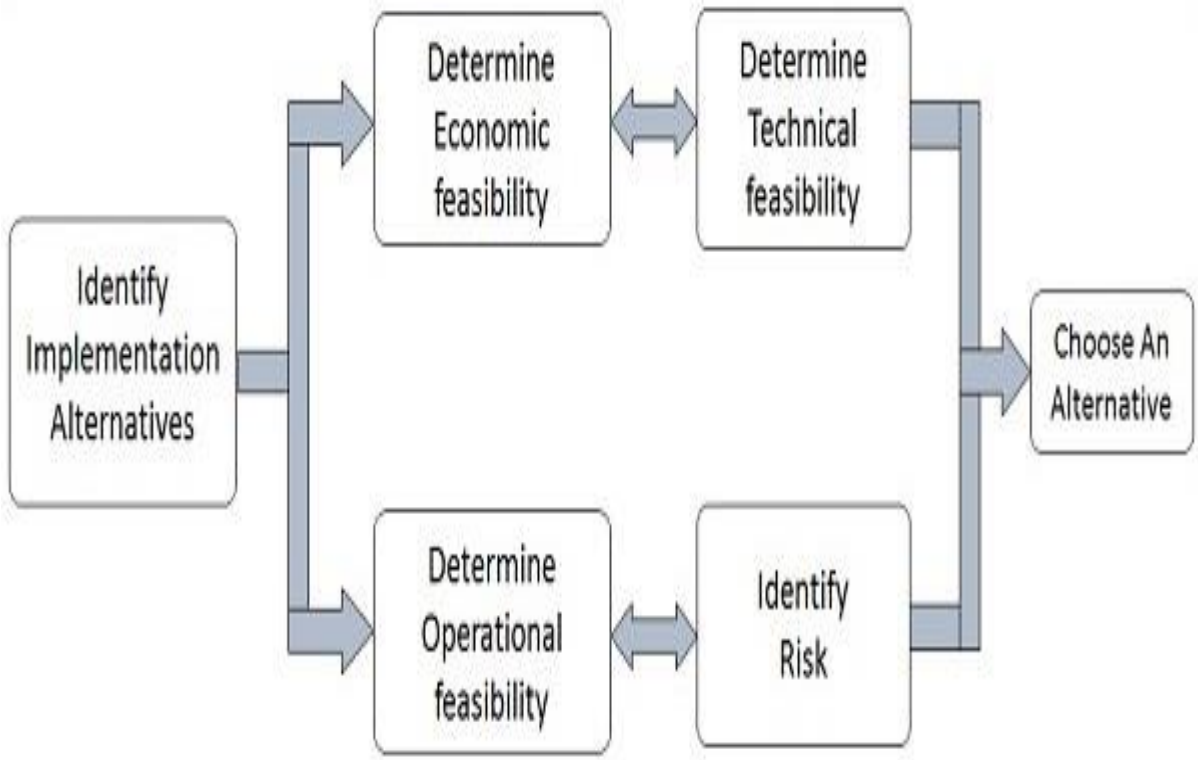
- It identifies the possibility of improving an existing system, developing a new system, and produce refined estimates for further development of system.
- It is used to obtain the outline of the problem and decide whether feasible or appropriate solution exists or not.
- The main objective of a feasibility study is to acquire problem scope instead of solving the problem.
- The output of a feasibility study is a formal system proposal act as decision document which includes the complete nature and scope of the proposed system.

Steps Involved in Feasibility Analysis

The following steps are to be followed while performing feasibility analysis −

- Form a project team and appoint a project leader.
- Develop system flowcharts.
- Identify the deficiencies of current system and set goals.
- Enumerate the alternative solution or potential candidate system to meet goals.
- Determine the feasibility of each alternative such as technical feasibility, operational feasibility, etc.
- Weight the performance and cost effectiveness of each candidate system.

- Rank the other alternatives and select the best candidate system.
- Prepare a system proposal of final project directive to management for approval.



Types of Feasibilities

Economic Feasibility

- It is evaluating the effectiveness of candidate system by using cost/benefit analysis method.
- It demonstrates the net benefit from the candidate system in terms of benefits and costs to the organization.
- The main aim of Economic Feasibility Analysis (EFS) is to estimate the economic requirements of candidate system before investments funds are committed to proposal.
- It prefers the alternative which will maximize the net worth of organization by earliest and highest return of funds along with lowest level of risk involved in developing the candidate system.

