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THE SIMULATION OF PROJECT MANAGEMENT

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Abstract

The Simulation of Project Management is a stand-alone application that aims to prepare future project leaders by providing simulated project management experience and be used by students who are taking Project Management course to test their knowledge on this course and therefore increase their interest and skill in handling project in future.

Basically, the Simulation of Project Management will inform the results to the player after the simulation end from the following perspectives: project schedule, project cost, resource management and quality of the software developed by the project team members. The Simulation of Project Management is divided into 8 main modules which are: Overall Project Schedule, Team Organization, Manpower/Budget Schedule, Team Member Schedule, Project Leader Schedule, Module Design/Coding/Module Test Progress Table, Integration Test Progress Table and Simulation Result Screen.

This system was developed on Microsoft Windows XP Professional platform using Microsoft Visual Basic.NET with Macromedia Flash MX supported. Besides, the Database Management System (DBMS) for the Simulation of Project Management is Microsoft Access 2000, which is the most popular database nowadays.

Literature reviews on all topics involved have been conducted to determine the feasibility of the system. All these activities are aimed at achieving the best outcome, which is to create a comprehensive Simulation of Project Management to fulfill the needs and satisfaction of the player.

ACKNOWLEDGEMENT

Finishing this project is one of my first few successes in my life. Therefore, I hope that it will be a stepping-stone towards a better future.

Firstly, I would like to thank Mdm Ow Siew Hock, my supervisor for giving me a chance to develop this system, which is an interesting idea suggested by her. Secondly, I would like to thank for her constructive advice, generous guidance, encouragement, support and supervision along the project. Her hardworking and kindness in helping me throughout the project is deeply appreciated. Thanks to Ms. Su Moon Ting, who contributed suggestion and comments to this project. She is so considering and I really feel grateful, as she became my moderator for this project.

Besides, I would like to express my gratitude to my parent Mr. Tan Tiong Kang and Mrs. Chew Fong Kuan for the support, understanding and inspiration as early form my birth until now. My thanks go also to all my course mates & friends for their valuable idea. Thanks to Mr. Tan Chee Hong, Mr. Teow Kean Boon, & Miss Heng Ai Shi for their comments and advice throughout the project.

Thank you very much.

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1.0 CHAPTER I: INTRODUCTION

1.1 *Project Background*

The aim of this project is to develop a Project Management Simulation that applies the skills and knowledge on management. The system has the needs to test a person skills and ability to manage a project.

The simulation's main purpose is to prepare a small project for users who are going to be a manager or planning a software development project. There will be various test and question along the simulation to test the user.

1.1.1 Project & Project Management

Today almost every organization gets involved in many projects. One reason projects are so important is the fast pace of change; another is the more specialized nature of modern business. Many of these projects involve information systems, a distinctive type of project. Firms have enlarge their information system , this means that there are more and more unique activities drawing people from diverse location and organization with specialized skills.(Olson,D.L. , 2001)

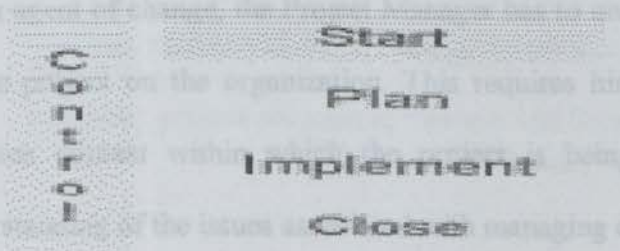

Figure 1.1 Project control

1.1.2 Project Manager

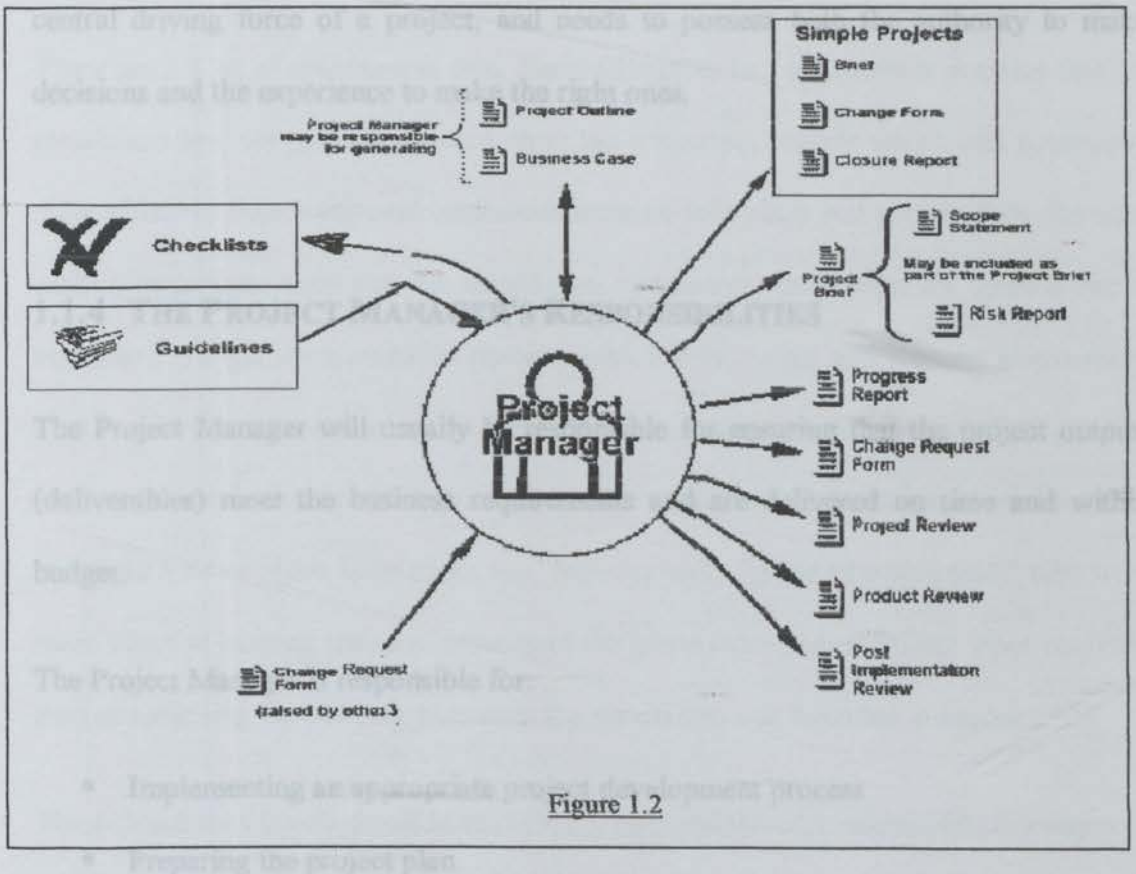

Figure 1.2

1.1.3 ROLE

The role of Project Manager is to act as the bridge between the business managers (sponsor, stakeholders) and the project team, and to deliver the project on time, within scope and budget. (Olson,D.L. , 2001)

As an agent of change, the Project Manager has to understand the impact of the results of the project on the organization. This requires him or her to understand both the business context within which the project is being undertaken and have a good understanding of the issues associated with managing change. (Olson,D.L. , 2001)

The Project Manager provides the direction and process for the project team and is the central driving force of a project, and needs to possess both the authority to make decisions and the experience to make the right ones.

1.1.4 THE PROJECT MANAGER'S RESPONSIBILITIES

The Project Manager will usually be responsible for ensuring that the project outputs (deliverables) meet the business requirements and are delivered on time and within budget.

The Project Manager is responsible for:

- Implementing an appropriate project development process
- Preparing the project plan
- Creating and managing the project team
- Delegating objectives and tasks to each team member
- Monitoring and managing project progress
- Identifying and managing risk and issues
- Managing the scope of the project and controlling changes
- Communicating within and beyond the project team
- Reporting project progress to Sponsor and Steering Committee

1.2 Project Definition

There were a lot of problems at first. Early advocates had to convince skeptics that the simulation was not just a classroom stunt but a learning vehicle which was potentially more effective than traditional classroom lectures, role plays and case studies. Because early simulations were run on mainframe computers, they were an administrative nightmare. To get the simulation running with timely output and without interruption, took much effort; the software was difficult to use; and simulation documentation, when it existed, merely consisted of game rules with mathematical formulae which often did not make a lot of sense. Instructors, too, were typically "game administrators" who were more adept at helping trainees understand the game rules and computer input routines, than at achieving the learning outcomes the simulation was intended to support.

Three decades of development have radically changed the capabilities and parameters of management training. Not only are the simulations easier to use, with better software and outputs, and readily interpretable diagnostics, but they can actually replicate complex and dynamic business relationships. The simulation-based workshop focuses on many different skill clusters simultaneously, including team development, project planning and control methods and interpersonal competencies. Instructors, once burdened by cumbersome mechanics, are now free to concentrate on teaching. Participants are able to spend the bulk of their time practicing and applying skills – not only "hard" project management skills but also "soft" ones, like interpersonal skills and teamwork. .(Olson,D.L. , 2001)

1.3 *Project Objectives*

The objectives of this project are:

1) To help prepare future project leaders by providing simulated project management experience.
2) Can be used by students who are taking Project Management course to test their knowledge on this course and therefore increase their interest and skill in handling project in future
3) Emphasize the importance of the leader in a project in order to complete the project successfully.
4) Expose students to the real working environment by providing some features like supervisor's review and comment, customer's complaint and additional requirement throughout the project development.
5) To be used by IT sector as a tool to train their staff in managing project.
6) As a measure or exam before recruiting an employee for a company

1.4 Project Scopes

The project objectives are to develop a simulation that could access user with an image of a project simulation. The dummy project will give a near real environment based on a sample project. The standards parameters are:

1.4.1 How to schedule the time

- Provide user interface to let the player key in the project name & start date, no need end date because the duration of the project already fixed by us.
- Need to display the Gantt chart, pert chart and also the calendar.
- Need to create some buttons which will be used to pause or save the game when the player want to quit the game and continue it for the next time by just click the saved game & load it again. The simulation time will start to generate once the game be loaded or stopped when player click the pause button.
- Must be able to let user to check the overall project/task/subtask status at anytime once the game started.
- The allocation marks will be like this:

  No delay -> full marks of schedule will be given.

