DEVELOPMENT OF A WEB-BASED
SOFTWARE PROJECTS MANAGEMENT APPLICATION
USING ORACLE APPLICATION EXPRESS

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DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF COMPUTER SCIENCE

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UNIVERSITY OF MALAYA
KUALA LUMPUR

JANUARY 2011
ABSTRACT

The current Software Project Management Application used by Longbridge Consulting Sdn Bhd is based on the use of excel worksheets. As a Small Medium Enterprise (SME), Longbridge Consulting Sdn Bhd is unable to utilize commercial project management solutions to the simple fact that these software’s are costly, complicated and cumbersome to implement for their software development projects. Common issues faced by the project manager are difficulties in keeping track of project details such as project status, tasks, milestones and also the important task of report generation. These issues are in no way unique and limited to just Longbridge Consulting Sdn Bhd as there are yet many organizations today that are also facing these exact same problems.

This research presents a prototype Web-based Software Project Management Application (SPMA), which is developed on the Oracle Apex. Apex is a browser-based web development tool that enables the rapid development of database-centric web applications. The goal of creating the web-based Software Project Management Application (SPMA) will be to provide an alternative solution that will be able to cater to the above-mentioned problems while at the same time ensuring the project quality is not sacrificed. Web-based Software Project Management Application (SPMA) caters to several components of project management such as the managing of multiple projects along with their associates, releases, tasks, milestones and features, tracking and the overall monitoring of a project’s progress. Actions like generating reports can be done on the fly whilst allowing real-time actions of creating, updating and viewing of project details all of which can be done via online. The implementation of this application was then measured by in terms of system data accuracy and system response time. During evaluation the result showed that system data accuracy and system response of this tool is almost 50% better and faster than excel based work sheets system.
ACKNOWLEDGEMENTS

I would like to express my praise and gratitude to the Almighty ALLAH for HIS mercy and countless blessings. I would like to Thank and express profound gratitude to my supervisor, Mr. Mustaffa Kamal Nor and Mr. Mohd Harul Nizam, for their invaluable support, encouragement, supervision and useful suggestions throughout this M.Sc. Research work candidature. I would also like to express my gratitude to all my University Lecturers for their guidance and support.

I am grateful for the cooperation of “Longbridge Consulting Sdn.Bhd” company by allowing me to interview their CEO and Staff. First, I really appreciate the kindness of Mr. Bob Gill CEO of Longbridge Consulting Sdn.Bhd, who gave me so much important data for analysis. Additionally I would also like to thank Mr. Leung (DBA) and Mr. Jasraj (System Analyst) of “Longbridge Consulting Sdn.Bhd” for their support and help. They were willing to help me answer all my questions without hesitation. Moreover, I would like to acknowledge all of my respondents who answered the survey.

I am thankful to my parents, for their moral and financial support and my brothers for being in touch with me. I sincerely thank my friends who have supported me through these years.
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List of Abbreviations

DFD: Data Flow Diagram.
ERD: Entity Relationships Diagram.
SPMA: Software Project Management Application.
1.0 CHAPTER 1 – INTRODUCTION

1.1 Background

In this journey of new era, software development plays an important role because people use computers in their daily life to do their work with ease and to save time. To use computers means to use different applications to perform different functions in the aim of lessening our burden and therefore software development has major part to do. As we enter the software development the first and foremost thing that plays an important role for the success of the project or the software developed is project management. According to Friedlein (2001), the two primary skills a project manager should possess are “Communication” and “Knowledge”, (i.e. industry experience, business disciplines and skills, and “all the connotations of experience and wisdom”). Without the proper project management it is almost impossible to develop the software within the budget and timeframe allocated. Project management carried out without proper measurement cannot hope to complete the project within the confines of the time and budget allocated. This is the case in both large-scale organizations and small-scale organizations.

With the increasing size and complexity of software’s today, software development has become a more complicated process and hence the requirement to take care of even the simplest activity in the development process has become equally tedious. The problems usually faced in the software developments are cost overrun, schedule overrun. At the core of these problems lies the problem of poor estimation. Wrong estimation will undoubtedly results in a disaster in the development process. Therefore effective estimation is essential for proper project planning and control and is one of the most critical and challenging tasks in the development process. Under-estimating a project leads to quality degradation, employee over exploitation and setting short schedule and
hence results in missed deadlines. Over-estimating is equally if not even worse than the previous condition i.e. allocating more resources to the project and thus increasing the cost of the project outside of the predefined scope.

Proper planning of the project and tracking the project development is the second essential task for assuring the success of the project. Once the estimates are available the next task is to assign the tasks to individuals. Regular feedback from the development process is helpful in determining the status of the task and the project. Tracking allows the project manager to cater to any unexpected situation that might arise while development is in process. As stated earlier, estimation plays the key role in the management of the development process, it is essential that the model or the method being used should be correct and stratified with the most recent data available and if standard parameters are being used in the method then those parameters should be well calibrated with the available data.

The Software Projects Management Application is a project management tool, which will be able to manage multiple projects along with their associated phases, tasks, features, milestones, and releases. This application will help project managers to avoid unnecessary risks and issues, ensure project quality and improve productivity on the whole. This application will utilize oracles latest development tool “Application Express” (formerly known as HTMLDB) which will provide the application better performance and results in order to meet organizational needs in terms of speed, effectiveness and usability. Oracle application express is a rapid web application development tool for the Oracle database which is 100% web based development and PL/SQL driven.

Some of the futures available via application express are: fast development periods, a 100% web based development tool, ready to use components, professional look and feel, easy to create prototypes, simple to deploy and straightforward to comprehend.
Application express is a fairly new application builder geared toward web development and does not require the use of an application server.

### 1.2 Problem Statement

All projects managers may universally know the software development lifecycle, as it is the founding block for any successful software project conception, initialization, development and eventually deployment. However what is not well know is the various stumbling blocks that may bring any software projects to a halt – resulting in missed deadlines and overall failure in meeting the planned milestones.

Many organizations today, including software development houses, still face such problem to a certain degree as every organization have their own different needs to manage a particular software project, and some of the organization cannot afford to buy a project management application as they are expensive and difficult to use. As most of the organizations are still facing difficulties to manage their software projects resources and their details are:

- Difficulty in achieving the required efficiency in their projects
- Difficulty in keeping track of their employee tasks in real time.
- Difficulty in keeping track of the overall project completion status.
- Unable to meet planned Milestone due to unplanned problems arising.
- Difficult to keep track of new features implemented.
- Difficult to keep track of new releases of the software product.
- Hassle for project managers to prepare reports on project tasks and milestones.
1.3 Motivation

Today the use of software has become essential in our daily office lives. The organizations which develop software must produce good quality product to satisfy the customer and whilst ensuring to be within the budget, in order to be profitable. If there is no profit it is mere waste to run an organization. Every person tries to be as comprehensive as possible in his thinking and knowledge. As being in the software industry for past 5 years in different companies where project details was not recorded efficiently and new technology were being reviewed for best of the project estimation. It is important to be aware about new technologies, which are being created every day to which will enable businesses to be more agile and reliable. Willingness to develop this application was a new enhanced development tool released by oracle i.e. “ORACLE APEX”. As a rapid web application development tool for the oracle database, it can be utilized as a productive tool to build applications that report on database data. The success of project is directly proportional to the project management and the measures taken by it.

1.4 Objectives

Software project management tools for developing software projects will enormously help to reduce a lot of problems and will support the management to ensure the quality of the product. This research is an attempt to highlight the reasons for delays and incompleteness in software projects and to minimize them, reduce complexity and ensure project quality by developing a prototype tool named Software Project Management Application (SPMA). This tool will help and support the managers in performing their responsibilities. Thus, what the tool can do is to provide sufficient information in order to reach the right decision.
The following are the SPMA objectives:

♦ To identify the issues related with software project management in a software industry.

♦ To design and develop a software project management application that helps project managers in managing projects.

♦ To provide information for assigning personnel on the basis of their work experience, qualification, and knowledge in specific area.

♦ To keep track of changes in project requirements.

♦ To produce valuable reports on each project, maintained by SPMA.

The research was carried out by analyzing, comparing and evaluating problems in past researches from literature review and comparison of some software project management techniques and tools. Survey on software project management was conducted and analyzed to develop the prototype tool. It is hoped that SPMA will pave the way for developing useful project management tools, which can reduce problems, attempt to ensure quality and to allow for better software project management.

1.5 Expected Outcomes

The potential goal of this project will be to produce a software projects management application that can be applied to all software companies, in order to assist their project managers in their planning, implementation and finally deployment. It is hoped that this will eventually result in such organization as these software development consultancies having the best (or most appropriate) application assisting them with their project management.

The maximum potential that are predicted as an eventual outcome from the development of this application are:
- Offer project managers a means for achieving higher efficiency in their projects
- Enable project managers to track their employees’ tasks.
- Enable project managers to easily get updated project status.
- Enable project managers to efficiently schedule and achieve their project milestone.
- Enable project managers to keep track of new features implemented
- Enable project managers to keep track of new releases.
- Enable project managers to prepare detailed and timely reports on project tasks and milestones.

1.6 Research Significance

Global E-Commerce and E-Governance programs have brought into sharp focus for the need of database systems to store and manipulate data efficiently (Sayed and Shamsul, 2009). It doesn't matter how big the company is, all it needs is a software project management applications to stay on top of the game. Management software helps to make sure that project details will be seen by everyone involved in the project whenever they need to. Effective communication is one of the major challenges to a project’s success (Thomas et al, 1999). This material can be shown in a number of ways using charting or report applications whereby users are given the option to restrict or otherwise control access depending on exactly what each person on the project is doing, including everything from read-only access to full project editing rights. While user may not see the need for it now, they will usually find it helpful at least once during the project.

Users can handle or edit the schedule during each stage of their project. Most Software project management applications will ease the communication process between user and
the client, as well as the others involved. This helps users to take away the pressure of organization, as the management software is always there to refer to when needed. If company is worried about giving information that isn't relevant or useful to the client, software project management applications often help by restricting the client to certain charts or reports, while others working on the project can have a wider range of access. The management software might be digital (coming from an online source), which offers a better form of project security.

Once a project is reaching its completion, the pressure rises dramatically, making it far more difficult than usual to delegate last-minute tasks, something that is almost a certainty even where the best organized project are concerned. By training the team to understands and utilizes the basic functions of software project management applications, the project manager will save everyone a considerable amount of time and frustration. This not only makes the project manager's job easier, it also makes everyone else's job easier whilst allowing for a more cost-effective use of company's time.

Finally, when the project is finished, the management software will track and showcase each team member’s efficiency at handling the tasks given him or her. Users are given a clearer picture of their abilities, how they manage their time, and how they work in a team. At the end of the day, web-based software project management applications can greatly contribute to the success of project managers worldwide.

1.7 Organization of thesis

This project is organized into six chapters. Chapter 1 provides a short background, identifies software project management related areas. Furthermore objectives, expected outcomes and the problem statement are part of the chapter 1.

Chapter 2 will cover the literature review of software project management. This chapter discusses about the purpose and activities in software project management. This chapter
also highlight on different types of web based software project management. The advantages and what a software project management can do will be discussed. Existing practice in Longbridge Consulting Sdn.Bhd will be reviewed.

Chapter 3 will discuss about the methodology applied in this research. Data gathering, design and capturing system requirement will be also discussed in this chapter.

Chapter 4 will concentrate on the findings and analysis for the new proposed system. Requirement structure, specification, system design and system architecture will be discussed here.

Chapter 5 will focus on the system prototype. Deploying application, testing, test scripts and system prototype will be shown and discussed.

Chapter 6 will conclude the evaluation and conclusion. User evaluation, system functionalities, comparison with existing system, system strength and limitations will be discussed. Recommendations for the future will be reviewed in this chapter.

1.8 Conclusion

Software project management issues described in this chapter represent the core of project manager's toolbox for leading the project to successful completion. However, it is important to stress that even if all of the important practices and issues could be briefly covered here, software project management in reality requires a more detailed insight into the practices themselves, as well as a lot of experience, judgment, and intuition. Best practices of software project management are always those that can be applied to the system being built, the technology the developers use, and the organization that develops the system. In this way software project management manages software projects and other aspects well.
2.0 CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction

Decades ago, computers were used to serve specific functions. These standalone units began to accumulate data to serve the individual departments. Little information passed beyond the organizational boundary. As move towards the information age, cross-boundary information needs become more important to provide organizations with the leading edge (Zaitun et al., 2001).

The word project management is a combination of following activities (Kathleen et al, 2005):

- Organizing the work
- Estimating resources
- Allocation of resources
- Assigning tasks
- Controlling project execution
- Tracking and reporting progress
- Defining the products of the project
- Project Closure meets

In order to build a software project management one should able to understand the project management and its activities, as project management is an immense area, which includes all the activities in the above list. Quality, effort and time are inter-related. If the project demands a higher quality then it is going to use more resources and the effort required will be high and the effect will infiltrate to time. The first challenge that project management faces is to ensure that the project is delivered within time and budget and with the desired quality. The second challenge is more crucial and grueling one for optimizing the resource requirements.
According to Fuller (1997), “Software project management is a set of principles, methods, tools, and techniques for the effective management of achieving objective oriented work.” Software project management allows the user to track the activities that go into completing a project. Software project management helps the user track all of the tasks as well as the resources required to complete them.

