



Acknowledgement

At the finalization of our project we are expressing gratitude to Almighty, the most merciful, for his kindness to give us acute ability and patience to accomplish this project successfully. Without his endless clemency, it could be unattainable for us to fetch out the core of many things that were needed at every steps of this work.

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Abstract

Systems analysis is a problem solving technique that decomposes a system into its component pieces for the purpose of the studying how well those component parts work and interact to accomplish their purpose. In our project we choose to analyze and design the system of Chittagong Power Station (Raozan, Chittagong). The system designers surprised to observe the strong and vigorous features of System Analysis & Design and implemented it in many management systems to reduce management cost, easy access to data, security and flexibility. With time, it could pull out its features with internet and network based information systems. Now there are complex software, developed using the concept of System Analysis & Design, that can meet the increasing demand of the enterprises and their clients. Unlike the file system, it proved itself as the most important part of the business, education, banking, finance and other sectors. Though in recent times, the Information Systems are dependent on copious applications, System Analysis & Design are still providing theories for supporting efficient and reliable systems. As part of our sessional work, we took the project that fulfills the secured, robust, cost optimized and automated system requirements of a manufacturing organization. Our project **Cost Optimization and System Analysis of Chittagong Power Station** provided stepwise analysis of the current system and, after finding out the requirements and pitfalls, it proposed a new system in a more efficient and reliable fashion.

Chapter One



Introduction

Introduction:

Systems analysis is a problem solving technique that decomposes a system into its component pieces for the purpose of the studying how well those component parts work and interact to accomplish their purpose.

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

System analysis and design is the assessment of a predicament and effective designing of its solution. Systems analysis is effectual when all aspects of the problems are evaluated. It dissects a system into its component pieces to stud how those interact and work.

Objectives:

- To study the system of an organization and discover their knotty and complex areas of operation.
- To design an UML.
- To draw DFD of that organization.
- To make appropriate questionnaire for gathering information.
- To do the feasibility analysis.
- To develop an innovative and enhanced system for them.

Overview of the organization:

The N210-12.9-538/538 super high pressure intermediate reheat condensing, three cylinder double exhaustion turbo set turbine, installed at the Unit 1, was manufactured by Dong Fang of China. It has rated capacity of 210 MW and a normal speed of 3,000 RPM. The steam flow at rated parameter at full load is 652.5 t/h at the temperature of 538 °C (1,000 °F) with a live steam pressure of 12.9 MPa. The boiler is a DG-680/13.7-14 type of super high pressure, one intermediate re-heat cycle and single drum natural cyclic type boiler manufactured by Dong Fang of China. It has a steam generating capacity of 680 t/h generating 541 °C(1,006 °F) 13.73 MPa pressured steam at the boiler outlet. At full load, it consumes 52695.4m³/h of natural gas. The efficiency of the boiler is rated at 94.93%. Transformers are manufactured by Shen Yang of China.

Location:

Raozan Power Station is a thermal power in Bangladesh. It is located in Raozan upazilla of Chittagong district 25 kilometers from Chittagong beside the Chittagong-Kaptai highway. It is owned and operated by the Bangladesh Power Development Board (BPDB). Total area of this facility is 98 acres.

Information:

Generation Capacity of the power station is 420 MW (2x210 MW) and the required materials and equipment are supplied by M/S China National Machinery & Equipment, Import & Export Corporation, China. The main fuel of this power plant is natural gas. The generated power is supplied to national grid. There are 2 departments. Operation and maintenance,

- Cost of per unit related to power generation is given below:

Unit-1:

Total cost Tk. 666 Crore

Including Tk. 387 Crore

Unit-2:

Total cost Tk. 675 Crore

Including Tk. 368 Crore

Reasons of choosing this organization:

- This organization has all the levels of management structure.
- this power generation station situated in Raozan which is maintained by the BPDB to supply to the national power grid.
- This is a complete organization situated near our university so it would be easier to gather information.

Management Information:

3 types of information are kept. They are:

1. Strategic: These are long term decisions taking information. This can be overall performance. Amount of production per year. Its all the long term problems. This is managed by top level management.
2. Tactical: These are short term information. They are directed by mid level managers. This can be the information about short term recruitments of the organization. This includes the salary maintenance of employees.
3. Operational: Operational information are from line management. Its the day to day jobs' information. It can include the daily check up of the tools. Any disturbance in supply of fuel are also here reported.

Information Gathering:

Questions:

- How many departments?
- Ans: there are four departments.
- How operate this company?
- Ans: P.D.B through a Chief Engineer operate this company.
- What are the raw materials?
- Ans: Natural gas, river water.
- Who are the vendors of this company?
- Ans: Natural gas providers
- What is the current status of this company?
- Ans: All two units are functional.
- What is the basic product of this company?
- Ans: Electricity.
- What is the achievement of this company?
- Ans: Does a good contribution to the national grid and is still helping in any sudden unwanted crisis.
- What modifications are taken by the authority?
- Ans: Several steps had been taken. Like – up-to-date machineries, qualified manpower according to that.
- What is the goal of this company in this year?
- Ans: To continue it's journey with it's former glory.
- What is the production capacity of this company?
- Ans: 420 MW.
- What is the average production capacity of this company?
- Ans: 210 MW.
- What are the main production equipment of this company?
- Ans: Natural gas, River water.
- Why this location is chosen and what is the advantage of choosing this location?
- Ans: This location is chosen because of it's availability of river water, easy transportation process and the placement is quite far away from the denser civilization.

Requirement specification:

After having the answers of all of our questions, the requirement specification becomes like,
The proposed system needs to have (based on user requirement and people demand)-

- A digital accounts section for easy and efficient account management.
- Noise reduction
- Fully automated machines
- Better disaster or havoc management
- Global database