  For every 1 day delayed -> 5% marks of schedule will be deducted, maximum is 10 days. If more than 10 days delayed, 0 marks will be given to the overall project performance. When the project already overscheduled for 7 days, the system will pop up a warning message to the player which require the player to use resource leveling (inter-related with resource) or add more cost for import more staff (inter-related with cost) to solve that problem.

- Incident issue:

  Top-level management suddenly wants to change requirements to shorten or extend the project schedule. So, the system needs to allow player to add budget to deal with this situation.

1.4.2 Manage the cost and Budget

- Project budget -> RM 100,000
- Always display the progress of the overall project & also the money which already be used.
- The allocation marks will be like this:
- No over budget -> full marks of cost will be given.
- For every RM 1000 over budget, 1% marks of cost will be deducted.
- Incident issue: Display the warning message/complaint from top-level management or client when the project starts to over budget. This is to ensure the project to stay on the right track.

1.4.3 Assign suitable task to available employees

- Every staff has their own profile. Each staff has their own capability & knowledge in different field. The system will set the attitude & working efficiency for them.
- So, if the player selects the wrong or not suitable person, it will slow down the project progress & cause the task/subtask can not be completed on time.
- Provide user interface for player (manager) to push/encourage/scold the worker about their performance on each task.
- The allocation marks will be like this:
- If incident occur, for example: receive complaint from the customer/top-level management/staff, 5% marks of resource will be deducted for each complaint. Wrong allocation of staff will also result lost of 5% marks
- Incident issue:

  Some of the workers who really have bad attitude want to quite in the mid way of the development project. So, it will test the player on how to handle in this circumstance by using the knowledge on project management.

1.4.4 Quality

- Display the quality of the software depend on the error found during project review.

- Generate trend chart to display the allocation of mark for that three major parts to let the player can clearly discover what is his/her weaknesses on project management.

- Performance evaluation to determine whether the player is a successful manager or not:

  - obtains 80% of overall marks and above --Excellent
  - 70% ≤ overall marks < 80 % ----------Good
  - 60% ≤ overall marks < 70 % ----------Average
  - 50% ≤ overall marks < 60 % ----------Poor
  - < 50% ----------Sorry! You need to study more on project management!

Every answer and action taken by the Manager will result in different endings or it will trigger more problems for the Manager.

The project will cover at most of the skills needed in handling a general Information System project.

1.5 Overview of Project Simulation

The main purpose of this report is to state in full the processes involved in the development of Project Management Simulation. The report consists of several chapters.

The first chapter is the introduction. It gives an overview of the project. It covers project overview, project definition, the objectives and project scopes. Project definition consists the existing of similar system, the strengths of the new Simulation, project limitations and project's goals. Chapter 2 is the literature review. It contains a critical review of studies done in related fields. Specifically, it includes some studies in Project Management and Roles of a Project Manager as well as other sources relevant to this project. Chapter 3 is on Methodology. Which show the method used to find fact and information in accomplishing the project. There are a few elicitations such as Questionnaires, Interview, Observation, and various methods to find out user requirements. Chapter 4 is a chapter on system analysis. It describes the development model chosen and steps taken to accomplish this project. The discussion of the system requirements, the project schedule and preliminary design of the system are attached.

Chapter 5 discusses on the system design that describe the details of the program structures and how the program works. Chapter 6 tells how the program implemented what are the function and usage. Training on how to use the program is essential. Chapter 7 stresses on the system testing to ensure quality program developed and make sure the program works perfectly.

Chapter 8 is where all discussion on the problem and solution done. This chapter is also important because it can be a good guideline for future development or maintenance.

The conclusion contains the summary of important points that discussed in each chapter.

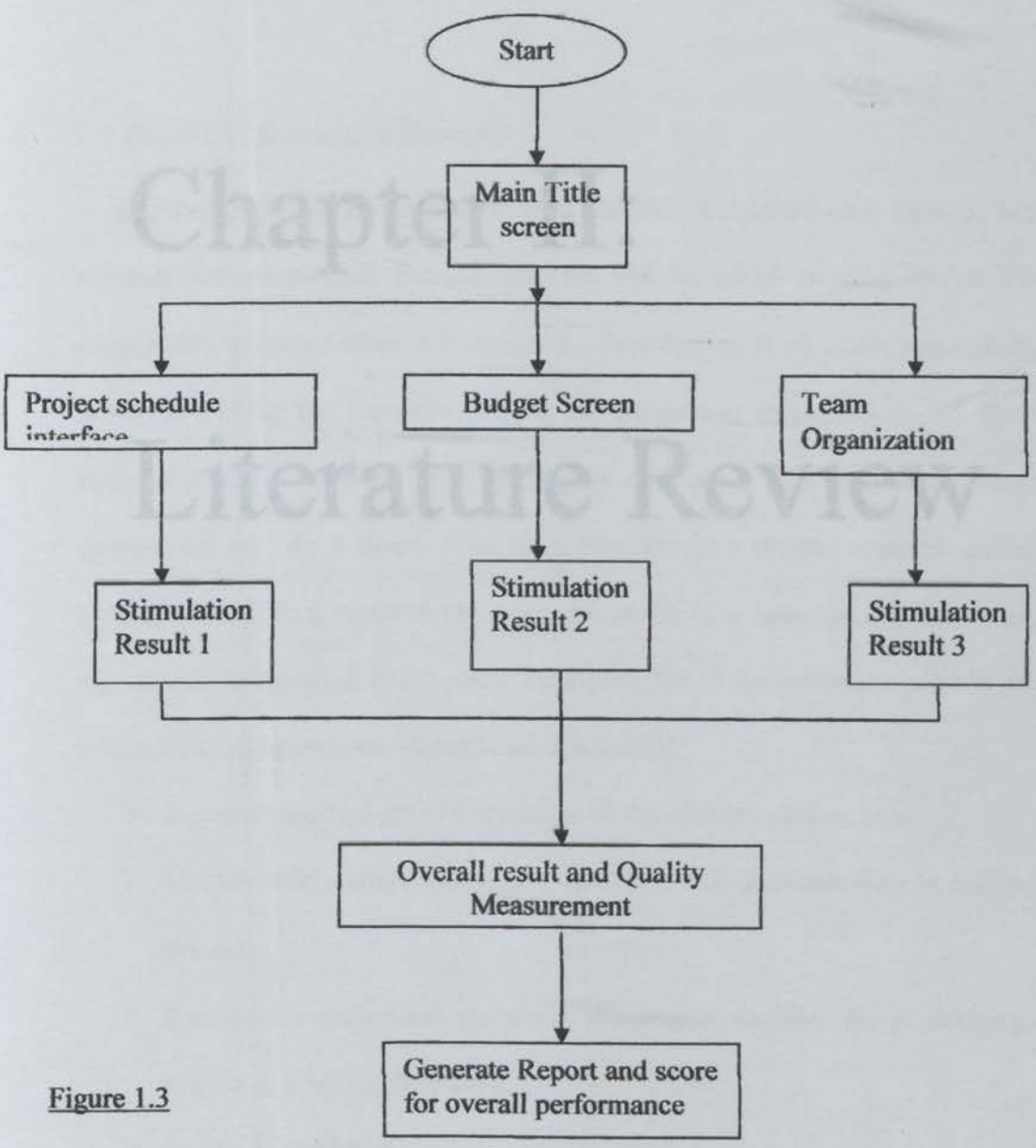

Figure 1.3

Chapter II:

Literature Review

2.0 CHAPTER II : LITERATURE REVIEW

This chapter reviews the related topics that have been studied. It covers the Project Management and the approaches that might be used to develop the project. Then, the discussion is about the Project Manager and Material used since the approach has been chosen to complete the system. On the last part, Fujitsu Project Management Simulation system will be reviewed to have the understanding of how the simulation works.

2.1 Role of Literature Review

A literature review is an account of what has been published on a topic by accredited scholars and researchers. Occasionally we will be asked to write one as a separate assignment, but more often it is part of the introduction to an essay, research report, or thesis. In writing the literature review, our purpose is to convey to our reader what knowledge and ideas have been established on a topic, and what their strengths and weaknesses are. As a piece of writing, the literature review must be defined by a guiding concept (e.g. research objective, the problem or issue we are discussing, or our argumentative thesis). It is not just a descriptive list of the material available, or a set of summaries. In general, the literature review should:

- Increases the breadth of knowledge of the selected subject area.
- Identify information, techniques, methods, and ideas that may be relevant to the project.
- Provide the intellectual context of the project, enabling the positioning of ones project relative to other work.
- Justify the research.

- Illustrate how the subject has been studied previously.
- Enable the researcher to learn from previous theory on the subject.
- Highlight flaws in previous research.
- Outline gaps in previous research.
- Ensure that the work is adding to the understanding and knowledge of the field.
- Help refine, refocus or even change the topic if necessary.

