

**APPLICABILITY OF STANDARD PROJECT
MANAGEMENT APPROACH IN SOLVING ISSUES
RELATED TO SOFTWARE PROJECTS –THE CASE
STUDY OF CEB**

**MASTER OF BUSINESS ADMINISTRATION
IN
INFORMATION TECHNOLOGY**



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December 2007

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MANAGEMENT APPROACH IN SOLVING ISSUES
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STUDY OF CEB**

By

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 This dissertation is submitted to the Department of Computer Science, University of Moratuwa in partial fulfillment of the requirements for the Degree of Master of Business Administration in Information Technology

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December 2007

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any University, contain any material previously published or written by another person except where due reference is made in the text.

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I endorse the declaration by the candidate.

Signature of the supervisor

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Prof.Niranjan Gunawardena



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ABSTRACT

Ceylon Electricity Board is the national electricity utility provider for the whole island. Incorporation of state of art technologies and standards are vital within the responsibilities bounded for the organization to fulfill the electricity requirements of the nation. With the increase of number of software projects, which are in multiple stages, it is required for the IT division to manage those projects efficiently and effectively. In order to meet this requirement, the research work focuses on deriving a Project Management Model with Processes Management, which is required to be tailored to the business need.

Further, this dissertation gives in detail the findings of a case study carried out by investigation of a suitable Project Management Model. In this process, existing software environment was investigated including as to how the IS activities were carried during past 20 years, main project types, major activities and current stages of those projects. With the increases of software to be handled, users of software systems might encounter certain difficulties in the absence of an appropriate management approach. Therefore, the dissertation has also included the approach carried out for the exploring significant problematic areas faced by the software users within the CEB environment.

The result indicates a Project Management Model, which incorporated practices from PMBOK, PRINCE2 and DSDM. According to the outcome, Project Management Model consists of four layers. Layer 1 indicates the factors affecting the project. This mainly consists of PMBOK knowledge areas. Majority of user problems were represented because of the lack of utilization of activities of these knowledge areas. Layer 2 indicates the strategic focus, which needs to align with the software environment. Layer 3 represents the project process, which consist of initiation, planning, execution and closure. Set of practices and tools were introduced for software implementation projects. Finally, the Layer 4 represents some major factors, which functions as foundation for many projects. Some of them are skills development, project environment and job positions. All in all, the above four layers of this PM model represent a comprehensive PM solution that is well represented by the findings of this research.

DEDICATION

This thesis is dedicated to my beloved parents who have always been with me in every hurdle I cleared.

Meththa Perera

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ABBREVIATION

AGM	Assistant General Manager
CEB	Ceylon Electricity Board
CMM	Capability Maturity Model
CSC	Consumer Service Center
DGM	Deputy General Manager
DSDM	Dynamic System Development Method
EDP	Electronic Data Processing
EE	Electrical Engineer
ES	Electrical Superintendent
ESB	Electricity Service Board
FMIS	Finance Management System
GIS	Geographical Information System
HP	Havelett Packard
HR	Human Resources
IEEE	Institute of Electrical & Electronic Engineering
IM	Information Management
IS	Information System
IT	Information Technology
MIS	Management Information System
OGC	Office of Government Commerce
PM	Project Management
PMBOK	Project Management Body Of Knowledge
PMI	Project Management Institute
POS	Point Of Sale
PRINCE	PRojects IN Controlled Environments
RDBMS	Relational DataBase Management System
SK	Store Keeper
SMC	Service Main Connection
SME	Small to Medium-sized Enterprises

WAN	Wide Area Network
WBS	Work Breakdown Structure
WIP	Work In Progress
WPN	Western Province North
WPS	Western Province South
R1	Region 1
R2	Region 2
R3	Region 3
R4	Region 4



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Chapter: 1

Introduction

1.1 Background and Motivation

Private as well as government sector organizations seek automation of their business processes incorporating information technology. While private sector targets on high profit margins through better customer satisfaction, public and government sector organizations main objective is to fulfill accountability to the public by improvement of operational efficiency, improve transparency through information disclosure and improve convenience for citizens. The e-government concept [1] has grabbed attraction of public and government sectors, which involves comprehensive implementation of information technology in above areas. In Sri Lankan context, existence of required infrastructure facilities to gear the growth of IT [2] is vital to achieve the development of the country with above objectives.



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These activities of public and government sector organizations involve large-scale software projects, which require higher level of project management approaches. Most projects were outsourced. Success levels of those projects are in multiple stages and still some organizations need to pay more attention on those projects because of the lack of PM standard is used.

Considering organization for the research is the CEB. In 1969, the CEB was setup as the national power utility with reflecting a monopoly in electricity power sector in Sri Lanka. CEB's core business processes include power generation, transmission and distribution through out the country. With nearly 3.9 million customers as of 2007, the process management activities are however not effective and need comprehensive improvements in those activities.

Therefore it motivated me to study how the PM standards with process management can be utilized and derived for large-scale software projects in a widely spread organization such as CEB.

1.2 Problem Statement

In order to manage the IT needs of the CEB, Separate IT division was established in late 1992. Major software projects handles by the CEB IT division are, Billing System and the FMIS.

It was common that almost all the government sector organizations software systems in mission critical business processes were outsourced. FMIS was an outsourced project which handover with all the controls. (eg: handover of source codes) to the CEB due to some management failures by the vendor organization. With respect to various factors such as financial crisis, organizational management activities, senior management of the CEB wants to reengineer the system to cater to the existing requirements of the organization. With the unbalanced situation occurred in the IT division due to the increase of number of software projects to handle, users of these software systems are affected. In existing situation, role of CEB IT division is to manage these projects, which are in multiple stages in efficiently with solving all the software related issues, which are affected for the organization performances.

Therefore it is necessary for CEB IT division to maintain and manage standardize project with process management approach towards meeting their corporate objectives. In advance, it should provide structure, not rigidity, and serve as a guiding set of company best practices and principles for managing projects. Through such, standardize approaches CEB could increase the percentage of their contribution in the national economy.

1.3 Research Objectives

1. Identify most significant issues pertaining to software projects within the CEB environment.
2. Identify existing reasons, which prevented in addressing those identified issues in objective 1.
3. Identify mostly used PM standard approaches and best practices in software projects.
4. Identify those standards and practices in objective 3 to come up with a suitable PM model, which suits to solve the issues under the objective 1 and 2. This will cover the identification of best practices to carry out software projects within CEB considering quality, cost and time constraints.

1.4 Research Methodology

With the observations, the existing software project environment was identified which includes the type, status and major activities involve with those identified projects. To identify the problems faced by the CEB software clients who are the users of software provided by the IT division a pre survey was carried. Based on the pre survey, to gather user responses in order to find most significant issues, a questionnaire was prepared. This questionnaire mainly was focused on PMBOK knowledge areas. Statistical test was performed for data analysis. Mostly used PM approaches were identified through the literature survey. In order to find the reasons to exist client's issues and the issues faced by the IT division as software providers, structured interviews were performed. According to the observations of the research, suitable PM model was introduced at the end.

1.5 Significance of the Study

With the increase of number of software projects to handle, findings of this research would facilitate the identification of management areas, which are essential in managing software projects within CEB environment. Especially in multi project environment with having software projects in different stages with involving multiple activities.

1.6 Structure of the Dissertation

➤ Chapter 1 : Introduction

This chapter mainly focuses on background of the study and what made motivation for me to study this area as my research. In addition to the background and motivation, research problems and objectives of the research are described with some general information such as methodology and significance of the study.

➤ Chapter 2: Literature Survey

This chapter elaborates supportive literatures on PM. Especially it covers some important aspects of PM when it is going to use as a standardized approach. Some of the findings included in this chapter will be analyzed in detail in the Chapter 5 under the section 5.6 Case Study Analysis in Popular PM Models.

➤ Chapter 3: Research Methodology

This chapter covers the overall research plan, which includes how the research is designed.

➤ Chapter 4: Business Case

This chapter evaluates the existing projects environment within the CEB and how the history of IS activities performed by highlighting major activities. While considering the historical activities, finally indicates the challenge of the IT division.

➤ Chapter 5: Data Analysis and Discussion

This chapter indicates quantitative and qualitative type of data analysis, in order to have discussions with information gathered through the analysis. Main objectives defined in the research were achieved within this chapter.

➤ Chapter 6: Conclusions and Recommendations

This chapter includes the overall attempt of the research work in summary and recommendations from the findings of the research and recommendations for future research areas.



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Chapter: 2

Literature Review

2.1 Introduction

The previous studies and findings with respect to the area of PM are discussed in this chapter. Those findings are categorized under sections such as the importance of PM, Business value of a PM model and PM model implementation. Those sections are facilitated with case studies, which were practiced in similar research area.

2.2 Software Projects and PM

Most software projects in government sector were outsourced, mainly due to the intention of cost reduction and streamlining the process efficiently [3]. Though such projects were developing with high quality PM standards by the vendors, strength of the agreements between the vendor and the shareholder is determined the continuation and success of the project. Handover of incomplete, poor quality deliverables to the shareholder was resulted in the case of failure to continue those agreements. Strategies of project handover [4] may not follow in a standard in such situations. Since it is not filling the shareholder's requirements and the lack of contribution towards the enterprise goals [5], those software projects were considered as failure projects. However, there are many more reasons, which were affected for a failure of software projects [6].

For CEB IT division, the effort in PM is vital since they need to manage projects, which are in multiple stages. PM should concern responsibility and decision-making about the project to deliver the expected results of the project in the context of agreed-upon specification expectations, commitments and constraints [7]-[9]. There are many professional PM associations across the world to facilitate and allow for team up with PM activities [10]. Some associations have defined standards and methodologies for IT PM

practices [11]. Usefulness and the applicability of those methodologies are varying according to the type of the project and organizational practices.

2.3 PM Standards

Among the defined standards for PM practices, PMBOK based PM is a global standard for PM, issued by PMI. According to the PMI's definition of PM [12], it conveys how critical of understanding of PM activities for an organization which deal with projects. To understand basic structure of the PM, PMI provides a framework including nine knowledge areas and five process groups [12]. With the complexity and the unique characteristics of government projects, to maintain the efficiency, effectiveness and accountability, it is essential to have standardized practices [13]. The management of the organization should understand the goals of comprehensive planning of the project [14] to achieve the corporate objectives. The development of a project plan is the critical stage and the key to achieve success in any project. Existence and the role of a Project Manager and the comprehensive project plans are significantly contributed for the project success not only in large organizations but also in SME's [15].

PRINCE2 is a PM method, tailor for use on all types of project. It is owned by the UK Office of Government Commerce and is in the public domain. PRINCE is a process-based method for effective PM [16].

DSDM from UK Consortium, called it as the DSDM Consortium. DSDM focuses on delivering business benefit instead of, as in traditional development methods, the avoidance of blame through signed-off specifications [17].

2.4 Importance of PM

PM is a powerful transformational management technology that is undeniably shown to help individuals and organizations successfully plan and accomplish many difficult programs and projects around the world. PM has grown, matured and spread around the

world to include a robust set of theories, principles, methodologies, practices, activities, people and organizations [18]. A model is some form of representation designed to aid in visualizing a thing that cannot be observed directly, either because it has not yet been constructed or because it is an abstract. For an organization, establishing a robust model of PM is necessary that would better enable practitioners alike to hold a shared vision. Then it would be better positioned to establish and improve organizational practice, research and education and training efforts [19]. Further, in this paper it is discussed about the most essential things, which should be accomplished by a PM model. Some of them are,

1. Clarify the overall scope and extent of the comprehensive PM body of knowledge.
2. Break up the body of knowledge into logical and understandable categories or divisions.
3. Indicate the interrelationships between the various categories into which the PM body of knowledge can be subdivided.
4. Take into account the complexities of PM and the integrating nature of the Project Manger's job and of his or her supporting team.
5. For potential PM practitioners it is Simple and understandable to present.

According to the PM best practices published by the Giga Information Group, the steps that are going for successful PM are not new concepts. Those are standard procedures and project chances of success can be improved. The poor planning and fuzzy requirement cause poor productivity [20] of the projects.

2.5 Business Value of a PM Model

The Business value of embracing a PM model was reflected in many situations. (eg: PM tool implementation at HP). According to their publications, “HP exceeds expectations by cutting over \$3 billion in cost during its first year of operation. A new PM system was directly responsible for enabling HP to reduce \$110 million in projected project cost at

the same time the system contributed in a number of indirect ways to HP's cost cutting effort as a whole" - *CEO HP* [21]. The case also included how the HP was operated before the introduction of PM method. With the implementation of new methodology, HP was able to define some key principles of PM which should consider [21] in managing projects.

Mission critical process in any organization, which handles projects, is PM. The Software Engineering Institute in its CMM, PM Maturity Model, ISO, IEEE and many others are clear evidence of the need for methodology for an organization.

The importance of having a PM methodology was described the users, their roles and responsibilities, time scales and the way to perform. Finally, it permits for collection of useful information regarding projects and their performances to give decision makers a basis for effective project portfolio management [22].

2.6 How to Implement a PM Model

Researchers have highlighted that for any PM methodology implementation, gap analysis was the starting approach in clearly delineating the difference between reality and the ideality in comparative form. To support the above scenario, questioning session should be conducted. Through the questioning session, the existing problems with the problems noted were drilled down to the root-cause issues to be solved. Identified problems should be prioritized and summarized. Once the prioritization of problems is performed, it should find out ideal PM methodology to implement.

Case study of implementation of a PM model in multi project environment has clearly mentioned that the model was implemented only to the software development division. Its success was stimulated over other divisions in the company. Other managers in the divisions such as human resource development, sales also implemented. Everybody in the company is engaged in some projects to bring better products/service and more benefit to

solve customers' problems while providing an opportunity for personal and professional growth [23].

Similar practice as above was performed in the case study of implementing a PM and Program Management standard in order to reengineer the public work management at the Japanese Government Ministry. The result of such implementation of a suitable model was given a drastic reduction of the construction works duration, improved profitability for contractors and enhanced quality of work. Significant improvements in motivation of all players, such as government officials and contractors, and a higher satisfaction level for locals [24] were achieved through this PM standard implementation.

The case study of development and implementation of PM methodology in Ericson Services Ireland, gives comprehensive knowledge about the activities performed within the research context [26]. According to the author of the case study, senior manager's impression of development and implementation of a PM methodology is not an easy task with their experience in involving these activities. According to them, it was a costly venture. However, it should be one of the cornerstones of an organization's project success. It is clearly mentioned about PM methodology and the way it serve as a guiding set of company best practices and principles for managing projects. According to the case study, they have to use a phase approach in finding and implementing the PM methodology. Two phases were there. One was investigation phase and other was the implementation phase [26]. Investigation phase identify the existing PM related matters. At the implementation phase, suitable PM model was implemented.

PMI's PMBOK standard is not specially designed for specific organization environments such as software environments. However, some researchers were identified the way of customize it for software development environments. How main process areas and relevant knowledge areas can be included for the software development environment [29] was defined in the approach.

Chapter 3

Research Methodology

3.1 Introduction

The detailed description of the research methodology is discussed in this chapter. Research design is based on mainly with the PMBOK knowledge areas and the processes. However, the appropriate best practices, which are essential for the CEB environment is selected with the consideration of PMBOK as well as other PM standards and process standards. Further, the research design section consists of data collection methods, questionnaire design and steps of achieving objectives of the research. A comprehensive analysis of tools and techniques, which are defined in identified standards, is used in deriving the best practices.

3.2 Research Design



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3.2.1 Sample

Entire population represents the CEB employees who are involved with software projects. Population was divided to two main categories as software clients who are the users of the software systems and software solution providers who is the IT division of the CEB. Within those categories, Senior and middle management employee categories were only selected for the sample. The sample was listed in Anexure1.

3.2.2 Data Collection Method

To investigate the information related to above studying areas, structured interviews and questionnaires were used with the people who were involved in software projects directly and indirectly with in CEB environment. In addition to interviews, observations were used to gather other supplementary information such as strategic focus, management interest of applying new PM practices, existing software projects activities and status.

3.2.3 Pre Survey

Pre survey was carried out to gather the existing software problem areas faced by the CEB clients. For this, unstructured interviews were carried out with people who covering each business categories.

3.2.4 Design of Questionnaire

Identified software issue areas were categorized according to the PMBOK knowledge areas. Figure 3.1 shows the nine knowledge areas of PMBOK.



Figure 3.1: Overview of Project Management Knowledge Areas
Source: PMBOK Guide, PMI

Questionnaire was designed to cover the categorized issue areas in each knowledge area. Questionnaire consists with two sections. Part A questions were designed to gather some general information. Part B questions were designed to cover the issue areas identified in the pre survey and provided to response in five scale values. Full questionnaire was listed in Annexure2. However, the issues cannot categorize under these knowledge areas were considered separately. Set of questions were prepared to carry out the structured interviews, in order to find reasons for identified issues. Set of question areas were listed in Annexure 3.

3.2.5 Steps to Achieve Research Objectives

1. Identify most significant issues pertaining to software projects within the CEB environment.
 - a. The questionnaire was distributed to senior managers and senior executives involved in power Generation, Transmission and Distribution business processes.
 - b. Used Likert scale type questionnaire and the scale >3 data were considered as most significant issues. Hypothesis test of sample mean used to identify most significant issues.