Technical Feasibility

- It investigates the technical feasibility of each implementation alternative.
- It analyzes and determines whether the solution can be supported by existing technology or not.

- The analyst determines whether current technical resources be upgraded or added it that fulfill the new requirements.
- It ensures that the candidate system provides appropriate responses to what extent it can support the technical enhancement.

Operational Feasibility

- It determines whether the system is operating effectively once it is developed and implemented.
- It ensures that the management should support the proposed system and its working feasible in the current organizational environment.
- It analyzes whether the users will be affected and they accept the modified or new business methods that affect the possible system benefits.
- It also ensures that the computer resources and network architecture of candidate system are workable.

Behavioral Feasibility

- It evaluates and estimates the user attitude or behavior towards the development of new system.
- It helps in determining if the system requires special effort to educate, retrain, transfer, and changes in employee's job status on new ways of conducting business.

Schedule Feasibility

- It ensures that the project should be completed within given time constraint or schedule.
- It also verifies and validates whether the deadlines of project are reasonable or not.

Input/Output and Forms Design

Input Design

In an information system, input is the raw data that is processed to produce output. During the input design, the developers must consider the input devices such as PC, MICR, OMR, etc.

Therefore, the quality of system input determines the quality of system output. Welldesigned input forms and screens have following properties −

- It should serve specific purpose effectively such as storing, recording, and retrieving the information.

- It ensures proper completion with accuracy.
- It should be easy to fill and straightforward.
- It should focus on user's attention, consistency, and simplicity.
- All these objectives are obtained using the knowledge of basic design principles regarding −
    - What are the inputs needed for the system?
    - How end users respond to different elements of forms and screens.

Objectives for Input Design

The objectives of input design are −

- To design data entry and input procedures
- To reduce input volume
- To design source documents for data capture or devise other data capture methods
- To design input data records, data entry screens, user interface screens, etc.
- To use validation checks and develop effective input controls.

Data Input Methods

It is important to design appropriate data input methods to prevent errors while entering data. These methods depend on whether the data is entered by customers in forms manually and later entered by data entry operators, or data is directly entered by users on the PCs.

A system should prevent user from making mistakes by −

- Clear form design by leaving enough space for writing legibly.
- Clear instructions to fill form.
- Clear form design.
- Reducing key strokes.
- Immediate error feedback.

Some of the popular data input methods are −

- Batch input method (Offline data input method)
- Online data input method
- Computer readable forms
- Interactive data input

Input Integrity Controls

Input integrity controls include a number of methods to eliminate common input errors by end-users. They also include checks on the value of individual fields; both for format and the completeness of all inputs.

Audit trails for data entry and other system operations are created using transaction logs which gives a record of all changes introduced in the database to provide security and means of recovery in case of any failure.

Output Design

The design of output is the most important task of any system. During output design, developers identify the type of outputs needed, and consider the necessary output controls and prototype report layouts.

Objectives of Output Design

The objectives of input design are −

- To develop output design that serves the intended purpose and eliminates the production of unwanted output.
- To develop the output design that meets the end users requirements.
- To deliver the appropriate quantity of output.
- To form the output in appropriate format and direct it to the right person.
- To make the output available on time for making good decisions.

Let us now go through various types of outputs −

External Outputs

Manufacturers create and design external outputs for printers. External outputs enable the system to leave the trigger actions on the part of their recipients or confirm actions to their recipients.

Some of the external outputs are designed as turnaround outputs, which are implemented as a form and re-enter the system as an input.

Internal outputs

Internal outputs are present inside the system, and used by end-users and managers. They support the management in decision making and reporting.

There are three types of reports produced by management information −

- **Detailed Reports** − They contain present information which has almost no filtering or restriction generated to assist management planning and control.

- **Summary Reports** − They contain trends and potential problems which are categorized and summarized that are generated for managers who do not want details.
- **Exception Reports** − They contain exceptions, filtered data to some condition or standard before presenting it to the manager, as information.

Output Integrity Controls

Output integrity controls include routing codes to identify the receiving system, and verification messages to confirm successful receipt of messages that are handled by network protocol.

Printed or screen-format reports should include a date/time for report printing and the data. Multipage reports contain report title or description, and pagination. Pre-printed forms usually include a version number and effective date.

Forms Design

Both forms and reports are the product of input and output design and are business document consisting of specified data. The main difference is that forms provide fields for data input but reports are purely used for reading. For example, order forms, employment and credit application, etc.