Management Hierarchy

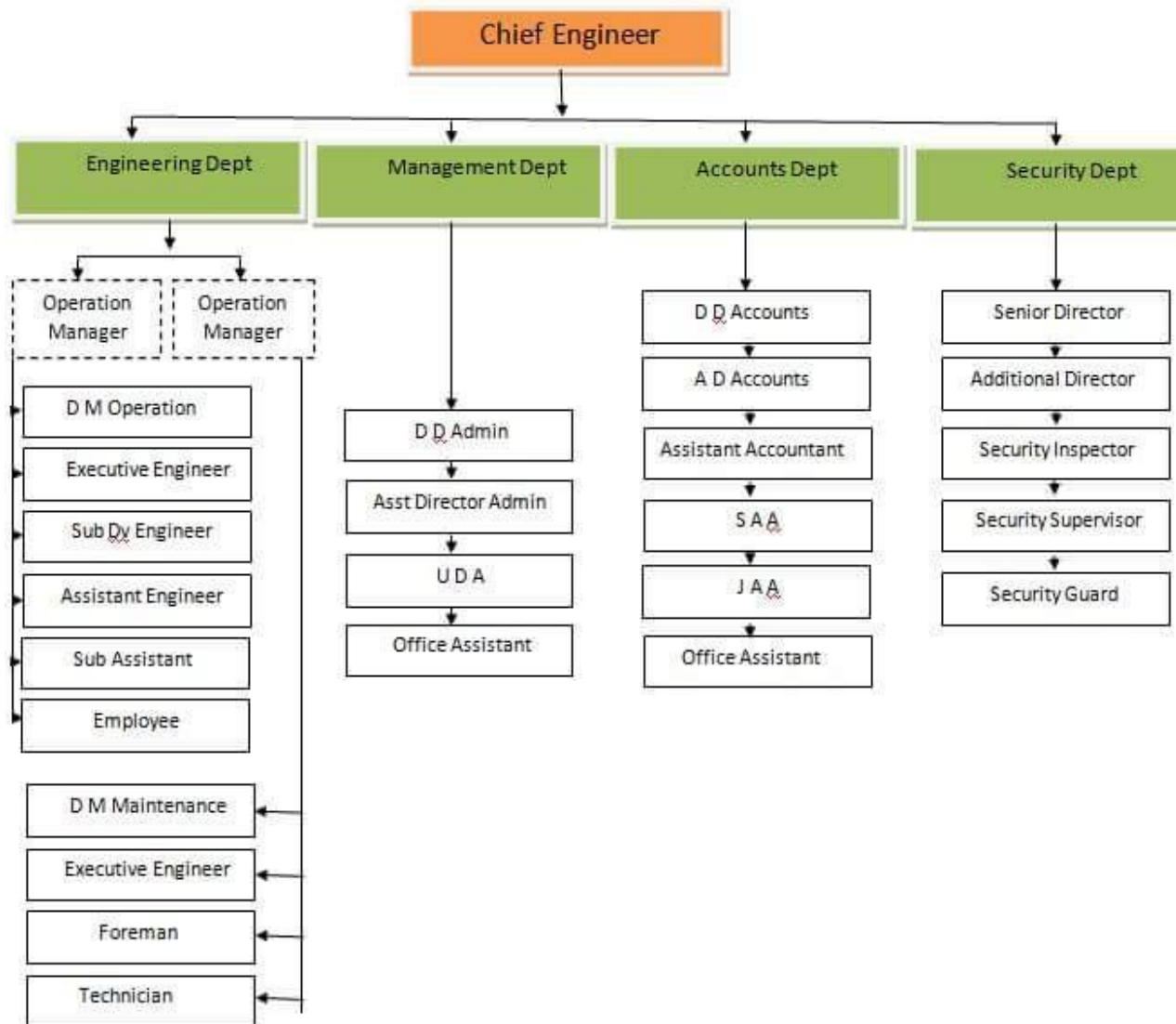


Fig 1.1: Management hierarchy of Chittagong Power station

Chapter two



Analysis of organization

Analyzing the current system:

The Context Diagram shows the system under consideration as a single high-level process and then shows the relationship that the system has with other external entities such as systems, organizational groups, and external data stores.

Another name for a Context Diagram is a Context-Level Data-Flow Diagram or a Level-0 Data Flow Diagram. Since a Context Diagram is a specialized version of Data-Flow Diagram, understanding a bit about Data-Flow Diagrams can be helpful.

A Data-Flow Diagram (DFD) is a graphical visualization of the movement of data through an information system. DFDs are one of the three essential components of the structured-systems analysis and design method. There are two types of DFD:

1. Physical DFD.
2. Logical DFD.

Context Diagram:

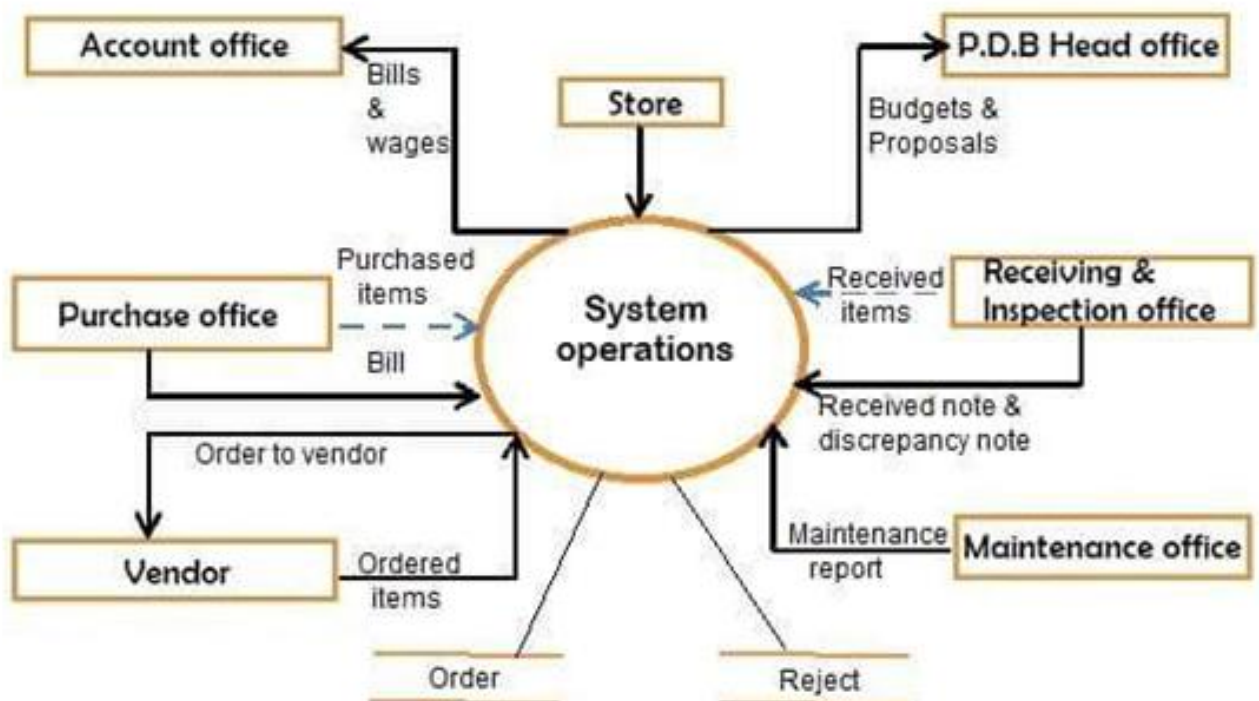


Fig 2.1: Logical-Data Flow Diagram of Raozan Thermal Power Station.

Data Flow Diagrams:

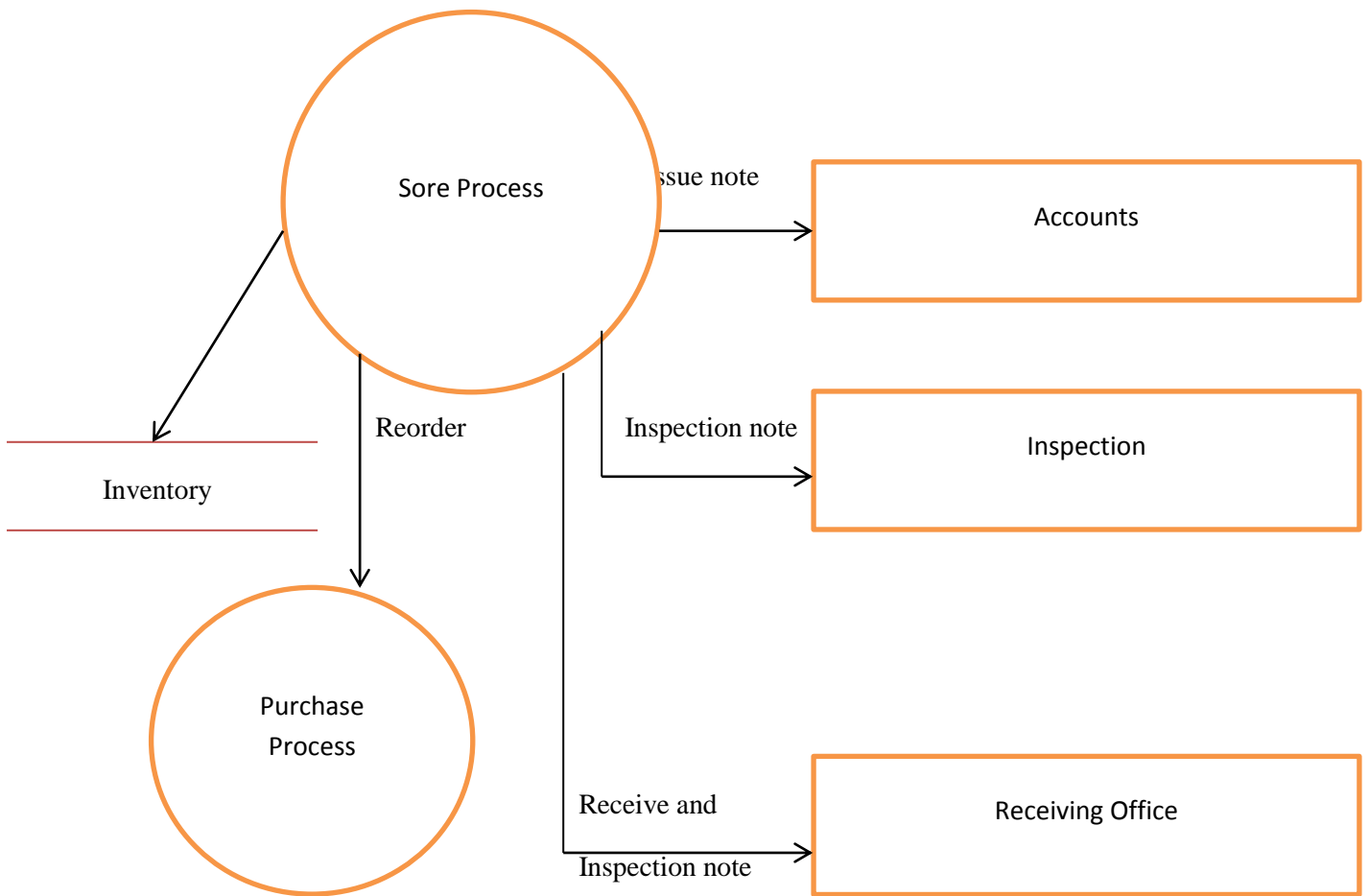


Fig 2.2: Data flow diagram of store process

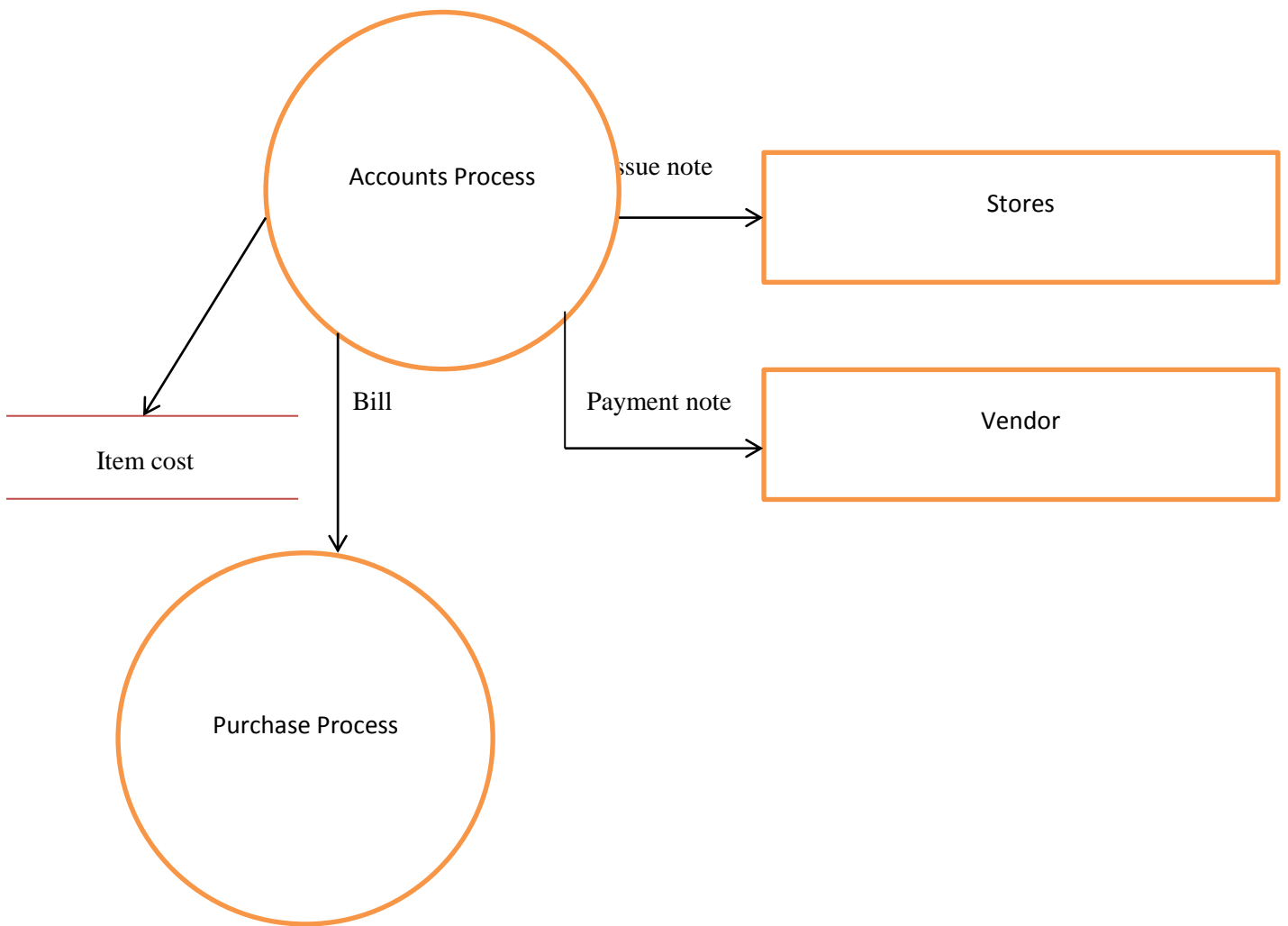


Fig 2.3:Data flow diagram of accounts process

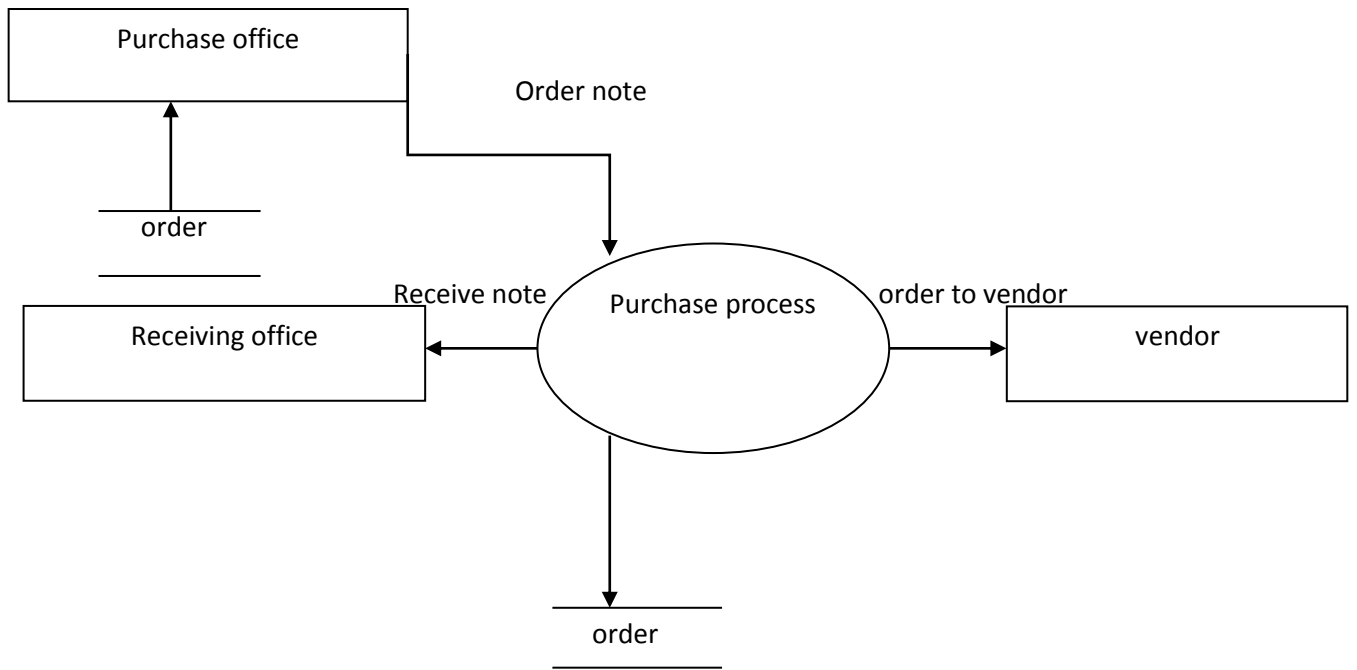


Fig 2.4: purchase Process

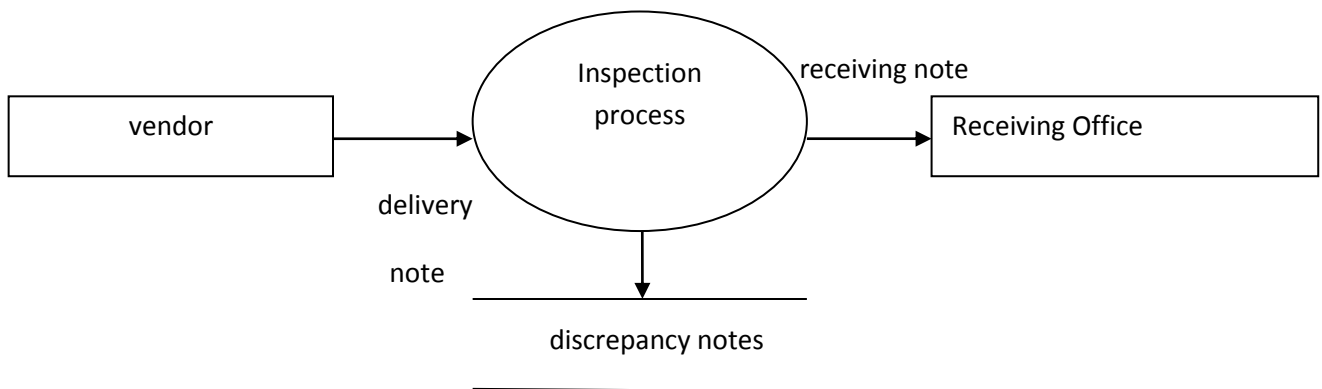


Fig 2.5: Inspection Process

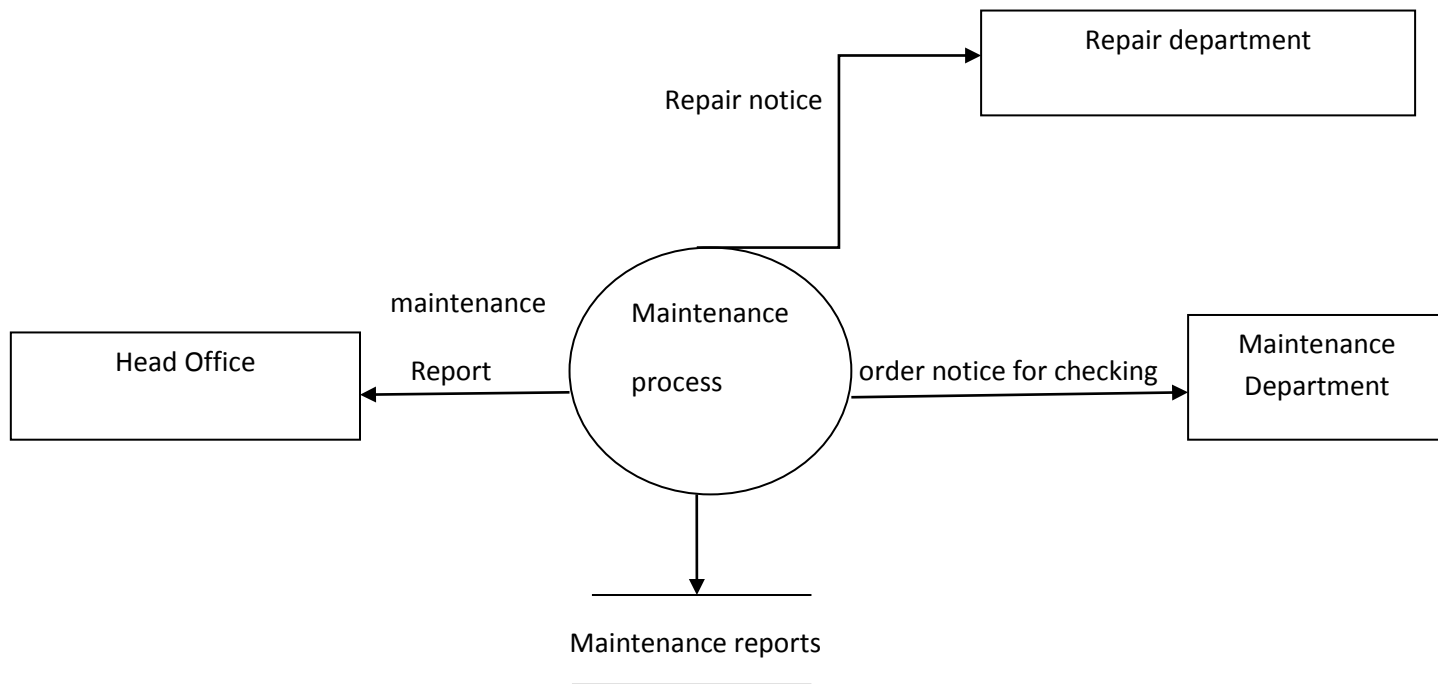


Fig 2.6: Maintenance Process