Software project management is the organization and management of resources in such a way that all the work required to complete a project can be done within defined scope, quality, and time (Kathleen et al, 2005). Increased pressure to reduce cost and delivery time in a highly global and competitive environment has given due credit to project management principles, techniques and tools. Software project management, in particular, is an area of research with a view to achieve higher levels of quality and to improve both cost and schedule estimates (Aneerav et al, 2007). Identifying tasks, assigning people to interrelated tasks, obtaining and parceling out necessary materials, meeting deadlines (or having fall-back plans when deadlines are not met), its mission is to outcome as a constructive product or service. Software project management is the organization and management of resources in such a way that all the work required to complete a project can be done within defined scope, quality, and time and cost constraints. Software project management differs from general project management, as certain inherent characteristics are unique to software development (Hughes and cotterell, 2006). These characteristics are invisibility, complexity, conformity and flexibility.

- *Invisibility* implies that the process of developing the software cannot be seen (Is not visual); thus it is difficult to control, monitor, measure and estimate project progress.
• **Complexity** of software project is increased in that software projects include not only the development, but also the implementation and maintenance of the system that may be distributed and that interface with many existing systems.

• **Conformity** of software is essential. Traditional disciplines involve physical non-changing resources, whereas software projects involve a variety of resources where the software is expected to conform to the requirements of humans and organizations.

• **Flexibility** is needed, as software systems are required to conform to the standards of the organization. Thus it is subjected to a high degree of change.

Software that supports crucial business activities may be utilized to gain a competitive advantage for its organization. In other words, the quality of the software development process, as well as improvements in the development of the project management software can significantly enhance the quality of the software (Schwalbe, 2006).

Since the operational environment of the software project management has changed, new methods are needed to enhance and support standard software project management practices. Different paradigms are evolving and several may hold promises to address both this changing environment and the unique nature of software project management.

### 2.2 Purpose of Software Project Management

Resources and activities are the key players in any organization for completion of any project. The purpose of Software project management is to first find out the activities needed to take the project to its end and secondly to allocate resources to these activities in a planned way.

Web-based software project management makes it easier to manage schedules and resources, communicate project status, and report project information. A good
computer-based software project management package helps quickly determine whether plans are feasible, spot potential pitfalls, and track the project to completion. Project management methodology existed long before personal computers, but modern computers make it easier to cover some of the more complex concepts. One of the most challenging aspects of executing a complex project is the planning and tracking of all its different stages. All the elements of the project need to be broken down into sub-projects that run in parallel but are ready to rejoin the main project at a certain time. These types of challenges are just the type of problem project management software was designed to tackle. The commercial software industry is about half a century old. In 1975, Fred Brooks, in his classic text “The Mythical Man Month”, compared large software systems development to the dinosaurs. As described, an industry with excessive schedule pressure, long overtime, and constant change and frequent overruns (McConnell, 2003).

In the intervening quarter-century, as software is integrated into more and more products and process, little has changed from the negative picture painted by Brooks. The often-quoted Standish (2009) “Chaos Report”, summarizing a survey of software projects, reports that:

- Only 32% of software projects were completed on time and on budget.
- 24% of projects were cancelled before they ever get completed.
- 44% of projects were challenged (late, over budget and/or with less than the required features and functions).

Problem solving is essential to software development. Indeed, many of the basic processes that are the backbone of software development can be viewed as standard problem solving processes, ranging from requirements analysis, specification, and design to testing or verification (Deek, 1999). As software development has increased in complexity, an additional factor has grown in importance: collaboration. In fact, the increasing complexity of applications has necessitated the use of teams or groups to
develop software because it is infeasible for individuals to develop large software systems with appropriate expediency or levels of quality.

According to Prey (1996) computer scientists are not well prepared for this contemporary environment because their preparatory training usually focuses on the construction of small programs (programming-in-the-small) and provides little experience in complex software development. In contrast, the development of large systems in an efficient and timely manner requires a team effort, and the more complicated the problem, the larger the team needed to solve it. Another contributing factor to the need for team development is that domain-specific expertise tends to be localized and geographically distributed. Studies have shown that, particularly when such developers are dispersed, their success depends critically on their ability to use effective software project management (Nunamaker, 1999). Such factors have made teamwork in systems development a necessity, not merely a technically feasible option.

One of the local companies operating in Kuala Lumpur was chosen in this study. The reason this local company was chosen was due to initial research on software companies to understand why software projects get delayed. Though they did have Excel based application and manpower but still they cannot meet deadlines and still can’t keep track their software projects status. The following sections explain in detail about the findings on the company and some brief explanations on their issues, which is feasible and adequate to be implemented.

### 2.3 Software Project Management Activity Processed

Software project management has large number of activity processes but there are two important activities for a project manager, as most critical activity that distinguishes from others is “Project planning”. This is justified because the project plan is the
The two important activities that lead the project to a success are:

- Project planning
- Monitoring/Tracking

2.3.1 Project Planning

Projects are expensive in terms of both time and money. Ineffective planning may take decades to complete a project with average complexity. Planning should be done carefully before and during the development of the project as this helps in avoiding serious mistakes. After the first phase, when requirements collection for the project is over the next step is to identify the dependencies among the various modules and tasks, and to pave a road map for the development process. Assigning right task to the right person is a major challenge in this phase. Available estimates play a key role in whole planning process by providing the information about the time and effort required for the project and for various tasks in the project.

2.3.2 Monitoring the Project (Tracking)

When project is under development it is necessary to take feedback from the development process and analyze the status of project. This helps in detecting any problem occurred during development or any schedule or cost slippage and signals the project management about the problem so that necessary actions could be taken to rectify the problems. While tracking the status of the projects, the estimated values are compared with the actual values collected during development.


2.4 Advantages of Software Project Management Application

For years, companies have struggled to deliver projects on time and within budget. But with today's emphasis on getting more bangs for the buck, project management software tools are more crucial than ever. This challenge has led many to turn to in-house project management tools as a way to boost efficiency, cut costs, and improve on project delivery in terms of time and budget. In spite of efforts made, these in-house solutions often result in lengthy, costly and never-ending projects that force companies in areas out of their field of expertise.

- Work more effectively as a team by sharing information
- Anticipate difficulties and conflicts, and easily modify plans as needed
- Identify and resolve resource allocation issues
- Make better decisions that affect the outcome of the project
- Determine the effects of making changes to the schedule, allowing us to be proactive, and not just reactive

2.4.1 Software Project Management Application Capabilities

At the most basic level, Software project management will help organizations to manage projects from start to finish, and allow employees at different levels to have an input into the process.

Software Project management has been around for a number of years now and as a result, it does far more than just manage the projects themselves. Project applications can also carry out scheduling, cost control and budget management, resource allocation, collaboration, communication, quality management and documentation or administration. Projects can be complex and dependent on many different factors, departments, and outcomes. As such, project software can help to determine which events depend on one another, how exactly they depend on each other, and what
happens if things change or go wrong. In addition, they can schedule people to work on various tasks.

People also use software project management to deal with uncertainties in the estimates of the duration of each task; arrange tasks to meet various deadlines; and juggle multiple projects simultaneously, following are some feature that help project managers to manage projects.

i. Identify tasks

Task identity is an important component of the project, which needs to be identifying for all the jobs that need to be done in a project and later on need to record in Web-based software project management application for assigning to the appropriate team members.

ii. Assign tasks

Once the tasks has been identified then each task need to be assigned to the appropriate team members and record them in the Web-based software project management application to achieve the goal of the project.

iii. Develop timelines for project milestones

Timelines are used to help team members to know what milestones need to be achieved and under what time schedule. A project manager will be able to record the time line for each task that has been created in the application for tracking of the project milestones.

iv. Enable Web-based Software Project Management

Web based applications are the ultimate way to take advantage of today's technology to enhance organizations productivity and efficiency. Web based application gives an opportunity to access business information from anywhere in the world at anytime. It also facilitates to save time and money and improve the interactivity with customers and partners.
Software project management application is to facilitate team access from anywhere, as it is better for the team to track their project detail anywhere in the world. This feature makes a project manager’s work easy to monitor the project status from any part of the world.

2.5 Existing Systems

a. Trac Open Source Project

Trac is an enhanced wiki (wiki is a piece of server software that allows users to freely create and edit web page content using any web browser) and issue tracking system for software development projects. Trac uses a minimalistic approach to web-based software project management. Their mission is to help developers write great software while staying out of the way. Trac should impose as little as possible on a team's established development process and policies.

Trac allows wiki markup (wiki markup is a lightweight markup language used to write pages in wiki websites) in issue descriptions and commit messages, creating links and seamless references between bugs, tasks, change-sets, files and wiki pages. A timeline shows all current and past project events in order, making the acquisition of an overview of the project and tracking progress very easy. The roadmap shows the road ahead, listing the upcoming milestones.

Trac runs on any system supported by Python and the depending modules. Today we are aware of people running Trac on various Linux distributions, Mac OS X, FreeBSD, NetBSD and MS Windows. As trac software does not seem to be for all industries as of its limited features there are many feature which Trac software is not capable to do, one of them is data backup as this is one the important aspect of keeping data safe and for future use if required.
Trac software is not capable of generating reports in .csv or excel format as it has own report generator, which make users uncomfortable in today’s techno generation. It is also difficult to install, as it has dependency that most people have problems with are the Subversion Python bindings, which again require SWIG. There's not much can be done about that though, seeing that Trac is a Python application integrated with Subversion. Trac software is also difficult to install, as there are lot of thing that need to be setup before installing.

b. Projectpier

ProjectPier is an open source community aimed at developing simple, powerful and intuitive software for software project management and group collaboration. ProjectPier gives a flexible system for managing projects involving multiple organizations by providing a central place for all project activity and information while integrating with users' existing tools and workflow. Thousands of people all over the world, from study groups organizing a school project to large universities managing hundreds of international research projects, are using this software to get a grip on their project's tasks, communication, files and more. ProjectPier is a cross-platform application that is written using PHP, JavaScript and a database backend like MySql. The system requirements for this software are:

- Web server (Apache recommended) that can run PHP5 scripts (MySql, GD and SimpleXML extensions are required),
- MySql database with InnoDB support (version 4.1 is recommended).

Being free software it still lack some of the requirements for the software project management as reports has to be in a well formatted, easily accessed and downloaded from the system, as this software does not generate reports in CSV or excel format. This software also does not have the backup capabilities to maintain records for future use.
This software also does not keep trace of over all work done for the project, as project managers need to review the overall project status to take the necessary action if there is any delay or amendments for the project.

c. Microsoft Project

Microsoft project gives robust project management application with the right blend of usability, power, and flexibility, so users can manage projects more efficiently and effectively. Users can stay informed and control project work, schedules, and finances, keep project teams aligned, and are more productive through integration with familiar Microsoft Office system programs, powerful reporting, guided planning, and flexible tools.

Microsoft Project has been extended with Microsoft office project server and Microsoft project web access. Project server stores project data in a central database. Project web access allows user to display and update this data over the Internet. Web access allows authorized users to access a project server database across the Internet. Web access includes timesheets, graphical analysis of resource workloads and administrative tools.

Being one of the commonly used project management software in today’s life as it has some limitations and drawbacks which Microsoft need to overcome as they are:

- Only one user can view real time information and do updating. Other users accessing the same project can only view-dated information.
- The organization will have to rely on one person to do updating on a particular project.
- Microsoft project cannot view detailed, task-level information for resources working on multiple projects from MS project professional. Detailed task information is only available for one project at a time.
• Microsoft project requires MS project professional to control project and resource data and then publish the information to the web. However, users of MS Project web cannot edit the information but they can read, implying that each project manager or resource manager requires a copy of MS Project professional loaded on their terminal.

• Microsoft does not have a web-based tool for project managers and resource managers to do updating. This will imply more costs and expenses.

• Team members do not have an opportunity to see the whole project work and very often do not know what their colleagues are doing.

• It's hard to collect all the updates at one time.

• Top management does not have the full picture of the project and does not know what each team member is busy with.

• Each user needs an updated version of Microsoft project to be installed on his computer. It is very expensive and takes a lot of time to set up.

• Users always need to remember where the correct file is located.

• It’s impossible to control changes made to the file.

• The file does not provide the overall view for all the projects the organization is involved in.

• Not every team member can update the file.

• Updates take time.

• Microsoft project server is a very expensive solution (up to $75 000, the set up of which can take up to several weeks)

• Users need to also buy and install Microsoft Office Project Professional and Microsoft Office Project Web Access.

• It's difficult to use and requires additional training of personnel.

• Only the project manager can update the whole schedule.
2.6 Web-based Software Project Management Application (SPMA) vs. Other Project Management Applications.

Any project in business needs a proper project management. All the different elements: personnel, components, paperwork have to come together at the right times to produce a smooth flow and ensure deadlines are hit and money’s not lost.

There are many software project management tools designed for different complexities of project, from small, two or three-person developments to massive company-wide changes. Effective software project management helps us handle all the complex projects of company’s business without interruptions from unclear roles, miscommunication, convoluted tasks and lack of accountability.