- During form designing, the designers should know −
    - who will use them
    - where would they be delivered
    - the purpose of the form or report
- During form design, automated design tools enhance the developer's ability to prototype forms and reports and present them to end users for evaluation.

Objectives of Good Form Design

A good form design is necessary to ensure the following −

- To keep the screen simple by giving proper sequence, information, and clear captions.
- To meet the intended purpose by using appropriate forms.
- To ensure the completion of form with accuracy.
- To keep the forms attractive by using icons, inverse video, or blinking cursors etc.
- To facilitate navigation.

Types of Forms

Flat Forms

- It is a single copy form prepared manually or by a machine and printed on a paper. For additional copies of the original, carbon papers are inserted between copies.
- It is a simplest and inexpensive form to design, print, and reproduce, which uses less volume.

Unit Set/Snap out Forms

- These are papers with one-time carbons interleaved into unit sets for either handwritten or machine use.
- Carbons may be either blue or black, standard grade medium intensity. Generally, blue carbons are best for handwritten forms while black carbons are best for machine use.

Continuous strip/Fanfold Forms

- These are multiple unit forms joined in a continuous strip with perforations between each pair of forms.
- It is a less expensive method for large volume use.

No Carbon Required (NCR) Paper

- They use carbonless papers which have two chemical coatings (capsules), one on the face and the other on the back of a sheet of paper.
- When pressure is applied, the two capsules interact and create an image.

CRT Screen Design

Many online data entry devices are CRT screens that provide instant visual verification of input data and a means of prompting the operator. Operator can make any changes desired before the data go to the system processing. A CRT screen is actually a display station that has a b (memory) for storing data. A common size display is 24 rows of 80 characters each or 1,920 characters.

There are two approaches to designing data on CRT screens: in. and software utility methods. The manual method uses a work sheet m like a print layout chart. The menu or data to be displayed are blocked in the areas reserved on the chart and then they are incorporated into system to formalize data entry. For example, in the first command in the partial program is interpreted by system as follows: "Go to row 10 and column 10 on the screen and display (SAY) the statement typed between quotes." The same applies to the three commands. The command "WAIT TO A" tells

the system to keep menu on the screen until the operator types the option next to the word.

"WAITING."

The main objective of screen display design is simplicity for accurate and quick data capture or entry. Other guidelines are:

1. Use the same format throughout the project.

2. Allow ample 3pace for the data. Overcrowding causes eye strain and may tax the interest of the user.

3.Use easy-to-learn and consistent terms, such as "add," "delete,' and "create."

4. Provide help or tutorial for technical terms or procedures.

The second approach to designing screen layouts is through so utility, usually provided by the CRT vendor. For example, IBM provides a screen Design Aid (SDA) package that allows the designer (at the terminal) to modify the display components.

Output Design

Computer output is the most important & direct source of information to the user. The system is accepted by the user only by the quality of its output. If the output is not of good quality, the user is likely to reject the system. Therefore, an effective output design is the major criteria for deciding the overall quality of the system.

While designing the output one should try to accomplish the following:

1. Determine what information to present to the user?

2. Decide whether to display or print the information.
3.
4. Arrange the presentation of information in an acceptable format.

5. Decide how to distribute the output to intended recipients.

Output Design Objectives

1. Designing output to serve the intended purpose.

2. Designing output to fit the user.

3. Delivering the appropriate quantity of output.

4. Making sure the output is where it is needed.
5. Providing the output on time.
6. Choosing the right output method.

Output Design Technologies/ Methods

Producing different types of output requires different technologies. Some common output methods are;

1. Printers

Printers are widely used output devices. It is used to generate had copy.

Advantages

1. It is permanent.
2. It is portable.
3. Its information cannot be changed by the user.
4. It provides detailed information.
5. Affordable for most organization.

Disadvantages

1. May be noisy.
2. Compatibility problems with computer software.
3. May be slow.

2. Screens as Output

Screens are increasingly popular output technology. It becomes feasible because as their size and prize decreases & their compatibility with other components increases.

Advantages

1. Interactive
2. Quiet

3. Good for frequently accessed.

4. Works in online & real time transmission.

Disadvantages

1. Require cabling & setup space.

2. Is expensive to develop.

3. Video, Audio & Animation

A video is a complex form of output since it combines the strength & potential emotional impact of audio with a stimulating visual channel.