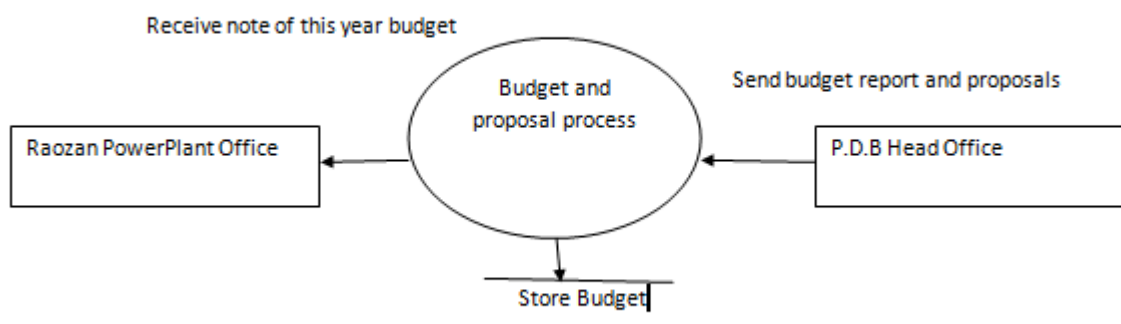
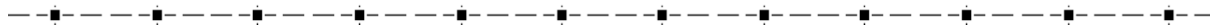


Fig 2.7: Budget Process

Chapter Three



Object Oriented Analysis and Design of Systems

UML Diagrams:

We have got the overall view of the system of the organization. Now we have to draw the UML diagrams. There is a saying that a picture is worth of thousand words. So the class, use case, activity, sequence diagram are drawn in this step.