Table 2.1

<table>
<thead>
<tr>
<th>Software Application</th>
<th>Trac Open Source</th>
<th>Projectpier</th>
<th>Microsoft Project</th>
<th>SPMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>Phyton</td>
<td>PHP</td>
<td>Microsoft</td>
<td>APEX</td>
</tr>
<tr>
<td>Database</td>
<td>SqlLite</td>
<td>MySql</td>
<td>MS Sql 2000</td>
<td>ORACLE</td>
</tr>
<tr>
<td>Web based</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Tracking</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple Project</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple User</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>User Admin</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Backup</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Privilages</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>User Access Control</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Above table 2.1 shows the comparison between different project management software with web-based software project management application (SPMA) and the comparison shows that SPMA has more functionalities then the other three software stated in the table 2.1. The comparison in the above table 2.1 is based on functionalities of the each application stated on the left side of the table 2.1 as they are:
a) **Language:** Programming language that has been used to develop each software stated in table 2.1 is Phyton, PHP, Microsoft and Apex.

b) **Database:** Database that has been used for storing data by each software stated in table 2.1 is Sql Lite, MySql, Ms Sql 200 and Oracle.

c) **Web based:** This function represents which software stated in the table 2.1 has the web capability, were user can get the information of the project in any where in the world.

d) **Tracking:** This function represents which software stated in the table 2.1 has the capability of tracking the project details.

e) **Multiple Project:** This function represents which software stated in the table 2.1 has the capability of handling multiple projects.

f) **Multiple User:** This function represents which software stated in the table 2.1 has the capability of handling multiple users accessing at any point of time.

g) **User Admin:** This function represents which software stated in the table 2.1 has the capability to have at least one user administrator.

h) **Backup:** This function represents which software stated in the table 2.1 has the capability of data backup.

i) **Privileges:** This function represents which software stated in the table 2.1 has the capability of granting privileges to a specific user.

j) **User Access Control:** This function represents which software stated in the table 2.1 has the capability of controlling the user access, which means limiting the access to a particular user.

### 2.7 Longbridge Consulting Sdn. Bhd

Longbridge Consulting Sdn.Bhd is a private, Malaysian based organization, set up to provide the required value-added, practical and skills-oriented services of the highest quality. They are here to fulfill the needs of the customers that are in search of the solutions to overcome the difficulties that are facing the Information and communications (ICT) industry today.

Bob Gill spearheads Longbridge Consulting Sdn.Bhd. An early pioneer and veteran of oracle, who was the fourth (4th) oracle Malaysia employee back in 1989. Bob has been
in the ICT industry for 27 years, with 22 years of oracle technical experience dating back to 1985, when he first used oracle RDBMS V5, SQL*Forms V2 and the days of RPT/RPF (Reports) on a WANG VS server. Bob, who brings both local and overseas experience, expertise and ability that leads Longbridge Consulting Sdn.Bhd capabilities and competencies in the area of oracle's core and java technologies.

Bob Gill has spent more than 13 years overseas providing his expert services in Australia, England, Holland, Germany, Belgium, France and Taiwan. Since Longbridge Consulting Sdn.Bhd inception, they have grown steadily and have a group of ICT professionals who had worked and consulted for various local based organizations, besides having gained international and overseas consultancy exposure in various industries. Longbridge Consulting Sdn.Bhd has worked on several IT and telecommunications projects, and are here to bridge the knowledge gap that is required to help their customers to move forward into the future for mutual benefits.

2.7.1 Their Services

Longbridge Consulting Sdn.Bhd helps fit clients existing technology to their business processes and problems, as well as identify their needs to successfully steer their organization in the right direction towards business success through Longbridge Consulting Sdn.Bhd services, solutions and innovations. From initial strategic planning to rapid implementation of projects, consulting, outsourcing, support and training, Longbridge Consulting Sdn.Bhd offers a one-stop service center for all ICT needs.

Besides being able to outsource the required technical expertise for company’s mission-critical ICT projects, Longbridge Consulting Sdn.Bhd also offer a very cost-effective model for application design and development though the procurement of their application development framework, Longbridge Consulting Sdn.Bhd Secure Framework. Longbridge Consulting Sdn.Bhd differentiate their services from others by
ensuring that these services are delivered to client to address the problem of skills deficit and other critical issues that are being faced by the ICT industry today. The services offered by Longbridge Consulting Sdn.Bhd are as follows:

**a. Customized Application Development of client/server**

Client-Server applications and n-tier architecture have always played a key role in operation of businesses. Ability to input, process, store, and access data from anytime, anywhere and any device is powering e-Businesses of today. Longbridge Consulting Sdn.Bhd specializes in development of high-end client-server applications and robust enterprise applications with user-friendly interfaces. Depending on business requirements, their consultants and developers can also help in developing web-enabled applications and systems.

**b. Software Re-Engineering of Applications**

Many companies today are thinking about how they can web enable their Oracle Forms-based client server-based enterprise application suites, perhaps because of anticipated competitive pressure, customer demands. The goal of conversion for web enablement would be to maintain the business flow, business logic and functionalities while achieving improvements in performance, scalability. As Longbridge Consulting Sdn.Bhd offers Web-enablement of Oracle Developer client/server applications using Developer 6i, 9i, 10g Developer Suite toolset and Conversion and Migration of SQL*Forms 2.x, 3.x and Developer 2000 to Developer 6i, 9i, 10g Developer Suite modules for their clients.

**c. Application Architecture and Application performance Tuning**

To survive at the architecture level, the IT specialists who do well are those who think in terms of strategy, systems, policy, and procedures. Move beyond programming, and
learn new ways to approach security from a higher, application architecture level. Stay ahead of security breaches and help ensure the enterprise is highly secure. Most discussions of software security concentrate on the applications themselves or the data they contain. As Longbridge Consulting Sdn.Bhd provides review of current application architecture, database and application design, with special emphasis on performance and also review of current security management of application, and providing consultancy and services for improving this aspect of the application.

Longbridge Consulting Sdn.Bhd also has been performing application tuning analysis; optimizing the 'expensive' SQL statements using new features and enhancements in Oracle 9i/10g; and providing general guidelines for performance improvement, both for client/server and web-based architectures for their client’s business improvement.

d. Systems Integration, Data Conversion and Migration

In today’s world, improving business efficiencies, driving up market share, and achieving business results depend upon the intelligent application of technology. The ability to organize and manipulate data from investments in hardware, software, telecommunications and people is essential to the ability to solve business problems.

e. Database and Application Technical Training:

Longbridge Consulting Sdn.Bhd offers data base and application technical training courses for their customers, which include generic and customized oracle 9i/10g database and application-specific courses with advanced SQL, PL/SQL, optimization and application performance tuning, and security management courses. As main aim is to provide a better approach for project scheduling, it seems that it is difficult for companies to keep track of their project schedule that is why most of their project’s gets delayed.
2.8 Oracle Apex

Oracle has created software and services that enable organizations to get the most accurate and up-to-date information from their business systems. Oracle remains in the forefront in simplifying IT systems and provide complete solutions allowing customers to get better information. Yet, like it or not, having the right IT system in place plays a critical role in today’s business. A lesser known but powerful application development tool that comes freely bundled with an oracle DBMS is oracle application express (Oracle Apex). Over the past few years, the oracle application express has increased twofold mainly because it is easy to use, saves money when consolidating spread sheets and desktop databases, and comes with the bundled for free with oracle database (Yuhanna and Megan, 2006). Oracle apex is a browser-based web development environment that enables quickly develop database-centric web application. Apex was launched, as an MS Access/Excel killer (Lorenzen, 2007). The focus has been on consolidating fragmented information into the database in a user-friendly manner. Oracle apex is a great tool, which keeps getting better with the each release.

Oracle apex and oracle database XE was chosen because of the fact that it is a freeware software development environment based on the oracle database. Oracle database 10g express edition (Oracle Database XE) is based on the oracle database 10g release 2, code based that's free to develop, deploy, and distribute. As an on demand platform, Apex provides a complete set of features for building business applications including data models and objects to manage data, a workflow engine for managing collaboration of that data between users, a user interface model to handle forms and other interactions, and a Web services API for programmatic access and integration.
a) Apex and PHP

PHP is just scripting, like Perl, .Net, Ruby. It's a bunch of code. Apex uses declarative objects like regions, reports, items, and validations. One has to hand code so much in PHP where as it is already built into Apex like every aspect of interactive reports, or validations. To build an application in Apex would take less time rather than to build in PHP. PHP has almost always had a poor security record at best, with Oracle Apex it has an excellent security out of the box and can add to that security base with minimal effort (protection against cross site scripting, protection against SQL injection, session state protection, custom authentication/authorization schemes, data encryption). Another consideration to Apex is the maintainability of the site. PHP code grows to extreme proportions quickly (again, because it is essentially a blank slate) and the only way to manage that code is to do an extreme amount of documentation. Apex splits code up in a nice visual format that separates validations, widgets, and regions on the page (which also allows to leave a comment for each piece).

Regarding Apex and PHP, what's already been said: Apex is a framework with a lot of pre-supported objects and a fully-supported environment, with PHP, it either have to code everything by hand or surf the forums for code snippets to achieve the functionality. PHP will allow you slightly more control at the cost of development time. Apex gives a robust development environment and native database support out-of-the-box. Setting things up from scratch using PHP, it is important to install the PHP add-ins to whatever web server used and define database connections.

2.9 Conclusion

This chapter provides the background for both the exploratory and in-depth research of the software project management. This chapter emphasized on the different project management software and their functionality, which helps to understand the importance
of the software project management and its functionalities. The software products that will be used for this research were defined. The service provided by the Longbridge Consulting Sdn.Bhd were defined in order to understand the business point of view of the company. The importance of this chapter is to understand and review the existing software project management in order to fulfill the criteria of the software project management.
3.0 CHAPTER 3 – METHODOLOGY

3.1 Introduction

This chapter describes the methodology chosen for this Project development. Methodology is a collection of procedures, techniques, principles, and tools that help developers build computer system.

Research methodology will be used during the application development phase. Research methodology involves the use of qualitative data such as interviews, direct observations, survey and analysis of documents and material. Questionnaire and documents review are the research method used for developing this project prototype application.

3.2 Research Methodology

There are various methods in collecting information or more precisely data gathering. It can be carried out by searching the related topic literatures, white papers, technical papers, marketing reports, conferences proceedings, product data sheets, product brochures, web pages, project focus groups, conducting interviews with experienced personnel, distributing questionnaire, or even communicate to people. The research methods used for this dissertation purpose are the review of literatures and books from the Internet, unstructured interview and data gathering by distributing questionnaires. It is important to know the consumers’ experiences and personal preferences and by doing these will definitely contribute greatly to the development of this software prototype application.

There several different types of activities that needs to perform in order to complete the research as shown in figure 3.1 below:
3.2.1 Data Gathering

Gathering data is a frequent part of solving problems and satisfying curiosity. To look up information to answer a question or to formulate new questions, to conduct surveys and draw conclusions from them, in order to gather and analyzing data. Theoretically, this research is based on the select perspective and other people’s previous research work and studies, which covers and focuses on all the aspect of SPMA. The notion of SPMA and its framework are studied and analyzed to suit the new development. Additionally, all the ideas in SPMA related materials such as journals; Internet, newsletters, articles, questionnaires, textbooks and Interviews have been extracted and analyzed to generate new ideas and thoughts. The availability automated tools excel, spreadsheet and forms, which have been gathered from the Longbridge Consulting Sdn Bhd are used as reference to identify the weaknesses of the discipline, because the practical approach is the best way to learn on how the system works. All the information gathered has been studied, and they have been classified as the primary and secondary data. Formulas, standards and procedures are specifically identified from the SPMA framework. Only relevant standards and procedures are identified, gathered and interpreted to fit the new system.
3.2.1.1 Unstructured Interview

Unstructured interviews have been used in this research to gain a general understanding of the requirements from the project manager’s point of view on the development of project management software prototype application. An informal discussion with the company employs has been done, by allowing the discussion to be open. The reason to choose unstructured interviews for this research is because unstructured interview are flexible, simple, informal and time saving when preparing for the interview. Interviewer also has the freedom to change some questions or the sequence of the questions according to the responses or reactions from the interviewees when having the face-to-face discussions.

Face-to-face research method was chosen to use, such as interviews, as well as opportunistic observation, to gather data. This approach was necessary because to gain a broad understanding of the system, which necessitated open-ended, semi-structured questioning techniques. Since the answers could be ambiguous face-to-face questioning needed where feedback was immediate. Few staff members of Longbridge Consulting Sdn Bhd were interviewed and each interview taking 10-15 minutes. Notes were taken during and after each interview. Interviewed a cross section of staff — analysts, managers, developers and testers, interview questions are stated in appendix a — interview questionnaire.

3.2.2 Design and Coding

The design phase is concerned with describing how the system is to perform its task so as to meet the new system requirement. In this research project, the design is divided into two parts of an iterative process. Conceptual design enlightens the user on what the system will perform whilst the technical design is a translation from the conceptual design, but it provides a more detailed description in assisting a system developer to
understand the actual hardware and programming language needed to solve the problem. In this research project, the conceptual design gives attention to the system functions whereas the technical design expresses the form the system will take including the hardware and software aspects.

The design phase is where the business requirements start to be translated into an IT solution. Fundamental decisions are made in terms of the underlying technology. For instance, will this be a web application or client/server, will the development require visual basic or java, and will this system use SQL server, oracle, or DB2. The technology utilized will be based on the needs of the project and the current technology architecture used by the company. Online processes are translated into screens and workflow definitions. Batch processes are defined. Online screen and report layouts are built. Basically, the entire solution is built on paper (or using design tools) in a deliverable such as a Technical System Design Report. When this phase is completed, the solution can be turned over to the programmers to start implementing the solution in code.