Advantages

1. Good for the individual user.

2. Good for transient messages.

3. God where the worker needs hand free.

4. Good if the output is highly repetitive.

Disadvantages

1. Is expensive to develop.

2. Needs a dedicated room where the output will not interfere with other tasks.

3. Has limited application.

4. CD-ROMs &DVDs

The display of material on **CD-ROMs** have increased because of the growing demand of multimedia output.

Advantages

1. Speedy retrieval.

2. Allows multimedia output.

3. Has large capacity.

4. Less vulnerable to damage.

Disadvantages

1. More difficult to develop.

2. Expensive to develop.

Design of Output Reports

In designing a printed report, the system analyst incorporates both functional & stylistic considerations so that report supplies the user necessary information in a readable format.

Functional Attributes

1. The heading or title of the report.

2. The page number.

3. The date of preparation.

4. The column headings.

5. The grouping of related data items together.

6. The use of control breaks.

Stylistic Attributes

The stylistic attributes of a printed report include

1. The report should be well organized i.e. the report should read from top to bottom & left to right.

2. Additional blank spaces between columns also contribute to the readability of a report.

Form design requirements

This section provides valuable guidelines for building forms that work well with the mobile app.

- Each form must have an associated Display Menu Item.
  - The Display Menu Item's **Allow Root Navigation** property must be set to **Yes**. This setting enables the mobile framework to open the form that is

referenced by the menu item.

- Each form must be directly accessible via its Display Menu Item.
    - To verify accessibility, open the menu item via a URL. Just append **&mi=** to the URL, where the value is the Application Object Tree (AOT) name of your menu item.
    - If the form doesn't open or show data when you access it in this way, the form won't work with the mobile app.
- Each form that shows data must have one Master Root Data Source.
    - This data source must be the first data source on the form (top-most in the designer).
    - This data source must not be joined to any other data sources.
- Each form must work with the data source filters.
    - After you open the form in the web client, open the filter pane by using the **Show filters** button.

Then click **Add a filter field**, and verify that the Master Root Data Source appears as the table for fields in the list of available fields. Other tables can also appear, but the Master Root Data Source **must** appear in this list. Otherwise, the mobile app won't enable searches and navigation that uses context.

- Searching: The mobile app does online searches against data by using the Filters framework behind the scenes.
- Navigation that uses context: The mobile app enables list-to-details navigation (and other context-aware navigation) by first opening the target form via the menu item and then using the Filters framework to show only the specified record context.
- List-to-details navigation: The table that the grid is bound to on form A (the list form) must be the Master Root Data Source on the details form (form B). When a user selects a record in the list on form A, the mobile framework navigates with record context by applying filters on form B that uniquely identify the record.

Design considerations

Using data methods

You can use display methods to show data on pages (both list type pages and detail type pages). However, there are two key points to remember when you use display methods:

- **Searching** – When a user performs an “online” search (that is, a search that is run against data in the web client instead of locally cached data), the search won't match against display methods, because the Filtering framework in the web client doesn't support searches against data methods. However, when a user does a search against locally cached data, the search will match against display methods, provided that the records have been cached on the device.

- **Offline** – If a user creates or updates data while their device isn’t connected to the server, temporary records are created in the local cache. Because these temporary records haven't yet been processed in the web client, if the records have any fields that are automatically populated or defaults by server-side business logic, these fields will remain empty until the records have been synced with the web client. Display methods fall into this category of fields that will be empty for a temporary record.

Designing for offline

Unlike the web client, which is highly connected to the server and maintains an open user session that has open forms on the server, the mobile app creates user sessions (and opens forms) only in short bursts while the app is being synced with the server (via data read for pages, or via data write/update for actions). If there are no actions to sync with the server, and if the local data cache is up to date, the mobile app won't communicate with the server as a user navigates around the app (unless the user triggers an explicit pull-to-refresh). It's important that you keep this data flow pattern in mind while you design pages and actions in the mobile app. You should not expect form logic to run every time that a page is loaded or an action is started. You should also never expect form logic to run while a user is completing an action. Form logic is run only when the action is being synced with the server. The following list describes the only times when you should expect Form logic to run. **Form logic runs right before a page is opened on the mobile app for the first time.**

1. *When a user first opens a page, the mobile app reaches out to the web client and opens the associated forms.* During this process, logic such as form init and data source init is all run in the usual manner.