2. Identify existing reasons, which prevented in addressing those identified issues in objective 1.
 - a. Structured interviews were carried with directing the identified problems in objective1 to the senior managers of the IT division who involve in making decision concerning the software projects.

3. Identify mostly used PM standard approaches and best practices in software projects.
 - a. Used the standards defined by PMI , UK and DSDM
 - b. Detailed analyses of case studies were performed.

4. With existing and gathered data in above objectives, the best suit PM model and best practices for the CEB software environment was identified as objective 4.

Chapter 4

Business Case

4.1 Introduction

CEB is the monopolistic organization, which supplies electricity for the entire nation. It generate or acquire supplies of electricity to construct maintain and operate the necessary works for interconnection of the generating stations, substations and for the transmission and distribution of electricity in bulk from generating places to required positions. The electricity market in Sri Lanka is in high demanding position. This has necessitated a radical restructuring of CEB's business and the information systems, which support it.

With considering IS activities, in late 1992's to early 1993's, IM branch was established in order to facilitate day to day business related activities with the state of art technology . Supply of software for the CEB customer billing activities and provide management information for the senior managers using FMIS were included as major software activities. This chapter mainly emphasis on how the IS activities were carried over the last 20 years and the existing structure of the IT division. Finally, the challenge of the IT division is discussed in this chapter.

4.2 How Information System Activities Evolved Over the Last 20 Years

➤ In 1982's: Begin of major IS activities

At this time there was no separate division for IS activities. IT activities were controlled under the Finance Management Unit. Major information system application was the Billing application, which handles the electricity billing information. There were some integrated IBM FORTRAN systems for load studies and sag calculations. Internal engineering staffs of the CEB were developed those systems. Billing Application was an

IBM System34 punch card system. Many large organizations in Sri Lanka, this kind of system were used (eg: Petroleum). It was a centralized system. Around 5 lks of customer data was handled. Major activities performed were collecting data from consumer service centers, area offices and province offices. Then data were sent to the head office, which was located at Colombo. At the Colombo head office, data were entered to the system. Therefore it took long duration (eg: nearly 8 months) to get the completed bill to the user and long time to give new connection. High numbers of data entry operators were involved.

➤ **In 1989: Separate unit for IS activities**

IS activities were separated from Finance Management. IS activities were allocated to Engineering Unit. Separate branch called EDP branch for IS activities was established. Head position of the EDP branch was titled as DGM. At this time, numbers of consumer accounts was increased. Therefore, it was needed to reduce the time taken for billing activities, and new connections. The management and the ministry was identified the requirement for a high data processing power. High level of political power intervention for decision-makings was reflected. IBM high processing power machines were purchased. It cost 2 lks per machine and distributed those machines to every area office. However, centralized bill entering process was continued. The production of computerized bill printout was removed. A pre printed bill was given to write bill information manually. Therefore, the time taken (eg: early it was nearly 8 months) to get the bill to the user was reduced.

➤ **In late 1989 to early 1990**

The engineering unit was developed the SMC system and implemented. To enter new connection data for area level was facilitated with this system. At this time, numbers of consumer accounts were increased to 1 million. AS400 machines were purchased. Higher management decided to outsource a new billing package. For this, World Bank funds

were used and tenders were called for a new billing package. Specifications, which were received, not according to the requirements of the tender evaluation team.

➤ **In late 1992 to early 1993,**

With major structural change, higher management decided to establish an IM branch. IM branch and EDP branch, both were under a one DGM.

➤ **In 1994,**

With the output of tender evaluation team, decision was taken to develop the billing system with an internal development team.

➤ **In early 1997 to late 1998: Adjust the IM branch structure**

Senior managers were involved in design a new structure for IM Branch. Head of the branch was titled as DGM IM. This DGM IM position was directly under the AGM Transmission. Positions were created for Manager IS, Engineer IS services, System Analysts, Analyst Programmers, Network Administrators and System administrators. At this time, internal development team was developed the Billing System and Implemented a decentralized billing process. AS400 machines were removed. Moved to open source UNIX systems with RDBMS and flat file structure was removed. At this time, major attention was given for consumer information of bulk supply. Client- server architecture was implemented and WAN was established.

During this period, a requirement for Financial System was emerged. A World Bank fund for a financial system project was obtained. MIS Branch for the financial system project was established. For financial system development, agreement was signed with Millennium IT. Structure for MIS branch with head of the position as the Project Manager was designed. An Accountant, Electrical Engineers, Programmer and System Analyst were there. Due to management problems in the vendor company, CEB management were decided to terminate the agreement with Millennium IT and the

financial system, which they developed, was purchased for the CEB, with source codes. The Financial system in few sites was implemented.

➤ **In 1999,**

To locate the geographical location of the consumers, a GIS was outsourced. A Newzeland team was provided the consultation. Major activities necessary to protect systems from Y2K bug were carried during this period and all software were managed to survive from it successfully.

➤ **In early 2000 to late 2002,**

POS related to consumer billing in every area offices were developed and implemented. Implement of all the modules of the financial system were failed due to some identified bugs. Therefore, decision was taken to implement only inventory module of the financial system. To fix bugs in the financial system, tenders were called for a development team. This development team was outsourced and after fixing bugs, migration to new development version of the financial system was performed.

➤ **In 2003,**

Bugs in the financial system were cleaned and other modules were implemented as parallel run in one site (eg: in WPN).

➤ **Late 2004 to early 2005: Adjust the MIS branch structure**

With the number of site expansions, the MIS branch structure was re-designed. Decision was taken to carryout development of the uncompleted modules of the financial system. The DGM IT was created new carder positions such as Software Engineer and Information Technologist. POS counter application was implemented throughout the country.

➤ **In late 2005 to mid 2006,**

The financial system was implemented completely in two provinces including two power Generations sites and inventory modules in all provinces. POS applications at Banks were implemented.

With considering the above IS activities, at present as the IT department, they are involving in handling two major projects. Those are Billing System and FMIS.

Figure 4.1 in the following section indicates how the internal structure of the IT division was organized. Staff of the IT branch was assigned according to the project types handled by the IT department. However, there are employees who are working and carrying their duties in multiple projects within this structure.



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➤ **Structure of the IT Department**

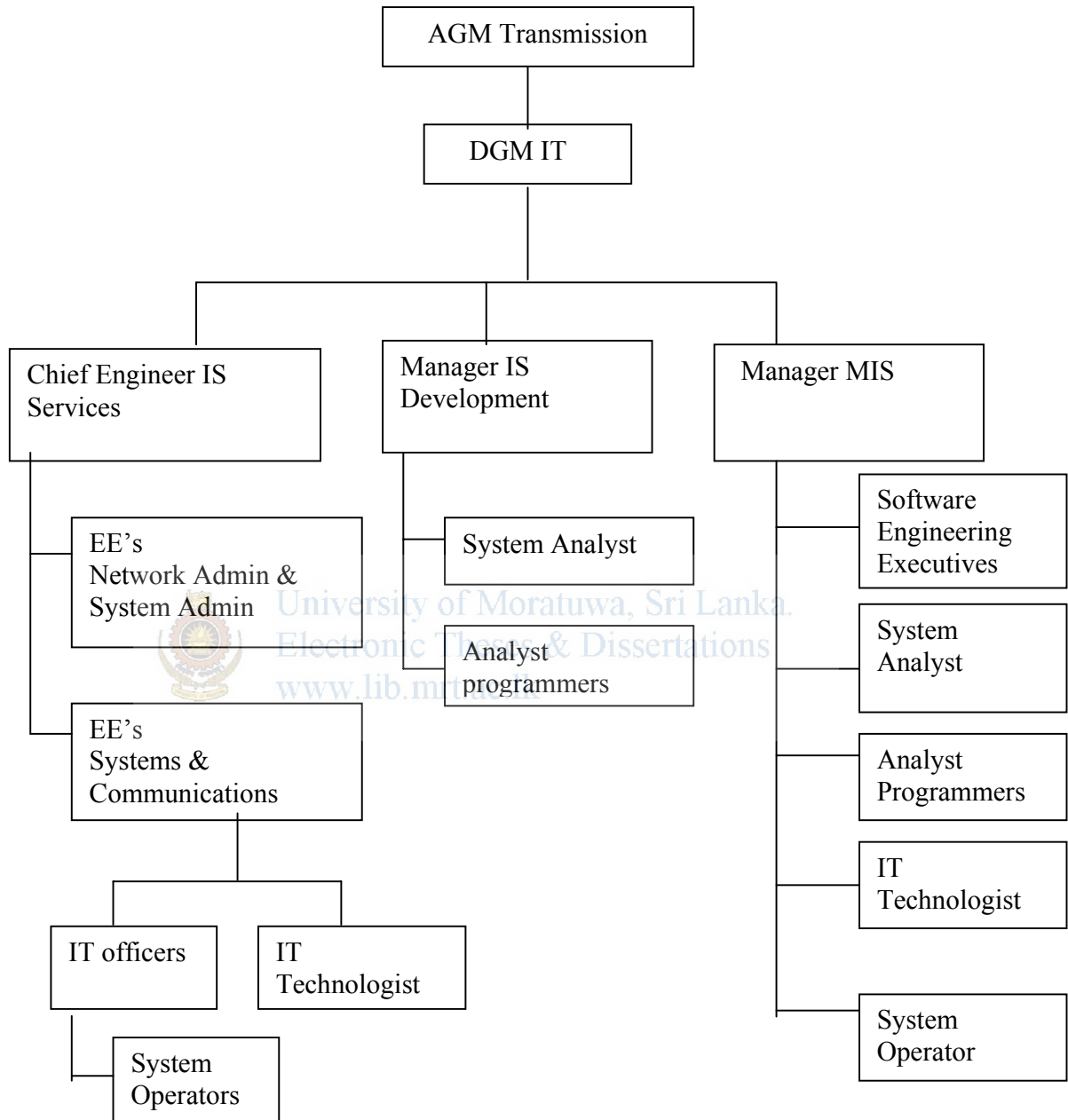


Figure 4.1: Structure of the IT Department

4.2 The Challenge

With the increase of software products in multiple stages and activities relevant to software, it highlights the significance of embarking on internal change to adopt PM practices whilst to function effectively for fulfilling the user needs. In order to improve the overall efficiencies of its business processes dealing with software provided by the IT division, it needs to search for a PM solution that could deliver the functionality, security, scalability, and usability that senior managers require.



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Chapter 5

Data Analysis and Discussion

5.1 Introduction

The observed and gathered data, detailed analysis of data and the discussions regarding the results in appropriate sections is included in this chapter. The detailed discussion of observed data regarding the software projects environment within the IT division is included in section 5.2. The pre survey data and the identification of most significant issues faced as software users with the use of hypothesis test is indicated in the section 5.3. The identification of the reasons for the identified issues and detailed discussion of the reasons are included in the Section 5.4. The data regarding the software issues faced by the IT division as the software providers are included in the section 5.5. Software provider's issues were analyzed with the use of findings from the similar case studies, which has found through literature survey. Finally, findings from data analysis lead to conclude with the suitable PM model, which suits for CEB environment is included under the section 5.6. The PM model with the identified layers and detailed discussion with practices, which are needed to perform under each layer, are represented in his section.

5.2 Critical Analysis of Software Project Environment within IT Branch

At present, IT division is involved in handling multi projects and those projects were in multiple stages while having different activities to be carried out.

5.2.1 Analysis of Structure of the IT Department

Projects are typically part of an organization that is larger than project. Larger organizational structure was represented in the CEB, which highly influences for projects. When consider organizational system, those whose operations were carried on primarily through projects, were considered as project-based organizations. Such organization can be in two statuses [13]. In CEB, their revenue is primarily from

performing project activities. In order to facilitate that, CEB has adopted some management activities of projects through IT department with providing FMIS designed for accounts tracking and the Billing System to collect the income to the organization.

Figure 5.1 shows the Head of the IT division position was represented within the CEB organizational structure.

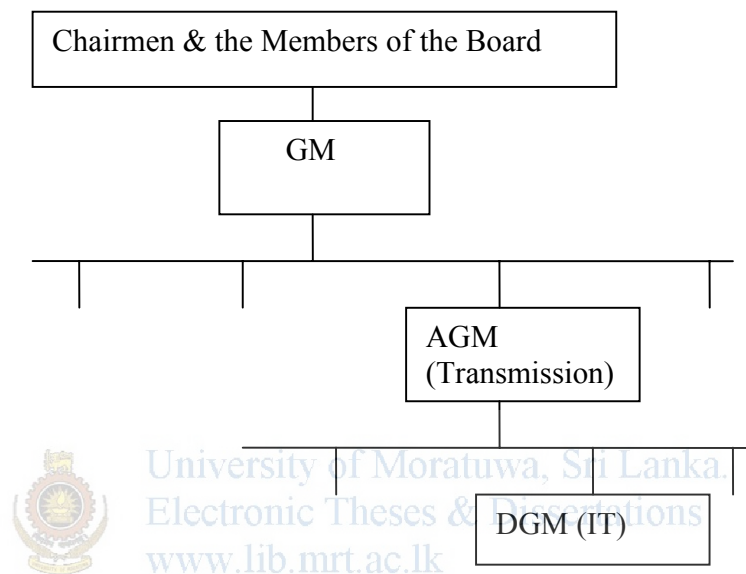


Figure 5.1: Position of the IT Division within the Structure of the CEB

According to this structure, there is no separate higher authority level assigned only for the IT activities other than DGM IT. IT division is under the AGM Transmission division. However, Transmission division is a separate business unit, which has separate set of business goals. Their main business focus is not with IT. Therefore, current structure has limitations in performing IT related activities.

➤ **Proposed IT division structure (High level)**

Proposal was given to restructure the IT division's internal structure. The high-level proposed structure is indicated in Figure 5.2.

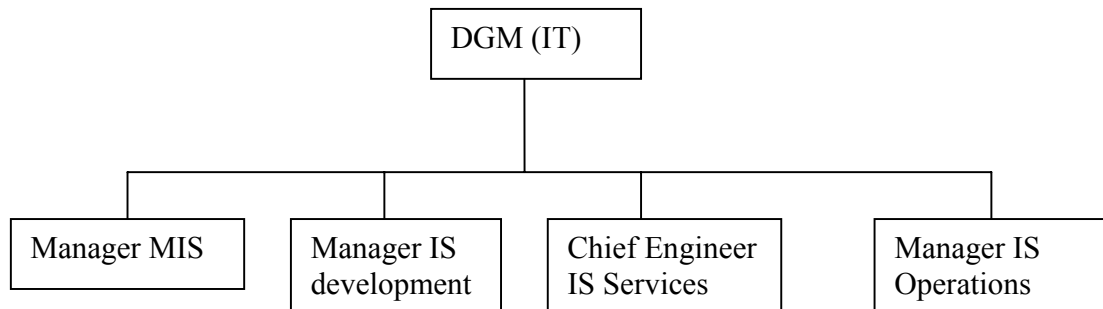


Figure 5.2: Proposed IT Division Structure (High level)

➤ **Role of Each Authority**

Manager MIS: Handles the FMIS project

Manager IS Development: Handles the Billing system

Chief Engineer IS Services: Handles the Infrastructure necessary for above systems i.e. Communication and Networking

Manager IS Operations: Implementation and operational activities relevant for above projects.

Since these functions of each authorities represents their role in major projects, PMBOK suggesting to have project environment [13] in such situation. With complexity of works, it is ideal for CEB to carryout these roles as project. Authorities can act as Project Managers. Head of the department (DGM IT) can act as the Manager of project managers, with representing a project environment.

The concept of PMO can be achieved with in the IT division since it has functional type structure [13] with representing the functionalities of major projects.

Figure 5.3 shows how the PMO structure can be used within IT division according to the PMO definition above.

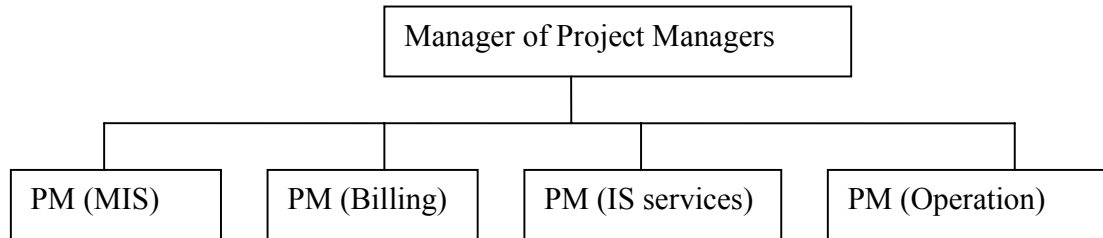


Figure 5.3: Proposed PMO Structure (High level)

5.2.2 Project Types

5.2.2.1 CEB FMIS

To handle the CEB financial activities, provided software solution was the FMIS. This software is an outsourced one, and handed over by the vendor company with the source codes and currently is maintained by the CEB MIS branch. This is consisting with several modules, which are integrated in order to perform financial activities. Those modules are,

- Inventory
- Cash book
- General ledger
- Project costing
- System Administration

➤ Major Activities

Major activities are involved with this project such as software modifications, bug fixings, introduction of new software modules and software implementations activities. Software implementation activities are the most challenging and difficult to perform since it is dealing with cultural change of CEB working environment.