The other thing that happens at this point is that the high-level strategy documents prepared earlier are fleshed out into more detailed planning documents. For instance, the training strategy is used as input to create a training plan. The training plan describes in detail what classes will be built, who will build them, who will teach them, who will be taught, where the training will be held, what the outline of the classes is, and so forth. In essence, just as the solution is designed, the training is also being designed in detail. Likewise, a testing plan, data conversion plan, and implementation plan are created to guide the detailed activities necessary for construction.
3.2.2.1 Capturing System Requirements

In software engineering, the first important thing is the need to understand what the system is supposed to do. To determine the functional requirements for a system is to identify its data flow. Data flow diagrams are used during the analysis phase of a project to identify and partition a system's functionality. Unneeded functionality should be avoided, as they are the biggest waste in software development since it makes not just the analysis phase but also every following phase longer (Poppendieck, 2003). This model also serves as the foundation for all other development work. Data flow diagrams partition the system into a set of logical, minimally related pieces, each of which describes some ways in which the system will function.

3.2.2.2 Coding

The construction phase is the development process for many developers. (It is also the start of the development process for many unsuccessful projects) Now the solution starts to be implemented in code. The programming language that will be used in this application is PLSQL and user interface will be in oracle’s newly enhanced tool known as oracle APEX. Each developer will be unit testing as the application is being developed. The primary goal of unit testing is to take the smallest piece of testable software in the application, isolate it from the remainder of the code, and determine whether it behaves exactly as expect. After unit testing, the testing plan, which describes integration testing, system testing, and user acceptance testing guide the testing process. Application developer will do integration test. The purpose of integration testing is to verify functional, performance, and reliability, which also includes some kind of behavioral as well as structural testing. System testing will be performed after the system is implemented. Testers usually will try to break the system by entering data that may cause the system to malfunction or return incorrect information. Once the system
testing will be over user acceptance testing will take place. User Acceptance Testing is often the final step before rolling out the application. Usually the end users who will be using the applications test the application before ‘accepting’ the application. This type of testing gives the end users the confidence that the application being delivered to them meets their requirements. This testing also helps nail bugs related to usability of the application.

### 3.2.3 Testing and Evaluation

Testing is conducted by performing a validation of the implementation, to show if it complies with the original requirements, specifications and design. Following are the next steps to be performed in this research after system is ready.

- Unit testing
- Integration testing
- Systems testing

The developer will do unit testing and integration testing during the development phase, as it is easier for them to rectify the error and fix them back at the same time. The end users will do system testing based on the test scripts, which will be given to them once the development phase is over. If any error occur during the system-testing phase it will be recorded and send back to developer for a fix.

At this point, the fully tested solution is ready to be implemented. This could be as easy as saying that system is now live or it could be as complicated as integrating a complex series of related applications across multiple locations. Implementation could itself be huge. However, if any one created an implementation strategy and implementation plan up front, this now becomes a matter of execution. Implementation may still be complex, but at least it doesn’t have to figure out everything from scratch. Depending on the
timing of the project, someone may also be training at this point, but again, it’s all in line with the training plan.

### 3.2.4 Implementation

Implementation is the final step towards the newly developed system. This involves the process of replacement of the existing system with the newly proposed and designed system. The various methods available for the accomplishment of this purpose are:

- Direct approach
- Parallel Approach
- Pilot Approach

The system will be implemented using parallel approach. In this approach, the existing system continues to function in parallel with the new system so that results generated by it can verify. Once the organization become fully satisfied with the functionality and output of the system, then old system will be discarded.

#### 3.2.4.1 Parallel Approach

The parallel approach is the recommended approach for the new system implementation. Parallel approach is the smart and safe implementing approach, which would work in the light of the working environment. The current system, which is running, would run as previously and the new system would enter the previous data of the system. Both the existing and the new system will run side-by-side, for sometime. Results of the two systems will be compared to provide both protection and control. The length of parallel operation can vary. Usually the old system will retain through one or two processing cycles with the new system. Parallel operations will provide users a chance to become comfortable with changes before old methods disappear. This method will also provide an opportunity to establish the improvement of the new system. Most
important of all, parallel approach, involves the least risk and the most protection of the organization. The next step would be that the system would take the regular producing data, although the data would be entered in manual system as well as the new system. The old system report is the correct one and the new system report must be up to the standard of the old report.

Now that application is complete, the next step is to deploy it. Typically, developers create applications on one server and deploy it on another. Although this approach is not required, it enables us to resolve bugs without impacting the production instance.

### 3.2.5 Analysis and Result

The purpose of the analysis is to define and communicate the goals and objectives that will steer the project. The analysis allowed us to understand the project management process and issues facing by project managers during the software development process. This analysis also helps the researcher to use the appropriate methodology. Interview review and interaction with the users gave broad rage of understanding of the system and how the process is processed during development phase. As a result most of the candidates were desire to follow general capabilities in project management tools.

- Multi-user capability.
- Multi-project capability and support.
- Easy–to-use, intuitive and quick to learn.
- Less cost, Scheduling, resource and reporting capabilities.
- Flexibility - ability to integrate user-defined parameters.
- Interoperable with Desktop tools.

Results shown in table 3.1 were been observed during the interview and personal interaction with the users in different places.
### Table 3.1
**Results**

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<th>Capabilities</th>
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<tr>
<td>Multi-project capability and support</td>
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<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>Easy-to-use, intuitive and quick to learn</td>
<td>72%</td>
<td>15%</td>
<td>5%</td>
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<tr>
<td>Less cost, Scheduling, resource and reporting capabilities</td>
<td>57%</td>
<td>23%</td>
<td>20%</td>
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<tr>
<td>Flexibility - ability to integrate user-defined parameters</td>
<td>65%</td>
<td>15%</td>
<td>30%</td>
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<tr>
<td>Interoperable with Desktop tools</td>
<td>65%</td>
<td>15%</td>
<td>30%</td>
</tr>
</tbody>
</table>

#### 3.2.6 General Discussion

Most current business undertakings are supported by the software applications. The quality, effectiveness and efficiency of these applications determine the success or failure of many business solutions. As a result, businesses often find that they need to obtain a competitive advantage through the development of the software development that supports crucial business activities. The quality of the software development process plays a key role in the quality of the software implementation. Improvements in the development of project management software can therefore result in a significant improvement in software quality (Schwalbe, 2006).

#### 3.3 Conclusion

This chapter contains the methodology, which describes the approaches and procedures used during this research project in order to develop guidelines for the development of the proposed automated tool.
The plan provides the functional requirements of the tool and a simple but sufficient to develop the tool accordingly. It details in dataflow diagram how the user will use the tool to accomplish different tasks of data preparation, which are organized into independent modules as illustrated by dataflow diagrams. The main activities are analysis, design and coding. In the coding phase only one types of programming are involved SQL and PLSQL programming is used to build application and the user-interface using oracle APEX.
4.0 CHAPTER 4 - ANALYSIS AND DESIGN

4.1 Introduction

This chapter discusses about the proposed system analysis and generates the possible models. In analysis phase, the analyzer can understand the needs of the system requirements. The analysis process has to be done properly because many errors in developing systems come from insufficient analysis. Then, it discusses data model design for the system based on the user requirements to develop the fully functional system. In the next stage, the system architecture for system prototyping will be produced.

In the first section, the requirement analysis of the Software Projects Management Application (SPMA Tool) is presented. DFD is used for elicitation of the requirements of the Software Projects Management Application. DFD are grouped under the related perspectives and briefly described. In the second section, the design of Software Projects Management Application based on the requirements is presented.

Firstly, modules of the Software Projects Management Application is given and explained in the Module Decomposition section. Also classes of modules that realize the use cases identified in the requirement analysis are explained. In the Data Decomposition section, the database tables used in each module is given and explained.

4.2 System Analysis

The main two components in the system analysis are requirements specification and requirements structuring. Requirements specification is divided into several parts: user requirements, hardware requirements, software requirements, functional requirements and non-functional requirements.
DFD, Context diagram, and ERD are techniques used to represent requirements structuring and it gives a clear description of the system for both user and system developer.

4.2.1 Requirements Structure

Requirements structure is a method, which structures the data and information gathered and it gives a clear description of the current system operations and the new system requirements by modeling it in diagrams form for easy determination and understanding. Ensure that all project phases and requirements are identified, executed, evaluated and closed. Its disciplines, methodologies, and management practices are the building blocks to developing sound plans, organizing work, and making optimal use of available resources (Turner, 1999).

The author has defined two structuring methods for this research, which are process and conceptual modeling.

4.2.1.1 Process Modeling

Process modeling represents the processes involved in a system graphically in the form diagram. Functional decomposition is the basic technique for process modeling. Process models may be used to show the principal activities and deliverables involved in carrying out some process.

The following design models of Software Projects Management Application were prepared to show an overview of the system structure, how sub-systems share data, how they are distributed and how they interface with each other:
The Context Diagram

The Context diagram is related to dataflow diagram, wherein a single bubble represents the entire system (Figure 4.1). The context diagram highlights several important characteristics of the system:

- The people, organizations, or systems with which the system communicates.
- The data that the system receives from the outside world and that must be processed in some way.
- The data produced by the system and sent to the outside world
- The data stores that are shared between the system and the terminators.

These data stores are either created outside the system and used by the system, or created by the system and used outside the system.

Figure 4.1
Context Diagram
4.2.1.2  Conceptual Data Modeling

Conceptual Data Modeling is the first stage in the process of top-down database design. This model is used to show definitions, structures and relationships between data. Data model is important and it needed for data elements in database design, programs and even the user interfaces. It should make it easy to see the overall picture of the organization. An Entity relationship model (ERD) is used in this research.

I) Semantic Data Model:

Semantic data models define the logical form of the data processed by the system. Using entity-relationship model, the logical data structure is defined as a set of tables in a relational database, with some tables having common keys.

The database defined for Software Projects Management Application follows the rules of data normalization. Data normalization is the process of defining tables properly to provide flexibility, minimize redundancy and ensure data integrity. The goal was to design database tables to save space, minimize duplication and protect the data to ensure its consistency (Post and Gerald, 1999). Complete ERD diagram for software projects management application (SPMA) system are stated in appendix b – erd diagrams.

II) Data Decomposition

The following database tables are designed:

- **SOFTPROJ_COMPETITIVE_RELEASES**: This table keeps competitive releases.
- **SOFTPROJ_CONTRIBUTORS**: This table keeps contributors information
- **SOFTPROJ_MILESTONES**: This table keeps the milestones Information of the project.
- **SOFTPROJ_ORGANIZATIONS**: This table keeps the information for organizations.
• SOFTPROJ_PROJECTS: This table keeps the project information.
• SOFTPROJ_TASKS: This table keeps the tasks information.
• SOFTPROJ_TASK_HISTORY: This table keeps history of projects.

4.2.2 Requirements Specification

Requirements specification is done to help them to understand the system and it can be used as reference for developing the Software Projects Management Application System. Once the requirements can be determine for the proposed system then the development of the system can be done successfully.

An interview (see appendix a – interview questionnaire) was conducted with the staff at Longbridge Consulting Sdn.Bhd, in light that the staffs have worked on numerous different projects previously. Based on the feedback obtained in response to questionnaire queries in regards to software development projects it have been noticed a prevailing trend whereby more often than not most of the projects were delayed. One of the causes for the delays was that the project scheduling was not documented properly, as found that there were also some flaws of assigning tasks, managing new updates and milestones that affect the project deadline. There was basically a very limited management on projects.

Ultimately through integrating “Web-based Software Project Management Application” into the Software development lifecycle, project managers will be better able in tracking and controlling the project. Furthermore by analyzing and evaluating problems in both current and past projects will benefit project managers in the long run with future project estimation, tracking projects assets and controlling the effects of changes in project requirements - thus reducing overall delays and failure in meeting deadlines.

As stated above, there exist many problems in software project management. As noticed that one of the reasons of these failures in software projects is related with the
difficulties of software project planning. One of the problems of software project planning is improper project scope definition. In some cases, boundary of the project scope may not be defined correctly. This improperly defined boundary may change throughout the project life cycle. This change causes the waste of the effort spent for the parts extracted in the new scope. Because of being useless of their previous works, the project member becomes frustrated and unmotivated.

Another problem is related with the task assignment process. During software project planning, in most cases, tasks are assigned to the project members directly by the project manager. Generally, project managers do not know details of the tasks. Therefore, assigned tasks may not be in sufficient detail and/or may not be completed in the specified time. Since the task assignments are prepared without taking the opinion of the developers, they shift responsibility of uncompleted tasks to managers.

For a project to success, a well-defined project plan is essential. To say that a project plan is well defined, the most important parts of the plan, which are the project scope, schedule and task assignments, should be well defined. To prepare such a project plan, firstly the boundary of the project scope should be defined concretely. Then project scope should be decomposed in to the project tasks. To make the project plan well defined, realistic and achievable, the project members, who know the details of the work, should participate in preparation of the plan.

Nowadays, the number of software projects developed in a distributed environment increases. In such a situation, to provide the contribution of the project members to project planning, software project planning activities could be performed in a distributed environment. Another necessity is to utilize the organizational processes while preparing the project plan. For software project planning, most of the development activities may be similar for different projects. These activities may be defined at the organizational level to be used later in the project planning.
As a result, preparing a well-defined project plan is a large and complex process. It is not an isolated process from the project members; it is most often the result of a collective effort. It begins before technical work starts, continues as the development evolves and ends when the software delivered. To provide the individuals’ contribution, it is required to include them into project planning process. In this study, focus was on developing a software project management application (SPMA). This application enables more than one people prepare the different parts of the project scope, schedule and task assignments by utilizing the organizational processes.