2.2 Approach to Literature Review Definition

There are many kinds of literature review approach such as internet, magazines, newspapers, books, journals, reports and etc. After finding related article or books, we need to pick important information by:

- Organizing data which related directly to the thesis or research question you are developing
- Synthesize results into a summary of what is and is not known
- Identify areas of controversy in the literature
- Formulate questions that need further research

2.2.1 Internet Surfing

Today cyber world has enable any information to be obtain from the World Wide Web. The Internet offered a vast choice of sites to learn about programming languages and development software for free. This sites contained online tutorials and lessons on programming languages and software development tools. There were also online newsgroups and forums that would respond to the questions posted to them. These sites were very helpful especially when one needs to learn something new within a short period of time. Numerous tools, applications and systems on project management were obtained from the World Wide Web. I found many useful article or tips to help me in developing my project using existing search engines such as :

- http://www.google.com
- http://www.freewarefiles.com
- http://www.planetsourcecode.com
- http://www.download.com
- http://www.altavista.com
- http://www.about.com

To obtain the desired information or the relevant website, selecting the right keywords is crucial. Certain search engines presented sites on project management systems that have to be purchased and it was for commercial purpose. Where else terms such as 'project management freeware tools' or project management free download' offered a vast choice of related sites on project management tools. By and large, the Internet was the main source to provide information on literature review and to offer required information on whole.

2.2.2 Reading

Beside that, I also manage to find some related thesis on Project Management in the University of Malaya Main Library. There are various books explaining about Project Management and Project Manager from different aspect such as:

- Trevor L.Young – How To Be A Project Manager
- Jean Knutson – Succeeding in Project – Driven Organizations
- Project Management for 21st Century

Journals and documentations on project management applications and systems became the fundamental resource to understanding the structure, functions and the developing method of the preceding systems. Where as the newspapers and magazines on computer technology provide the latest news and updates on computer technology.

However , my main reference are the Fujitsu Project Management Participant's Handbook .

2.2.3 Supervisor's Experience on Game Development

The most important source of information is my supervisor Assoc. Prof. Dr. Ow Siew Hock . With her knowledge and experiences in the Simulation, she guided me throughout the whole process of developing this project. The progress of my project were given to her regularly so that she knew what is going on and to advice me if there are problems.

2.3 Existing System Reviews

2.3.1 Microsoft Project

Microsoft Project 2000 provides project managers with the flexibility to collaboratively plan and track projects. Using Project 2000, information can now be shared with a broader audience in much less time. New features within Project allow workgroup access to projects and project files. This allows for overall improvements of productivity within an organization. Upon successful completion of Managing With Microsoft Project 2000, the participants will be able to: (Dobson,D. , 1999)

- Set up and create a baselined project plan for saving and viewing information statistics.
- Enter data for completed single/ multiple tasks that started and finished on schedule and track tasks that are completed late.
- Identify the critical path and slack time of a project.
- Assign resources to single/ multiple tasks and create new calendars for tasks, assign costs to resources and analyze resource allocations.
- Share project information with other applications.
- Resolve resource and time conflicts as well as level resources.
- Perform variance analysis in Microsoft Project.
- Work with views, prepare reports, and set interim plans.

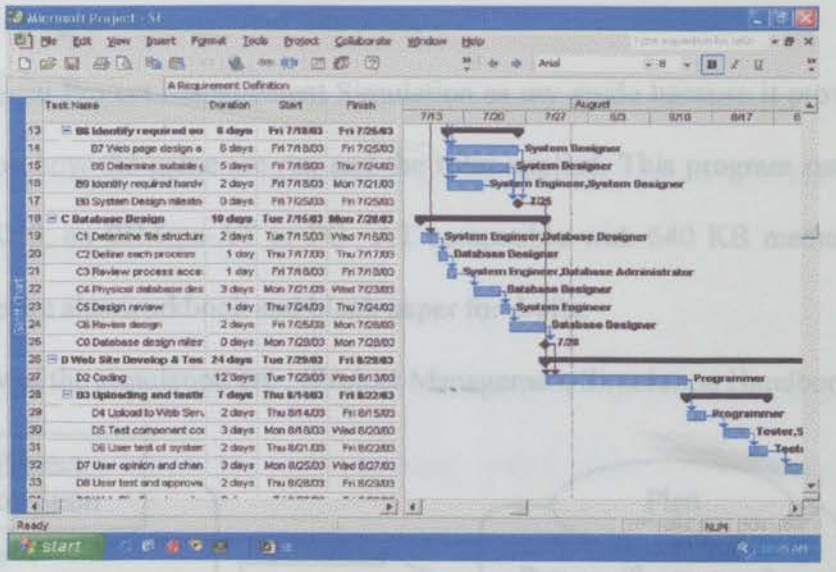

Figure 2.1 Gantt chart

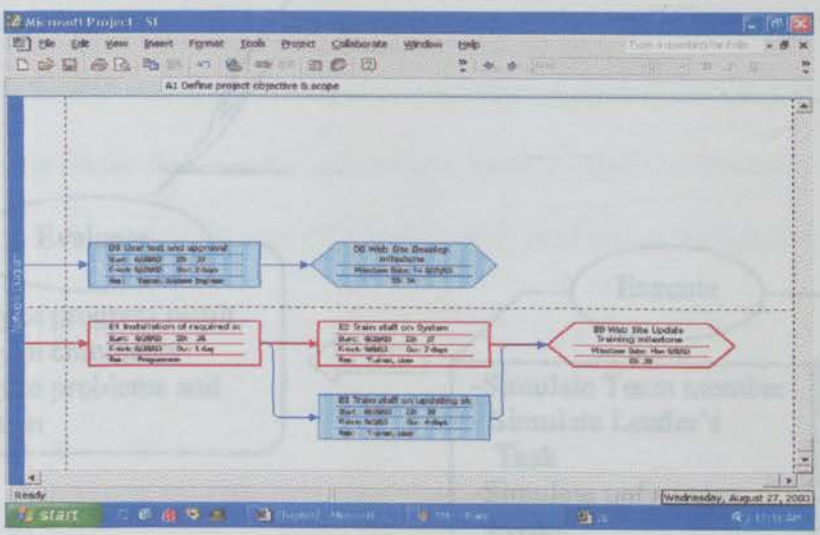

Figure 2.2 Network diagram (PERT Chart)

2.3.2 Fujitsu Project Management Simulation

I take the Fujitsu Project Management Simulation as my guide because it provides full information on how the game are run and the rules applied. This program runs with a Fujitsu FW8040, an IBM pc-AT or PC –AT compatible with 640 KB memory and a printer. There are also workbook and blank paper for drafts.

The overview of the simulation are : (Project Management Simulation Handbook, 1988)

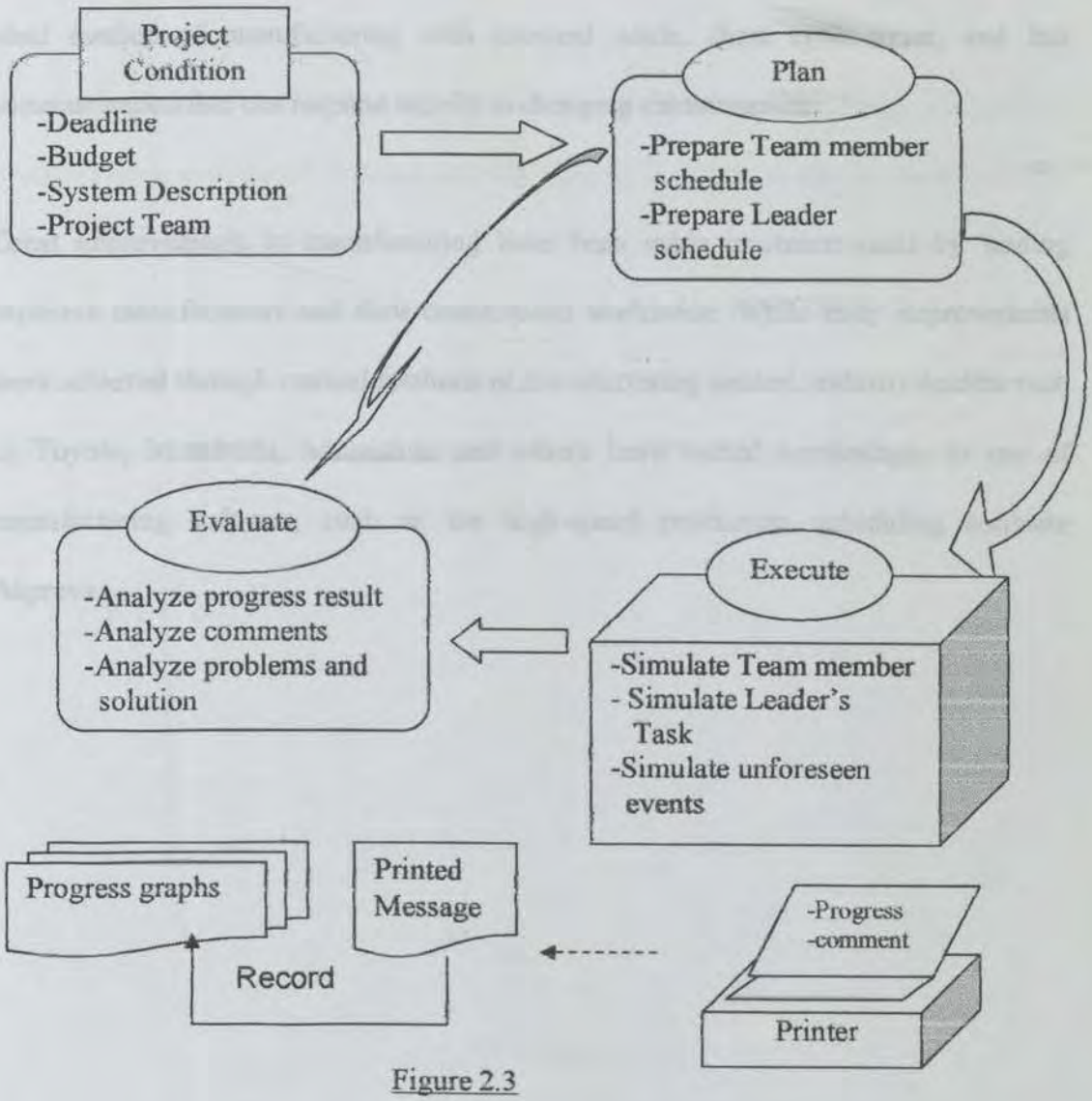

Figure 2.3

2.3.3 Kaizen Gantt Chart

Kaizen in Japanese simply means "improvement", but the term has become specifically associated with the philosophy of continuous improvement for which the Japanese manufacturing industry is famed.