➤ **Benefits**

- To generate inventory, WIP related accounting information all provincial accountants are used FMIS. Due to this, stock adjustments are not being accumulated.
- The time and effort in producing information was saved.
- Errors in manual works were eliminated.
- Stock verifications can be performed easily.
- Central repository of inventory information is being maintained with achieving transparency of provincial inventories across the organization. Therefore, provincial engineers can view live stock levels and auditors get accurate information. High-level data analysis was performed.
- ES's can use the system to get information regarding their stocks.
- Work of Area SK was reduced.
- Monthly Accounting information can be provided with the help of the FMIS.

➤ **Current Status**



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Inventory module was activated in all provincial stores, some depots and central stores. (eg: CSC in WPN, CSC in UVA province, CSC in NWP, CSC in WPS1 and Southern province, Samanalaweva Power Station, All Mahaweli Complex Power Stations and Meter Lab Piliyandala). Full system covering Inventory, Cash Book, General Ledger and Project Costing are implemented in WPN as a parallel system, WPS2 as an online system, Energy Purchase division only ledger activities and WPS1 as online system.

Following analysis according to the observations was indicated the percentage of software implementation activities yet to be completed. Since CEB operates as functional units FMIS module implementation in each units can be visualized as follows.

➤ **Inventory Module Implementation in Power Generation**

Table 5.1 shows the data relevant for number of sites implemented in Power Generation. Figure 5.4 shows those data in a chart view. Figure 5.5 shows the percentage of implementation within the entire Power Generation Unit.

Table 5.1: Inventory Module Implementation in Power Generation

Power Generation Division	No of Sites	%
Mahaweli Complex	7/7	100%
Randenigala	1	
Victoria	1	
Ukuwela	1	
Bowathanna	1	
Rantabe	1	
Kotmale	1	
Nillambe	1	
Laxapana Complex	0/5	0
Wimalasurendra		
Old Laxapana		
New Laxapana		
Canyon		
Samanala		
Thermal Complex	0/4	0
Other Hydro Complex	1/4	25%
Samanalawewa	1	
Iginiyagala		
Udawalawe		
Kukuleganga		

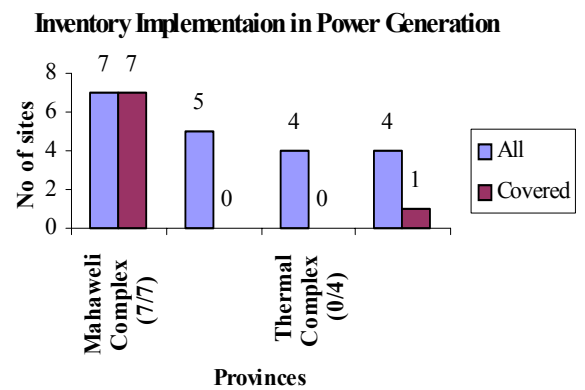


Figure 5.4: Inventory Module Implementation in Power Generation

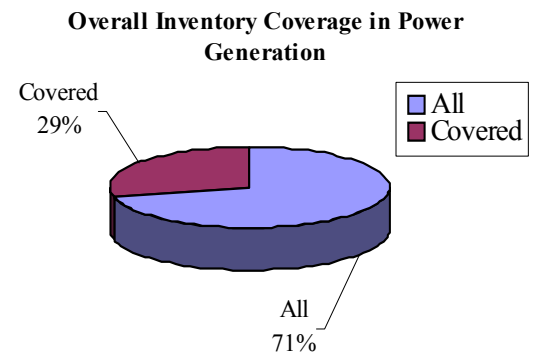


Figure 5.5: Percentage of Inventory Implementation in Power Generation

➤ **Inventory Module Implementation in Distribution R1**

Table 5.2 shows the data relevant for number of sites implemented in R1. Figure 5.6 shows those data in a chart view. Figure 5.7 shows the percentage of implementation within the entire R1 unit.

Table 5.2: Inventory Module Implementation in Distribution R1

Distribution R1	No of sites	%
Central Stores	1/1	100
Colombo City	0/1	0
Provincial stores	0/1	
North Western Province	22/22	100
Provincial stores	1/1	
Area stores	5/5	
CSC	16/16	
North Central province	1/11	9.1
Provincial stores	1/1	
Area stores	0/1	
CSC	0/9	
Nothern Province	1/16	6.3
Provincial stores	1/1	
Area stores	0/2	
CSC	0/13	

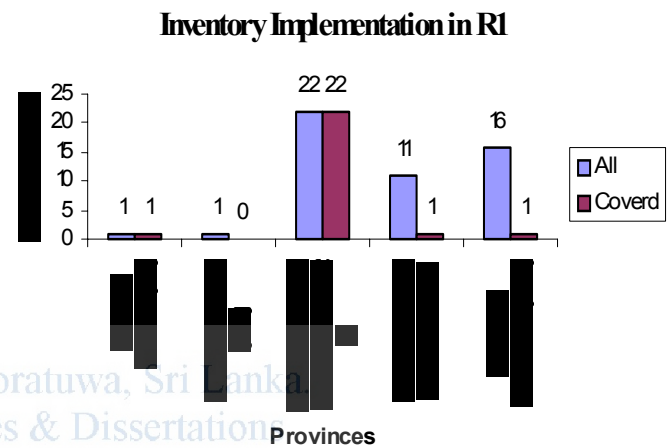


Figure 5.6: Inventory Module Implementation in R1

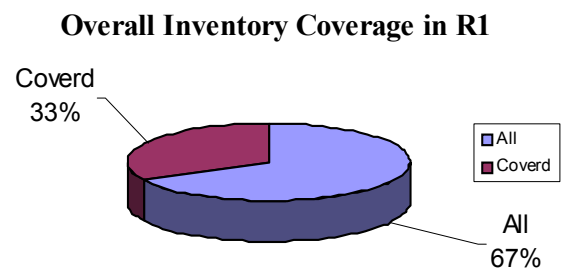


Figure 5.7: Percentage of Inventory Implementation in R1

➤ **Inventory Module Implementation in Distribution R2**

Table 5.3 shows the data relevant for number of sites implemented in R2. Figure 5.8 shows those data in a chart view. Figure 5.9 shows the percentage of implementation within the entire R2 unit.

Table 5.3: Inventory Module Implementation in Distribution R2

Distribution R2	No of sites	%
Western Province North	22/22	100
Provincial stores	1/1	
Area stores	5/5	
CSC	16/16	
Central Province	1/29	3.5
Provincial stores	1/1	
Area stores	0/6	
CSC	0/22	
Eastern province	4/23	17.4
Provincial stores	1/1	
Sub stores	3/3	
Area stores	0/4	
CSC	0/15	

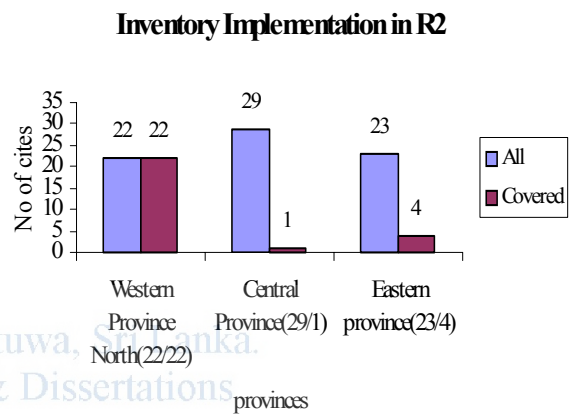


Figure 5.8: Inventory Module Implementation in R2

Overall Inventory Implementation in R2

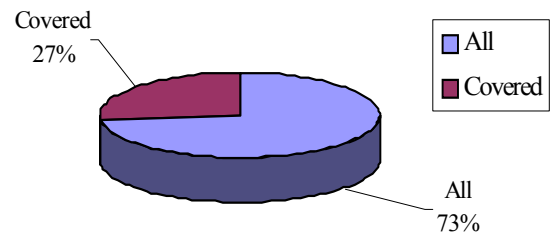


Figure 5.9: Percentage of Inventory Implementation in R2

➤ **Inventory Module Implementation in Distribution R3**

Table 5.4 shows the data relevant for number of sites implemented in R3. Figure 5.10 shows those data in a chart view. Figure 5.11 shows the percentage of implementation within the entire R3 unit.

Table 5.4: Inventory Module Implementation in Distribution R3

Distribution R3	No of sites	%
Western Province South2	1/19	5.3
Provincial stores	1/1	
Area stores	0/4	
CSC	0/14	
Sabaragamuwa Province	1/17	5.9
Provincial stores	1/1	
Area stores	0/2	
CSC	0/14	
Uva province	17/17	100
Provincial stores	1/1	
Area stores	3/3	
CSC	13/13	

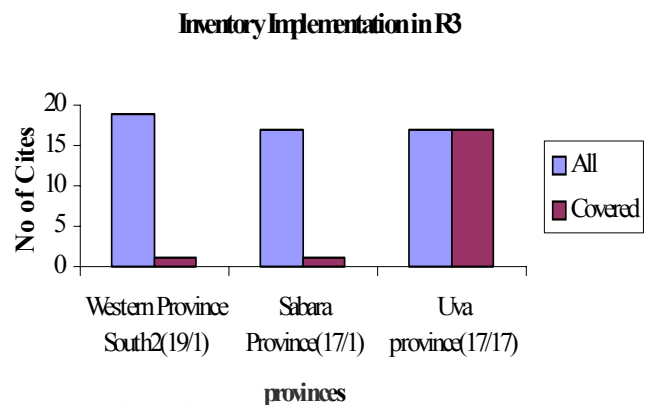


Figure 5.10: Inventory Module Implementation in R3

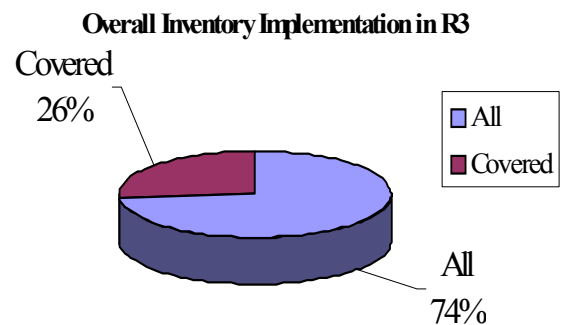


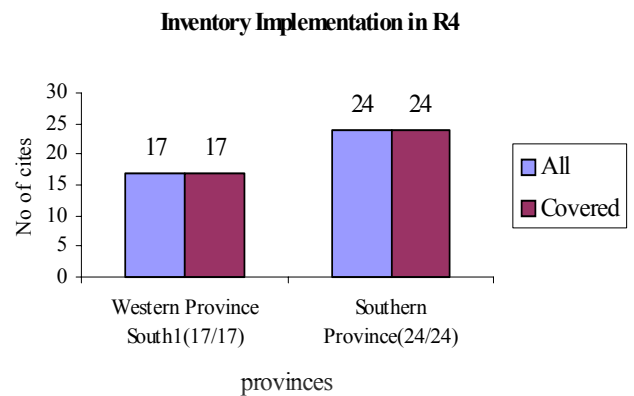
Figure 5.11: Percentage of Inventory Implementation in R3

➤ **Inventory Module Implementation in Distribution R4**

Table 5.5 shows the data relevant for number of sites implemented in R4. Figure 5.12 shows those data in a chart view. Figure 5.13 shows the percentage of implementation within the entire R4 unit.

Table 5.5: Inventory Module Implementation in Distribution R4

Distribution R4	No of sites	%
Western Province South1	17/17	100
Provincial stores	1/1	
Area stores	3/3	
CSC	13/13	
Southern Province	24/24	100
Provincial stores	1/1	
Area stores	4/4	
CSC	19/19	



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Figure 5.12: Inventory Module Implementation in R4

Overall Inventory Implementations in R4

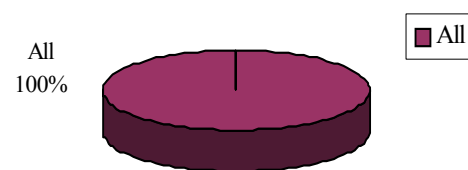


Figure 5.13: Percentage of Inventory Implementation in R4

➤ **Full System Implementation**

Table 5.6 shows the data relevant for number of provinces included for each distribution sector, which implemented the full system. Figure 5.14 shows those data in chart view.

Table 5.6: Full System Implementation

Distribution R4	No of sites	%
R1	0/4	0
R2	1/3	33.4
Western Province North (parallel system)		
R3	1/3	33.4
Western Province South2 (online system)		
R4	1/2	50
Western Province South1 (online system)		

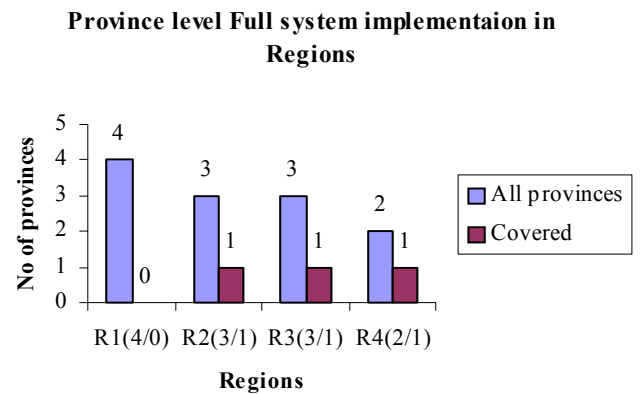


Figure 5.14: Full System Implementation in Province Level of Regions

Other than these distribution regions, Energy Purchase branch in the Transmission division operates the ledger activities through the system.

With analyzing those data, it can be seen that high volume of system implementation activities are yet to be cover.

5.2.2.2 CEB Billing System

➤ **Project Type**

Software modules were implemented to facilitate consumer's bill preparation. The in-house development team was developed all the modules. Customer bill processes performs in two categories. Those are Bulk and Ordinary bill process. Separate software modules were designed to facilitate above two processes.

➤ **Major Activities**

Major activities with this project are software modifications, introduction of new software modules with targeting consumer convenience, use of new technologies and provide reliable information for the consumers. Implementation activities were almost covered through out the country.

➤ **Benefits**

- Capture consumer information which is relevant for bill preparation activities (eg: consumption and payments)
- Maintain single repository of payment information, hence can utilize for analytical purposes of the income information.

➤ **Current Status**

Software relevant for Bulk Supply billing processes was implemented at every Provincial Offices. Software relevant for Ordinary billing processes was implemented at every Area Offices and Province Offices. POS system was implemented through out the country. Peoples Bank incorporates POS counters at their premises and facilitates online bill payment through their web links.

Therefore, with considering above gathered data, major activities involve with the IT department when concerns the software are as follows,

5.2.3 Major Activities Categorization

1. Software development
Quality improvement of existing software's and introduction of new software modules according to the business need were included.

2. Implementation and operational activities
Software modules implementation through out the country and provide excellent operational support services with reliable infrastructure facilities for software's were included.

The identification of project types, status and activities need to perform further for the IT division was included in this section 5.2. Findings of this Section 5.2, will link with Section 5.6 to conclude the suitable PM model for CEB software environment.

5.3 Pre Survey Data

To identify the existing software management related issues face by the CEB clients, Pre survey was carried out. More than 80 issues were gathered during the pre survey. PMBOK management areas were mainly used to categorize the issues in order to prepare the questionnaire.

Reason to categorize as according to the different management areas are,

1. Software development environment within the IT department is evaluated according to the PMBOK knowledge areas in order to identify the existing PM environment. Hence, it will be able to prove that the relationship between the client's software issues and the reasons to exist such kind of issues.
2. Research's main framework of PM is PMBOK.

However, the issues cannot categorize with nine knowledge areas of PMBOK were considered as separately.

5.3.1 Identified Software Related Issue Areas in Client's Direction

1. Awareness of how software will help for business activities.
2. Lack of clearly planned goals.
3. Lack of responsibility with software.
4. Lack of knowledge about IT department focus and the instructions.
5. Lack of knowledge about the activities needed to perform by them selves.
6. Less commitment for software activities.
7. Low time flexibility to do software activities.
8. Less support from seniors.
9. Lack of documents given relevant for implementation activities.
10. Less participation for progress meetings.
11. Less participation for software scope planning activities.