2. The mobile app framework reads the required data directly from the controls on the forms and sends the data back to the mobile app.

3. The mobile app caches the data and shows it in the page on the mobile app.

4. Future attempts to open the page will load the cached data. These attempts won't run the form logic again, unless the user explicitly refreshes the page or the cache expires. (Currently, the cache set to expire after 30 minutes.)

Processing an action that has been submitted to the server from the mobile app

1. When a user opens an action and fills in the data in that action, *no form logic is run*. A user can complete an action either offline or online. The system behaves the same way in both cases.

2. After the user clicks **Done**/**Save** on the action, the mobile app queues a data synchronization operation. This operation will be synced with the server when the mobile app is connected to the Internet.

3. When an Internet connection is detected (which can happen immediately after the action is completed) the mobile app sends the data synchronization operation to the server for processing.

4. While the operation is processed on the server, the framework opens the associated forms and enters the data from the action by passing values into the form controls. *During this process, form logic is run in the usual manner (init, modified, clicked, and so on, are all run).* However, the mobile user might have moved to a different part of the app while this processing is occurring. *Any form logic that shows/hides controls will have no effect on the UI that is seen in the mobile app.* Therefore, to minimize synchronization times, it's best not to include any UI logic on the form.

If you decide to modify existing forms so that they work with the mobile framework, instead of building new mobile-specific forms, you might have to conditionally change the form's behavior for mobile-specific scenarios. You can use the following static X++ application programming interfaces (APIs) in your X++ code to determine whether the code is being accessed during a session where a web client user is designing pages/actions or during a session that the mobile framework back end created to load pages/actions for a mobile user. **When a form is being used with the mobile designer**

When a form is being used by the mobile framework back end to load pages and run action

The form controls for the various base data types (strings, dates, and numbers) and grids are supported. However, a few common controls have limited support. **Reference groups** Fields from within Reference groups controls are compatible when you design pages. However, they aren't compatible when you design Actions. Although you might be able to select these fields without experience any issue, Reference groups have a fundamental incompatibility with the mobile framework. We recommend that you not use Reference groups. Instead, add a control directly to the form, and then bind the control directly to the surrogate foreign key (SFK) by using the property sheet.

H/W / S/W Selection and Maintenance

The Computer Industry

Computers have become a useful and necessary part of modern society. They have been used in all types of businesses ranging from mail order and retail sales, to communications such as phone lines and internet access. Computers are prevalent in hospitals and supermarkets, universities and malls, restaurants and government agencies. By 1998, over 40% of all families in the United States had a personal computer.

The earliest type of machine used for computing was the abacus, dating back to possibly 3000 b.c. in Babylon. Still used in the 1990s, it was a simple system of beads that slid on wires. The next major improvement was made by Blaise Pascal (1623–1662) in 1642, when he developed a "mechanical adding machine" he called the Pascaline. In 1694, Gottfried Wilhem von Leibniz (1646–1716) made changes to the Pascaline so it could multiply as well. An Englishman named Charles Babbage (1791–1871) designed the first modern computer. Named the Analytical Engine, it used punched cards. American Herman Hollerith (1860–1929) used the punched card technique to make a machine for use in tabulating results of the U.S. Census in 1890. He founded the Tabulating Machine Co. in 1896, which became International Business Machines (IBM) in 1924. Dr. John V. Atanasoff and assistant Clifford Berry developed the first electronic computer circuits using Boolean algebra in 1940. In 1944, IBM finished the Mark I computer, which used electromagnetic signals.

From this point, computer history was marked by "generations." The first generation of computers featured the use of vacuum tubes, which contributed to their characteristically huge size. Another limitation was their programming language. This period lasted roughly from the late 1940s to the mid-1950s. The second generation, approximately mid- to late-1950s to the early-1960s, saw the use of the transistor instead of the large vacuum tubes. This led to smaller, more efficient, and less costly machines. Improvements in programming language gave them greater flexibility.

This generation of hardware generated new jobs in the computer industry such as programmers and software developers.

The third generation, mid-1960s to 1971, was based on the innovation of the semiconductor which replaced transistors, reducing heat and also the size of the computers. Another new development was the use of the operating system, which used one central program to control access to numerous other programs. Also, a new programming language called BASIC was developed by two Dartmouth professors. The fourth generation of computers began in 1971 and continued into the late 1990s with the new development of large-scale integrated circuits. This again reduced the size and price of computers. In 1975, the first personal computer, the Altair 8800, was introduced by Micro Instrumentation and Telemetry Systems (MITS). IBM released its version in 1981 which used the Disk Operating System (DOS) developed by Bill Gates of Microsoft, one of the most prominent software companies. Apple brought out its Macintosh computer in 1984. By 1986 there were over 30 million computers in the United States.