The goal of this process of continuous improvement is just-in-time manufacturing - an ideal method of manufacturing with minimal waste, short cycle times, and fast communication that can respond rapidly to changing circumstances.

Great improvements in manufacturing have been made in recent years by leading Japanese manufacturers and their counterparts worldwide. While early improvements were achieved through manual methods of manufacturing control, industry leaders such as Toyota, Mitsubishi, Matsushita and others have turned increasingly to use of manufacturing software, such as the high-speed production scheduling software Asprova.

2.4 Summary of Literature Review

Overall these literatures Review have given me a kick-start to my project.

I found many useful ideas that I can enhance to make my project more quality. Whenever I need help, I will also refer to my kind supervisor or even seek information through Forums in Internet where experts and users discuss various solutions to problems I may encounter during the project development.

Beside that, there is countless application available, ranging from stand-alone applications to web-based systems and freeware tools. Most of the freeware tools are the trial version of an application. There are also various web-based project management systems available on the Internet today. It ranges from a simple time-tracking web site to a complex and collaborative project-planning tool for organizations. But these systems require the user to pay a sum of money for the service provided. Most of the existing system can only provide information on the interface, the story line but not in details.

2.5 Relationship of Literature Review to Project

The Literature Review will greatly improve my original idea on this Simulation because of the knowledge I gain from references and existing programs. Many concepts of Project Management can be retrieved from books and articles. The Roles and Problem faced by Project Manager can be learned in the Internet's forums.

Through existing system, I found out how the simulation work together with the rules and constraints applied. From their Interface I can create a much better and user-friendly environment for my user .I can also prepare the requirements needed to support the functions of my program.

Microsoft Project also provides useful information on displaying Gantt Chart, Pert Chart and Resource schedule. From there, I can design my program by adding these charts, tables and reports.

Chapter III:
Methodology

3.0 CHAPTER III: METHODOLOGY

3.0.1 Introduction

This chapter explains the research approaches taken during the system development. It also discusses the system development life cycle chosen to complete the system.

3.1 Development Methodology

To develop the proposed system successfully, a suitable methodology needs to be applied. Software engineering methodologies contains frameworks that define the phases of the development processes. There are various methodologies to develop an application. To develop this system, the advance software engineering methodology – Rational Unified Process (RUP) model was selected.

3.2 Introduction to Rational Unified Process (RUP)

Rational Unified Process is a software engineering process, delivered through a web-enabled, searchable knowledge base. This process enhances team productivity and delivers software best practices via guidelines, templates and tool mentors for all critical software lifecycle activities. It provides a disciplined approach to assigning tasks and responsibilities within a development organization. Its goal is to ensure the production of high-quality software that meets the needs of its end-users, within a predictable schedule and budget. Its knowledge base allows development teams to gain the full benefits of the industry-standard Unified Modeling Language (UML).(Scott, Kendall ,2001)

3.3 RUP Methodology

The Rational Unified Process methodology is comprised of the ideas and experiences of industry leaders, partners, and literally thousands of real software projects, carefully synthesized into a practical set of best practices, workflows, and artifacts for iterative software development. When used in combination, the best practices promoted by the RUP methodology - which include: Develop Iteratively, Manage Requirements, Use Component Architectures, Model Visually, Manage Change, and Continuously Verify Quality-- strike at the root causes of software development problems, helping developer avoids common pitfalls as the developer leverages new technologies and tools.

3.4 The Architecture of the RUP

One of the central best practices of RUP is the notion of Developing Iteratively. Rational Unified Process organizes projects in terms of disciplines and phases, each consisting of one or more iterations. With the iterative approach, the emphasis of each workflow will vary throughout the lifecycle. The iterative approach helps developer addresses risk early and continuously, through demonstrable progress and frequent executable releases. (The Rational Edge . 2003)

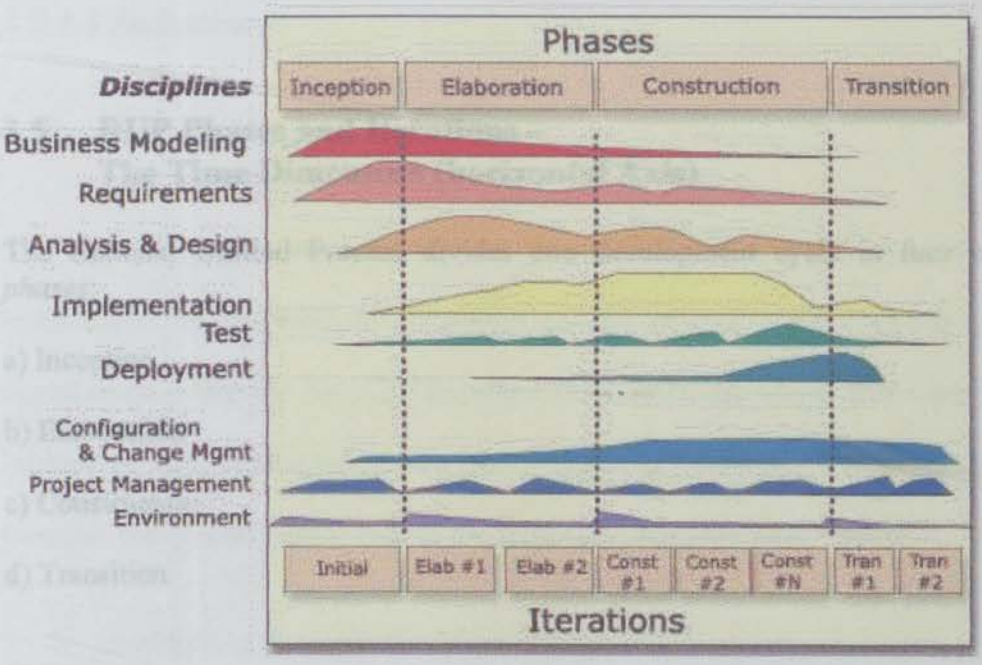

Figure 3-1: The iterative model graph shows how the process is structured along two dimensions

The RUP project structure is shown in two dimensions:

- the horizontal axis represents time and shows the lifecycle aspects of the process as it unfolds.
- the vertical axis represents disciplines, which group activities logically by nature.

The first dimension represents the dynamic aspect of the process as it is enacted, and it is expressed in terms of phases, iterations, and milestones. The second dimension represents the static aspect of the process: how it is described in terms of process components, disciplines, activities, workflows, artifacts, and roles. (The Rational Edge . 2003)

3.5 RUP Phases and Iterations – The Time Dimension (horizontal Axis)

The Rational Unified Process divides one development cycle in four consecutive *phases*:

a) Inception

b) Elaboration

c) Construction

d) Transition

Each phase is concluded with a well-defined *milestone*—a point in time at which certain critical decisions must be made, and therefore key goals must have been achieved.

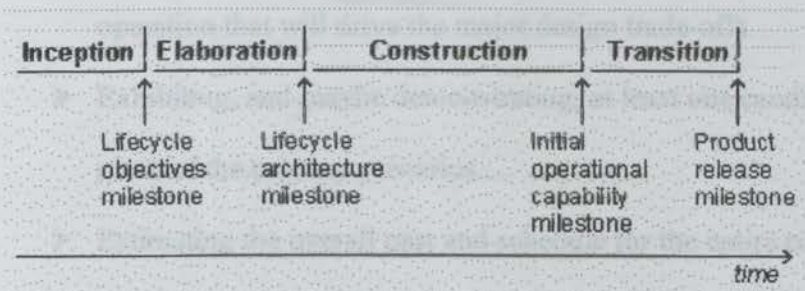

Figure 3-2: The phases and major milestones in the process.

3.5.1.1 Inception

Objectives

The overriding goal of the inception phase is to achieve concurrence among all stakeholders on the lifecycle objectives for the project. The inception phase is of significance primarily for new development efforts, in which there are significant businesses and requirements risks which must be addressed before the project can proceed. The primary objectives of the inception phase include:

- Establishing the project's software scope and boundary conditions, including an operational vision, acceptance criteria and what is intended to be in the product and what is not.
- Discriminating the critical use cases of the system, the primary scenarios of operation that will drive the major design trade-offs.
- Exhibiting, and maybe demonstrating, at least one candidate architecture against some of the primary scenarios
- Estimating the overall cost and schedule for the entire project (and more detailed estimates for the elaboration phase that will immediately follow)
- Estimating potential risks (the sources of unpredictability)
- Preparing the supporting environment for the project.