12. Lack of idea in scope of software.
13. Less awareness about uncovered software functionalities.
14. Documents not received regarding software scope
15. Documents not received indicating resource requirements.
16. Less awareness of initial risk, which are to be faced.
17. Lack of formal acceptance of software.
18. Reluctance to avoid manual practices.
19. Lack of standard defining committees for changes in software.
20. Lack of awareness about the schedule activities in implementation.
21. Lack of Inquiring about schedule activities.
22. Not consider about the scheduled time changes.
23. Lengthy duration to implement software.
24. Lengthy duration to response for day today matters.
25. Lack of responses for change request of software.
26. Delay of document transfers between business units.
27. Delay of business information.
28. Extra concern on cost.
29. Lack of separately allocated budget for software activities.
30. Lack of guidance in cost estimations for software implementation.
31. Lack of tracking of cost variances.
32. Less support from the software for my day today business activities.
33. Need further facilities through the software.
34. Lack of operating manuals.
35. Difficulty of understanding functionalities.
36. Lack of authority assignment in software.
37. Lack of guidance by the software for incorrect activities.
38. High rate of software errors.
39. High rate of data errors without a software system.
40. Lack of awareness about the security controls of software.
41. Lack of trust in using the system.

42. Lack of previous data without software.
43. Difficulty of getting entire region information.
44. Lack of analytical studies of information.
45. Need manual copies of document to be collected though having software.
46. Less awareness about the backups of data.
47. Lack of motivation to interact with the system.
48. Lack of clarity in data display in some screens.
49. Lack of clarity in output documents of software.
50. Not showing only the relevant function for duties.
51. Less quality in screens of the software.
52. Less quality in Color combinations.
53. IT equipments not purchased through IT department.
54. Lack of support from IT division in purchasing relevant for software's.
55. Lack of Identify potential suppliers.
56. Lack of performance evaluation of suppliers.
57. Lack of keeping records of supplier contacts.
58. Lack of obtaining standard specification documents.
59. Less IT/SW awareness of employees.
60. Lack of defining roles and responsibilities of software implementation staff.
61. Lack of software trainings.
62. Less quality in activities of implementation staff.
63. Less physical attendance of support staff in problem situations.
64. Age of staff.
65. Employee status (contract/trainee/permanent) who involve with software.
66. Less motivation of employees to use software systems.
67. Lack of communication links to connect to head office for software issues.
68. Lack of software updates.
69. Less confidence of the problem in order to get a solution.
70. Reluctant to get assistance from IT division in doubtful situations.
71. Less understanding of responses from the IT division.
72. Less satisfaction of solving problems related to software's by the IT division.

73. Less awareness of whom to contact in any software issue.
74. Less awareness about the helpdesk activities.
75. Less awareness of data security.
76. Lack of confidence in instructions given by the IT division.
77. Lack of inform to the IT division in system failures.
78. Less awareness about security features of the system.
79. Less awareness about security threats regarding software activities.
80. Lack of security awareness programs.
81. Less awareness about precautions to be carried out for any security threats.
82. Lack of periodically monitoring of activities, which are necessary to perform regarding software security.

Above identified problem, areas were categorized according to the following management areas.

1. Role Ambiguity
2. Scope of Software Product
3. Time Management
4. Cost Management
5. Quality Management
 - a. Function
 - b. Screens
 - c. Data
6. Procurement Management
7. HR Management
8. Communication Management
9. Risk Management

Detailed questionnaire was prepared according to the above gathered issue areas, to find out most significant issues pertaining to software's within the CEB environment. See Annexure2. Questionnaire was designed to provide responses in scale value.

5.3.2 Scale

- 1- Strongly agree
- 2- Somewhat agree
- 3- No idea
- 4- Somewhat disagree
- 5- Strongly disagree

In finding most significant issues, questions were designed to consider the scale between 3 to 5 responses, as most significant issues. 38 user responses were collected.

After obtaining the probabilistic occurrences of each issue according to the scale, PROB function in Microsoft Excel was used for further analysis. This PROB returns the probability that values in a range are between two limits.

5.3.3 Functions



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PROB (x_range, prob_range, lower_limit, upper_limit)

X_range: the range of numeric values of x with which there are associated probabilities.

Prob_range: a set of probabilities associated with values in x_range.

Lower_limit: the lower bound on the value for which you want a probability.

Upper_limit: the optional upper bound on the value for which you want a probability

Results of this function greater than 0.5 were considered as significant issues.

N.B: under the section 5.3.4 in the chart view of results, the issue number according to the questionnaire was represented as 1 to 10. See Annexure2

Mean value was calculated for each issue area in order to give an idea about the entire population of CEB software users.

$$\text{Mean of each Issue Area } (\mu) = \sum_{\text{all } x} x P(x)$$

At the same time, Standard deviation was calculated for each issue area.

eg:

9. I have received documentation of planned software implementation activities in my unit

Table 5.7: Probability of Issue Occurrences with Mean and STDV

X	1	2	3	4	5	Prob of X occurrences between 3 and 5	Mean	STDEV
Probability	0.0	0.17	0.0	0.6	0.23	0.8	3.9	0.9

5.3.4 Identification of Most Significant Issues

Test of hypothesis about the population means was used in order to find most significant issues. Null hypothesis was set to the population mean. According to the scale values defined in the questionnaire, scale greater than 3 were denoted as most significant issues.

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Since the sample size was 38, population can be considered as normal with the σ unknown but the sample standard deviation S is known, t test statistics was used. This was focused on all the relevant PM areas identified through the survey. P -value calculated according to the t value in order to reject the H_0 . Significant level considered as 5%.

The representation of significant issues identified under each management areas were listed in the section 5.3.4.

5.3.4.1 Role Ambiguity

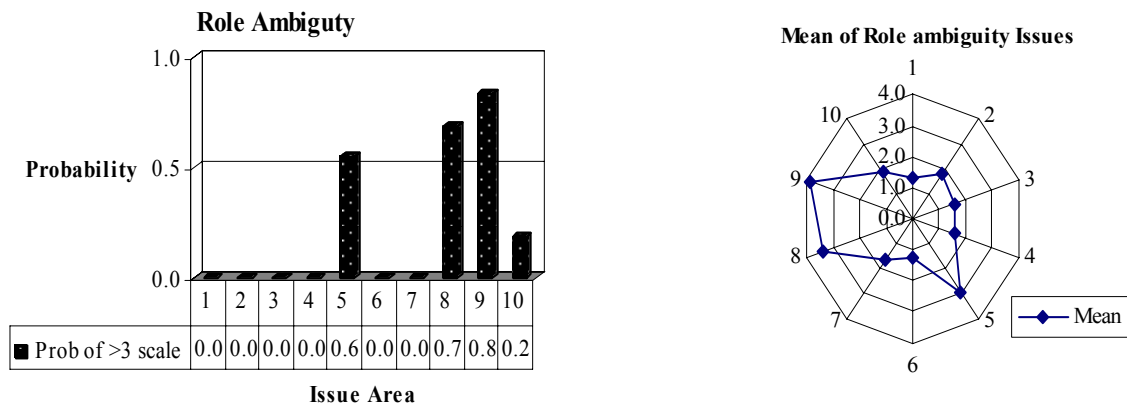


Figure 5.15: Role Ambiguity Issues

Figure 5.15 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

After the p-value was calculated for each issue area, sample data does not support the claim that issues no's, 8 and 9 are not as significant issues. Therefore, lack of commitment from the higher management (issue No 8) and No documentation was provided regarding software implementation plan (issue No 9) were considered as most significant issues in the area of Role Ambiguity.

1. Lack of commitment from the higher management (issue No 8).
2. No document was received of software implementation plan in order to have guidance (issue No 9).

5.3.4.2 Scope of the Software Product

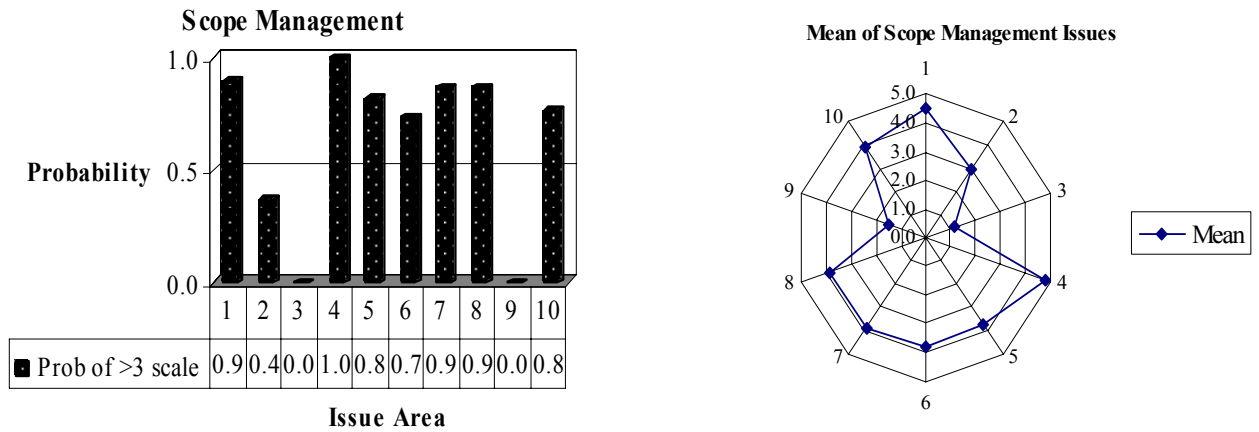


Figure 5.16: Scope Management Issues

Figure 5.16 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's, 1,4,5,6,7,8 and 10 are not as significant issues. Therefore, following issues were identified as significant issues in the area of scope management.

1. Not involved in scope planning (Issue No 1).
2. No document received regarding the scope covered by the software (Issue No 4).
3. Lack of idea in initial risk factors of software (Issue No 5).
4. No documented resource requirements for implementation activities (Issue No 6).
5. Not doing a formal acceptance of the software when finished the implementation (Issue No 7).
6. No documents related to a formal acceptance. (Issue No 8).
7. No change control committees or standard defining committees (Issue No 9).

5.3.4.3 Time Management

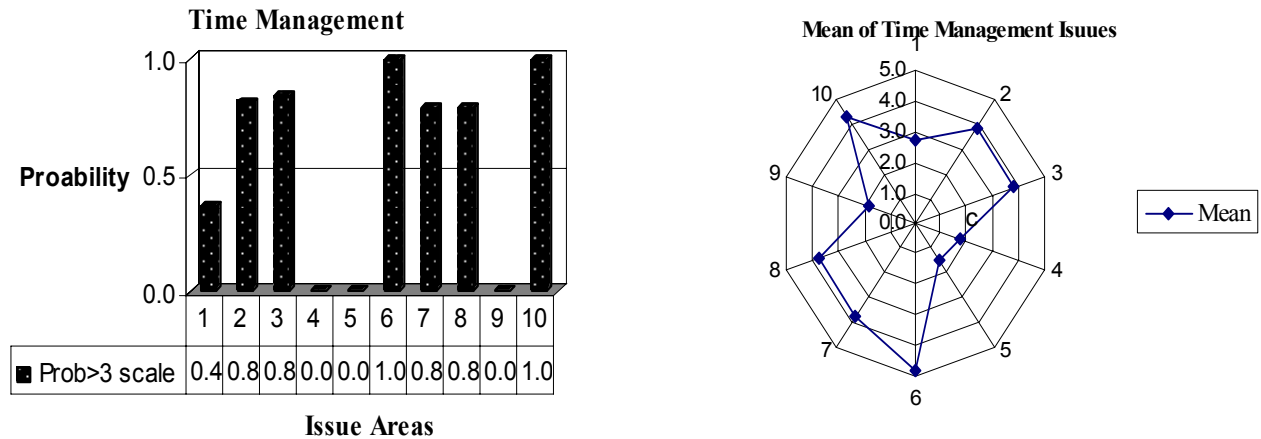


Figure 5.17: Time Management Issues

Figure 5.17 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's, 2,3,6,7,8 and 10 are not as significant issues. Therefore, following issues were identified as significant issues in time management area

1. No document received indicating duration of activities in software implementation (Issue No 2).
2. No documents indicating type and quantities of resources. (Issue No 3).
3. Takes long time to fill the software needs (Issue No 6).
4. Takes long time to response for day today matters (Issue No 7).
5. Lack of responses for change request of software (Issue No 8).
6. Delay to give business information (Issue No 10).

5.3.4.4 Cost Management

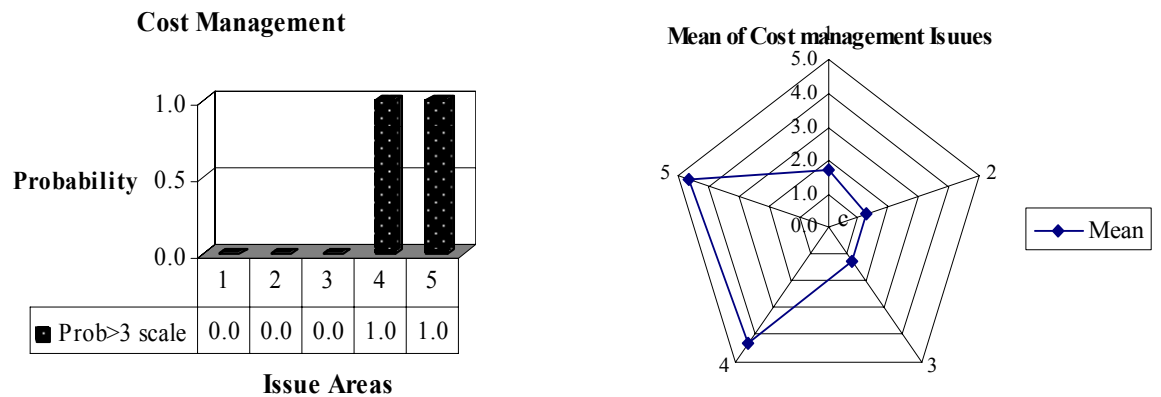


Figure 5.18: Cost Management Issues

Figure 5.18 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's, 4 and 5 are not significant issues. Therefore, following issues were identified as significant issues in cost management area.

1. Need guidance in preparation of cost estimations for software implementation (Issue No 4).
2. No tracking of cost variances (Issue No 5).

5.3.4.5 Quality Management

➤ Functions Quality

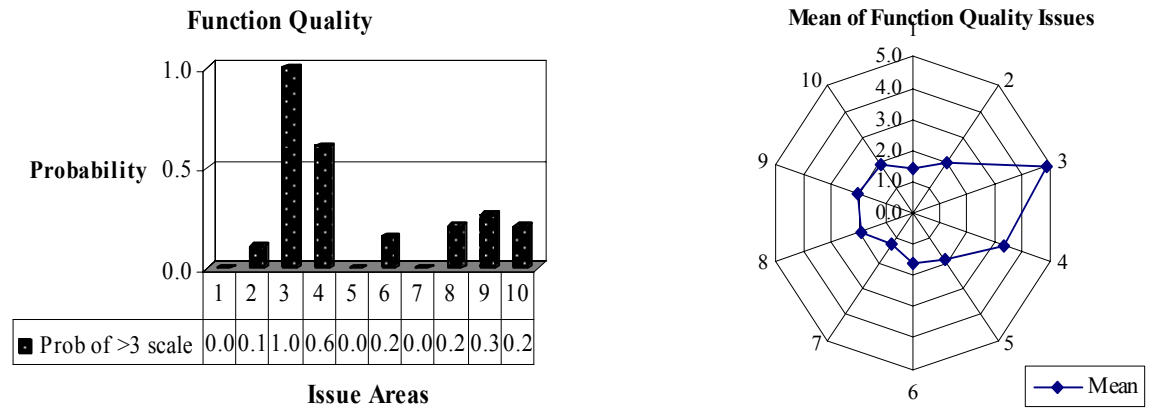


Figure 5.19: Function Quality Management Issues

Figure 5.19 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's, 4 as a not significant issues. For issue no 5, p-value indicating 0.0506. Therefore, issue no 4 was only considered as a significant issues in function quality area.

1. Need more functionality with software solution (Issue No 4).

➤ **Data Quality**

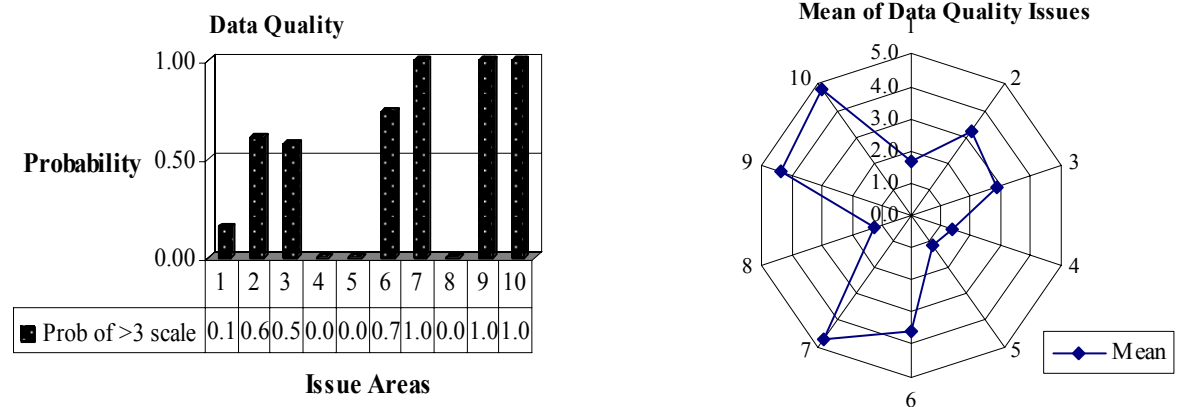


Figure 5.20: Data Quality Management Issues

Figure 5.20 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 6,7,9 and 10 are not as significant issues. For issue no 2 p-value indicating 0.2 and for issue no 3 p-value indicate as 0.9341. Therefore, following issues were identified as most significant issues in Data Quality Management area.