4.2.2.1 User Requirements

A good set of requirements is needed for any project, especially computer system projects, to be successful. This is where many projects fail, in that they do not specify correctly what the system should do. Main requirements of software projects management application (SPMA) are:

- Projects management application (SPMA) system should enable the staff to access application by login into system using valid username and password.
- The user interface should be simple and easy to use.
- The system is available in a website in an Internet environment.
- The system should enable the staff to create and update project data details according to their access grants.
- System should enable the staff to update and delete any module according to their access grants.
- System should able the user to see some information of the each projects at any point of time anywhere in the world.
- System should be able to generate reports in excel or .CSV format.
- System should be able to display the completion of percentage on dashboard.
4.2.2.2 Functional Requirements

Functional requirements describe what a system does or are expected to do. It is often referred as its functionality (Bennett et al., 2002). It is the activities that the system must perform. The basic functional requirements in this system are:

- Allow the registered staff to login into the system.
- Allow the staff to create and update project.
- Allow the staff to add new projects and insert their related information in all the sections.
- Allow the staff to create and update tasks.
- Allow the staff to create and update milestones.
- Allow the staff to give the access and grants for different users.

4.2.2.3 Non-functional Requirements

Non-functional requirement are those that describe aspects of the system that are concerned with how well it provides the functional requirements (Bennett et al., 2002). The basic Non functional requirements in the system are as follows:

- The user interface should be simple.
- Ease to use of the Graphical User Interface (GUI).
- Able to connect to WAN network via Internet environment.
- Security considerations: an authentication and authorization process is vital to Software Projects Management Application (SPMA)
- System to protect its use from unauthorized users to access the Projects information.
4.2.2.4 Data Flow Diagrams

In a data-flow model, the subsystems process their inputs and produce outputs. Data flows from one to another and is transformed as it moves through the sequence. The rounded rectangles represent sub-systems that may themselves be complete programs. Rectangles are used to represent data stores and circles mean user interaction.

The data-flow models of Software Projects Management Application show the intuitive way in which people think of their work in terms of input and output. It also show the data process in different levels according to degree of abstraction required. It contains the main process and shows the interfaces between the system under development and the external entities. Complete DFD diagrams for software projects management application (SPMA) system are stated in appendix c – dfd diagrams and appendix d – detailed dfd diagrams.

4.2.2.5 Hardware Requirements

To develop the Software Projects Management Application (SPMA) System, following hardware is recommended to support the system. The following are the minimum requirements for this project:

- Intel Pentium III and above.
- 20 GB Hard disk.
- 512 MB RAM.
- 17” SVGA monitor.
- Mouse.
- Keyboard.
4.2.2.6 Software Requirements

Software requirements are must haves. What is required for the applications to run properly and what is necessary in order to make the application successful. A software requirement is a comprehensive description of the intended purpose and environment for software under development. A software requirement minimizes the time and effort required by developers to achieve desired goals.

- Windows 98 and above, or Unix or Linux operating system.
- Oracle Apex with 10g expresses database.

4.3 System Design

This defines the process or art of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. One could see it as the application of systems theory to product development. In the logical design and physical phases, the author is concerned on the creation of the software projects management application (SPMA) system while implementing the requirements and constraints gathered during the analysis phase.

Starting up a project, including key tasks such as understanding the basic business requirement and whether the project offers a viable and worthwhile option, appointing project staff (including where appropriate the roles of project board/executive, project support, project management team and project manager) and preparing a project brief.

The essential principles included are:

- Achieving a general understanding that the project needs the right people in place, with the authority, responsibility and knowledge to make decisions in a timely manner.
- That the interests of all main parties are reflected, and offer the required range of resources and skills to see the project through successfully.
• That project managers/project management teams understand and agree upon what they are responsible or accountable for, and are clear on to whom they should report.

• Those areas of individual responsibilities will collectively cover all aspects of project management.

• That the project needs to start with a reliable high level brief incorporating a statement of requirements and expectations and based upon consistent and adequate information.

• The brief should cover what, why, how and when things should be done and who should be involved in the process.

• The final plan for achieving the requirements and expectations will be determined by the choosing of the best approach. Examples range from using past experience, existing delivery or internal development from scratch, through to approaches that use external expertise or ‘off the shelf’ purchases.

Initiating a project involves laying the ‘foundations’ for successful fulfillment of project requirements and expectations. Key principles included are:

• That all parties understand the importance of a well-managed project.

• That staffs are committed to producing a well-managed project, and that this commitment is built by the parties understanding the project aims, rationale/need, method, risks, and of their role in achieving project success.

• That the project manager understands the level of expectations surrounding the project and that project parties reach agreement on both this level of expectation and the means of assessing its achievement.

• That the timescale, resource requirements (costs) and potential risks are suitably established and that countermeasures are devised for risks.
• Stressing the importance of asking: ‘why something should be or is being done’ and refining the business case as appropriate.

• Establishing a monitoring framework by asking what level of monitoring is required and how is it to be achieved.

• The importance of an efficient storage and retrieval system for project information. An appropriate filing system should be established for expected levels of information that will be produced.

4.3.1 Logical Design

Logical design is the development of the software projects management application (SPMA) system based on understanding of how the system will operate. During this phase, the users will know how the system will look like. The author will describe all the systems inputs, outputs and interfaces that will appear in the system and display through diagram a brief view of the proposed system to the user. In logical design, the author is only concern in designing and developing interfaces reports, and message dialogues based on user requirements and priorities to create the interfaces, reports, and message dialogues.

4.3.1.1 System Interface Design

Interface design is very important for the user because the user often judges the quality of the system with it. The system has a friendly user interface. This interface has real coordinated Projects that provides useful and relevant information for the users. Some layouts interface design is given below. To see a full scale of User Interface Design, please refer to appendix e- application test results.

Figure 4.2 below shows the interface of the login screen of the software project management application.
As in Figure 4.3 below shows the dashboard of the software project management application with the details of the all projects currently stored in the software project management application. This interface will be displayed once a valid user logins successfully.
4.3.1.2 Databases Design (Logical Data Modeling)

In the first stage of logical modeling the conceptual schema will map the logical schema. The conceptual schema done in the analysis phase and the author designed the logical structure of the system to capture the essential data that needed to be stored. But this is not the final phase for database design. The logical schema becomes to a normalized representation of the conceptual schema by minimizing redundancy in the data and leveraged relational concepts.

An important aim of a database system is to guarantee database consistency, which means that the data contained in a database is both accurate and valid. Integrity constraints represent knowledge about data with which a database must be consistent (Ibrahim, 2001).

The 1NF, 2NF, 3NF, and BCNF steps of Normalization were applied onto data model relations whenever necessary. The database relations, attributes, and primary keys were determined at the end of this operation. Therefore, the tables are normalized. The
logical structures of the database table keys are shown in table 4.1 and table structures are shown from figure 4.4 to figure 4.7 below.

Table 4.1  
**Database table Keys**

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                                                2) Project id           |
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                                                3) Feature id           |
|                               |             | 3) RELEASE_ID     | 2) Feature id                                                   |
| SOFTPROJ_COMPETITIVERELEASES  | 1) ID       | 2) PRODUCT_ID     | 1) Competitive release id  
                                                2) Project id           |
| SOFTPROJ_CONTRIBUTORS         | 1) ID       | 2) ORG_ID         | 1) Contributors id  
                                                3) Project id           |
|                               |             | 3) PRODUCT_ID     | 2) Organization id                                             |
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                                                2) Project id           |
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|                               |             | 3) FEATURE_ID     | 2) Project id                                                   |
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                                                2) Project id           |
| SOFTPROJ_TASK_HISTORY         | 1) ID       | 2) PRODUCT_ID     | 1) History id  
                                                3) PROJECT_ID           |
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**Figure 4.4**
Table structure

**Figure 4.5**
Table Structure-cont
### Figure 4.6
#### Table structure-cont

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#### Figure 4.7
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4.3.2 Physical Design

Physical design is often concerned with databases, programming and development of the system environments. During this time, this research tries to design the most appropriate design that will satisfy the requirements gathered by the users and their system internal and external environment. An ERD data model (shown in appendix b) shows a physical design of the system.

4.4 Conclusion

The purpose of this chapter is to present the software requirements analysis of the software projects management application by using Oracle’s best-kept secrets Oracle APEX, Because Oracle Application Express resides in the Oracle database, it has minimal impact on network traffic. Plus, Application Builder includes a large number of monitoring reports to enable user to identify and tune application performance. The Software Projects Management Application shall meet both functional and operational requirements. This research has defined and specified the data requirements, structure, and system design. Requirements structure has been defined by DFD, data dictionary and ERD techniques. By setting a clear requirement for the system it can prevent determine the scope in future and it can be used to measure the performance of the system and find out of the system developed had met with the previous planned.
5.0 CHAPTER 5 – SYSTEM PROTOTYPE AND TESTING

5.1 Introduction

This chapter covers the system prototype and testing of The Software Projects Management Application. The SPMA is a basic Project / Task tracker. User can manage multiple projects along with their associated releases, tasks, milestones and features. The Dashboard is available from the upper right of every page. It can display a Graphical View or Report View. The Report View list Open Tasks, Past Due Tasks, Open Milestones and Categories all assigned to the currently select person. Although contributors are defined per project, if user uses the same names, the report will show a consolidated list of open actions. The Graphical View contains a chart depicting open tasks.

5.2 System Prototype

The principle of this system prototype is to help users to understand the purpose of modules in the system. There are five main modules and a dashboard titled as “Home”. The modules contain titles as “Project”, “Tasks”, “Features”, “Milestones” and “Releases” as these are discussed below.

a. Home

This screen “Home” is the dashboard of software project management application, which shows status, tasks, features, milestones and releases of all the projects that are recorded in the system as shown in figure 5.1 below. The purpose of this screen is to help project managers to view all the projects and their details in a single screen, which will help to get an idea about each projects progress.
b. Project

This screen “Project” of software project management application shows the details of the project. Description of a project is stored in this screen, which can be viewed, updated and created at any point of time as shown in the figure 5.2 below. The purpose of this screen is be able to create, view and delete a particular project as this is an important part of the project management application, all the other modules is dependent on this module.
c. Tasks

This screen “Tasks” of software project management application shows the details of the Tasks. Each project have different task and those tasks need to be stored, as this screen allows to store, view and edit tasks at any point of time for a particular project as shown in the figure 5.3 below. The purpose of the screen is to store the information of a particular task for a particular project, and user should be able to make changes at any point of time, as this screen will capture information about each task for a particular project and who is assigned for a particular task. Start date, target date and actual date of a task is also captured in this screen, which will help project managers to make decisions for future action. User also can extract the data in a CSV file format from this screen for the recording purpose.
d. Features

This screen “Features” of software project management application shows the details of the features of a particular project. Each project have different features which need to be stored, as this screen allows to store, view and edit features at any point of time for a particular project as shown in the figure 5.4 below. The purpose of this screen is to capture the features of a particular project, as each project will have different features which need to be capture for the future development purposes by doing so the project manager will be aware of the feature that have been build.
e. **Milestone**

This screen “Milestone” of software project management application shows the details of the Milestones of a particular project. Each project have different Milestones which need to be stored, as this screen allows to store, view and edit Milestones at any point of time for a particular project as shown in the figure 5.5 below. The purpose of this screen is to capture the milestones of each project so the project will be accomplished on time or to make discussions if some one misses the milestone. This screen is important as it capture actual date for each release. This screen also shows the days out for a particular milestone, it means if the job is not finish on time the screen calculate the number of days delayed from the actual milestone date, which also will help project manager to enhance the project plan accordingly. This screen also has a calendar to select from for a milestone so that user will know about the day and date of a selected milestone.
f. Releases

This screen “Releases” of software project management application shows the details of the Releases of a particular project. Each project have different Releases which need to be stored, as this screen allows to store, view and edit Releases at any point of time for a particular project as shown in the figure 5.6 below. The purpose of this screen is to capture the releases of a particular project. This screen will be able to show the release date, description of a release and number of days that release has been delayed. This will help project managers to manage the release and keep the project information for the future planning.
5.3 Software Projects Management Application (SPMA) System Architecture

The selection of system architecture or development approach can be critical in ensuring that a system will meet changing demands of an organization. The system architecture for implementing this project is Web based Oracle Apex application system. The Software Projects Management Application (SPMA) System architecture is depicted in Figure 5.7.
Developers: developers are programmers who program or enhance the application based on the requirements.

Administrators: administrators are the people who administrate and monitor an application. Administrator has the authority to grant the access to end-users.

End users: end-users those who run the application.

Software Projects Management Application (SPMA) System architecture consists of Oracle Application Express with oracle database and is comprised of data in tables and PL/SQL code. Whether anyone is running the oracle application express development environment or an application anyone built using oracle application express, the process is the same. Browser sends a URL request that is translated into the appropriate oracle application express PL/SQL call. After the database processes the PL/SQL, the results are relayed back to your browser as HTML. The application session state is managed in the database tables within application express. It does not use a dedicated database connection. Instead, each request is made through a new database session, consuming minimal CPU resources.
Oracle HTTP Server (Apache) and the embedded PL/SQL gateway the version of oracle database used determine how the URL is translated.

Versions before to oracle database 11.1 require oracle HTTP server (apache) with mod_plsql. The following illustration shows that architecture.

With oracle database 11.1 or higher or oracle database 10g express edition, oracle HTTP server (apache) can be removed from the architecture and replace it with the embedded PL/SQL gateway. The following illustration shows the architecture using the embedded PL/SQL gateway show in Figure 5.9.