3.5.1.2 Elaboration

Objectives

The goal of the elaboration phase is to baseline the architecture of the system to provide a stable basis for the bulk of the design and implementation effort in the construction phase. The stability of the architecture is evaluated through one or more architectural prototypes. The primary objectives of the elaboration phase include:

- To ensure that the architecture, requirements and plans are stable enough and the risks sufficiently mitigated to be able to predictably determine the cost and schedule for the completion of the development.
- To address all architecturally significant risks of the project
- To establish a baseline architecture derived from addressing the architecturally significant scenarios, which typically expose the top technical risks of the project.
- To establish a supporting environment.

3.5.1.3 Construction

Objectives

The goal of the construction phase is on clarifying the remaining requirements and completing the development of the system based upon the baseline architecture. The construction phase is in some sense a manufacturing process, where emphasis is placed on managing resources and controlling operations to optimize costs, schedules, and quality. The primary objectives of the construction phase include:

- Minimizing development costs by optimizing resources and avoiding unnecessary scrap and rework.
- Achieving adequate quality as rapidly as practical
- Achieving useful versions (alpha, beta, and other test releases) as rapidly as practical
- Completing the analysis, design, development and testing of all required functionality.
- To iteratively and incrementally develop a complete product that is ready to transition to its user community.

3.5.1.4 Transition

Objectives

The focus of the Transition Phase is to ensure that software is available for its end users. The Transition Phase can span several iterations, and includes testing the product in preparation for release, and making minor adjustments based on user feedback. The primary objectives of the Transition Phase are:

- beta testing to validate the new system against user expectations
- beta testing and parallel operation relative to a legacy system that it's replacing
- converting operational databases
- training of users and maintainers
- roll-out to the marketing, distribution and sales forces
- assessment of the deployment baselines against the complete vision and the acceptance criteria for the product

3.6 Iterations

Each phase in the Rational Unified Process can be further broken down into iterations. An *iteration* is a complete development loop resulting in a release (internal or external) of an executable product, a subset of the final product under development, which grows incrementally from iteration to iteration to become the final system.

3.7 Core workflows (vertical axis)

There are nine *core process workflows* in the Rational Unified Process, which represent a partitioning of all workers and activities into logical groupings.

The core process workflows are divided into six core "engineering" workflows:

1. Business modeling workflow
2. Requirements workflow
3. Analysis & Design workflow
4. Implementation workflow
5. Test workflow
6. Deployment workflow

And three core "supporting" workflows:

1. Project Management workflow
2. Configuration and Change Management workflow
3. Environment workflow

Although the names of the six core engineering workflows may evoke the sequential phases in a traditional waterfall process, developers should keep in mind that the phases of an iterative process are different and that these workflows are revisited again and again throughout the lifecycle. The actual complete workflow of a project interleaves these nine core workflows, and repeats them with various emphasis and intensity at each iteration. (The Rational Edge . 2003)

3.7.1 Business Modeling

One of the major problems with most business engineering efforts, is that the software engineering and the business engineering community do not communicate properly with each other. This leads to the output from business engineering is not being used properly as input to the software development effort, and vice-versa. The Rational Unified Process addresses this by providing a common language and process for both communities, as well as showing how to create and maintain direct trace ability between business and software models. In Business Modeling developers document business processes using so called business use cases. (The Rational Edge . 2003)

3.7.2 Requirements

The goal of the Requirements workflow is to describe *what* the system should do and allows the developers and the customer to agree on that description. To achieve this, developers elicit, organize, and document required functionality and constraints; track and document tradeoffs and decisions. (The Rational Edge . 2003)

3.7.3 Analysis & Design

The goal of the Analysis & Design workflow is to show *how* the system will be *realized* in the implementation phase.

Analysis & Design results in a *design model* and optionally an *analysis model*. The design model serves as an abstraction of the source code; that is, the design model acts as a 'blueprint' of how the source code is structured and written.

3.7.4 Implementation

The system is realized through implementation of components. The Rational Unified Process describes how developer reuse existing components, or implement new components with well defined responsibility, making the system easier to maintain, and increasing the possibilities to reuse. (The Rational Edge . 2003)

3.7.5 Test

The Rational Unified Process proposes an iterative approach, which means that developer test throughout the project. This allows developer to find defects as early as possible, which radically reduces the cost of fixing the defect. Tests are carried out along three quality dimensions reliability, functionality, application performance and system performance. For each of these quality dimensions, the process describes how developer goes through the test lifecycle of planning, design, implementation, execution and evaluation.

3.7.6 Deployment

Although deployment activities are mostly centered on the transition phase, many of the activities need to be included in earlier phases to prepare for deployment at the end of the construction phase. The Deployment and Environment workflows of the Rational Unified Process contain less detail than other workflows. (The Rational Edge . 2003)

3.7.7 Project Management

Software Project Management is the art of balancing competing objectives, managing risk, and overcoming constraints to deliver, successfully, a product in which meets the needs of both customers (the payers of bills) and the users. The fact that so few projects are unarguably successful is comment enough on the difficulty of the task.

3.7.8 Configuration & Change Management

In this workflow the RUP describe how to control the numerous artifacts produced by the many people who work on a common project.

This workflow provides guidelines for managing multiple variants of evolving software systems, tracking which versions are used in given software builds, performing builds of individual programs or entire releases according to user-defined version specifications, and enforcing site-specific development policies.

3.7.9 Environment

The purpose of the environment workflow is to provide the software development organization with the software development environment—both processes and tools—that are needed to support the development team. (The Rational Edge . 2003)

This workflow focuses on the activities to configure the process in the context of a project. It also focuses on activities to develop the guidelines needed to support a

project. A step-by-step procedure is provided describing how developer implements a process in an organization.

Certain aspects of the Environment workflow are not covered in the process such as selecting, acquiring, and making the tools work, and maintaining the development environment.

3.8 RUP Advantages

Most software teams still use a *waterfall* process for development projects, completing in strict sequence the phases of requirement analysis, design, implementation/integration, and test. This inefficient approach idles key team members for extended periods and defers testing until the end of the project lifecycle, when problems tend to be tough and expensive to resolve, and pose a serious threat to release deadlines. By contrast, RUP represents an iterative approach that is superior for a number of reasons:

- RUP lets developer take into account changing requirements. The truth is that requirements usually change. Requirements change and "requirements creep" -- the addition of requirements that are unnecessary and/or not customer-driven as a project progresses -- have always been primary sources of project trouble, leading to late delivery, missed schedules, dissatisfied customers, and frustrated developers.

- In the RUP, the iterative approach is very controlled; the number, duration, and objectives of iterations are carefully planned, and the tasks and responsibilities of participants are well defined. In addition, objective measures of progress are captured.
- RUP is a use-case-driven approach, which means that the use cases defined for the system can serve as the foundation for the rest of the development process. Use cases used for capturing requirements play a major role in several of the process workflows, especially design, test, user-interface design, and project. They are also critical to business modeling.
- RUP provides a methodical, systematic way to design, develop, and validate architecture. It offers templates for describing an architecture based on the concept of multiple architectural views. It provides for the capture of architectural style, design rules, and constraints.
- RUP is a guide to the effective use of the Unified Modeling Language (UML) for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system. By using UML, RUP gives developer a standard means of writing the system's blueprints, covering conceptual items such as business processes and system functions, as well as concrete items such as classes written in a specific programming language, database schemas, and reusable software components.
- RUP describes how to control, track and monitor changes to enable successful iterative development.

Therefore, the RUP methodology has been chosen as a guide for the development of stand-alone application - The Simulation of Project Management.

Table 3.1 Project schedule

Activities	Date	
	From	To
Literature review	1/6/2003	10/7/2003
System analysis	1/6/2003	10/7/2003
Methodology	11/7/2003	20/8/2003
System Design	21/8/2003	31/9/2003
Phase II	27/5/2003	15/10/2003
System design	1/10/2003	20/10/2003
Coding	21/10/2003	20/12/2003
System testing	21/12/2003	31/1/2004
Documentation	1/6/2003	31/1/2004

3.9 Summary

This chapter describes the research methods and the system development life cycle. The research has been done from four resources, which are the library, the Internet, discussions with the related personals of their interests and books or lecture notes.

The system development life cycle models that have been discussed are Rational Unified Process model. As RUP model are the latest and most efficient method, it has been chosen as the system development life cycle for the system. The model is easy to follow and systematic.

4.0 CHAPTER IV: SYSTEM ANALYSIS

4.1 Introduction

This chapter describes all of the requirements needed for the system development. It consists of functional requirements, non-functional requirements and development requirements.

Requirements analysis enables the developer to specify software elements and establishes design constraints that the application must meet.. A complete understanding of software requirements is essential to develop a good system. Even a well-designed system could lead to discontentment to the user and cause grief to the developer if the application is poorly analyzed and specified.

4.2 Functional Requirements-

The functional requirements consist of a set of tasks that the software is required to perform. From this requirement list, a guideline on the overall layout of the software can be planned. The functional requirements defined for this system are:

The system has the ability to give user a project situation. The project will be given specific duration, resources and budget. The system has the ability to store Budget, Duration and Resources in the database as its parameters. The parameters also should be editable from time to time to meet the changes on the parameters especially on budget and duration.(Sommerville , 2001)

4.2.1 Input Screens

i) The Simulation of Project Management contains 5 input screens for player to input the plan to develop the simulation project. These 5 input screens are:

- ❖ Overall Project Schedule
- ❖ Manpower/Budget Schedule
- ❖ Team Organization
- ❖ Team Member Schedule
- ❖ Project Leader Schedule

ii) The following will briefly describe the functions provided by each of these input screens.