1. Not easy to consolidate information in region (Issue No 6).
2. Lack of analytical studies of information (Issue No 7).
3. Data delays (Issue No 9).
4. Lack of idea in data backups (Issue No 10).

➤ Screens Quality

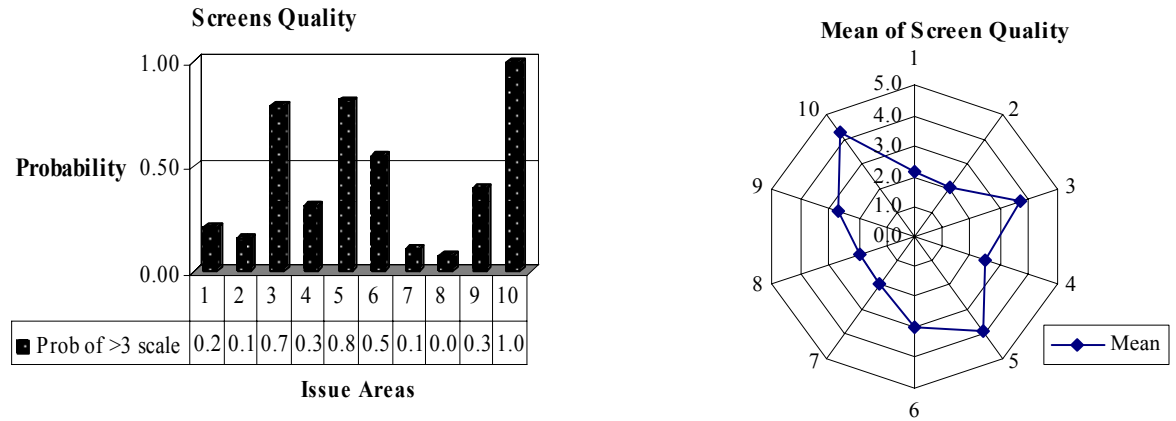


Figure 5.21: Screen Quality Management Issues

Figure 5.21 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 3, 5, 6 and 10 are not as significant issues. Therefore, following issues were identified as most significant issues in area of Screen Quality Management.

1. Lack of motivation to interact with the system (Issue No 3).
2. Need standardized output documents (Issue No 5).
3. Not showing only the relevant function for duties (Issue No 6).
4. Screens need improvements (Issue No 10).

5.3.4.6 Procurement Management

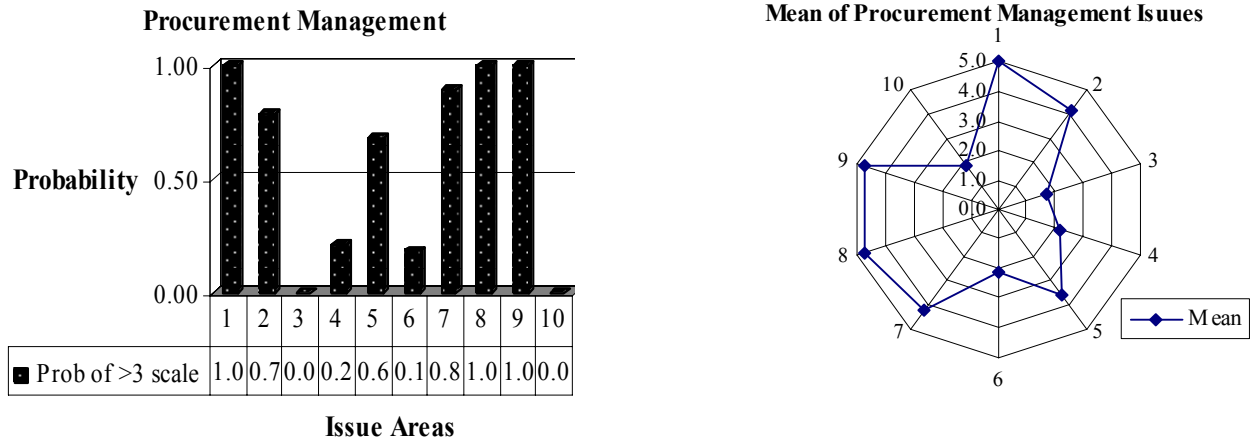


Figure 5.22: Procurement Management Issues

Figure 5.22 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 1, 2, 5, 7, 8 and 9 are not as significant issues. Therefore, following issues were identified as most significant issues in Procurement Management area.

1. IT equipments not purchase through IT department (Issue No 1).
2. Lack of support from IT division in purchasing relevant for software's (Issue No 2).
3. Software purchases done without guidance from IT division (Issue No 5).
4. No proper Identification of potential suppliers (Issue No 7).
5. Not doing Performance evaluation of suppliers (Issue No 8).
6. Lack of keeping records of supplier contacts (Issue No 9).

5.3.4.7 HR Management

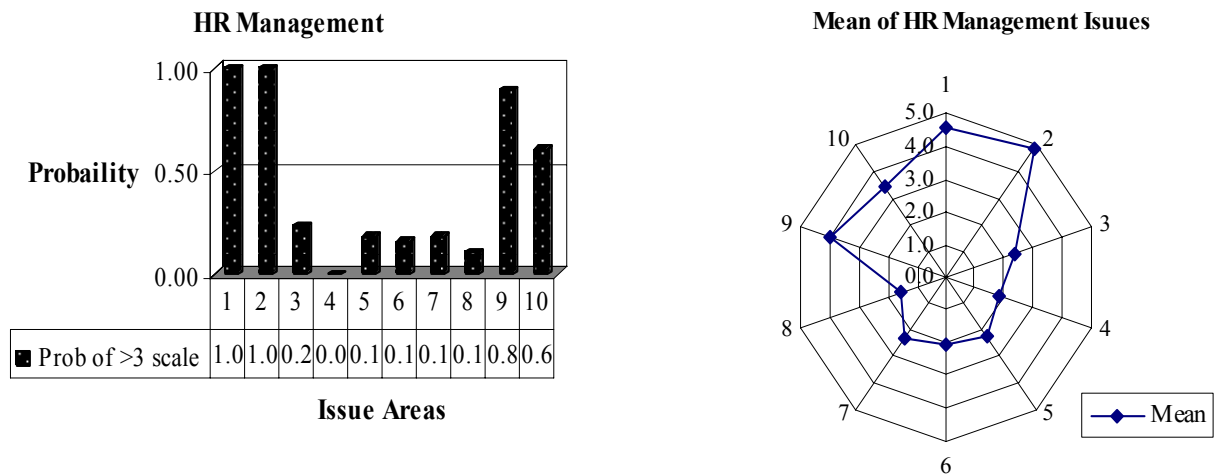


Figure 5.23: HR Management Issues

Figure 5.23 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 1, 2, 9 and 10 are not as significant issues. Therefore, following issues were identified as most significant issues in HR Management area.

1. Lack of IT/SW awareness of employees (Issue No 1).
2. Lack of idea in Roles and responsibilities of software implementation staff of IT division (Issue No 2).
3. Employee status who involve in software activities in the unit (eg: Age) (Issue No 9).
4. Motivation of employees to use software systems (Issue No 10).

5.3.4.8 Communication Management

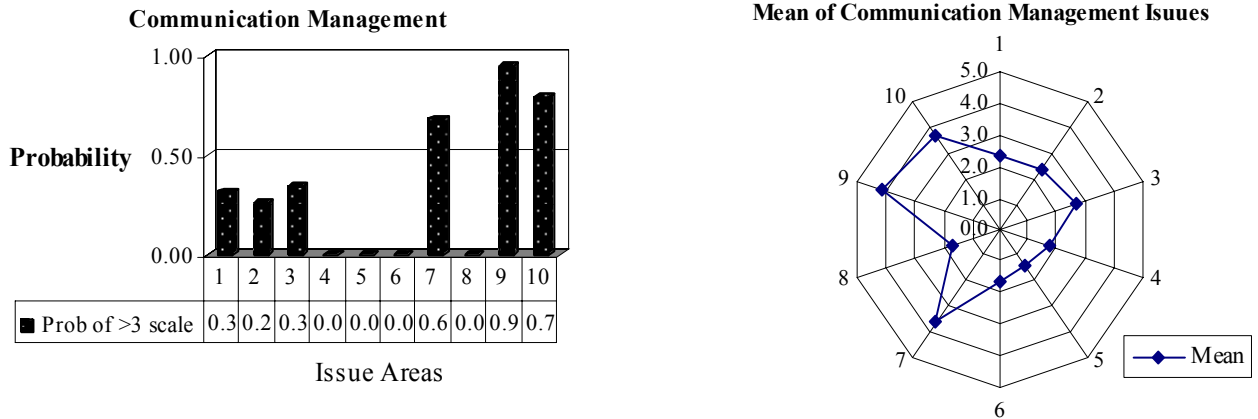


Figure 5.24: Communication Management Issues

Figure 5.24 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 7, 9 and 10 are not as significant issues. Therefore, following issues were identified as most significant issue in Communication Management area.

1. Lack of satisfaction of solving issues related to software's by the IT division (Issue No 7).
2. Need to remind for software assistance (Issue No 9).
3. Lack of awareness about the helpdesk activities (Issue No 10).

5.3.4.9 Risk Management

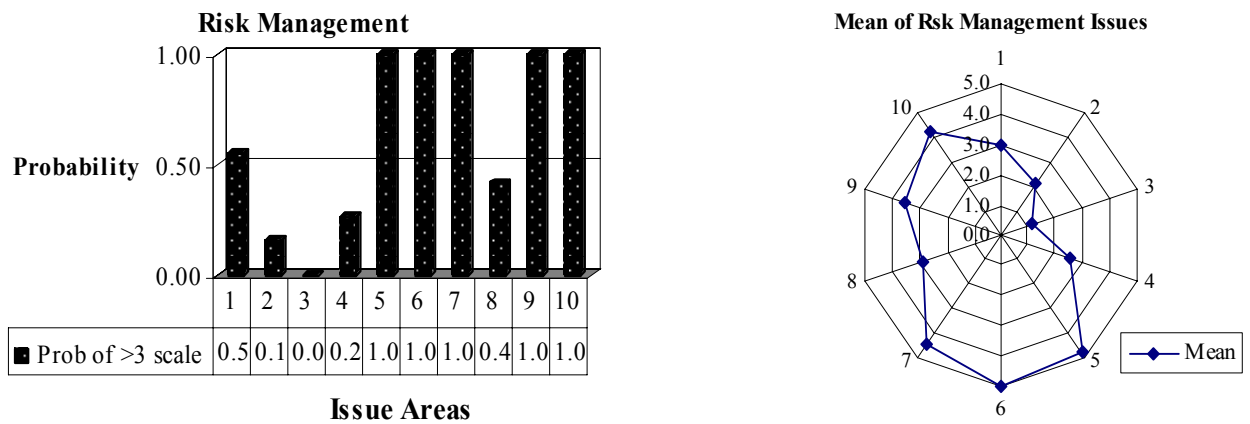


Figure 5.25: Risk Management Issues

Figure 5.25 shows the probability of occurrences and the mean value of occurrences scale greater than 3.

According to the Hypothesis test at the 5% significant level,

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

Calculated p values for null hypothesis using the t test for each issue area, sample data does not support the claim that issues no's 5,6, 7, 9 and 10 are as not as significant issues. Therefore, following issues were identified as most significant issue in Risk Management area.

1. Lack of awareness about data security (Issue No 5).
2. Lack of known about security features of the system (Issue No 6).
3. Not received security threats regarding software activities (Issue No 7).
4. Periodically monitoring of activities, which are necessary to perform regarding software security (Issue No 9).
5. Lack of IT/ SW awareness programs conducted by the IT division (Issue No 10).

As the findings of the section 5.3.4, total number of significant software issues faced by the CEB software users can be concluded to 44. Findings of this section will be linked with section 5.4 to investigate the reasons to exist those identified software issues.

5.4 Reasons for Identified Issues in CEB Software Client’s Environment

Identified issues were directed to the senior managers of the IT division. Separate questionnaire was prepared for structured interviews to identify how the activities execute in existing environment. See Annexure3. Management areas, which were not listed in the structured questionnaire, also identified during the interview sessions.

Based on the responses during the interviews, it was identified that those issues arises due to the lack of execution of following management process. Detail activities, which were needed to be carried out, were identified according to the PMBOK knowledge areas as well as other processes.

Identified significant issues under each management area in the section 5.3 were represented in “Issue No” column in each table.

5.4.1 Project Integration Management



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Table 5.8: Effects of Project Integration Management

	Process		Issue No
1	Develop a project charter to formally authorize a project	Business need	1 (Role Ambiguity)
		Customer need	
		Objectives and milestones	
		Method of acceptance	
		Method of scope control	
		Initial risk	
		Initial WBS	
2	Develop PM Plan	Develop PM plan	2 (Role Ambiguity)
		How to execute, monitor, control and closed	2 (Role Ambiguity)

The identified lacking processes, which are affected for role ambiguity issues was included in Table 5.8. Project charter document is facilitated to take the leadership roles in software implementation activities summarized information as above. Lack of such documents was lead to a less confidence in implementation activities. With the project charter document, Implementation plan should be provided to the managers of the implementation site, in order to have an overall picture of activities which going to be performed.

5.4.2 Strategic Alignment

Table 5.9: Effects of Strategic Alignment

	Process	Issue No
1	Commitment of higher management	1 (Role Ambiguity)

The important of strategic alignment for role ambiguity issues were included in Table 5.9. Overall company objectives must be aligned with each business units overall objectives. Since CEB having a long hierarchy of authorities, supports of relevant authority levels should be needed to accomplish software activities. Attitude s towards software systems were directly affected for software activities. Due to the high confidence in manual practices using simple software's and software implementation failures in past years, were also affected towards commitment of higher managers for software activities.

5.4.3 Project Scope Management

Table 5.10: Effects of Project Scope Management

	Process		Issue No
1	Scope Planning		1
2	Scope definition		2,3
3	Create WBS	Project schedules	
		Cost estimation	
		Resource requirements	4
4	Scope verification	Obtain formal acceptance of completed projects and deliverables	5,6
5	Scope control		7

The lacking processes in Scope management, which are affected for issues related to scope management were included in Table 5.10. Scope planning of software should incorporate all the levels of representatives. Documented scope covered by the software should be provided before the introduction of software. Otherwise, users may not be aware about the functionalities were covered by the software and at the later stage of implementation, they will ask for functionalities, which are not covered in the software. Hence it will be affected them to demotivate to use the system. Documented WBS with including resources, duration and cost details should be provided for the higher management of the implementation sites. Standard committees (eg Accounting, Quality enhancement) should be appointed to make decisions regarding changes of scope and enhancements.

5.4.4 Time Management

Table 5.11: Effects of Time Management

	Process		Issue No
1	Activity Definition	Identify the scheduled activities to be performed	1,4,6
2	Activity Sequencing	Identify the dependencies among schedule activities	
		Document the dependencies	
3	Activity resource estimating	Estimate the type and quantity of resources needed for the schedule activity	2
4	Activity duration estimating	Estimate the number of work periods for schedule activity	
5	Schedule development	Analyze activity sequence, durations, resources and schedule constraints	
6	Schedule control	Changes to the project schedule	3,5

Table 5.11 shows how time management processes are affected for issues related to area of time management. As mentioned above, detailed activities with their sub activities incorporating resources and duration estimations should be provided. In order to response for day today matters immediately, internal staff of the IT division should be well organized. Due to lack of human resources, attend to user problems getting delays. Since entire region activities were not automated with software and most activities were performed manually, information was delayed for the users who use software systems within that region. Therefore, sequence of activities was needed to be identified to automate entire region activities immediately.

5.4.5 Cost Management

Table 5.12: Effects of Cost Management

	Process		Issue No
1	Cost estimating	Develop approximate cost for project activities	1
2	Cost Budgeting	Aggregate the individual cost	1
3	Cost control	Control changes to the project budget	2

Table 5.12 shows how the processes of cost management were affected for issues related to cost management. Since the CEB working as separate business units, to interfere in cost allocation activities was hard. Senior managers do not have a clear picture about the cost incurred in software activities. Therefore, guidance should be provided in preparation of software implementation cost and detailed costs are incurred with each activity.

5.4.6 Quality Management



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Table 5.13: Effects of Quality Management

	Process		Issue No
1	Quality Planning	Identify which quality standards are relevant	Every Function, Data and Screen Quality issues
		Determine how to satisfy them	
		Identify ways to eliminate unsatisfactory quality	

Table 5.13 shows how the processes of quality management influence for the identified issues in quality management activities. Without considering total quality at once, quality should be addressed in each project separately in the areas such as Function, Data and Screen quality. Among the PMBOK process for quality management, comprehensive quality planning process is vital to solve the identified quality issues.