The embedded PL/SQL gateway provides oracle database with a web server and also the necessary infrastructure to create dynamic applications. The embedded PL/SQL gateway runs in the XML DB HTTP server in the oracle database and includes the core features of mod_plsql, but does not require the oracle HTTP Server powered by apache.
Inclusion of the embedded PL/SQL gateway simplifies the architecture and eliminates the middle tier. Most common browsers are supported (Microsoft, Netscape, Firefox, Mozilla). Applications can be developed and run anywhere where there is connectivity.

5.4 Software Projects Management Application (SPMA) Modules

Effective Software project management is central not only to project performance, but also to performance on the industry level. The principles of project management are applicable at all levels of the project hierarchy, ranging from individual work packages through to the provision of a single point of responsibility on behalf of the client. Different techniques and skills are applicable at different levels. The project manager who manages the entire project on behalf of the client must be able to co-ordinate teams of professionals from diverse backgrounds. In figure 5.10 are the following modules of the web-based software project management system.

![Software Project Management Modules Diagram](image-url)

**Figure 5.10**
Software Project Management Modules
a. Project

Project management has become the corner stone of youth organizations development but not the only way to run and manage an organization or institution; it is one of the tools for organizing tasks and pursuing concrete objectives and can be compared with and distinguished. Software projects allows user to manage multiple projects. Project details include a description, the default release, status, and list of contacts. This module allows users to store the project information into the database and allow users to update, delete and view the information any time anywhere.

b. Tasks

A task is a unit of work that will be assigning to a project member. In each project there will be more than one task, in this module system will allow user to create, edit, view and update task’s for the projects that has been created at any point of time.

Tasks are the real meat of the application. Each task has a name, priority, category, release, assignment, various dates, number of man-hours to complete and a description. User can also map it to a feature that it is in support of. Search tag is a free-form text field that allows user to enter any strings that will enable user to further category tasks. Below task details there are areas to track documentation impact and provide verification instructions along with tracking the person reviewing the task and the date on which it was reviewed. Most of the attributes of a task are optional. User can use as much or as little as the project requires.

c. Organization

An organization is a group of people who work together; in a company there will be different type of organizations i.e. Development organization, Quality assurance organization and many more. Organizations are used to categorize contributors. They
are not specific to a project but used by all projects. This module stores the information of organization for each task, which can be edited, and view at any time.

d. Contributors

An entity is responsible for making contributions to the content of the resource. Examples of contributor include a person, an organization, or a service. In each task there might be different contributors, this module allows user to create and maintain the contributors that are referenced by the tasks and milestones. Contributors are specific to a project but for a task, user can enter a person for assigned to or contributor that is not already defined as a contributor. This module also allows users to stores the information of each contributor and user will be able to create, view and delete the contributor depending on the user’s request.

e. Categories

Allows users to create and maintain the categories that are referenced by the tasks. Categories are specific to a project. Categories answer the question "What is this item or page" and are used to classify content, for example, sales reports, action items, tasks, corporate icons and graphics, and location maps are all examples of typical categories. For every item, tasks or page that user create, user can assign it to one category. The purpose of categories is to enable users to quickly display a listing of a particular type of content. Categories are used to organize tasks into logical groups.

f. Features

Features allow user to detail features of an application. Features can then be linked to tasks to show that a task is in support of a certain feature. Features are hierarchical in nature and have a status of their own. User can identify the release in which the feature
was introduced. That allows user to track the growth of a project or product over time. If user specifies to publish a feature, it will then be displayed on the Printer Friendly View. In addition to being mapped to tasks, features can also be mapped to comparison releases. This allows user to define either releases of a product or a competitive release and identify how the product compares. When user defines a feature, all the comparison releases that have been defined for the current project are displayed. User can either set the availability to yes, no or text. Yes will display a checkbox in the feature report, no will display a red x and text will display whatever text user enter under description.

g. Milestones

Milestones are specific to a project and can be associated with a specific release. Milestones allow user to specify certain events in the project that are not tasks such as feature complete, ready for internal testing. Milestones display on the tasks calendar but there is also a specific milestone calendar that displays only milestones for a selected release.

h. Releases

A release is a group of one or more files that are published as a unit. Each release can have a maturity level attribute to describe its state of completeness. Maturity levels are predefined and include development build, alpha, beta, and general availability. Releases are specific to a Project and allow user to group tasks together. Releases are especially helpful for projects to develop software. Releases allow user to define iterative releases and then track tasks and features against those releases.
5.5 **Product Perspective**

The “Software Projects Management Application” will be developed in oracle apex. This tool is an oracle scaled down version of oracle portal. It's a powerful and easy way to quickly develop a database-centric HTML web application. It is easy enough to use that “power users” can develop smaller user-friendly applications, and full time developers can create some very impressive applications.

Oracle application express is a rapid web application development tool for the oracle database. Using only a web browser and limited programming experience, professional applications can develop that are both fast and secure. Thanks to built-in features such as user interface themes, navigational controls, form handlers, and flexible reports, oracle application express accelerates the application development process. From the end user's perspective, the deployed applications require only a browser and access to an oracle database running application express.

5.6 **Testing**

Testing is finding out how well application works. In software development, testing is used at key checkpoints in the overall process to determine whether objectives are being met. The testing process is often divided into different levels or phases to make the whole process more manageable. These levels are designed to build upon each other, making the discovery of errors easier by first testing the application in smaller and less complex pieces. It is quite common to partition the testing process into the following phases:

- Unit testing
- Integration testing
- System testing
The above phases were being used to fulfill requirements of this proposed system in which unit testing and integration testing was done during development phase of the system, as it was easy for developer to rectify the errors and fix those errors at the same time. System testing was done on the basis of the test scripts shown in table 5.1 and table 5.2. The entire test script were tested and completed which is further discussed in this chapter.

5.6.1 Test Cases

Authenticate User

System should allow login only valid users, if user does not enter valid user name and password system should prompt error. Test result shown in Fig 5.11 below:

Invalid User

If a user keys in wrong user name or password the system will prompt an error as shown in the figure 5.11.

![Invalid User](image)

Figure 5.11
Invalid User
Valid User

Once the user is valid the main screen “Home” of the application will be displayed with all the projects that have been created in the system with their related information.

![Image demonstrating project management software](image)

**Figure 5.12**
Valid User

As in above figure 5.12 shows the details of each project stored in the software project management application and on the right side of the screen it displays the task related to a project which a user can click and update on any point of time. This screen also shows what is the current release of a project. Test case scripts that system should be able to perform are in the table 5.1 and table 5.2.
Table 5.1  
Test Case Scripts

<table>
<thead>
<tr>
<th></th>
<th>PROJECT</th>
<th>TASK</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>System should be able to create a Project and user should be able to insert the details of the project.</td>
<td>System should be able to create a task and user should be able to insert and assign the details of the task to staff.</td>
<td>System should be able to create the features of the each project.</td>
</tr>
<tr>
<td>Edit Details</td>
<td>User should be able to update the project details at any point of time.</td>
<td>User should be able to update the task details at any point of time.</td>
<td>User should be able to update the details of the features of the each project at any point of time.</td>
</tr>
<tr>
<td>View Details</td>
<td>User should be able to see all the details of the project.</td>
<td>User should be able to see all the details of the task.</td>
<td>User should be able to see all the details of the features of the each project.</td>
</tr>
<tr>
<td>Delete</td>
<td>User should be able to delete a project.</td>
<td>User should be able to delete a task.</td>
<td>User should be able to delete the features of each project.</td>
</tr>
</tbody>
</table>

Table 5.2  
Test Case Scripts-Cont

<table>
<thead>
<tr>
<th></th>
<th>MILESTONE</th>
<th>RELEASES</th>
<th>LINKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>System should be able to create a Milestone and user should be able to insert the details of the milestone for a project.</td>
<td>System should be able to create the release of a project and should be able to record the details of the releases for each project.</td>
<td>System should be able to create the links of the each project.</td>
</tr>
<tr>
<td>Edit Details</td>
<td>User should be able to update the milestone details at any point of time.</td>
<td>User should be able to update the releases details at any point of time.</td>
<td>User should be able to update the details of the links of each project at any point of time.</td>
</tr>
<tr>
<td>View Details</td>
<td>User should be able to see all the details of the milestone.</td>
<td>User should be able to see all the details of the releases.</td>
<td>User should be able to see all the details of the links of each project.</td>
</tr>
<tr>
<td>Delete</td>
<td>User should be able to delete a milestone.</td>
<td>User should be able to delete releases for the projects.</td>
<td>User should be able to delete the links of each project.</td>
</tr>
</tbody>
</table>
Refer to appendix e-application test results and GUI for the test result screen shots.

Once the entire system is validated, it must be combined with other system element such as hardware, end-user and databases. System testing verifies that elements are functioning properly and the overall system performance and objectives are achieved which in this case, software projects management application (SPMA) must achieve reliability, robustness, accuracy, flexibility and modularity.

5.7 Conclusion

This chapter presents system prototype of Software project management application. System architecture and product perspective are discussed in this chapter. Each modules of software project management application has been explained to understand the system prototype. Test case scripts were also been presented in this chapter for the testing purpose. The next chapter will discuss evaluation of test result of the system based on the test scripts.
6.0 CHAPTER 6 - EVALUATION AND CONCLUSION

6.1 Introduction

This chapter concludes the thesis by determining how the developed tool fulfilled the objectives and the aim. After the fulfillment of objectives and aim section, the conclusion section presents the significance and contribution of this thesis. This chapter will end pointing out the future directions of work related to the studies on the software project planning automation support.

6.2 User Evaluation

System test was carried out to get the user’s evaluation on the developed system. This is to ensure that the system has met the user’s requirement. In order to get user’s evaluation and perception on the system, an evaluation form is produced with several questions (see in appendix f), which the purpose is to get user’s information on particular part. The results of the evaluation are shown from figure 6.1 to figure 6.12 in this chapter.

6.2.1 System Functionalities

This section discussed the result obtained from the major functionality test (i.e. Create, Delete and Update a project, task, milestone and releases which is shown below from figure 6.1 to figure 6.6) and evaluation form, which focused on functionalities of the system. Below Figure 6.1 shows the percentage of user’s evaluation on the software projects management application (SPMA) to create, delete and update a project through the application.
Figure 6.1
Create delete and update Project

Figure 6.2 below shows the percentage of user’s evaluation on the software projects management application (SPMA) to create, delete and update a task through the application.

Figure 6.2
Create delete and update Task

Figure 6.3 below shows the percentage of user’s evaluation on the software projects management application (SPMA) to create, delete and update features through the application.
Figure 6.3
Create delete and update Features

Figure 6.4 below shows the percentage of user’s evaluation on the software projects management application (SPMA) to create, delete and update a milestone through the application.

Figure 6.4
Create delete and update a Milestone

Figure 6.5 below shows the percentage of user’s evaluation on the software projects management application (SPMA) to create, delete and update releases through the application.
Create, delete and update Releases

Figure 6.5
Create delete and update Releases

Figure 6.6 below shows the percentage of user’s evaluation on the software projects management application (SPMA) to see the project details in a single view through the application.

Single view Project Status

Figure 6.6
Single view of Project Status

Figure 6.7 below shows the percentage of user’s evaluation on the software projects management application (SPMA) system security based on question 1.
From Figure 6.7, about 60% respondents have agreed that the security level for the system currently represented by login process is secured in which the authentication process functioned properly.

As analyzed from question 2 which ask user’s feedback on data accuracy, only 40% of the respondents agreed that the system provides accurate data retrieval from the search mechanism used. There are 20% of respondents who are not sure with the system data accuracy (see Figure 6.8).
As analyzed from question 3, which asks users’ feedback on data retrieval, only 60% of the respondents agreed that the system provides accurate data retrieval from the search mechanism used. There are 20% of respondents who are not sure about the system data accuracy (see Figure 6.9).
Question 4, from the evaluation form focused on system effectiveness. Figure 6.10 shows a pie chart contains percentage of user’s feedback on the system effectiveness. About 60% of the respondents agreed that Software Projects Management Application (SPMA) system provides functions that increase the effectiveness in achieving its development objectives. However, 20% respondents are not sure with the system’s effectiveness.

![Pie chart showing user feedback on system effectiveness.](image)

**Figure 6.10**
Effectiveness in achieving its Objectives

As analyzed from question 5, which ask user’s feedback on system response, only 60% of the respondents agreed that the system response is fast (see Figure 6.11).
As analyzed from question 6, which ask user’s feedback on data reporting, only 60% of the respondents agreed that the system provides accurate reporting. There are 20% of respondents who are not sure with the system reporting (see Figure 6.12).
6.3 Comparison with Existing System

As far as current system in Longbridge Consulting Sdn.Bhd is concerned the project details are captured on excel sheets and data is inserted and update by the users, as there are more than one sheet ‘s for each project, which is not efficient to handle and manage. Below in Table 6.1 is the comparison between new and existing system.