Other important computer businesses that began during the 1980s were Compaq Computers, Sun Microsystems, and Unisys Corporation. In the late 80s, Texas Instruments and Motorola marketed new microprocessors. Microsoft's Windows, 1985, Windows 3.0, 1990, Windows NT, 1993, Windows 95, and Windows 98 became extremely popular operating systems due to the use of graphics which made them easy to use. In 1997, Microsoft's Office 97 for businesses saw sales totaling $78.8 million. Other very popular software in the 1990s were computer games, such as "Riven: The Sequel to Myst," the top seller in 1997.

The Internet or World Wide Web came about due to the efforts of Tim Berners-Lee. In 1989 he helped develop a system of "hyperlinks" that could be used to get access to related information, and by August 1991, that system was being used on the Internet, greatly improving the sharing of data. E-mail was a popular way to exchange messages on the Internet. The number of Internet users grew vastly throughout the 1990s, and by 1998 about 5 million people were using the Web.

Trends in the computer industry in the late-1990s included rental or lease options on computer systems, numerous models of personal computers in the below $1,000 price range, portable laptop computers, and a change in popularity from the large mainframe business computers to a "client/server system" which used a set of smaller, faster, and cheaper computers. Another innovation was "e-commerce," where consumers could browse through on-line catalogs and then place an order. Goods were purchased directly on-line, and banking and investments were controlled through the Internet. By the late-1990s, it was estimated that there were over 400,000 businesses world wide with web sites.

The end of the twentieth century had seen the personal computer become a part of the average citizen's daily life. The demand for workers with computer skills was

expected to increase as the computer industry continued to play an important role in the strength of the American economy.

Major Phases in Selection

Steps of Selection Process are

1. Requirement Analysis
2. System Specifications
3. Request for proposal
4. Evaluation & validation
5. Vendor selection
6. Post-installation review

1. Requirement Analysis

In this step, consider the following:

- Users requirements
- Organizations objectives
- The environment in which the system is being installed
- User's resources
- Budget

2. System Specifications

System specifications must reflect the following:

- System objectives
- User's requirements
- Flow charts
- Input Output requirements
- Cost

- The specification must describe each aspect of the system clearly, consistently & completely.

3. Request For Proposal(RFP)

After the requirements analysis & system specification have been determined, a **RFP** is drafted & sent to selected vendors for bidding. The request for proposal should include the following:

- Complete system specification
- Terms & conditions
- Time frame
- Quantity
- Minimum warranty period
- Training responsibilities
- Conversion responsibilities

4. Evaluation & Validation

The evaluation phase ranks vendor proposals & determines the one best suited to the user's needs. It looks into items such as;

- Price
- Availability
- Technical Support
- System validation ensures that the vendor can, in fact, match his/her claims, especially system performance.

5. Vendor Selection

This step determines the "winner" the vendor with the best combination of reputation, reliability, service record, training, delivery time, lease/finance terms & conversion schedule.

6. Post-installation Review

After installation, system specifications & user requirements are audited to pinpoint & correct any differences.

Criteria for Software Selection:

a) Readability

Readability means that he person other than a programmer can understand it easily.

b) Integrity

Refers to the accuracy of computation & results.

c) Generality

Generality means it can be used under different situations & requirements.

d) Modularity

Means writing software in modules

e) Portability

Means running the same software on different computer systems.

f) Capacity

Capacity refers to be a capability of the software package to handle user requirement for the size of files, a number of data elements, the volume of transactions & reports etc.

g) Minimal Cost

Cost is the major consideration in deciding between in house & vendor software.

h) Documentation

It should be well documented

A **computer** is a machine that can be instructed to carry
out sequences of arithmetic or logical operations automatically via computer programming.