5.4.7 Project Procurement management

Table 5.14: Effects of Procurement Management

	Process		Issue No
1	Plan purchases and acquisitions	Determine what, when and how to purchase before the project tasks	1
2	Plan contracting	Document the products and services	2,3
		Identify potential sellers	4
4	Select Sellers	Review offers and choose among potential sellers	4
		Perform written contracts	
5	Contract administration	Document and review how the seller is performing	5
		Evaluate the performances	6



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Table 5.14 shows how the procurement processes are affected for identified issues related to this management area. Decentralized procurement process was practiced by the CEB. Guidance in IT purchases for each business units is not done in a formal manner. The IT division did not do activities such as recommend potential suppliers and evaluation of supplier's performances. Therefore, detailed guidance should be performed according to the PMBOK processes in procurement activities to avoid above issues.

5.4.8 HR Management

Table 5.15: Effects of HR Management

	Process		Issue No
1	HR Planning	Identify project roles and responsibilities	2
		Reporting relationships	
		Staff management plan	

Table 5.15 shows how the HR management processes are affected for the identified issues in HR management. Since CEB is a widely spread organization and having high volume of employees, to identify the role of every people were difficult. Roles and responsibilities of each person who involve with the project should be provided before any project activities started at any site. Durations of human resources activities related to software activities should clearly mention and need to have formal agreements with the sites managers to release their duties after finishing their role in implementation activities.

5.4.9 Project Foundation

Table 5.16: Effects of Project Foundation

	Process	Issue No
1	IT/SW awareness of employees	1 (HR Management)
2	Employee status (eg: Age , skills)	3 (HR Management)

Table 5.16 shows how the project foundation activities are affected for HR management issues. Utilizing people, who are having IT background, were quick to finish out implementation activities. However, CEB represent employees in different age levels and many of them are not aware about new software technologies.

5.4.10 Program Management

Table 5.17: Effects of Program Management

	Process	Issue No
1	IT/SW awareness programs for employees	1 (HR Management), 5 (Risk Management)
2	Motivation of employees to use software systems	4 (HR Management)

Table 5.17 shows how the program management activities are affected for certain HR and risk management issues. Not only for new people who join to CEB but also for every employee IT Skills development programs should be carried out, with the new technology changes and updates.

5.4.11 Communication Management

Table 5.18: Effects of Communication Management

	Process	Issue No	
1	Communication Planning	Identify the information needs and communication needs	1
2	Information distribution	Make available information timely	2,3
3	Manage Stake holders	Manage communication with clients and resolve issues	2,3

Table 5.18 shows how the communication management processes were affected for issues identified under this area. Not all the sites throughout the country were interconnected in the CEB. Communication barriers were aroused due to that limitation. Purpose of Introduction of concept such as help desk is to provide convenience for the users. Communication plan should be prepared to fill the communication needs.

5.4.12 Project Risk Management

Table 5.19: Effects of Project Risk Management

	Process		Issue No
1	Risk identification	Identify which risk to effect for the project	1,2
		Document the risk	
2	Qualitative risk analysis	Prioritize risk considering probability of occurrence and impact	3
3	Risk response planning	Develop actions to reduce threats to project objectives	3,5
4	Risk Monitoring and control	Tracking identified risk	4
		Execute risk response plan	
		Evaluate effectiveness	

Table 5.19 shows how the Risk management processes are affected for issues identified under this area. Many employees who involve in software activities are with lack of awareness about risk activities and IT/SW technologies. Therefore, it is essential to guide them to perform their software activities securely. Identification of risk relevant for user activities is essential. Prioritize them and guide users for precaution activities should be performed strictly. (eg: follow the backup dates, updating virus software. monitoring activities regarding the given instructions needs to perform strictly).

Findings of this section 5.14 will be used in defining the suitable PM model under the section 5.7.

5.5 Current Issues Faced by the IT Division as Software Providers

According to the structured interviews carryout with the head of the IT division, following set of issues were identified. These issues can be considered as the reasons, which prevent in addressing the issues identified with the CEB software client. Therefore, research objective 2 was defined in introduction chapter was achieved with following identified issues related to IT division as CEB software provider.

1. Need improvements in the existing software products.
 - a. Quality improvements in functions, Data and screens
 - b. Technological improvements
2. Standardize the project documentation process.
3. Lack of corporate policies and procedures for IT activities.
4. Lack of IS strategies or IS master plan.
5. Cannot have rigid milestones.
6. Changing requirements of senior managers.
7. Lack of decision making process in project events.
8. Different PM practices within IT division.
9. Lack of standardized project status reporting.
10. Cannot continue rigid software plan.
11. Project status unknown to others in the IT division.
12. Lack of assessed actual project cost.
13. Do not have a way to measure staff activities.
14. Staff of the project involve in multiple tasks (eg: software developers involve in analysis tasks, operational works).
15. Project activities start without comprehensive plans.
16. Lack of utilizing software tools for PM activities.
17. Lack of project structured environment according to the project life cycle.
18. High demand to develop new software solutions.
19. Lack of standardized project review meetings.
20. Lack of proper version controls of software releases.

21. Changing specifications.
22. Delay in due dates.
23. Lack of human resource for project activities.
24. Lack of communication and negotiation between projects.
25. Lack of team building between projects.
26. Delays in purchases of project accessories and human resources.
27. Lack of management in clients inquiries.
28. Lack of skills development activities.
29. Lack of risk identification, risk mitigation activities.

Identification of the high-level processes, which were affected to exist above issues, was identified using the structured questionnaire listed in Annexure3.

Table 5.20: Management Areas Relevant for Software Providers Issues

Processes	Issue Area No
Integration Management	9,15,18
Strategic Alignment	3,4,6,7,10
Scope Management	6,21
Time Management	5,22
Cost Management	12
Quality Management	1,2
Procurement Management	23,26
HR Management	13,14,17,23,24,25
Project Foundation	28
Program Management	8,9,16,20,27
Communication Management	9,11,19,24,25
Risk Management	29

Identified issues were compared with case study findings under the section 5.6.

5.6 Case Study Analysis of Popular PM Models

A detailed analysis of case studies, which were found in literature survey, is included in this section. Purpose of this analysis is to present, set of software PM issues which were affected to implement a standardize PM approach. Some best practices were identified to over come their existing issues found in the CEB environment.

5.6.1 Case Study 1:

PM as an Executive Priority [21]

➤ Software PM issues at HP

- No common executive level program status reporting.
- No master plan for HP IT programs for customers.
- Some projects lacked a real project plan.
- Some projects were being managed with “task list”.
- Different inconsistent project methodology.
- Some projects where status was unknown or unavailable.
- Some projects where actual project cost was difficult to assess.

To solve above issues implemented a single methodology, a single process and a single PM office called HP Global Program Management Office. Following 16 key principles of PM achieved with the implementation of PMO at HP Company.

- Project plans accurately reflect the work the staff is doing.
- All significant IT work has a project plan, and the plan is used to manage the work.
- All IT projects are managed using PM software.
- Projects must go through a formal approval process.
- Projects are managed with an approved methodology.
- Projects have a WBS with key milestones and critical path identified.
- All project plans must have a baseline saved.

- Projects should generally be planned to last no more than one year.
- Project actual data (cost/hours worked) are updated weekly.
- All activities / task have at least 1 specific resource or role assigned.
- Projects have all supporting documentation (eg: Project charter, ROI) linked to the plan.
- Formal phase exit reviews are conducted at all significant transitions of the project.
- Projects must follow HP IT corporate policies with all the required project information, codes and finances established.
- Lesson learned are compiled on all projects.
- The appropriate level of PM discipline process and quality is applied to each project based on its scope, cost and impact.

5.6.2 Case Study 2:

Implementation of P2M for Software Development in Multi Project Environment [23]



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- Software PM issues
 - Ever-changing specifications.
 - Scope creep.
 - Lack of time.
 - Chronically delayed due dates.
 - Shortage of human resources (especially capable persons).
 - Ever-increasing number of product lines.
 - Round-the-clock development.
 - Yelling managers.
 - Aggressive task duration estimates.
 - No penalty for delay.
 - No multi-tasking.

➤ PM Solution

Critical Chain PM (CCPM)

This methodology focuses on human problematic behaviors in performing tasks in a project and implements schedule planning and schedule management based on the idea of correcting such behaviors naturally. In CCPM, human problematic behaviors are,

- Use all the time and budget given.
- Anticipating unexpected problems and estimating longer schedules for tasks.
- Start slowly and work overnight before the due date.
- Finish early but use all the time for elaboration.
- Give top priority to all tasks and start all as early as possible.

To minimize these problems, CCPM recommends schedule planning considering the following:

- Aggressive task duration estimates (eliminate buffer in each task and schedule task duration with 50% probability of success).
- Reporting early finishes (guarantee that the next task duration will not be shortened).
- Relay-runner work ethic (start immediately after receiving the baton. Once started, finish as soon as possible and pass the baton to the next process).
- No penalty for delay (half of the tasks are expected to be delayed).
- Aggregating safety (manage how many more days are required).
- Manage the whole process of the project, not individual tasks, and share the aggregated safety.
- No multi-tasking (focus on one task at a time).

Defined ODSC (Objectives, Deliverables, Success Criteria) for each projects at early stage

Project Network

- Incorporate every leader or project managers in preparation of schedules. Introduce a concept of project buffer.

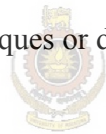
- The project buffer is 50% of the duration for each aggressive task duration estimate, aggregated and added to the end of the project as a buffer, which can be used to protect the due date from variations in the project.

5.6.3 Case Study 3:

Re-Engineering Public Works Management at Japanese Government Ministry through a “P2M” based Program and PM Method [24]

➤ Major PM issues

- Low contractor profits (losing money in many cases).
- Government financial difficulties.
- Poor cultivation of government human resources (how to educate experience to young people).
- Contractors frustrated and inconvenience caused about the changing construction techniques or design.



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➤ PM Solution

- One-day response program to finish public works early. It means that one should try to solve problems in a day as much as possible, but even in cases solutions cannot be provided in a day, one should make some kind of reply that would enable the building constructor to make plans for next steps.
- Supervisors will act on the situation quickly, enhancing his or her management capabilities by prompting discussions with their more experienced managers.
- Collaboration between government supervisors and contractors is enhanced so that the quality of the public works will improve.

5.6.4 Case study 4:

Electricity Service Ireland: Implementation of PRINCE2 [25]

- Reasons to Implement a PM strategy
 - To deliver expected business benefits through a better PM approach in IT enabled customer service business unit at ESB.
 - To improve the product, quality and risk.
 - To have a project documentation process.
 - In order to feel the benefits of clarity, scope, roles, responsibility and about the project deliverable for the people who involve in projects.
 - Lack of IT corporate policies and standards.
 - Lack of guidance on how to execute projects with in ESB environment.

5.6.5 Case study 5:



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Ericson Services Ireland: Implementation of PRINCE2 [26]

In order to overcome the software service related issues, Ericson Service Ireland has implemented a Standard PM Approach called PRINCE2.

- PM issues faced by the Ericson Services
 - Iterative software development projects.
 - The methodologies currently following were too inflexible for the projects within the group. The rigid milestones and rules did not deal with iterative and overlapping phases of a project.
 - Projects were delayed by the rules imposed by the existing practices.
 - Improving current practices were taking too much time away from core business activities.
 - Business decisions were taken at inappropriate milestones.

How to perform investigation for a PM methodology, which suits for the organization environment, can be indicated as follows.

- Investigate the business and project type.
- Outline the problems in PM within the business.
- Benchmark current approach to PM.
- Review PM Methodologies available.
- Select the methodology that is the best fit for your business and projects.

5.6.6 Case Study 6:

PRINCE2 and PMBOK: A Combination Approach at Getronics [27]

PM Elements relevant for Getronics during the implementation of PM standard as follows.

- Different PM approaches were existed in the different parts of the company.
- No clear differentiation between the “management deliverables” and the “specialist deliverables”- (whose development is the subject of the project).
- Need a support for the Project Support Office concept.
- To indicate the relationship between projects and programs with in the company.

5.6.7 Case Study 7:

PM training for Sabre Airline Solution [28]

➤ PM Issues faced by the Sabre Airline

- Project Managers utilize different standards when managing projects.
- Communications and negotiations not in standard in order to promote their products.
- Lack of team building across different products.

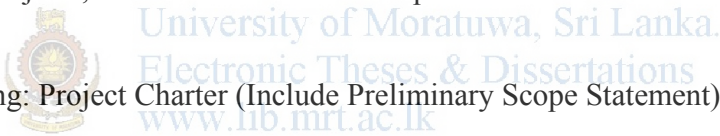
In order to overcome above issues Sabre Airline has introduced Standard PM training for managers who handle projects.

- Deliver Customized PM training on site.
- Each Project Manager trained to set clear expectations with customers and deliver numerous project requirements by facilitating win-win situation between Sabre Airline solution and its customers.
- Negotiations based on expectations that are set properly upfront.

5.6.8 Case Study 8:

PMBOK Approach Insight for Software Development Projects [29]

In PMBOK, though it has defined many inputs, outputs and tools for software development projects, critical attention must be paid to limited subsets. Namely,

- 
- Initiating: Project Charter (Include Preliminary Scope Statement).
 - Planning: Project Plan (Includes Activities, Resources, Schedule, Cost and Risk).
 - Executing: Functional Delivery Plan (Consistent with SDLC Methodology).
 - Monitoring and Controlling: Performance Reporting and Integrated change control.
 - Closing: Acceptance criteria.


Same processes were recommended for the software development environment with in the CEB. Since the software in IT division were included large-scale implementation activities, those activities should be carried as projects. Therefore, same project life cycle activities can be performed.

5.6.9 Summarized PM Issues Covered by PM Models

Table 5.21: PM Issues Summary from Case Studies

Case Study	PM Issues	PM Model
Case Study1	<ul style="list-style-type: none"> - Lack of executive level program status reporting - Lack of master plan for HP IT programs for customers - Some projects lacked a real project plan - Some projects were being managed with “task list” - Different inconsistent project methodology - Some projects where status was unknown or unavailable - Some projects where actual project cost was very difficult to assess 	HP Global Program Management Office with 16 principles of PM
Case Study2	<ul style="list-style-type: none"> - Ever changing specifications - Scope creep - Lack of time - Chronically delayed due dates - Shortage of human resources (especially capable persons) - Ever-increasing number of product lines - Round-the-clock development - Yelling managers - Aggressive task duration estimates - Lack of penalty for delay - Lack of multi-tasking 	Critical Chain PM (CCPM)

Case Study	PM Issues	PM Model
Case Study3	<ul style="list-style-type: none"> - Low contractor profits (losing money in many cases) - Poor cultivation of government human resources 	PM practices defined for the existing environment
Case Study4	<ul style="list-style-type: none"> - To deliver expected business benefits - To improve the product, quality and eliminate risk - To have a project documentation process - In order to feel the benefits of clarity, scope, roles, responsibility and about the project deliverable for the people who involve in projects - Lack of IT corporate policies and standards - Lack of guidance on how to execute projects with in ESB environment 	PRINCE2
Case Study5	<ul style="list-style-type: none"> - Iterative software development projects - The methodologies currently following were too inflexible for the projects within the group - The rigid milestones and rules did not deal with iterative and overlapping phases of a project - Projects being delayed - Improving current practices time consuming - Business decisions were being taken at inappropriate milestones. 	PRINCE2

Case Study	PM Issues	PM Model
Case Study6	<ul style="list-style-type: none"> - Different PM approaches existed in the different parts of the company - No clear differentiation between the “management deliverables” and the “specialist deliverables” - Need a support for the Project Support Office concept - To indicate the relationship between projects and programs with in the company 	PMBOK and PRINCE2 Combination Approach
Case Study7	<ul style="list-style-type: none"> - Project Managers employ different standards - Communications and negotiations not in standard in order to promote their products - Lack of team building across different products 	PM training with recommended practices
Case Study8	 <ul style="list-style-type: none"> - How to execute project life cycle in software development activities. 	PMBOK

Findings of this section 5.6 were linked with the investigated issues from the CEB software providers. With the analysis of the case studies, solution for identified issues can be provided with the use of a comprehensive PM model, which suits for the CEB environment.

5.7 PM Model for CEB

Main objective of this research is to find a suitable PM model, which can be applied for software projects within CEB software environment. The way of achieving research objective 4 was defined in research introduction section is discussed within this section.

This model shows how software activities of the IT division should be organized according to a standard PM model. This is focusing on all the internal processes and practices defined within the domain of the project and throughout the life cycle of the project. These elements of the model were included based on the investigated issues in the CEB software environment.

Specific set of activities for software implementation projects was identified during the interview sessions and those activities facilitated with some best practices were identified through case study analysis of popular PM models under the section 5.6.