Use Case Diagram

A diagram that depicts the interactions between the system and external systems and users. It graphically describes who will use the system and in what ways the user expects to interact with the system.

Use case – a behaviorally related sequence of steps, both automated and manual, for the purpose of completing a single business task.

--Description of system functions from the perspective of external users in terminology they understand.

- Subset of the overall system functionality.

--Represented graphically by a horizontal ellipse with the name of the use case appearing above, below, or inside the ellipse.

Actor -- anything that needs to interact with the system to exchange information.

--Could be a human, an organization, another information system, an external device, or even time.

There are 2 subsystems in our organization:

1. Use case Finance subsystem.
2. Use case Maintenance subsystem.

CLASS DIAGRAM

A class diagram in the unified modeling language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, and the relationships between the classes. It is represented using a rectangle with three compartments. Top compartment have the class name, middle compartments the attributes and the bottom compartment with operations.

ACTIVITY DIAGRAM

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control. An activity is shown as an rounded box containing the name of the operation.

SEQUENCE DIAGRAM

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. There are two dimensions.

1. Vertical dimension-represent time.
2. Horizontal dimension-represent different objects.

Use case Diagrams:

Use Case Finance Diagram:

Use Cases	Actors
Analyze Costs	Vendor, Accounting Department
Calculating budget	Accounting Department
Contacting Resources	Vendor, Accounting Department
Distributing Amount	Accounting Department
Report on Ongoing projects	Management Department , Accounting Department
Permit new Process	Management Department , Accounting Department

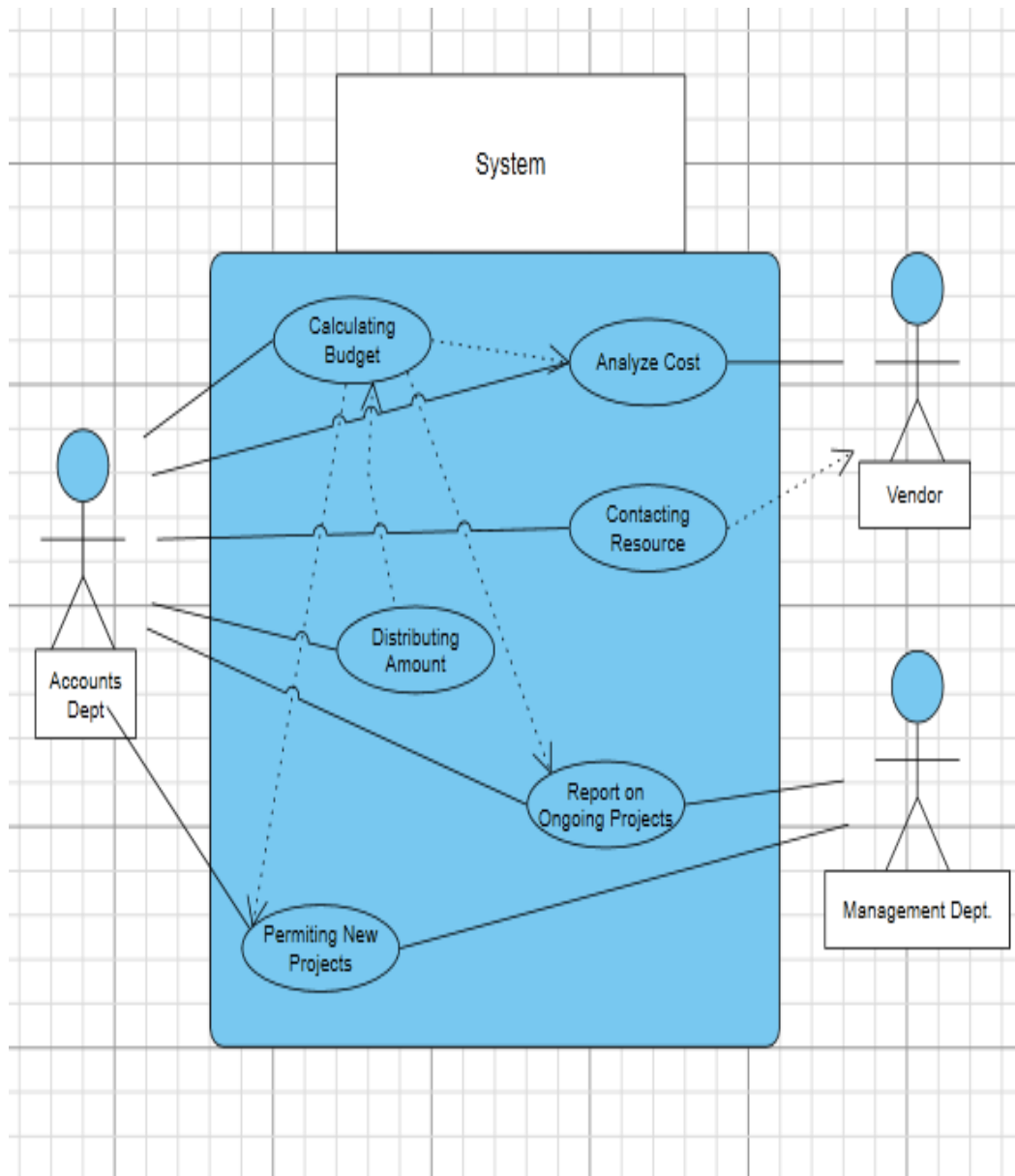


Fig 3.1: Use case diagram of Finance

Use Case For Maintenance Section:

Use Cases	Actors
Checking Plants	Maintenance Department
Taking Solution Measures	Operation Department
Analyzing Problem	Maintenance Department
Problem Solving information	Maintenance Department, Member Admin PDB