4.2.2 Overall Process Schedule

i) The Overall Process Schedule records the planned start and end dated for the Module Design (MD), Coding (CD), Module Test (MT) and Integration Test (IT) processes on the system.

ii) The simulation software must let the player to enter the duration for each process to complete in between of the start date and end date. The start date and end date for the project plan is fixed already.

iii) After the player has finished enter the duration for each process, click OK button and it will straight away displays the Gantt chart which shows the duration for particular process.

4.2.3 Manpower/Budget Schedule

i) The Manpower/Budget Schedule records the scheduled weeks on the project for each team member and the project leader's initial budget for the project.

ii) The player needs to input the schedule start and end weeks on the project for each of the team members and the number of project leader months into the Manpower / Budget Schedule.

iii) The simulation software must be able to calculate the total of effort in person-month and estimated overall project cost by using some mathematical formulas.

4.2.4 Team Organization

i) There are 4 types of staffs in the Simulation of Project Management which are System Analyst, Designer, Programmer and Test Engineer.

ii) The simulation software must display the staff's attribute list to enable the player to decide which staffs the player wants to choose.

iii) The player must at least select one person from each position. This Means that the project team will at least consist of 4 staffs and Probably up to 8 staffs (depend on the player's choice) which the Project leader (player) is not included.

iv) The simulation software must provide an attractive and user-friendly Interface to allow the player can easily selects staff for the project team Or undo the previous action.

4.2.5 Team Member Schedule

i) The Team Member Schedule screen records which team members are assigned to work on which subsystems.

ii) The player needs to assign team members to work on various subsystems through the Team Member Schedule screen.

iii) The Team Member Schedule lists the task that a team member is scheduled to do on the system.

iv) The player needs to assign each team member to perform various tasks on the system through the Team Member Schedule.

v) Team Member Schedule may be modified throughout the simulation to reflect changes in strategy.

4.2.6 Project Leader Schedule

i) The Project Leader Schedule lists the tasks that the simulation project leader (player) should perform from day-to-day.

ii) The player needs to register the schedule for the project leader for the first few weeks before the simulation start.

iii) As the simulation start, the player can modifies and adds some new tasks to the schedule to react to the various situations that maybe arise.

4.2.7 Output Screens

The Simulation of Project Management contains 2 output screens for the player to check the progress of project development in the simulation and 1 output screen for the

player to view his/her result only after completely playing this project management simulation or declare end of development during simulation at anytime. These three screens are:

- ❖ MD/CD/MT Progress Table
- ❖ IT Progress Table
- ❖ Simulation Result Screen

The following will briefly describe the functions provided by each of these output screens.

4.2.8 MD/CD/MT Progress Table

i) The MD/CD/MT Progress Table displays the progress of Module Design (MD), Coding (CD) and Module Test (MT) for each module in the system. It also shows the team member who is responsible for the task and the results of any review.

ii) This screen can be displayed when "Check Progress" is simulated on the Project Leader Schedule.

4.2.9 IT Progress Table

i) The IT Progress Table shows the detail of review status about the number of errors found in every subsystem and also the solved and unsolved errors during the Integration Test (IT) process.

ii) Like the MD/CD/MT Progress Chart, the IT Progress Table can be displayed whenever "Check Progress" is simulated on the Project Leader Schedule.

4.2.10 Simulation Result Screen

i) The Simulation Result Screen evaluates the project leader's management of the project in terms of

- Meeting the deadline (schedule).
- Allocate the right person in the right place (resource).
- Staying under budget (cost).
- Building a quality system (software quality).

Database

The database is where the information on budget, time consumed and resource for every task are stored. It send the data to the system when requested.

4.2.11 Use Case Diagram

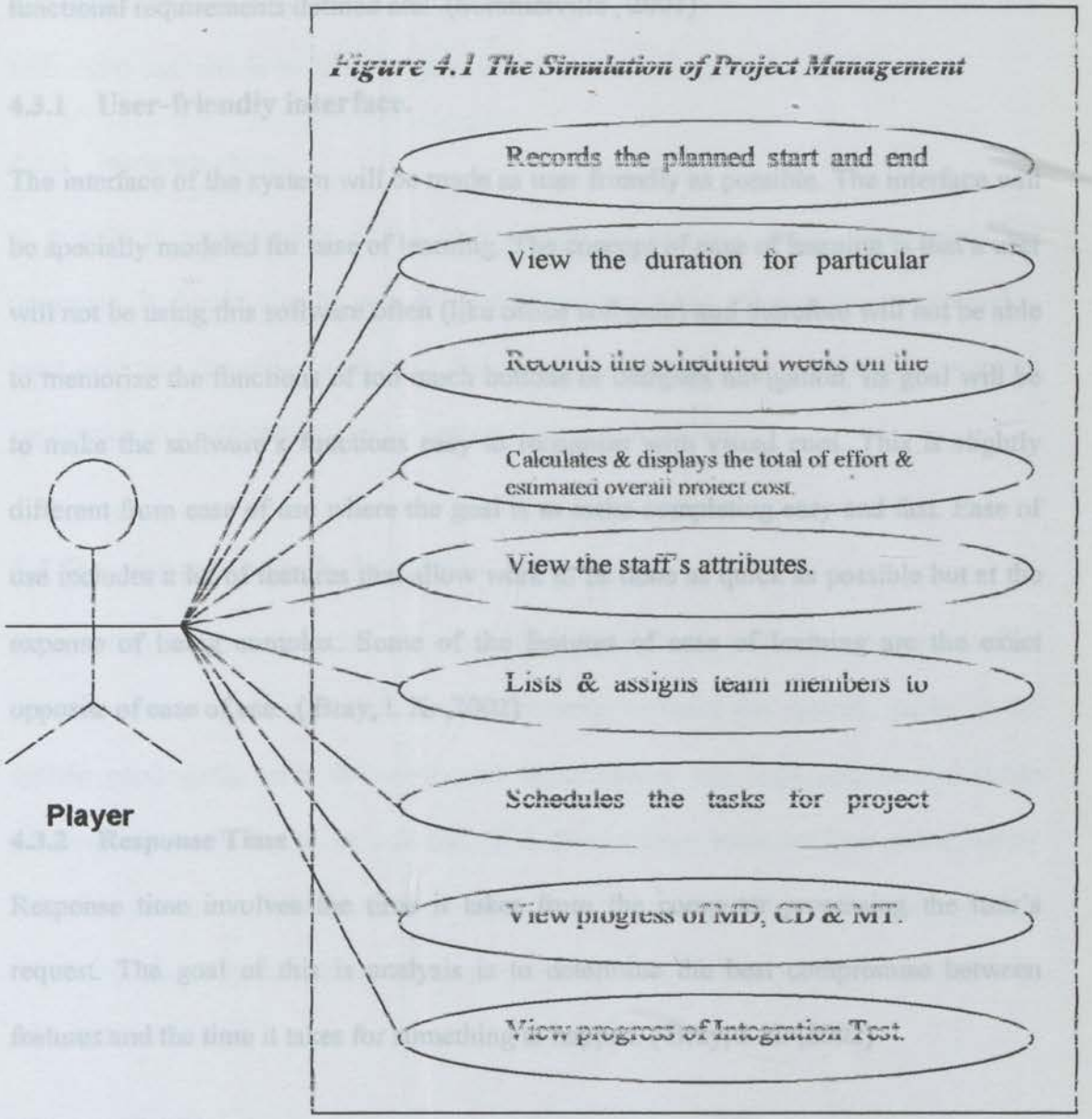

Figure 4.1 Use Case diagram for overall project

4.3 Non Functional Requirements

Non-functional requirements refer to functions that are essential but which are not directly related to the core function. For Project Management simulation, the non-functional requirements defined are: .(Sommerville , 2001)

4.3.1 User-friendly interface.

The interface of the system will be made as user friendly as possible. The interface will be specially modeled for ease of learning. The concept of ease of learning is that a user will not be using this software often (like office software) and therefore will not be able to memorize the functions of too much buttons or complex navigation. Its goal will be to make the software's functions easy to recognize with visual cues. This is slightly different from ease of use where the goal is to make completing easy and fast. Ease of use includes a lot of features that allow work to be done as quick as possible but at the expense of being complex. Some of the features of ease of learning are the exact opposite of ease of use. .(Bray, I. K. ,2002)

4.3.2 Response Time

Response time involves the time it takes from the computer processing the user's request. The goal of this is analysis is to determine the best compromise between features and the time it takes for something to happen. (Bray, I. K. ,2002)

4.3.3 Reliability

The system must be made stable on the target operating system specifications

4.3.4 Efficiency

Efficiency is defined here as making optimal use of space, time and other resources.

4.3.5 Security

The system should be able to verify the authorization of the users to ensure that only authorized user would be able to access to the system. (Bray, I. K. ,2002)

4.3.6 Maintainability

A system is maintainable if the maintenance programmer easily understands the programs. It should also be easy to modify and test when the program is updated to meet new requirements, rectifying a deficiency, correcting errors or moving the entire application to a different computer system. (Bray, I. K. ,2002)

4.4 Development Tools Analysis

Development tools analysis carried out on the existing tools to develop the system. The requirements analysis identified the requirements to build the system. To build the system proficiently with the mentioned requirements, the right and most suitable development tools has to be selected. The development tools analysis subsequently helped to determine the appropriate tools to build the system. The analysis was carried on the operating system, programming tool, Database Management System (DBMS) and multimedia tool.