PMBOK, PRONCE2 and DSDM combination PM Approach – proposal for the IT division software activities

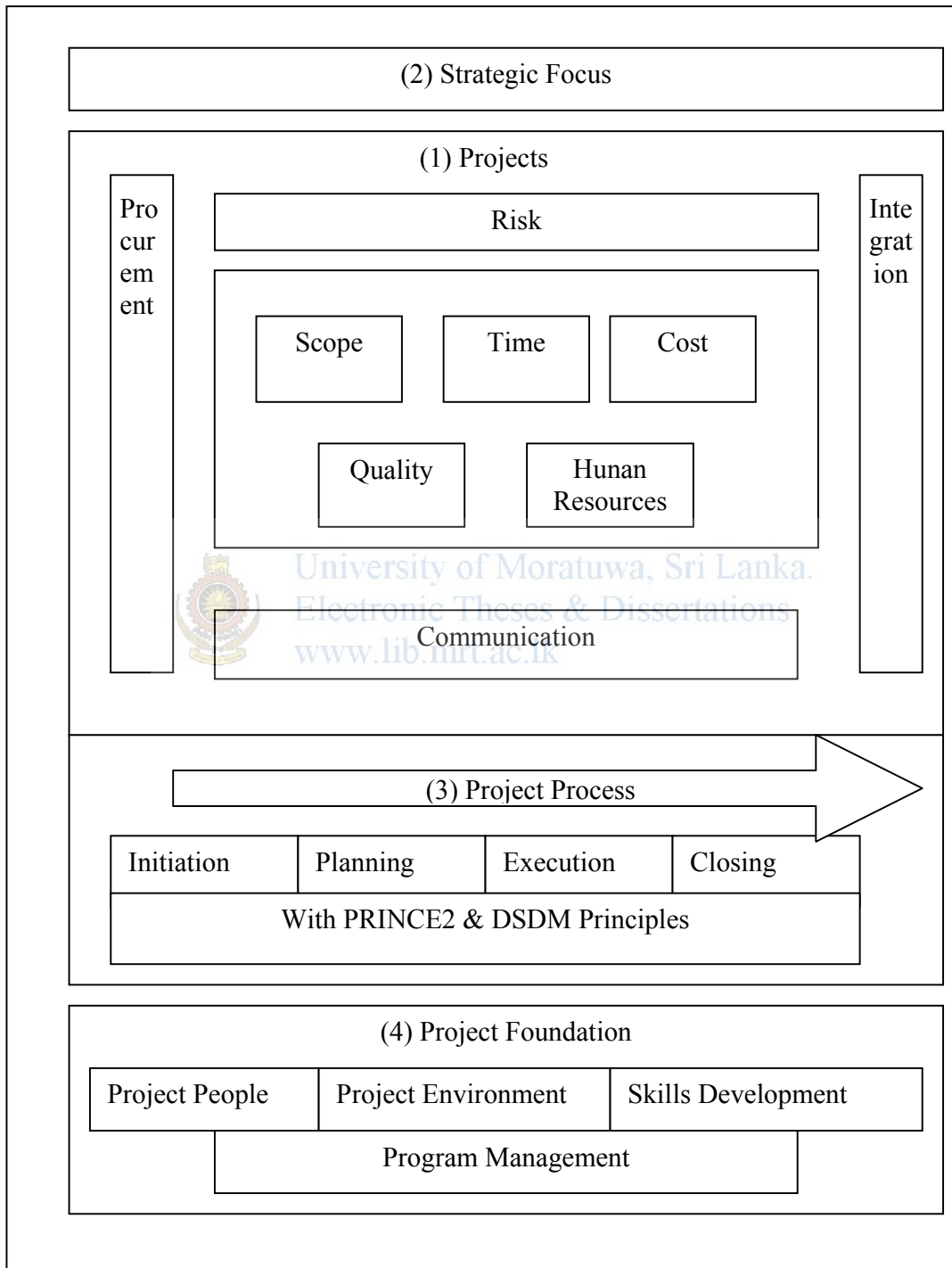


Figure 5.26: PM model for IT division

5.7.1 Projects

The nine knowledge areas of PMI's PMBOK, which represents the internal factors influencing for projects, is defined in this Layer1. These knowledge areas were selected due to some reasons. Firstly, the research is based on mainly with PMBOK framework and due to the comprehensive theoretical support given by PMBOK regarding these knowledge areas, which can be applied for any type of project. Secondly, many of the identified software problem areas from the pre survey were reside within these nine knowledge areas and process.

It is proposed that, Project Manager needs to ensure that these nine knowledge areas have proportionally attended during the project life cycle.

5.7.2 Strategic Focus

Second layer of this model was attempted to address the additional factors, which were affected for projects. Those are strategic context and the stakeholder focus towards software projects. According to the investigation, senior management of the IT division needs to have an IT Vision and a Mission towards achieving the CEB business goals.

5.7.3 Project Process

Third layer addresses the project life cycle to be addressed. Project life cycle can be incorporated with best practices from other PM Standards. (eg: PRINCE2 and DSDM). Selection of the practices will vary according to the project type. How the software development lifecycle and software implementation according to the PMBOK processes were discussed as follows.

5.7.3.1 Software Development Projects (From Case Study 8)

Table 5.22: Software Development Processes with PMBOK

	Initiating [2]	Planning [21]	Execution [7]	Controlling [12]	Closing [2]
Input	Contract Preliminary Scope Statement	Contract Customer requirement Plan updates	Customer feedbacks, Delivery Artifacts as execution Proceeds Corrective Actions	Execution results	Final software delivery
Processing	Detail Analysis Contract Clarification	Contract Review WBS Staff Plan Detail Schedule Risk Assessment	Specifications Project Development Integration Test System Test Site Test Patch Deliveries	Rich collection of reviews Performance Reporting	Defect closure plan
Output	Project Manager Assignment Project charter Constraints Assumptions	Project Plan	Solution Development, delivery, Validation and Acceptance plans Execution results	Corrective Actions Project Plan updates	Customer Acceptance
Stake Holders	PM Owner Development Manager	PM Owner Development Manager	PM Owner Project Team Development Manager	PM Owner	PM Owner

How the software development life cycle can be incorporated with PMBOK processes according to the research findings from literature survey were included in Table 5.22. Findings can be applied for the CEB environment since those findings were addressed the basic software development life cycle.

5.7.3.2 For Software Implementation – According to the findings of the research

Table 5.23: Identified Software Implementation Processes with PMBOK

	Initiating [2]	Planning [21]	Execution [7]	Controlling [12]	Closing [2]
Input	Priority sites Preliminary Scope Statement of implementation regards	Site status Detail scope of the implementation	Delivery Artifacts as execution Proceeds Corrective Actions	Execution results	Output of Software activities by the site users
Processing	Detailed Analysis - locations, current status Clarification of scope	Scope Review WBS Staff Plan Detail Schedule Risk Assessment Appoint committees	Execution of WBS activities	Rich collection of reviews Progress reviews Problem identification	Get the views of senior management Defect closure plan
Output	Implementation Team Assignment Develop Project charter Identify Constraints List of Assumptions	Implementation Plan	Acceptance plans Execution results	Corrective Actions Implementation Plan updates	Senior mangers Acceptance
Stake Holders	PM Higher Manager of the site Technical Lead	PM Higher Manager of the site Technical Lead	PM Implementation Team	PM Higher managers of the site	PM Higher managers of the site Technical Lead

Table 5.23 shows how the software implementation activities should be performed. Steps of these processes are identified according to the information found through observations and interviews under the section 5.4. Detailed discussions of phases are as follows.

➤ **Initiation Phase**

For this phase, key input is the preliminary scope statement. It provides the fundamental software scope that is covered in the implementation stage in a particular site (eg: functional scope of each software module that will be implemented). As output of the initiation process, project charter will be produced for the implementation process. This project charter should capture both the scope of implementation of software modules and the game plan for its pursuit. The scope determination includes detailed analysis of locations, status regarding software modules which have already been implemented, supporting staff (eg: IT technologists) available etc.

➤ **Implementation Planning**

The implementation project plan is a detailed synopsis of the various implementation activities, their dependencies, their estimated durations and specific resources that are requiring for their execution. Microsoft project can be used as a tool for this planning process. In developing the implementation plan, WBS reflects the major implementation activities.

➤ **Implementation Project Execution**

This is the phase where the bulk of the works are performed. i.e. the Identified WBS activities will be performed.

➤ **Implementation Monitoring and Control**

Project Manager should spend most of energy and time in this phase to monitor complex implementation projects. It is essential to have excellent communication. Since the site locations are distributed through out the country, it is hard for Project Manager to update the current project status. Information of accurate project status should be identified. Microsoft project can be used to track and record the detail project status. Considerable

effort that is required can be estimated by keeping a baseline project schedule for major activities.

➤ **Implementation Project Closeout**

This phase consist with the customer acceptance of the software. During this phase, it is necessary to provide all the success criteria, which are commonly understood, agreed upon in advance and measured quantitatively.

➤ **PRINCE 2 Practices**

Prince2 practices can be applied with in the project process (Layer3). However, in Layer1 guidance has defined details in how Project Manager should manage those areas. In the project process, three techniques of PRINCE2 can be incorporated in project life cycle. Those are Product based planning, Quality reviews and Change control [16].

Another practice was differentiation of “technical stages” and “management stages”. This will be helpful in designing the progress monitoring of projects. The technical stage incorporates specialized skills whilst the management stage involves commitment of resources and authority to spend.

Management levels identified by PRINCE2 can be defined within the project process of each project.

1. Corporate or program management – Especially in early stage of implementation activities.
2. Directing the project (Project Director).
3. Managing a project (Project Manager).
4. Managing product delivery (Team leader).

➤ **DSDM practices**

DSDM practices [17] can incorporate specially in the project process (Layer3)

- **Active User Involvement**

Each project is needed to have one ambassador user and tester who represent user interest. This ambassador user is a professional user who has more experience in CEB business environment, which was considered. This worker is a part time worker for the project.

- **Empowered Teams**

Project decisions were taken through steering committee. This tends to take considerable amount of time like weeks or months. Steering committee member should play a leading role in the project. This is effective especially in implementation projects. This will enable project members to feel that they have power and control over the product.

- **Collaboration and Corporation**

Teams can be grouped according to the knowledge and availability, without a specific structural approach to eliminate the bureaucracy, which many government institutions are experiencing.

5.7.4 Project Foundation

Fourth layer represents the foundation factors, which are necessary to perform project activities. Because above mentioned knowledge areas cannot contain as single entities and needed to support with various project environments such as support of middle and senior managers, authority assignments, stakeholder positioning , project locations and skills and resources needed to run the projects. Programs should be designed in order to change the attitude of people towards software projects, IT/SW skills and give up-to-date knowledge about the new technologies.

Chapter 6

Conclusions and Recommendations

6.1 Conclusions

As a large scale organization, CEB's effort in software activities is vital in order to achieve its business goals. The challenge for the IT division is to handle large-scale software projects, which are in multiple stages in effective and efficient manner. This report has drawn attention on finding a successive PM approach, in order to solve issues related to software projects within the CEB environment.

It has further illustrated the software project activities, which are essential to pay more attention with a successive management approach. With the investigations, software developments and implementations activities are the major activities. This investigation is linked with the research objective four, defined in chapter 1.

With the research objective one included in chapter one, identified the most significant issues with respect to the role ambiguity, scope, and time, quality in direction of function, screened and data, procurement, HR and risk management areas. With the use of hypothesis test, results highlighted 44 significant issues faced by the CEB software clients, which belong to above mentioned different management areas.

With the research objective two, Interview with senior managers of the IT division reveals reasons, which prevent in address above identified client issues and some issues faced by the IT division as CEB software providers. Results imply that, in order to solve above issues, it needs to pay more attention in the management areas, which identified in, separately with in software developments and software implementations. With the objective three, the report considered number of broader PM methodologies namely PMBOK, PRINCE2 and DSDM. Although these methodologies are theoretically comprehensive, this attempt is to identify an approach, which is applicable for software

projects, which belongs to CEB organization environment. Analysis of case studies in popular PM model implementations strengthens the achievement of objective three.

Finally, a combination approach from above methodologies is suggested according to the findings in objective one and two of the research with achieving objective four at the end. The model consists with four layers. Layer1 represented the management factors effecting for projects. Layer 2 represented the strategic focus, which is essential in aligning with software projects. Layer 3 indicated the project processes need to perform with respect to the software development and implementation projects. Layer 4 represented some other factors investigated during the research such as people's focus and awareness, skills development, training and project environment. This model further illustrates how to apply each layer component of this model for software implementation and development separately with in the CEB environment.

6.2 Recommendations



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The managers, to identify the key areas, which are needed to pay attention at the initiation phase of a project, should use this PM model. Findings of this research are not limited to the CEB environment. It can be used by the organizations, which handles software projects, which are in different stages in order to identify management areas to handle those projects. Organizations, which are facing similar type of issues with the software clients and the software development environment, it is recommended to use this model as guidance to have an approach in solving those issues.

6.2.1 Recommendations for CEB

CEB IT division can be used this PM model as the standardized guide to execute and manage software projects. Identified key management areas in the PM model should pay more attention by the managers of each project. As software development projects, IT division should consider software implementations activities also as projects. Implementation activities should be defined according to the phases in the layer 3 in the identified PM model, which are Initiation, Planning, Execution and Close. Summarized activities in each phase are as follows according to the Table 5.23.

➤ Initiation Phase

Prior to start implementation activities, functional scope of the software module should be provided for each site. Detailed project charter should be prepared. It needs to conduct kickoff meetings to review the project charter to ensure all internal parties who involved in the implementation activities having a common understanding.

According to the scope, project charter for implementation will be prepared and an implementation team will be appointed. Implementation team consists with staff from IT department as well as senior managers from the implementation site to take the leadership role to success the implementation process. Other than the implementation team, a separate committee will be formed for decision makings regard to policy matters and procedures.

➤ Implementation Planning Phase

For success of the planning, clear implementation scope is crucial. Planning should be performed in iteratively. Techniques to optimize potential plans, resource leveling, crashing and fast tracking should be used. Separate tasks will be allocated for the each members of the implementation team and documentation related to the clearly specified

roles will be given to each member. Documentation related to the implementation plan should be provided to the all senior managers of the sites.

➤ **Implementation Project Execution**

Defined activities in the implementation plan should be executed. Refer the detail activities in Table 5.23.

➤ **Implementation Monitoring and Control**

Project Managers should be updated with the status of each project. It is essential to have quantitative measures of the status. Since the project sites are located throughout the country, it is difficult for managers to monitor the activities. Therefore, end of the each day, the implementation staff should communicate over the phone with the Project Manager to update the status of project activities. Project progress meetings should be performed in once a week and committee decisions should be carried out for unresolved problems. Mutually agreed customer acceptance statements should be recognized and documented.

➤ **Implementation Project Closeout**

In each closure, it is needed to conduct a “lessons learnt” session among the clients and project team on their frustrating experiences. This open session involving clients and the project team will strengthen the relationship between parties and hence it will easy to continue the software activities.

6.3 Future Research

Since identified practices are common for all software projects within CEB environment, recommendation for future research is to apply this PM model for each project according to the type and nature of the project with performance measures to evaluate and control the project during its life cycle. Findings of future research will be how to customize the model for a specific project. Chose the largest, most strategic project where there were the greatest need for effective PM and which would also be the best test of the PM model.

Measure the productivity or customer satisfaction before and after each project. Firstly, bench mark the current state of the project (eg: implementation project of a one site) in terms of following areas such as activity completion time(man days), budget, scope, defects, time to deliver, adding value to stake holders and link with the strategic goals..

Then apply the identified PM standard model for a similar type of implementation project and evaluate after specific period. Check the deviation of the performance in terms of above defined criteria, which affect for a balanced and successful project completion. At the same time, get the feedbacks from project key peoples regarding the PM approach.