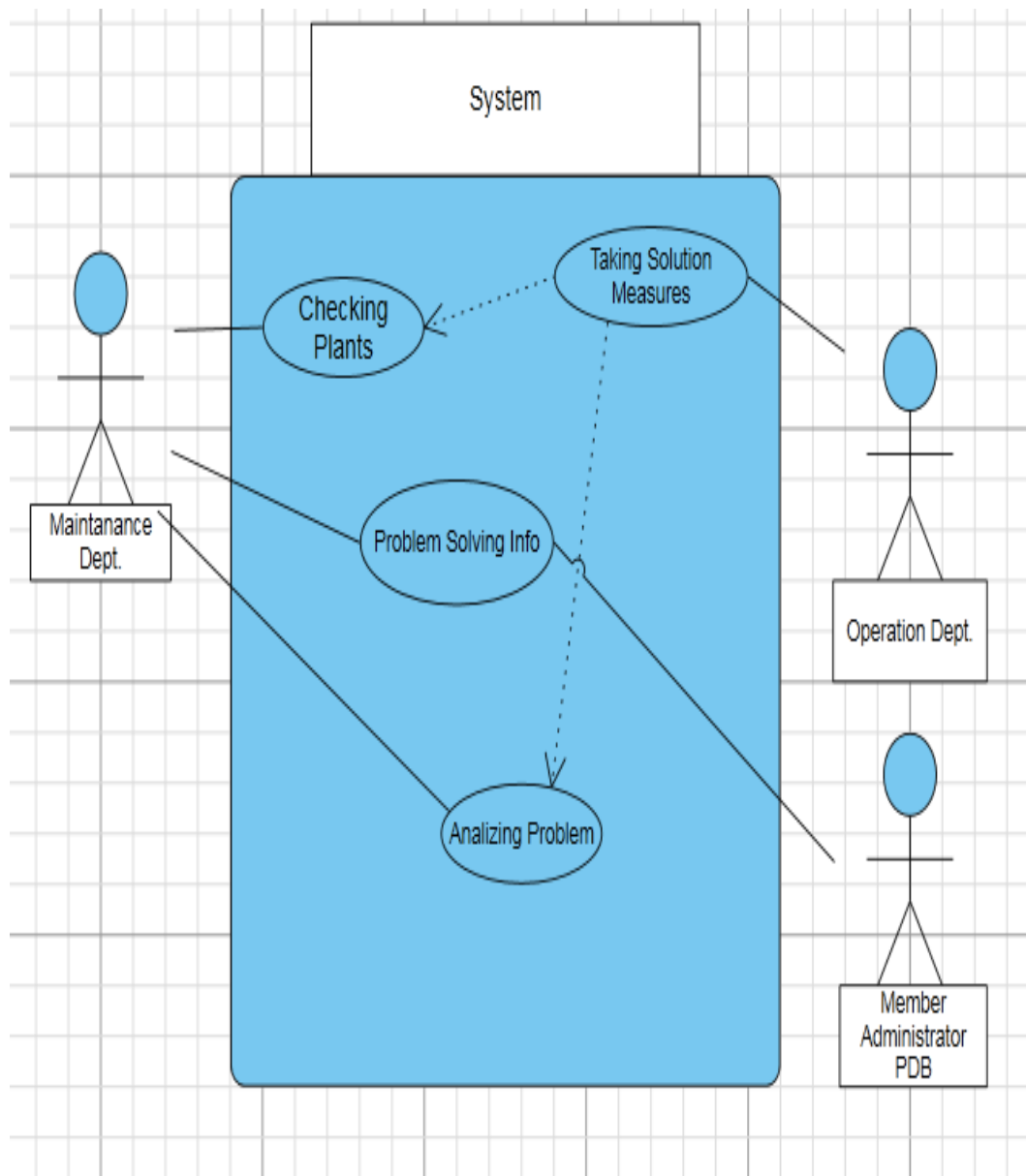


Fig 3.2: Use case diagram of Maintenance

UML Class Diagram:

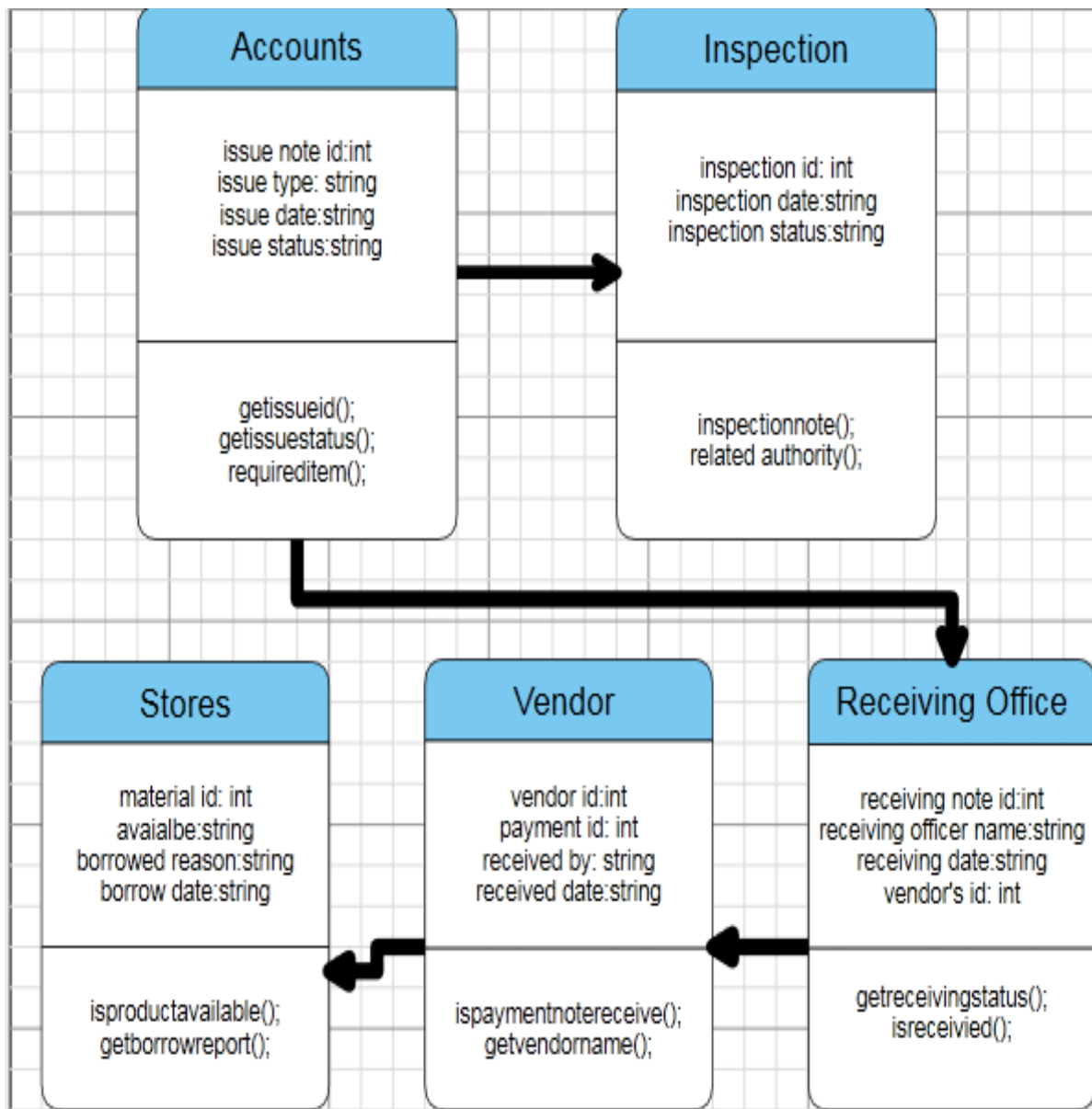


Fig 3.3: Class diagram

Activity Diagram:

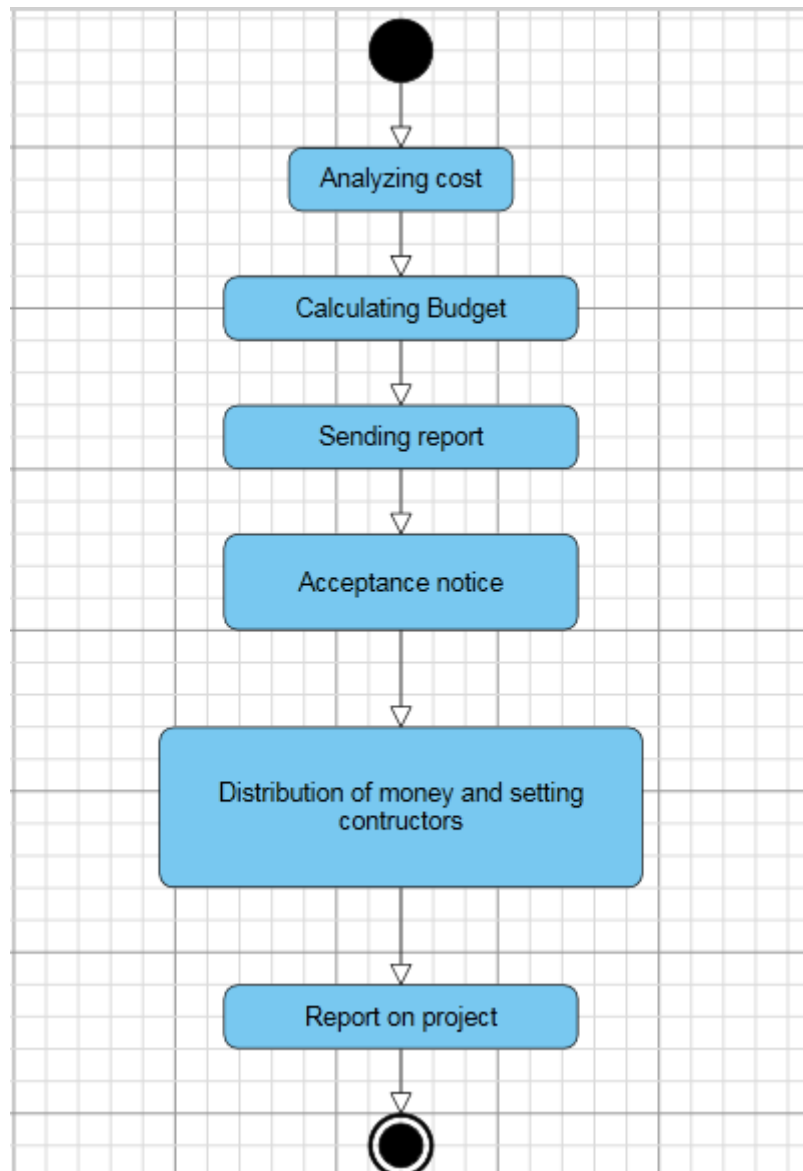


Fig 3.4: Activity diagram of new project management

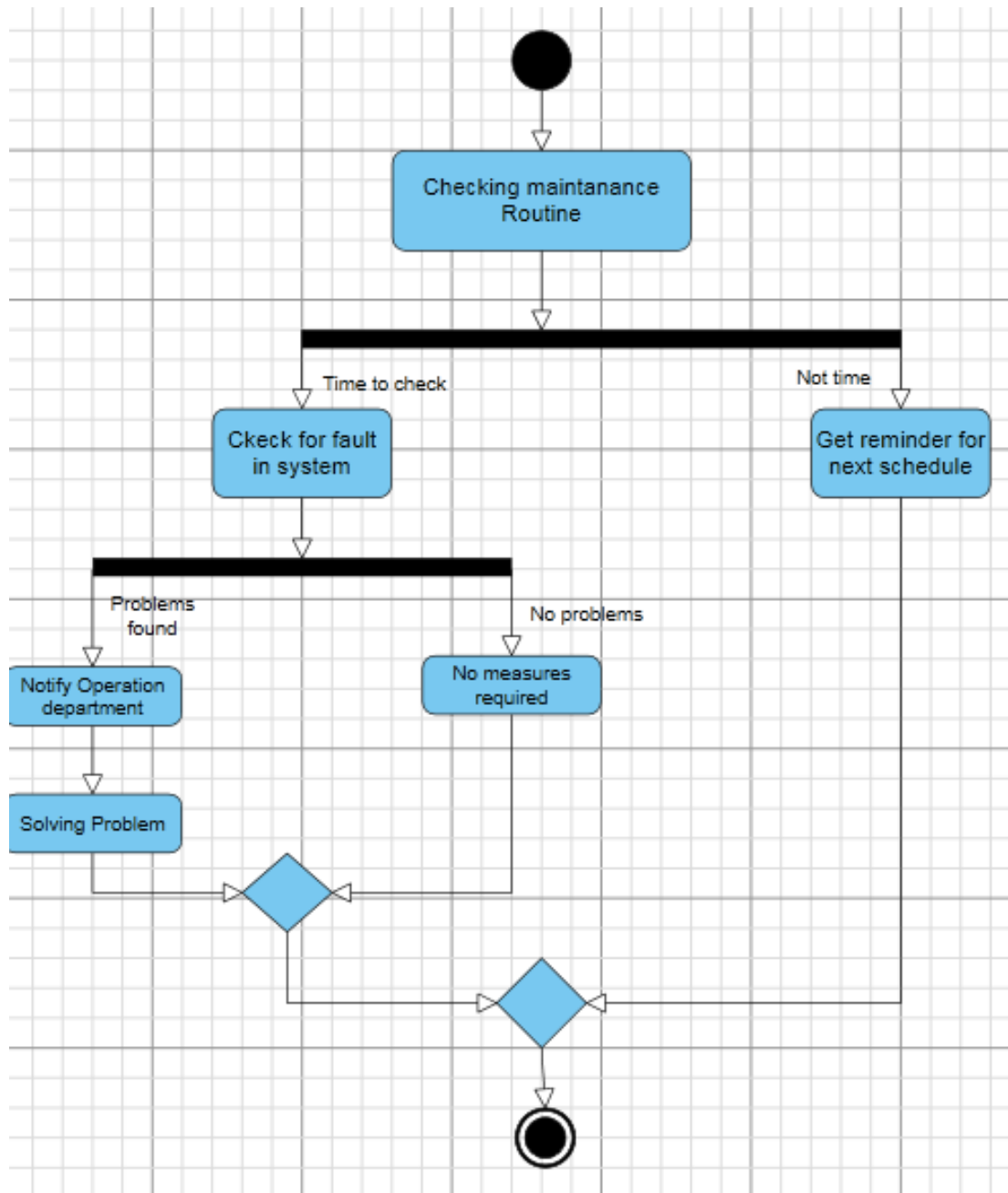


Fig 3.5: Activity diagram of Maintenance

Sequence Diagram:

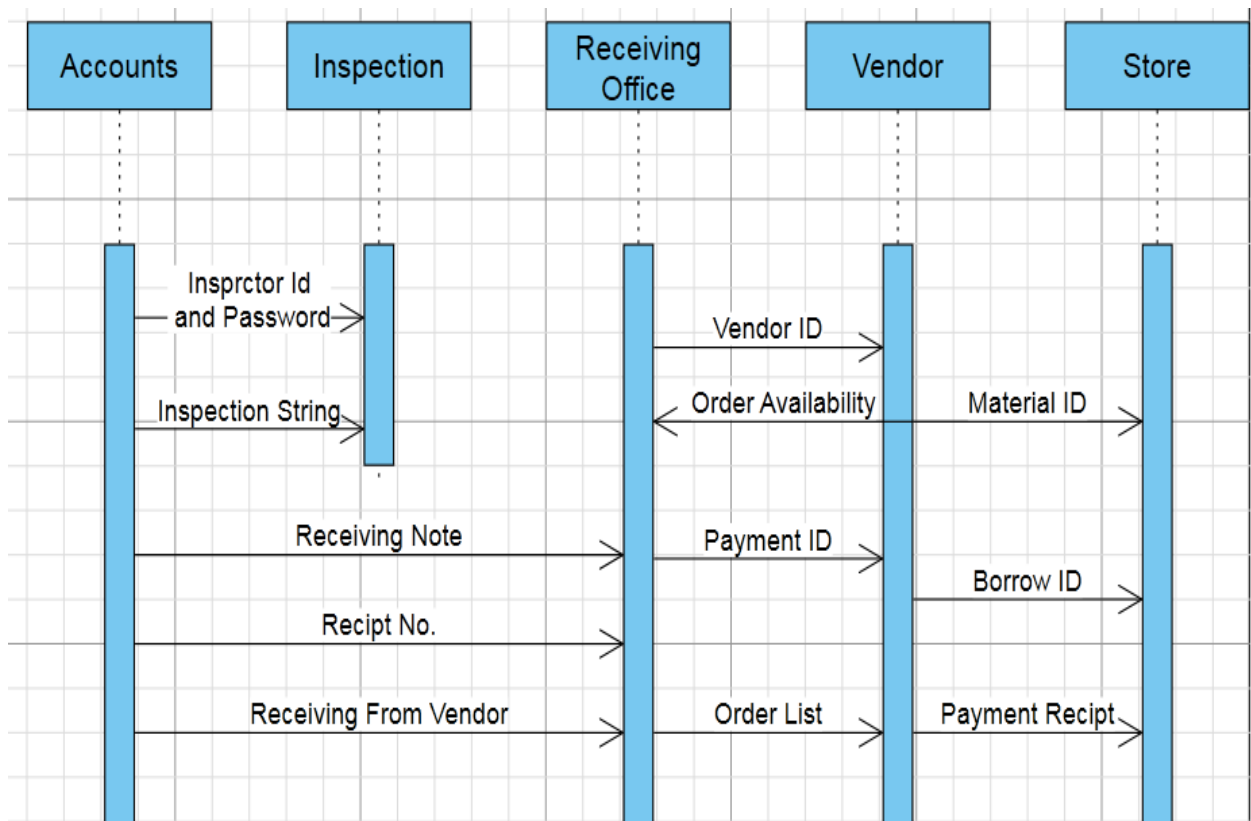


Fig 3.6: Sequence diagram of Maintenance

Chapter Four



Alternative Proposals and Feasibility analysis

Alternative Proposals

Up to this point our main concern was about gathering and representing useful information in specific format. Now, it's time to propose the best feasible solution using those information. Feasibility analysis is a scientific way of understanding and analyzing the harnessed information to generate new information systems i.e. model of an existed system, and choosing the best and optimal one.

Analyzing the overall system, a lot of problems are appeared suffered by the users as well as the organization we are working with. And we are able to find some alternative proposals against the current system. The analysis phase requires evaluating the pros and cons of more than one proposal for the case.

For our chosen organization *Coats Bangladesh Limited* has several faults in its existing system. We have formulated two proposals that solve these shortcomings. The proposals are stated below:

(A) Completely IT based system, overall database for PDB and providing training to all the members.

(B) Semi computerized system and employ new trained person.

Proposal A:

- 1) A global database will be introduced which can make the information flow easier i.e. any of the section can retrieve corresponding data from global database easily.
- 2) A well-defined log in system is required to ensure no data retrieval without access.
- 3) A fully automated accounts section without any error in the calculations or entry and it will also lessen the work load of the employees.
- 4) Automated system should have highest security to cope with unreliable nature of human.
- 5) Proper IT training for all the employees as the system is fully automated.

This proposal will solve the following problems :

- i. All the works of accounts will have less possibility of errors.
- ii. The data retrieval will be more reliable and exact. The data will be easy to access and classify.
- iii. All employees will have knowledge about IT system.

Proposal B :

1. The accounts section will be computerized.
2. Although the fully computerized system would be better we need to consider more security for data retrieval.
3. New employees with IT knowledge should be employed in each section to ensure proper entry of data.

This proposal will solve the following problems :

- i. The new trained employees will be able to handle the scattered data systematically.
- ii. The system will be correct and efficient than present.
- iii. Moreover it can be converted to proposal A in the future

Feasibility Analysis

A feasible project is one where the project could generate adequate amount of cash flow and profits, withstand the risks it will encounter, remain viable in the long-term and meet the goals of the business. A feasibility study is an analysis of the viability of an idea through a disciplined and documented process of thinking through the idea from its logical beginning to its logical end. From the gathered information, it is possible to define broad goals for the project and detailed sub-goals. Once these goals are quantified, the next step is to find out whether these goals can be met and, if met, how they will be met. Feasibility analysis is mainly concerned with these questions. The purpose of feasibility analysis is to make sure that we are on the right way to solve our respective problem. At the end of feasibility analysis, the cost-benefit analysis should be made and finally a proposed in detail should be prescribed. Our proposed solutions need to be evaluated on the basis of the following metrics:

1. Technical Feasibility
2. Operational Feasibility
3. Economic Feasibility

Technical Feasibility

Proposal A and B are technically feasible.

Operational Feasibility

Proposal A and B are operationally feasible.

Cost Benefit Analysis

Proposal A:

Software cost of global database: 200000 Tk.

Maintenance employee: 1

Salary of employee per year: 300000 Tk.

Recurring and maintenance cost per year: 50000 Tk.

Training cost: 500000 Tk.

Instruments for IT based system: 800000 Tk.

Total cost: 1850000 Tk.

Total income: 3000000Tk.

Benefit: 1150000Tk.

Payback period:

$$\begin{aligned}\text{Payback period} &= \text{total cost/benefit} \\ &= 1650000/1150000 \\ &= 1\text{year } 5 \text{ months}\end{aligned}$$

Tangible Benefits:

1. The improved system will secure the system.
2. The improved system will serve in more satisfactory manner.
3. The improved system will ensure no loss of information.

Intangible Benefits:

1. Employees will feel free and secure to work.
2. Time will be saved.
3. Top management can have extra time to think over improvements.

Proposal B:

No. of employees to recruit: 5
Total Salary per year: 1200000
Instruments for IT based system: 80000 Tk.

Total cost: 1280000 Tk.
Total income: 2600000Tk.
Benefit: 1320000Tk.

Payback period:

$$\begin{aligned}\text{Payback period} &= \text{total cost/benefit} \\ &= 1280000/1320000 \\ &= 11 \text{ months}\end{aligned}$$

Tangible Benefits:

1. The improved system will secure the system. Security is strictly maintained
2. The improved system will save all data.
3. The improved system will ensure exact accountability.

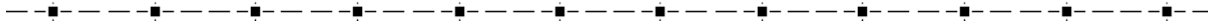
Intangible Benefits:

1. Time will be saved.
2. No need to train all employees.
3. Satisfaction of employees.

Chosen Solution:

The both option are feasible in technical and financial manner. But proposal B is much efficient than A as it has very low starting cost, need no training as the employee are skilled. Moreover the payback period is less. The A proposal can be implemented later from B. So we choose the proposal B for implementing.

Chapter Five



Conclusion

Limitations and Conclusion:

One alternative was chosen among them as it fulfilled the demand of the company and overcomes current limitations. Though it is modified, more reliable and easier approach to continue, it has still several limitations that are described below.

1. Information Security:

Since a database based system has been suggested, information security of the database is the principal shortcomings of the given proposal. A database can be unsafe and top secret information can be taken away by the administrator itself. So, information security should be highly maintained.

2. Freedom of the Higher Level Employees:

An automated system always reduces human effort and hence the higher level employees may get free time during office period. Since human nature is to be involved with evil deeds during free period, it should be carefully controlled so that none of them can spoil their office time.

3. Internet Security:

Website of the proposed system should be connected to the database in order to provide the up-to-date information to the customers and buy or order if necessary. For any web based application, hacking is a factor that needs to be considered first.

Here we used many tools to analyze and propose new system. The process of designing of management system depends mostly on information gathering. The system design process itself is quite involved and requires sound commonsense and judgment to decide the level of detail to which the design effort should proceed. Finally we tried to gather the feelings of user about current system.