Hardware Selection Criteria

- Hardware must support current software as well as software planned for procurement over the next planning interval [*year, 18 months, three years*]

- Hardware must be compatible with existing or planned networks
- Hardware must be upgradeable and expandable to meet the needs of the next planning interval
- Hardware warranties must be of an appropriate length
- Hardware maintenance must be performed by [*local/remote vendor, in-house personnel*]
- Whenever feasible, hardware standards will dictate procurement of like brands and configurations to simplify installation and support
- Routine assessments of installed infrastructure will feed an upgrade/replace decision process

Software Selection Criteria

- Software must be compatible with current and future hardware over the next planning interval
- Software maintenance and warranties must be of appropriate length and cost
- Sotware help desk must be maintained by [*vendor, third party, in-house personnel*]
- Software must be standardized throughout the business to improve purchasing power, simplify training, and facilitate support
- Software must comply with current standards set by technology leadership
- Software must support and enhance business goals

In addition to these hardware and software selection criteria, StratVantage will evaluate the proposed vendors on several criteria, including:

Stability — Vendor's attributes such as length of operations, size of customer base, size of income and revenue, company size, leadership, stock history and more can affect a technology purchasing decision

Proven Track Record — A vendor's experience not only in the broader market but in your business' specific industry can be key

Business Model Fit — If the vendor is offering, for example, software as a service, but your business isn't always Internet-connected, this business model mismatch could rule out the vendor

Mature Technology — You want to see continuity in the vendor's offerings. If the vendor has been through a series of acquisitions and is just now integrating new technology with an old line of business, you may want to obtain assurances on the longevity of the vendor's solution.

Service Level Agreements — Unfortunately, most vendor Service Level Agreements (SLAs) aren't worth the paper they are printed on. We'll help you understand the vendor's SLA and negotiate a service level partnership instead.

An example hardware and software need for Oracle products –

Hardware and Software Requirements

This chapter describes the hardware and software requirements of Oracle Communications Data Model:

- Supported Platforms
- Hardware Requirements
- Software Requirements

Before you install Oracle Communications Data Model, you must verify that all hardware and software requirements are met.

Supported Platforms

Oracle Communications Data Model 11g Release 2 (11.2) is supported on the following platforms. For each platform, the given operating system version or later versions are required:

- Linux x86
    - Oracle Enterprise Linux 4 Update 7
    - Oracle Enterprise Linux 5 Update 2
    - Red Hat Enterprise Linux 4 Update 7
    - Red Hat Enterprise Linux 5 Update 2

- Linux x86-64
    - Oracle Enterprise Linux 4 Update 7
    - Oracle Enterprise Linux 5 Update 2
    - Red Hat Enterprise Linux 4 Update 7
    - Red Hat Enterprise Linux 5 Update 2
- Solaris SPARC (64-bit)
    - Solaris 10 U6 (5.10-2008.10)
- AIX 5L Based Systems (64-bit)
    - AIX 5L V5.3 TL 09 SP1 (“5300-09-01”), 64 bit kernel
    - AIX 6.1 TL 02 SP1 (“6100-02-01”), 64-bit kernel

    Note:

    There are special considerations when installing Oracle Communications Data Model on AIX, see “AIX Platform: Changing the Database Parameter”,
- HP-UX Itanium
    - HP-UX 11i V3 patch Bundle Sep/ 2008 (B.11.31.0809.326a) or higher

Hardware Requirements

The Oracle Database installation guide for your platform includes procedures for checking that your installation meets the hardware and operating system requirements for Oracle Database.

Additionally, for a complete installation of Oracle Communications Data Model, the minimum hardware requirement is disk space of at least 10 GB.

Software Requirements

The minimum software requirements for Oracle Communications Data Model are as follows:

- Operating System: For details of supported platforms, see “Supported Platforms”.

- Oracle Database 11g Release 2 Enterprise Edition, including the Oracle Data Mining Option and the Oracle OLAP Option. See “Oracle Database Requirements”

- Oracle Warehouse Builder. See “Oracle Warehouse Builder”. (Oracle Warehouse Builder is required to use the ETL supplied with Oracle Communications Data Model.)

- Oracle Business Intelligence Suite Enterprise Edition. See “Oracle Business Intelligence Suite Enterprise Edition”. (Optional for Oracle Communications Data Model component installation. Required for sample report installation.)

Note:

The recommended patches and software versions are accurate as of product release. For latest recommendations for database and Oracle OLAP for supported platforms,
see http://www.oracle.com/technology/products/bi/olap/collateral/olap_certification.html.

Oracle Database Requirements

Oracle Communications Data Model requires Oracle Database 11g Release 2 Enterprise Edition.