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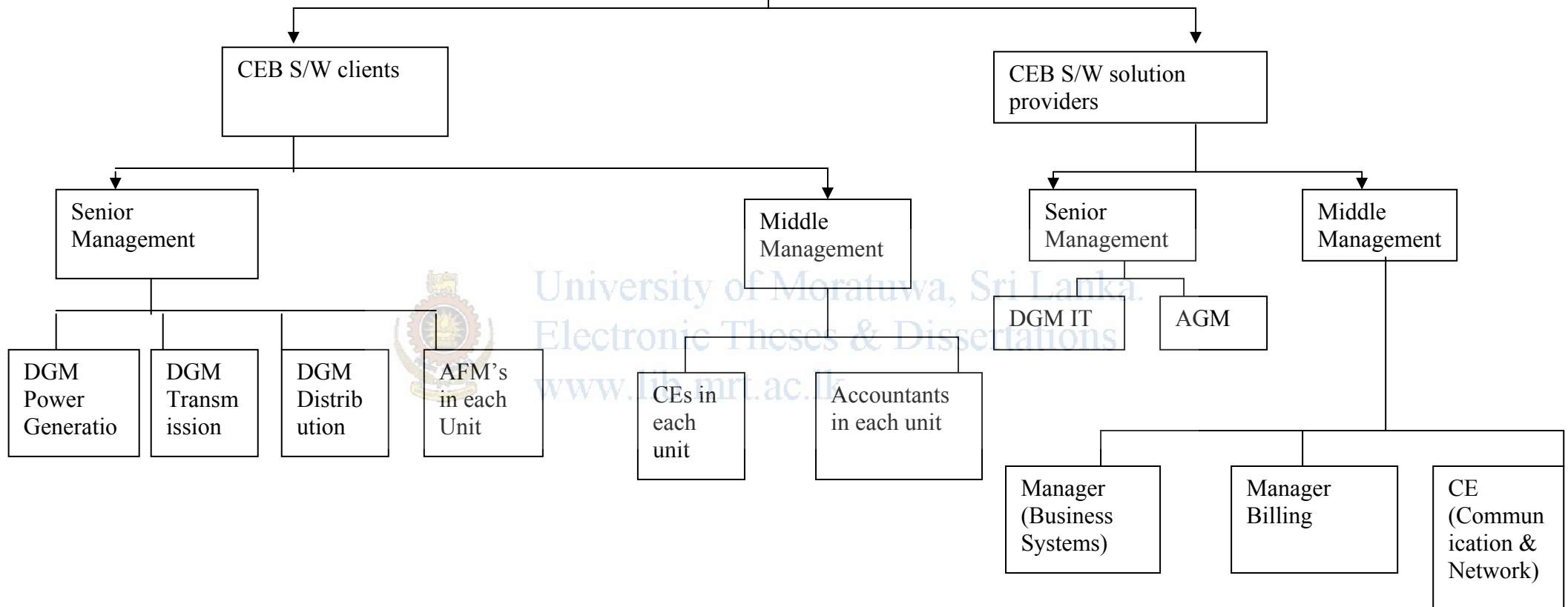
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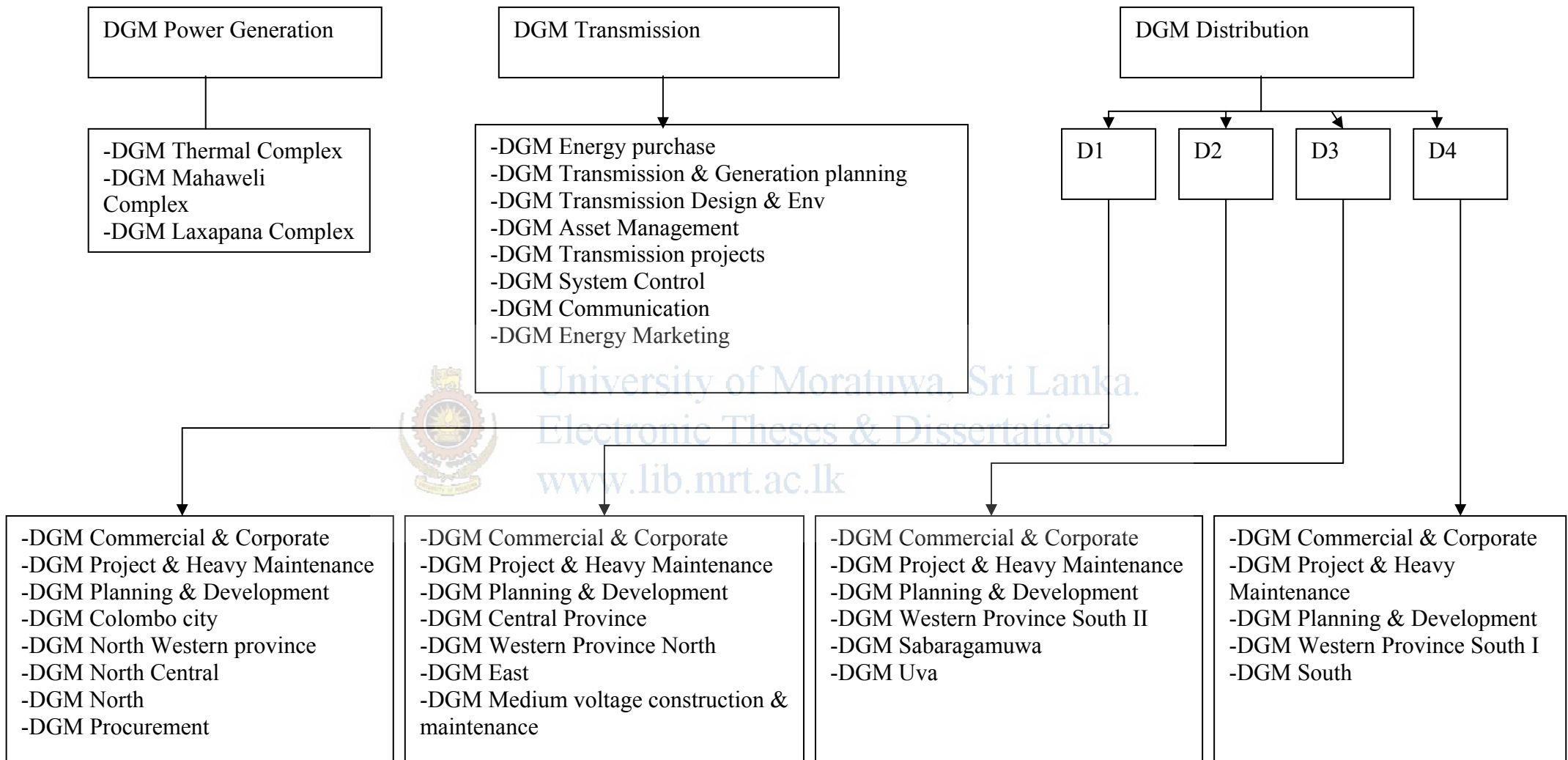


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Annexure 1

Sample Categorization for Interviews and Questionnaire





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Annexure 2

Dear Sir/Madam,

I am working as Software Engineering Executive at (MIS) CEB and doing a research study on “Applicability of Standard Project Management Approach in Solving Issues Related to Software Projects in CEB”. Main purpose of this study is to gather what kind of issues you are facing as users of software systems provided by the IT department and to give a management approach in solving those issues. Findings of this study will be a beneficiary to improve the software activities within CEB environment.

I would appreciate if you could spare few minutes of your precious time to fill the questionnaire based on the requirements and experiences.

Information contained in this questionnaire will remain completely confidential and be used solely for the academic purposes and assure your anonymity. Further, if you need any clarifications please contact the undersigned at your convenience.

Thanking you,

Yours truly,

.....
Meththa Perera

Tel: 0714240519

Office: 344577

E-mail: se2mis@ceb.lk

Part A

1. Business Unit:

- a. Power Generation
- b. Transmission
- c. Distribution:
 - i. D1
 - ii. D2
 - iii. D3
 - iv. D4

2. Role in the business unit:

Eg: DGM (Information Technology)

- a. DGM:
- b. AFM:
- c. CE:
- d. Other (specify your role):

3. IT department has implemented software solutions to my division.

- a. Yes
- b. No

4. Names and Implemented year of software solutions, which had introduced by the IT department for your business unit

	Name	Year of Implement
a.
b.
c.
d.

Part B

Strongly agree	Some what agree	No idea	Somewhat disagree	Strongly disagree
1	2	3	4	5

1 Role ambiguity in software system expansion

		1	2	3	4	5
1	I'm very much aware about how the software can Improve my day to day business activities.					
2	I have clearly planned goals to achieve through software systems.					
3	I know my responsibility in continuing software system once they introduce					
4	I know what IT department expect from me in software system expansion.					
5	I have received lucid explanations of what I have to do when Introduction of software in my unit.					
6	I'm giving my full commitment for the higher levels in order use software system.					
7	I'm sure I divide my time properly for software activities while performing other tasks.					
8	Do you get required support from your senior management for software activities and to face related risk					
9	I have given documentation of planned software implementation activities in my unit					
10	I have invited for implementation progress meetings in my unit					

2. Scope of software product

		1	2	3	4	5
1	I have involved with IT department staff in scope planning activities of software.					
2	I'm aware about the scope of business activities covered by the software solution					
3	I'm aware that the software solution provided will not cover all the business activities of my department.					
4	I have received documents related to the scope covered by the software solution.					
5	I'm aware about the initial risk factors relevant to the scope					
6	I received comprehensive set of documented resource requirements which are essential for the implementation.					
7	I always do a formal acceptance of the software solution delivered if it covers the business need.					
8	I always keep documents related to the formal acceptance of the software solution in my unit					
9	I agree to work according to the business process activities suggested by the software solution.					
10	I request for scope changes for the software through a change control committee.					

3. Time Management

		1	2	3	4	5
1	I'm aware about the scheduled activities in the software solution implementation in my unit					
2	I have received document which included scheduled activities in the implementation					
3	The documents also included type and quantities of the resource needed for each activity.					
4	I always inquiry if the scheduled activities are not completed during the defined period					
5	I do not prefer if the scheduled time increase.					
6	It takes long time to fill the software requirements once it request to the IT department.					
7	Time taken to response for day to day matters of the software by the IT department is high.					
8	Responses for change request are high.					
9	Document transfers between business units gets delay without a software system					
10	Mission critical information (eg balance sheets, stock statements) getting delays without software solution in my unit.					

4. Cost Management

		1	2	3	4	5
1	I'm not concerned about the cost to implement software solution					
2	I have a separate allocated budget for software activities in my unit.					
3	I'm willing to bare the cost if the solution best fit for my scope					
4	I always guided by the IT department in preparation of cost estimations for software implementation activities.					
5	I inquire from the IT division, if the cost of implementation getting high.					

5. Quality Management

5.1 Function Quality

		1	2	3	4	5
1	Software perform well as I expect					
2	Software solution provided will solve problems related to my duties.					
3	I need enhanced version of existing functions through the system.					
4	Operating manuals were provided.					
5	Operating of software functions were different from manual practices					
6	Operating the function of the software were easy to understand					
7	Level of authority in performing each functions can be achieved					
8	There are standardized set of roles to perform in each function (eg Entry, validation, Approval)					
9	Systems always guide me if I'm doing incorrect with the system.					
10	I have encountered many software errors with the system					

5.2 Data Quality

		1	2	3	4	5
1	Data errors can be minimize when use the software system.					
2	I'm aware about the security controls of the data of software solution.					
3	Software solutions which provided by the IT department were high secured to use.					
4	I'm satisfied with the accuracy of the information getting through the system.					
5	I have passed transaction data saved with the software system in order to provide when it is requested					
6	It is easy for me to consolidate information of entire region even the software not installed in the entire region.					
7	I'm doing analytical studies of the data like forecasting, trend analysis...etc using software system					
8	I'm collecting manual documents in order to prepare information					
9	I'm providing monthly information without delay using the software					
10	Documented information were received from the IT department about the data backups process in my unit					



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5.3 Screen Quality

		1	2	3	4	5
1	System is easy to use					
2	Appearance of screens are attractive					
3	It motivates me to interact with the system.					
4	Data display in the screens of the software is very clear.					
5	Output documents of the software were very clear					
6	It is easy for me to locate the required functionalities					
7	Unwanted functionalities were displayed					
8	Screen contents were clutter					
9	Color combinations of screens were attractive					
10	screens of the software no need any improvements					

6. Procurement Management

		1	2	3	4	5
1	IT equipments purchased through IT department.					
2	Support of IT department is high when doing purchases of IT equipments.					
3	I'm aware about what type of IT equipments are need for my unit					
4	Requirement of IT purchases for my unit will given by the IT department.					
5	I'm not doing any IT equipment purchases without any guidance from IT division.					
6	I have a separate allocated budget of IT purchases					
7	IT department provided guides in who are the potential suppliers for particular IT purchases					
8	Performances of suppliers were evaluated after any IT purchases.					
9	I always keep records of those suppliers who dealing with IT purchases					
10	IT department has published standard specification documents to be use for every IT equipment					

7. HR Management

		1	2	3	4	5
1	IT awareness programs were conducted by the IT division for employees in my unit.					
2	I have received the documented roles and responsibilities of the IT staff in implementation activities					
3	IT division clearly mentions which user roles should attend for software trainings needs.					
4	Trainings conducted by the IT department are well organized.					
5	Behaviors of the IT staff in implementation activities are in standard					
6	Physical attendance of people from the IT department in problem situation is satisfactory for me.					
7	I have permanent staff to involve with software system.					
8	I have only contract employees for software activities.					
9	Most of my permanent staff who involve in the software activities are above the age 40					
10	Users of my division were highly motivated by the IT division to use the software system.					

8. Communication Management

		1	2	3	4	5
1	It is always easy for me to connect to the head office for software issues.					
2	communication links are not established to connect with the head office					
3	I'm getting up-to-date information regarding the software updates					
4	I'm confidence in explaining software problems in order to get help from IT department.					
5	I always get assistance from IT department when I feel doubt with the system functions.					
6	For any software issue, responds are very clear from the IT department.					
7	I'm satisfy the way of resolving issues related to software solution					
8	I know whom to contact when a software issue arise					
9	It always needs to do reminds when request for assistance regarding software solution					
10	I'm aware about the purpose of the help desk activities					

9. Risk Management

		1	2	3	4	5
1	I'm aware about the security of data					
2	I have confidence in the staff that they following every steps which instruct by the IT department.					
3	I immediately inform to the IT department when any system failures					
4	Have you receive comprehensive set of instructions to use the system.					
5	Documented Security features relevant to each functions has given					
6	IT department always updates our unit about the security threats relevant to the software activities					
7	Security awareness programs conducted by the IT department are well organized					
8	IT department has given set of precaution activities for every security threats					
9	IT department periodically checking whether those instructions are followed by us					
10	IT department conducts IT/SW awareness programs for employees who uses the software					

Annexure 3

Structured Questions Areas

1. Project Integration Management

			1	2	3	4	5
1	Develop a project charter to formally authorize a project	Is it include business need					
		Is it include customer need					
		Objectives and milestones					
2	Develop preliminary project scope statement	Document characteristics & boundaries of the project					
		Method of acceptance					
		Method of scope control					
		Initial risk					
		Initial WBS					
3	Develop Project Management Plan	Develop PM plan					
		Is it contain how to execute, monitor, control and closed					
4	Direct and manage the work defined in the project management plan to achieve the project's requirements defined in the project scope statement.						
5	Monitoring & controlling the processes used to initiate, plan, execute and close a project to meet the performance objectives defined in the project management plan.						
6	Reviewing all change requests, approving changes and controlling changes to the deliverables and organizational process assets.						
7	Finalizing all activities across all of the project management processes to formally close project or a project phase.						

2. Project Scope management

			1	2	3	4	5
1	Scope Planning						
2	Scope definition						
3	Create WBS	Is it include project schedules					
		Cost estimation					
		Resource requirements					
4	Scope verification	Obtain formal acceptance of completed projects and deliverables					
5	Scope control						

3. Time Management

			1	2	3	4	5
1	Activity Definition:	Identify scheduled activities to be performed					
2	Activity Sequencing:	Identify the dependencies among schedule activities Document the dependencies					
3	Activity resource estimating:	Estimate the type and quantity of resources needed for the schedule activity					
4	Activity duration estimating	Estimate the number of work periods for schedule activity					
5	Schedule development	Analyze activity sequence, durations, resources and schedule constraints					
6	Schedule control	Changes to the project schedule					

4. Cost Management

			1	2	3	4	5
1	Cost estimating	Develop approximate cost for project activities					
2	Cost Budgeting	Aggregate the individual cost					
3	Cost control	Control changes to the project budget					

5. Quality Management

			1	2	3	4	5
1	Quality Planning	Identify the which quality standards are relevant Determine how to satisfy them					
2	Quality assurance	Perform quality assuring activities					
3	Quality Control	Monitor project results whether they comply with relevant quality standards Identify ways to eliminate unsatisfactory quality					

6. HR Management

			1	2	3	4	5
1	HR Planning	Identify project roles and responsibilities					
		Reporting relationships					
		Staff management plan					
2	Acquiring project team	Immediate acquisition of human resources to complete the project					
3	Develop project team	Improve the competencies and interaction of team members					
4	Manage Project Team	Tracking member performances					
		Provide feedbacks					
		Resolve issues					
		Coordinate changes to do to enhance performances					

7. Communication Management

			1	2	3	4	5
1	Communication Planning	Identify the information needs and communication needs					
2	Information distribution	Make available needed information timely manner					
3	Performance reporting	Collect and distribute performance information					
		Project status reporting					
		Project progress measurements					
		Forecasting performances					
4	Manage Stake holders	Manage communication with clients and resolve issues					

8. Project Risk Management

			1	2	3	4	5
1	Risk Management Planning	Decide how to approach, plan execute risk activities					
2	Risk Identification	Identify which risk to effect for the project					
		Document the risk					
3	Qualitative risk analysis	Prioritize risk considering probability of occurrence and impact					
4	Quantitative risk analysis	Numerically analyze the effect on overall project objectives of identified risk					
5	Risk response planning	Develop actions to reduce threats to project objectives					
6	Risk Monitoring and control	Tracking identified risk,					
		Execute risk response plan					
		Evaluate effectiveness					

9. Project Procurement Management

			1	2	3	4	5
1	Plan purchases and acquisitions	Determine what, when and how to purchase before the project tasks					
2	Plan contracting	Document the products and services					
		Identify potential sellers					
3	Request sellers responses	Obtain quotations, bids, offers or proposals					
4	Select Sellers	Review offers and choose among potential sellers					
		Perform written contracts					
5	Contract administration	Document and review how the seller is performing					
		Evaluate the performances					
6	Contract closure	Complete and settling the contracts					