<table>
<thead>
<tr>
<th>Software Projects Management Application (SPMA)</th>
<th>Longbridge Current System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data will be inserted and saved in the database through different Screen, which will be available online for everyone.</td>
<td>Data is inserted in excel sheets, and reside in one place.</td>
</tr>
<tr>
<td>Single view if the project status.</td>
<td>No single view available. User needs to view different sheet of a project.</td>
</tr>
<tr>
<td>Accessed By Multi User at any point of time.</td>
<td>Only one user can access at a single point of time.</td>
</tr>
<tr>
<td>Easy to manage.</td>
<td>Difficult to manage as the project grows excel sheet grows as well.</td>
</tr>
<tr>
<td>Faster data retrieval and better search options.</td>
<td>Time consuming.</td>
</tr>
<tr>
<td>More than one person can update Project details.</td>
<td>The organization will have to rely on one person to do updating</td>
</tr>
<tr>
<td>Everyone can have full picture of the project and will know status of each member.</td>
<td>Top management does not have the full picture of the project and does not know what each team member is busy with</td>
</tr>
<tr>
<td>All projects information is located in database and is available every time.</td>
<td>Users always need to remember where the correct file is located.</td>
</tr>
</tbody>
</table>
6.4 System Strength

Software projects management application (SPMA) Tool is a distributed project planning tool that enables more than a single person to prepare the different parts of the project scope, schedule and task assignment by allowing the use of the predefined organizational level activities and enabling the effective use of the project information through the project life cycle.

The strengths of software projects management application (SPMA) as a project management system are identified as follows:

- The software projects management application (SPMA) web-based system helps project managers to access from anywhere in the world.
- The software projects management application (SPMA) web-based system allows user to manage multiple projects at any point of time.
- Using oracle tool called oracle application express for this system as it is integrated with the database schema and internal DBMS structures, which offers reliability and faster response for any request from the application.
- Providing over all single view of the projects on its dashboard, which is good for the project managers to track the project status.
- The software projects management application (SPMA) web-based system has ability to assign tasks to a team or one or more project members.
- Reports can be generated straight away to .CSV files without having any supportive tool.
- Using oracle application express for this system, which is a more reliable, secure, and scalable alternative to spreadsheets and desktop databases.

In table 6.2 shows how the current problem has been solved.
Table 6.2
How Problem Solved

<table>
<thead>
<tr>
<th>Current Problems</th>
<th>How current problem solved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in achieving the required efficiency in their projects</td>
<td>The system will provide a single view of the projects details, as it is better for a project manager to see where and how the project is going ahead and project managers can make the changes if necessary to achieve the efficiency.</td>
</tr>
<tr>
<td>Difficulty in keeping track of their employee tasks in real time.</td>
<td>Each task will be recorded in the system and a person will be assigned to a particular task of a particular project so that it will be easier for managers to keep track of their tasks and the people assigned to each task in real time.</td>
</tr>
<tr>
<td>Difficulty in keeping track of the overall project completion status.</td>
<td>A single view details of a particular project will be shown on the dash board and all the information like open tasks, milestones, releases etc will be shown, so that it will help managers to see the project overall status.</td>
</tr>
<tr>
<td>Unable to meet planned Milestone due to unplanned problems arising.</td>
<td>Milestones for a particular project will be defined in the system according to the other important information like tasks, features etc, been recorded down. This will help managers to see where they are behind if they are unable to meet the milestone of a particular project.</td>
</tr>
<tr>
<td>Difficult to keep track of new features implemented.</td>
<td>Each features implemented will be recorded down in the system for a particular project and will be shown at any point of time.</td>
</tr>
<tr>
<td>Difficult to keep track of new releases of the software product.</td>
<td>Each new release will be recorded done for a particular project and will be shown at any point of time.</td>
</tr>
<tr>
<td>Hassle for project managers to prepare reports on project tasks and milestones.</td>
<td>By a click reports will be generated for project managers as the information is already been recorded down in the system for a particular project.</td>
</tr>
</tbody>
</table>
6.5 Limitations

No one can doubt that project management software is a great tool to help project managers save a significant amount of time. However, the tremendous power of project management software can break project manager into a false sense of security (Heerkens, 2002). As every other software, applications like MS Project are just tools; they do not execute the entire job for the project managers. It is unacceptable to expect a computer to manage the project; it just manages the amount of data that projects require to store (Verzuh, 2003). Project management software is incapable of establishing project objectives, define project tasks or dependencies, determine and manage project constraints (Richman, 2002). However, software does not replace the delicate skills of an experienced project management, which can use his experience and talent to lead a project towards a successful closure.

As oracle apex also named as oracle XE is used in this project and it has some limitations. Oracle XE is free but oracle has built certain limitations into the product. The first limitation is memory. Oracle database XE can address only 1GB of RAM. This limitation mainly affects how many users can access the database concurrently and how well it performs. The second limit is that XE will only use one CPU. XE will run on a multi-CPU computer but won't scale up to use those CPUs. This functionality requires oracle database standard edition or enterprise edition. The third limit is that only a single XE database can run on any given computer. One does not need a database for each application. Instead, oracle uses the concept of schemas to separate applications. Finally, a 4GB limit is enforced on disk space. 4GB is a huge amount of storage for most applications.
6.6 Future Directions of Work

This study results in a tool that satisfies the basic requirements of automated support for the software project planning process and provides some facilities for practical use of organizational level information. The tool may be improved in aspect of sharing project documents by integrating with the commonly used Configuration Management tools. Moreover in the organizational level, improvement to provide more detailed activity structure for the purpose of utilizing in the project schedule preparation may be performed.

- Notify all members who have been assigned if a new project schedule is created or updated via E-mail or SMS.
- Every week the system should send reminder for only those members who’s due date of their task is going to end.
- Every month Email should be send by the system to the Project Manager about the project status.
- User should be able to record the errors to the system from their respective places if they encounter any error during the application run.

6.7 Contributions

The main objectives of this thesis are to highlight the reasons for delays and incompleteness in software projects and to minimize them, attempt to reduce complexity and ensure project quality throughout SPMA development. Therefore the following are the main research contributions.

a) The need for project management tool to manage software projects: This tool may consider software project management tool specifically for software projects.
b) **Managing human resources**: **SPMA** helps project managers reduce delays and ensure project quality by providing the necessary information. These features can save a lot of time and moderate making decision, and ensures quality.

c) **Reduce problems and prevent the managers from making mistakes**: The tool helps to minimize the problems that the other projects have faced. This is done by analyzing the problems in past projects and comparing the problems in some selected projects and addressing the problems due to change in requirements.

d) **Technology issue**: Provides reports about the latest information, updated versions of the available software and these results would enormously help in saving time and effort for searching on the needed equipment and it helps to accurately estimate the project.

### 6.8 Conclusion

This thesis focused on the project management application to support project managers for their project planning. The application was developed with the intention to overcome the issues faced by the project managers during software development.

“Software Projects Management Application” makes a valuable contribution to project planning process. The “Software Projects Management Application” comprises more extensive capabilities. Therefore, this thesis is a significant study because of its contribution to reveal the deficiencies of existing project planning tools in aspect of collaborative preparation of project plan and utilizing the organizational information. As a conclusion, this thesis may be a reference to improve the capabilities of project planning tools. This thesis has represented the implementation of web based software project management application for project managers for planning software projects.
REFERENCES


APPENDIX A – INTERVIEW QUESTIONNAIRE

Interview Questions:

Software Project Management Application Survey:

Name : 
Age : 
Occupation : 

Q1: Does your company currently use any project management software Tool?

A). Yes
B). No

If “Yes” please name the program: ________________________________

If “No” Please indicate (tick) the reason/s for NOT using project management software tool (more than one can be chose):

Cost __________
Difficulty of use __________
Limitations of software __________
Not necessary __________
Others please Specify: ________________________________

Q2: Are you happy with your current project management software Tool?

A). Yes
B). No

If “No” Please indicate (tick) the reason/s for NOT using project management software tool (more than one can be chose):
Difficulty of use
Limitations of software
Lack of user friendliness
Not sufficiently tailored for business
Bugs/errors

Q3: Please rate in order of importance from 1 (most important) to 5 (least important) the following attributes of project management software Tool?

Usability/user friendliness
Extended functionality/variety of functions
Extended functionality/variety of functions
Technical support

Q4: Do you know about Microsoft Project?

A). Yes
B). No

If “Yes” Please indicate (tick) the reason/s for NOT using Microsoft Project (more than one can be chose):

Cost
Difficulty of use
Limitations of software
Lack of user friendliness
Not necessary
Others

Additional comments /suggestion:

__________________________________________________________________________
__________________________________________________________________________
Q5: Please rate in order of importance from 1 (most important) to 5 (least important) the following functions of project management software tool?

Importability/exportability  ________
Reporting  ________
Dashboard view  ________
Access for multi-user  ________
Backup’s  ________

Other functionality’s you would like to see:
________________________________________________________________________
________________________________________________________________________

Q6: Please indicate any requirement you would like to see in Project Management Tool?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you very much for taking the time to complete this form your cooperation is much appreciated.
APPENDIX C – DFD DIAGRAMS

Create Project

Figure 9.1
Create Project
Create Task

Figure 9.2
Create Task
Create Features

Figure 9.3
Create Feature
Create Milestones

Figure 9.4
Create Milestone
Create Releases

Figure 9.5
Create Releases
Create Links

Figure 9.6
Create links
Manage Organizations

Figure 9.7
Manage Organizations
Manage Contributors

Figure 9.8
Manage Contributors
Manage Categories
APPENDIX D – DETAILED DFD DIAGRAMS

Create Project

Figure 10.1
Create Project
Update Project

Figure 10.2
Update Project
Delete Project

Figure 10.3
Delete Project
View project details

Figure 10.4
View Project Details
Search Project

Figure 10.5
Search Project
Create Tasks

Figure 10.6
Create Task
Update Task

Figure 10.7
Update Task
Delete Task

Figure 10.8
Delete Task
Figure 10.9
View Task Details
Figure 10.10
Search Task
Create Features

Figure 10.11
Create Feature
Update Feature

Figure 10.12
Update Feature
Delete a Feature

Figure 10.13
Delete Feature
Figure 10.14
View Feature Details
Search Features

Figure 10.15
Search Feature
Create Milestone

Figure 10.16
Create Milestones
Update Milestone

Figure 10.17
Update Milestones
Delete Milestone

Figure 10.18
Delete Milestone
Figure 10.19
View Milestone Details
Figure 10.20
Search Milestone
Create Releases

Figure 10.21
Create Releases
Figure 10.22
Update Releases
Figure 10.23
Delete Releases
View Releases details

Figure 10.24
View Releases Details
Search Releases

Figure 10.25
Search Releases
Create Links

6.1.1 Validate Input
   - Validation Successful
6.1.2 Get Input
   - Input passed
6.1.3 Connect to DB
   - DB connection Successful
6.1.4 Insert Link
   - Received successfully
6.1.5 Close DB
   - Failed to close DB
6.1.6 Display Message

Figure 10.26
Create Links
Update Links

Figure 10.27
Update Links
Delete Links

Figure 10.28
Delete Links
Figure 10.29
View Link Details
Search Links

Figure 10.30
Search Links
Create Organization

![Diagram showing the process of creating an organization, including steps such as administrator, user, validation, input, database connection, and display message.]

**Figure 10.31**
Create Organizations
Update Organization

Figure 10.32
Update Organization
Delete Organization

Figure 10.33
Delete Organization
View Organization details

Figure 10.34
View Organization Details
Search Organization

Figure 10.35
Search Organization
Create Contributor

Figure 10.36
Create Contributors
Update Contributor

Figure 10.37
Update Contributors
Delete Contributor

Figure 10.38
Delete Contributor
View Contributor details

Figure 10.39
View Contributor Details
Figure 10.40
Search Contributor
Create Category

Figure 10.41
Create Categories
Update Category

Figure 10.42
Update Category
Delete Category

Figure 10.43
Delete Category
View Category details

Figure 10.44
View Category Details
Search Category

Figure 10.45
Search Category
APPENDIX E –APPLICATION TEST RESULT AND GUI

Login Screen

Below is the login screen for the user to key in their user name and password.

![Login Screen](image)

Figure 11.1
Login Screen

Testing of valid user

User need to key in the correct user name and password to log into the system as Screen below Figure 11.2 display’s the error message as user enters wrong password or user name.
After Valid User

Once the correct user name and password is keyed in, the application will straight go to application Dashboard where user can see all the projects with their details and their related tasks that need to be done during project management shown in Figure 11.3.

Main Screen of the Application Software Projects

User will see all the projects and their details in a single view report format on the dashboard of the application, which will be easy to maintain as all the related work can be done on the same screen i.e. View project definition, create project, delete project, Manage organization, create tasks, create milestones and other related work as for a project as shown in the Figure 11.3 below.
In the main screen user will see 7 tabs, which include view of the each project details i.e. Project, tasks, features, milestones, releases and links for a particular project.

![Project Management Dashboard]

Figure 11.3
Project Management Dashboard

Create a Project

User will be able to create or update a project and its details once successfully login. User needs to press “Create Project” button to create a new project and its details as shown in the figure 11.3. Once a Project has been created the information need to be key in as shown below in the figure 11.4 and figure11.5.

Once all the information is key in the user need to Press the “Create “ button to save the project details, user can also press the “Cancel” button to cancel the record to be saved as shown below in figure 11.4.
Figure 11.4
Create Project

Figure 11.5
Create Project cont
Once the project is created user can view the details by pressing “Project” tab as shown below in the figure 11.6. User can update the information for a particular project by pressing the “Edit Project” button or to create a new project press “Create Project” button as shown below in the figure 11.6.