Tip:

When you install the Database ensure that the database character set is UFT8 to support multi-language installations since Oracle Communications Data Model permits the installation of support for English and one other language.

Installation of the Oracle Communications Data Model component requires the following options to the Database:

- Oracle Partitioning

- Oracle Online Analytical Processing (OLAP)

- Oracle Data Mining

Tip:To confirm that you have Oracle Data Mining and OLAP options installed, follow the instructions outlined in “Confirming that Oracle Data Mining and OLAP Options are Installed”.
After you download and install the Database, upgrade to the latest patch. Patches are available from My Oracle Support (http://metalink.oracle.com).

Oracle Warehouse Builder

Oracle Communications Data Model requires the version of Oracle Warehouse Builder that comes as with Oracle Database 11g Release 2 Enterprise Edition. The ETL provided with Oracle Communications Data Model uses Oracle Warehouse Builder. For instructions on installing and configuring Oracle Warehouse Builder, see Oracle Warehouse Builder Installation and Administration Guide for Windows and Linux.

Tip:To confirm that you have Oracle Warehouse Builder installed, follow the instructions outlined in “Confirming that the OWBSYS Schema Exists”.

Oracle Business Intelligence Suite Enterprise Edition

You must have the Oracle Business Intelligence Suite Enterprise Edition installed before you install the Oracle Communications Data Model sample reports. (Oracle Business Intelligence Suite Enterprise Edition is not required for the installation of the Oracle Communications Data Model component.)

The Used Computer

Modern computers have the ability to follow generalized sets of operations, called *programs.* These programs enable computers to perform an extremely wide range of tasks. A "complete" computer including the hardware, the operating system (main software), and peripheral equipment required and used for "full" operation can be referred to as a computer system. This term may as well be used for a group of computers that are connected and work together, in particular a computer network or computer cluster.

Computers are used as control systems for a wide variety of industrial and consumer devices. This includes simple special purpose devices like microwave ovens and remote controls, factory devices such as industrial robots and computer-aided design, and also general purpose devices like personal computers and mobile devices such as smartphones. The Internet is run on computers and it connects hundreds of millions of other computers and their users.

Early computers were only conceived as calculating devices. Since ancient times, simple manual devices like the abacus aided people in doing calculations. Early in the Industrial Revolution, some mechanical devices were built to automate long tedious tasks, such as guiding patterns for looms. More sophisticated

electrical machines did specialized analog calculations in the early 20th century. The first digital electronic calculating machines were developed during World War II. The first semiconductor transistors in the late 1940s were followed by the silicon-based MOSFET (MOS transistor) and monolithic integrated circuit (IC) chip technologies in the late 1950s, leading to the microprocessor and the microcomputer revolution in the 1970s. The speed, power and versatility of computers have been increasing dramatically ever since then, with transistor counts increasing at a rapid pace (as predicted by Moore's law), leading to the Digital Revolution during the late 20th to early 21st centuries.

Conventionally, a modern computer consists of at least one processing element, typically a central processing unit (CPU) in the form of a microprocessor, along with some type of computer memory, typically semiconductor memory chips. The processing element carries out arithmetic and logical operations, and a sequencing and control unit can change the order of operations in response to stored information. Peripheral devices include input devices (keyboards, mice, joystick, etc.), output devices (monitor screens, printers, etc.), and input/output devices that perform both functions (e.g., the 2000s-era touchscreen). Peripheral devices allow information to be retrieved from an external source and they enable the result of operations to be saved and retrieved.

The Computer Contract

Computer Contracts: Principles & Precedents, which has a national and international focus, provides a a broad range of continuously updated template and sample technology agreements and supporting commentary. Each template contract is drafted with a checklist of key clauses making it easy to advise on specific situations. Many sample terms are provided from all the one perspective, for example supplier-focused terms and client/customer-perspectives.

Commentary covers policy, legislative and case law developments on contract law, intellectual property issues, remedies and taxation, with specific focus on important industry developments, internet and contemporary regulatory issues, spam, defamation, crime, censorship, copyright and privacy.
There are over 100 sample precedents ranging from the standards of software licensing, IT services and hardware supply contracts, to walk bespoke transaction types, such as: 3D Printing Service Agreements, SaaS and PaaS cloud terms, ePublishing terms, Firewall Management Agreements, Privacy Policies and Acceptable Use Policies for online sites.
The text includes relevant government and industry papers reporting or influencing policy developments in the IT sector.