4.4.1 Operating System

4.4.1.1 Microsoft Windows XP Professional

Windows XP was developed mainly for home/individual users. Intended for the home user market, it provides the following features:

- Microsoft Word , Excel , Access XP
- Simple graphics layout
- Easy system diagnostics and maintenance
- Peer-to-peer networking
- Web browsing and so forth

4.4.1.2 UNIX

UNIX is a multi-tasking multi-user operating system. It is an increasing popular operating system, which traditionally used only on minicomputers and workstation in the academic community. UNIX is now available on personal computers. UNIX, like other operating systems, is a layer between the hardware and the application run in the computer. It has functions that manage the hardware and execution of application. UNIX is an ideal platform for running mail server and network file systems.

4.4.2 Programming Tool

The programming tool is the main tool in developing the system. The tool should support:

a) Enable the development of windows application that work with database.

b) Support to create a high impact graphical user interfaces.

c) Be able to create professional looking installation packages for the application.

4.4.2.1 Microsoft Visual Basic.NET

Microsoft Visual Basic is an event driven programming language, where the code is executed as a respond to an event. Visual Basic also enables the developer to create application in a Rapid Application Development (RAD) environment.

Microsoft Visual Basic.NET is the latest version of the Visual Basic tool set that enables the developers to address today's pressing application development issues effectively and efficiently. Visual Basic.NET enable developer to create Windows-based applications in less time, incorporate data access from a wider range of database scenarios, and create components with minimal code. (Deitel & Deitel , 2002)

Developers can use Visual Basic.NET to build Windows-based applications that leverage the rich user interface features available in the Windows operating system. All the Rapid Application Development (RAD) tools that developers have come to expect can be found in Visual Basic.NET, including drag and drop design and code behind forms. The forms feature provides an easy way to create a graphical user interface.

Visual Basic.NET lets developer tackle any data access scenario easily. Visual Basic.NET provides support for both the new Microsoft ADO.NET for flexible, highly scalable data access and ActiveX Data Objects (ADO) data binding for connection oriented data access. (Deitel & Deitel , 2002)

Visual Basic.NET supports full object-oriented constructs to enable more componentized, reusable code. Language features include full implementation inheritance, encapsulation, and polymorphism. These features provide the availability for developers to reuse the code where enable more rapid development.

4.4.2.2 Java

Java programming language is a complete object-oriented language that is based on C++. Java programming language was developed by Sun Micro Systems in 1991.It can be used to make stand-alone applications as well as mini applications or applets and for special server applications.(Java Advantages and Disadvantages ,2003)

Java is a simple and familiar language. It is an object-oriented language similar to C++, so the learning curves for programmers with a background in C++. However, for those with little or no prior programming experience, the learning curve can be quite steep.

Writing in Java requires less code than other languages. Java takes out a lot of the complexities of C++, making its programs significantly smaller and less complex.

Besides, Java is platform independent so it avoids platform dependencies and allows programmers to write programs once and run them anywhere. Therefore, a Java program initially written in a Windows environment can run on a Macintosh or Solaris platform as well. (Java Advantages and Disadvantages ,2003)

4.4.3 Database Management System (DBMS)

4.4.3.1 MySQL

MySQL is a popular Open Source SQL database provided by MySQL AB. It is a relational database management, which is fast and easy to use. As an open-source software, it is possible for anyone to use and modify it. MySQL can be downloaded from the Internet without any cost. MySQL was originally developed to handle very large database much faster than existing solutions and has been successfully used in highly demanding production environments for several years. MySQL offers a rich and very useful set of functions. The connectivity, speed and security make MySQL highly suited for accessing databases on the Internet.

4.4.3.2 Microsoft SQL Server 2000

Microsoft SQL Server 2000 is a single process, multithreaded relational database server primarily intent for transactional processing. It is based on the client/server architecture, which divides processing into two components: a front-end or client component that runs on a local workstation and a back-end or server component that runs on a remote computer. The server can communicate with any ODBC compliant software program that resides on a computer connected to the network.

4.4.3.3 Microsoft Access 2000

Microsoft Access 2000 can interact with data over the World Wide Web and it can be used as the front end of high-end database such as Microsoft SQL Server. Data can be dropped into HTML pages that can be shared and manipulated on the web pages, making it easy for users to get important information to others. Data access pages are data bound HTML files that can be designed in Access. It can be used to view, edit and report on the data within a web browser. Access 2000 supports OLEDB a data access standard that allows Access 200 to connect directly to SQL Server. Access can also be used as the interface for the SQL Server database.(Dobson,D. 1999)

4.4.4 Multimedia Tools

The multimedia tools can help to create high impact user interfaces and environments. It is use to create the multimedia content likes animation, audio effects, and etc.

4.4.4.1 Macromedia Flash MX

Multimedia Flash was developed by Macromedia, Inc. It is a multimedia tool that enables developer to create multimedia content for Internet content and application. The approachable environment includes powerful video, animation, audio, vector graphics, bitmap graphics and application development features, which allow designers and developers to create rich user interfaces, online advertising, product tours, e-learning courses and enterprise application front ends.(Macromedia , 2003)

4.4.4.2 Macromedia Director 8.5

Macromedia Director is an industry standard authoring tool for multimedia production. It is mainly designed for web application. It combines multimedia elements into portable movie and backs them up with Lingo, which is Director's own interactive scripting language. (Macromedia , 2003)

Lingo is a powerful scripting language. It enables a Director developer and the user to control any situation in the production. While adding features to Director that Lingo does not provide, we can obtain or create C modules called Xtras, which could communicate with Director. (Macromedia , 2003)

Furthermore, Director has a host of media editors to create, modify, import or edit graphics, sounds, text, video and interactivity to deliver the highest quality productions possible. (Macromedia , 2003)

4.5 Development Tools Chosen

The proposed system was developed on a Microsoft Windows XP Professional operating system. Windows has been chosen over Unix because it is a widely used operating system both at home and far business purposes. The Simulation of Project Management is a stand–alone application and therefore the Windows platform would be more appropriate as Unix is still considered a higher-end operating system that is less common to the public. The database tool would be Microsoft Access 2000 as it is a common database and it is easy to use.

4.5.1 Programming Tool

- **Microsoft Visual Basic.NET**

Microsoft Visual Basic.NET had been selected as the programming tool for the project. Microsoft Visual Basic.NET is the most productive tool for creating high performance windows application. The reasons of the Microsoft Visual Basic.NET had been chosen are as follow:

a) Can easily access to database by using ADO.NET.

b) GDI+ that allow doing the advanced drawing and painting within forms.

c) Visual designer for windows forms.

d) Code aware editors that include statement completion, syntax checking, and etc.

e) Integrated compilation and debugging.

f) Expand features from Visual Basic 6.0 to provide a superior environment for developing windows applications.

g) Feel more comfortable and can develop the application rapidly.

h) Latest technology from Microsoft.

4.5.2 Database Management System (DBMS)

- **Microsoft Access 2000**

Microsoft Access in the relational database management system (RDBMS) will be used as the system database. The reasons of Microsoft Access have been chosen are as follows: (Dobson,D. 1999)

a) Microsoft Access is more suitable for the medium and small-scale application if compare with the others as Project Management Simulation Game is only a small-scale application.

b) Provide easy menu driven interface.

c) Can be easily access by application developed by Visual Basic.NET by using ActiveX Data Object.NET (ADO.NET).

d) Easily to maintain as most of the people have Microsoft Access that is included in the Microsoft Office package.

4.5.3 Multimedia Tool

- **Macromedia Flash MX**

Macromedia Flash is selected as the multimedia tools. The Macromedia products should produce the multimedia features required by the system. There are enabling to create beautiful, compact and resizable animation and graphics. Furthermore, their capabilities to import by the Visual Basic by using Shockwave Flash Control for Multimedia Flash are very important. (Macromedia , 2003)

4.6 System Development Requirements

The functional requirements consist of a set of tasks that the software is required to perform. The requirement is divided into two component; the hardware requirements and the software requirements.

4.6.1 Hardware Requirements

The hardware requirement of the system is as follows:

- Windows compatible computer
- 32 MB RAM or higher
- 20 MB of hard disk space or higher
- VGA monitor (800x600 or higher resolution)
- Computer-compatible equipments (keyboard, mouse, printer, etc)

The hardware requirement is based on the minimum requirements for the software that will be used to develop the system.

4.6.2 Software Requirements

The software requirements are requirements that have to do with the software needs that must be fulfilled in order to develop or run the system.

4.6.2.1 Developer Software Requirements

The developer should have all of the software shown below in order to develop the system and to maximize the potential of the project.

a) Microsoft Windows 98/Me/2000/XP

b) Microsoft Visual Studio.NET

c) Microsoft Access

d) Microsoft Flash MX

e) Adobe Photoshop 6.0

4.6.2.2 User Software Requirements

The users of the system should at least have the requirements shown below in order to execute the system.

a) Microsoft Windows 98/Me/2000/XP

b) Microsoft Access

4.7 Summary

The requirements needed for the system development consists of functional requirements, non-functional requirements and development requirements. The development requirements include both hardware and software requirements.

There are two functional requirements decided for the system. It should have the ability to generate or simulate the project schedule , cost and unforeseen event, and it should be able to accept and stores information of current schedule and cost as its parameters. The functional requirements are broken into modules. There are the database and GUI module.

The non-functional requirements aimed for the system includes user-friendly interface, quick response time, reliable and efficiency.

The system development requires a personal computer with minimum specification needed to run VisualBasic.NET as it is the software used to develop the system.

Chapter V:

System Design

5.0 CHAPTER V: SYSTEM DESIGN

5.1 Introduction

This chapter describes the components of the system, which hold the specific functions that should be done by the system. It involves the system design overview, major components of the system and the class diagram of the system.