![Figure 11.6 View Project](image)

**Update Project Details**

Once the “Edit Project” button is pressed user will be able to change the information of the project, once the information has been change then user need to press “Apply Changes” button as shown below in figure 11.7. User will be also able to delete a project by pressing the “Delete” button or to cancel the changes then user just need to press the “Cancel” button as shown below in the figure11.7.
Delete Project

Project can be deleted by pressing the “Delete” button as shown in the figure 11.7. Once the user clicks the “Delete” button a confirmation message will prompt on screen asking for check the confirmation to delete the project with project name displayed on the deletion message. User needs to click the check box and press the “Delete Project” Button as shown below in figure 11.8 to delete a project permanently from the database.
Create Task

Tasks need to be created for each project. To create a task user need to press the “Task” tab, as the “Task” tab will show all the tasks for a particular project as show below in the figure 11.9. User can create or view the tasks details in this tab. To create a task user need to press the “Create task” button to create a task as shown below in figure 11.9. Task can be also edited by clicking the “Paper and pencil” image shown below in the figure 11.9 left side of the screen.
Figure 11.9
View Task

Once the “Create Task” button is clicked, the task information need to key in as shown below in the figure 11.10. Once information is keyed in user can press the “Create” button to save the task or user can cancel the record by pressing the “Cancel button” user can also delete a task by pressing the “Delete” button as shown below in the figure 11.10
Figure 11.10
Create Task

Update Task Details

Task can be edited by clicking the “Paper and pencil” image shown in the figure 11.9 left side of the screen. Once the edit “Paper and pencil” image is pressed user will be able to change the information of the task, once the information has been change then user need to press “Apply Changes” button as shown below in figure 11.11. User will be also able to delete a task by pressing the “Delete” button or to cancel the changes then user just need to press the “Cancel” button as shown below in the figure11.11.
Delete Task

Task can be deleted by pressing the “Delete” button as shown in the figure 11.12. Once the user clicks the “Delete” button a confirmation message will prompt on screen asking for the confirmation to delete the task press “ok” to delete and ‘Cancel’ to stop deletion as shown below in figure 11.12.
Figure 11.12
Delete Task

Download Task Details

Task details can be downloaded in CSV file by pressing on the text ‘CSV’ at the bottom on the left side of the application as shown below in the figure 11.13 and the result of CSV file is shown below in the figure 11.14
Download Task Details in CSV file

Figure 11.13
Download Task Details

Task Detail CSV

Figure 11.14
Create Feature

Features can be created for each project. To create feature user need to press the “Feature” tab, as “Feature” tab will show all the features of a particular project as show below in the figure 11.15. User can create or view the feature details in this tab. To create a feature user need to press the “Create Feature” button to create a feature for a project as shown below in figure 11.15.

Once the “Create features” button is clicked, the features information need to key in as shown below in the figure 11.16. Once information is keyed in user can press the “Create” button to save the feature or user can cancel the record by pressing the “Cancel button” user can also delete a feature by pressing the “Delete” button as shown below in the figure 11.16.
Update Feature Details

This screen shows all features for a particular project in the report form at the right side, which can be, edit at the same time. And down portion is for the previous releases as shown below in figure 11.17. User will be able to change the information of the features, once the information has been change then user need to press “Apply Changes” button as shown below in figure 11.17. User will be also able to delete a feature by pressing the “Delete” button or to cancel the changes then user just need to press the “Cancel” button as shown below in the figure 11.17.
Delete Feature

Features can be deleted by pressing the “Delete” button as shown in the figure 11.18. Once the user clicks the “Delete” button a confirmation message will prompt on screen asking for the confirmation to delete the feature press “ok” to delete and ‘Cancel’ to stop deletion as shown below in figure 11.18.
Milestones need to be created for each project. To create a milestone user need to press the “Milestone” tab, as the “Milestone” tab will show all the milestones for a particular project as show below in the figure 11.19. User can create or view the milestone details in this tab. To create a milestone user need to press the “Create Milestone” button to create a milestone as shown below in figure 11.19. Milestone can be also edited by clicking the “Paper and pencil” image shown below in the figure 11.19 left side of the screen.
Once the “Create Milestone” button is clicked, the milestone information need to key in as shown below in the figure 11.20. Once information is keyed in user can press the “Create” button to save the milestone information or user can cancel the record by pressing the “Cancel button” as shown below in the figure 11.20.
Update Milestone Details

Milestone can be edited by clicking the “Paper and pencil” image shown in the figure 11.19 left side of the screen. Once the edit “Paper and pencil” image is pressed user will be able to change the information of the milestone, once the information has been change then user need to press “Apply Changes” button as shown below in figure 11.21. User will be also able to delete a milestone by pressing the “Delete” button or to cancel the changes then user just need to press the “Cancel” button as shown below in the figure 11.21.
Delete Milestone

Milestone can be deleted by pressing the “Delete” button as shown in the figure 11.22. Once the user clicks the “Delete” button a confirmation message will prompt on screen asking for the confirmation to delete the milestone press “ok” to delete and ‘Cancel’ to stop deletion as shown below in figure 11.22.
Download Milestone Details

Milestone details can be downloaded in CSV file by pressing on the text ‘Download CSV’ at the bottom on the left side of the application as shown below in the figure 11.23 and the result of CSV file is shown below in the figure 11.24.
Figure 11.23
Download Milestone Details

Figure 11.24
Milestone Details CSV
Create Releases

Releases need to be created for each project. To create a release user need to press the “Releases” tab, as the “Releases” tab will show all the releases for a particular project as show below in the figure 11.25. User can create or view the Release details in this tab. To create a release user need to press the “Create Release” button to create a Release as shown below in figure 11.25. Releases can be also edited by clicking the “Paper and pencil” image shown below in the figure 11.25 left side of the screen.

Figure 11.25
View Releases
Update Releases Details

Releases can be edited by clicking the “Paper and pencil” image shown in the figure 11.25 left side of the screen. Once the edit “Paper and pencil” image is pressed user will be able to change the information of the Release, once the information has been change then user need to press “Apply Changes” button as shown below in figure 11.21. User will be also able to delete a release by pressing the “Delete” button or to cancel the changes then user just need to press the “Cancel” button as shown below in the figure11.26.
Delete Release

Release can be deleted by pressing the “Delete” button as shown in the figure 11.27. Once the user clicks the “Delete” button a confirmation message will prompt on screen asking for the confirmation to delete the Release press “Ok” to delete and ‘Cancel’ to stop deletion as shown below in figure 11.27.

Create Link

Link can be created for each project either to link to their web page or to link for testing purpose. To create a link user need to press the “Link” tab, as the “Link” tab will show all the Links for a particular project as show below in the figure 11.28. User can create or view the link details in this tab. To create a link user need to press the “Create Link “button to
create a link as shown below in figure 11.28. Link can be also edited by clicking the “Paper and pencil” image shown below in the figure 11.28 left side of the screen.

![Image of a software interface showing links and a 'Create link' button.](image)

**Figure 11.28**
View Links

Once the “Create link” button is clicked, the link information need to key in as shown below in the figure 11.29. Once information is keyed in user can press the “Create” button to save the Link or user can cancel the record not to be save by pressing the “Cancel” button as shown below in the figure 11.29.
More over dashboard screen has more functionality to look at, as the following categories in a single view, which can be edited at the same time through the dashboard screen:

1. Open Tasks.
2. Past Due Tasks.
3. Open Milestones.
4. Task Categories.

These details can be viewed on the based on the users or all as shown in below figure 11.30, which is based on a particular user.
Figure 11.30
Single View Detail For Projects

Graphical view of open tasks for all the projects is shown below in figure 11.31.
APPENDIX F – USER EVALUATION

Name: ___________________________ Age: _______ Gender: _____
Company: ________________________ Occupation: _______________

1): Login process is secured in which the authentication process functioned properly.
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure

2): Project information and its related data are captured accurately.
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure

3): System provides accurate data retrieval from the search mechanism used.
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure

4): System provides functions that increase the effectiveness in achieving its
development objectives.
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
5): **System response time is faster.**
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure

6): **System reporting generation is accurate and properly displayed.**
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure

7): **System is functioning according to the expectations during create, delete and update of any module in the application.**
   a). Strongly Agree
   b). Agree
   c). Strongly disagree
   d). Disagree
   e). Not sure
Deploying Application

Deployment is the process by which one can distribute a finished application or component to be installed on other computers. To deploy this application on another server, there is need to install and configure another Oracle Application Express instance. Topics in this section include:

- Move the Application Definition
- Alternate Authentication Mechanisms to Consider
- Create Users
- Publish the URL

Move the Application Definition

The definition for this application lives within the oracle database. The application definition includes everything that makes up the application, including the templates, but it does not include database object definitions or the underlying data. To move an application to another oracle application express instance, export the application definition from your development server and import it into your production server.

Topics in this section include:

- Import the application definition into the production instance
- Load the data

Import Application Definition to Production Instance

Log in to the production instance of the workspace home page shown in Figure 12.1 below.
On the application home page, click import as shown in Figure 12.2 below.

Figure 12.1
Apex Workspace Login Home page

Figure 12.2
Apex Application Import Homepage
On the export/import page, click import and then click next shown in Figure 12.3 below.

![Figure 12.3](image)

**Figure 12.3**
Apex Application Import/Export Page

For import file as shown in Figure 12.4 and Figure 12.5 below:

1) **Import file** - Click the browse button and then locate your exported file.

2) **File Type** - Select application, page, or component export.

3) **File character set** - accept the default and click next.
Figure 12.4
Import Apex Application

Figure 12.5
Application Successfully Imported
Once the success message appears, the next step is to install the file. Click install as shown in Figure 12.6 below.

![Image of Install Apex Application](image1.png)

**Figure 12.6**
Install Apex Application

![Image of Application Installed Successfully](image2.png)

**Figure 12.7**
Application Installed Successfully
If the installation is successful, the post-app install utility options page appears as per Figure 12.7 above. From here, user can select one of the following:

- Select run application to see the application running
- Select application attributes to view the application definition within application builder

**Load the Data**

The next step in deploying your application is to load the data. At a minimum, user would need to populate the main tables in database e.g. SOFTPROJ_PROJECTS, SOFTPROJ_ORGANIZATIONS etc.

Note there are various mechanisms user could use to accomplish this task, including:

- Use the application itself to create data.
- Use the data Loader to load data copied from a spreadsheet.
- Use SQL scripts and run scripts to create data.
- If user has data existing already within an oracle database, use either export/import to move data between machines or use SQL to retrieve and transform existing data and load it into the application tables.

**Alternate Authentication Mechanisms to Consider**

When the application login page calls the login API with a user name and password, the application express engine calls the credentials verification method specified in the application's current authentication scheme. Users have three choices as to how credentials are verified from within the login API:
• Implement the method yourself as a PL/SQL function returning Boolean and put it in your application's schema.

• Use the built-in LDAP authentication method, which checks user name and password against the LDAP directory that user specify.

• Use the built-in oracle application express authentication method, which checks the user name and password against the oracle application express workspace repository.

The application is currently using the built-in oracle application express authentication method.

Create Users

In order for your application to be accessible, you need to create users. If someone is using oracle application express authentication the simplest way to create users it to access the manage users page. To create a new user:

1) Go to the workspace home page as shown in Figure 12.8 below.
2) From the administration list on the right side of the page, click “Manage application express users” as shown in figure 12.9 below. This link allows managing different kind of users, as each user will have different user name and password to access the software project management application.

![Manage Application Users](image)

**Figure 12.9**  
Manage Application Users

3) Under user identification, enter the required information. User name, password and confirm password need to key in order to create a user successfully. Any field in the figure 12.10 with red (*) need to key in, as they are compulsory fields. This screen has also user account control facility, this also screen allows to lock a user and to allow the users to change password at the time first use.
Once all the fields are keyed in then click “Create User” to save the record as shown in figure 12.11 below.

Figure 12.10
Enter User Details

Figure 12.11
Create Users
Once user has been created successfully then they will be displayed on the screen as shown in the Figure 12.12 below.

**Figure 12.12**
*Application User Dashboard*

**Publish the URL**

Now that application has been deployed, loaded data, and created users, DBA can publish your production URL. URL can be determined to your application by positioning the mouse over the run icon on the application home page. The URL appears in the status bar at the bottom of the page.

The run icon gets its value from the home link attribute on the edit security attributes page. This link is only referenced by this icon and by applications that do not use the application express login API. Consider the following example:

```
http://127.0.0.1:8080/apex/?p=107:24:2977605847036568::::::
```

Where:

- 127.0.0.1:8080 is the URL of the server
• apex/ is the data access descriptor (DAD) name

• f?p= is a prefix used by oracle application express

• 107: is the application being called

• 24 is the page within the application to be displayed

• 2977605847036568::::: is the session number

To run this example application, that would use the URL:


When users log in, they receive a unique session number. As user may recall, you created the application using the create application wizard. This wizard creates a process on the Login page (page 101) that controls authentication. The contents of the process are:

WWV_FLOW_CUSTOM_AUTH_STD.LOGIN(
   P_UNAME => :P101_USERNAME,
   P_PASSWORD => :P101_PASSWORD,
   P_SESSION_ID => :FLOW_SESSION,
   P_FLOW_PAGE => :APP_ID||':1'    );

Note that the page is hard coded into this process. Because of this, the page one can pass in to the URL is overwritten and does not need to be included. The application can be accessed by using the following URL: http://127.0.0.1:8080/apex/f?p=107:24

As can be seen from the example used, the URL has no meaning and can be rather long. The host name can be changed to make it more symbolic. One can also configure apache to rewrite your URL so that you can publish an abbreviated format and a URL that would be more intuitive to your users. See your apache documentation for details.