The object-oriented design is an easy to understand design with graphical presentation from the requirement to specification of the system. Identify object is so easy as every object represent the real object in the real world for example the Project Leader, the team member, schedule, cost and etc.

This chapter also describes how the components are joined together to make the system runs. The system is build base on the object oriented design and I used all method including Class diagram, Sequence Diagram and state chart to present a much clearer view of the overall system.

5.1.1 System Design Overview (Class Diagram)

Class diagram is the most common diagram found in modeling object-oriented system. It shows a set of classes, interfaces, collaborations, and their relationships that consist of dependency, generalization, and association relationships.

Class diagram is used to model the static design view of the proposed system. Besides, class diagram can also be used to model logical database schema that used to store persistent information. Collectively, the class diagram of a system represent the system's complete static design view but individually, each class represents just one aspect.(Scott,Kendall ,2001)

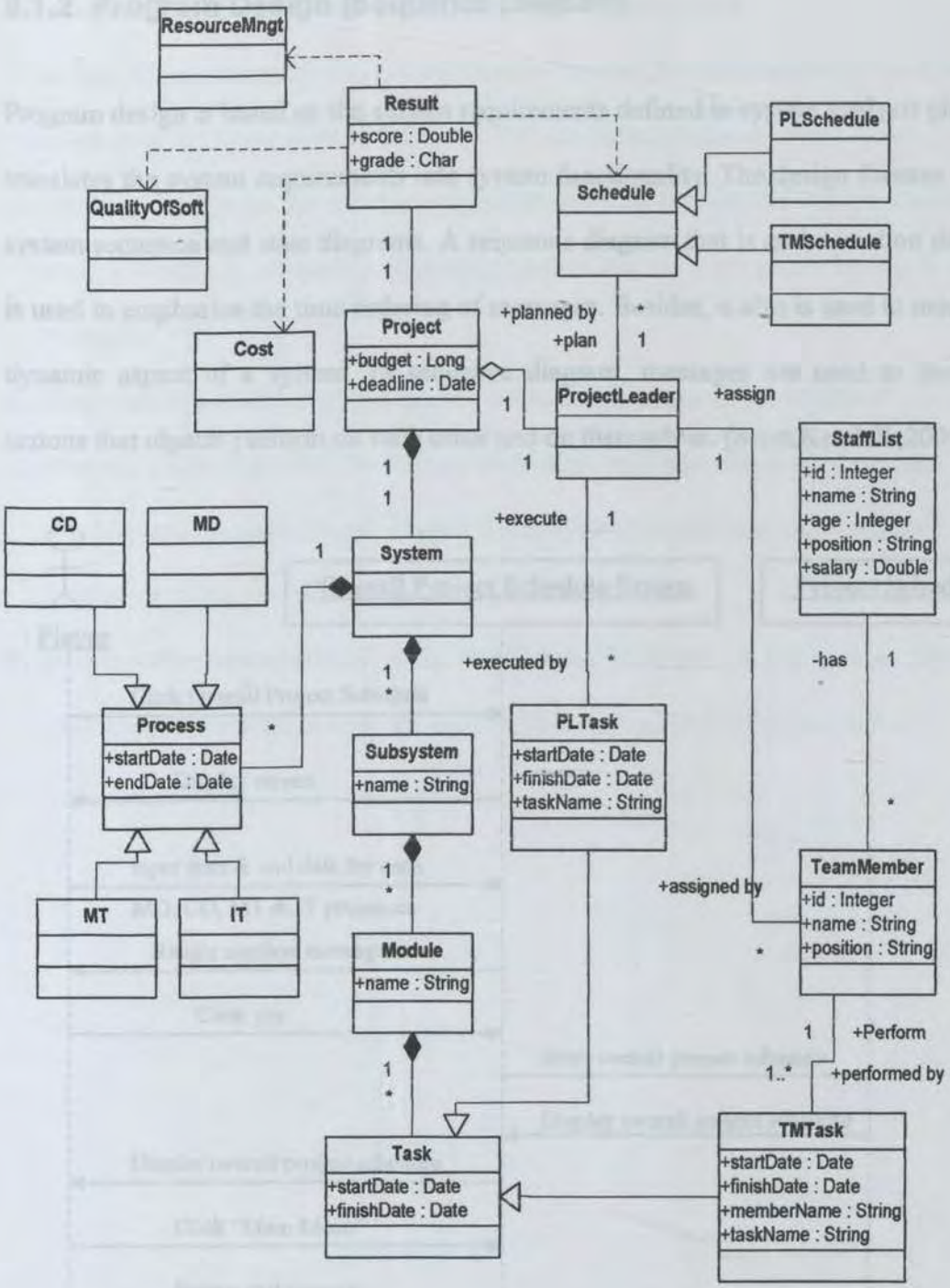

Figure 5.1 Class Diagram of the Overall Project

5.1.2 Program Design (Sequence Diagram)

Program design is based on the system requirements defined in system analysis phase. It translates the system requirements into system functionality. The design focuses on the system sequence and state diagrams. A sequence diagram that is an interaction diagram is used to emphasize the time ordering of messages. Besides, it also is used to model the dynamic aspect of a system. In sequence diagram, messages are used to show the actions that objects perform on each other and on themselves. (Scott,Kendall ,2001)

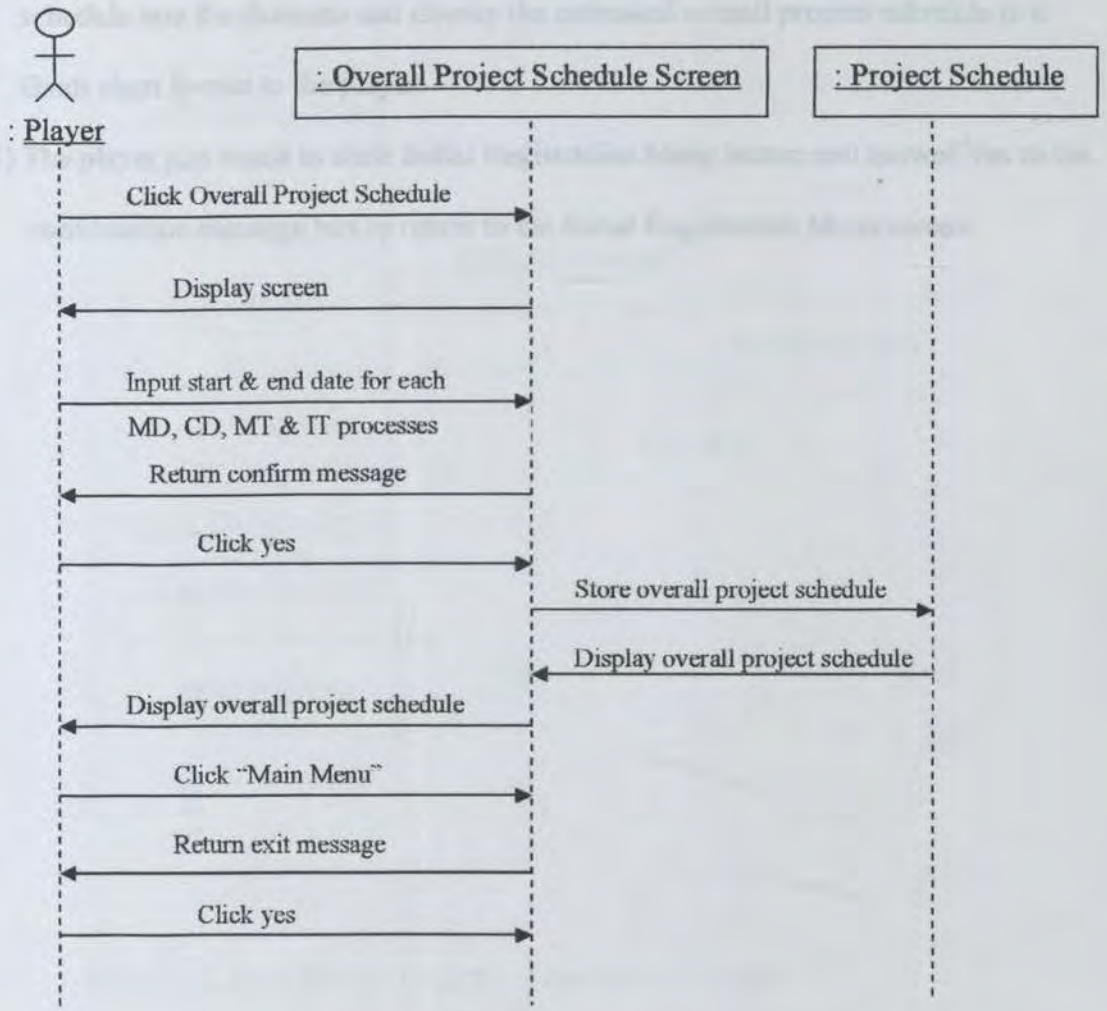

Figure 5-2: Overall Project Schedule Sequence Diagram

Explanation for Overall Process Schedule sequence diagram

1) At first, the player needs to click the Overall Process Schedule button in the main screen in order to enter into the Overall Process Schedule input screen.
2) After that, the player has to input the start & end date for Module Design, Coding, Module Testing & Integration Testing processes into the table on the screen & click OK button.
3) Then, the system will display a confirmation message box to the player.
4) After the player had click Yes button, the system will store the overall process schedule into the database and display the estimated overall process schedule in a Gantt chart format to the player.
5) The player just needs to click Initial Registration Menu button and answer Yes to the confirmation message box to return to the Initial Registration Menu screen.

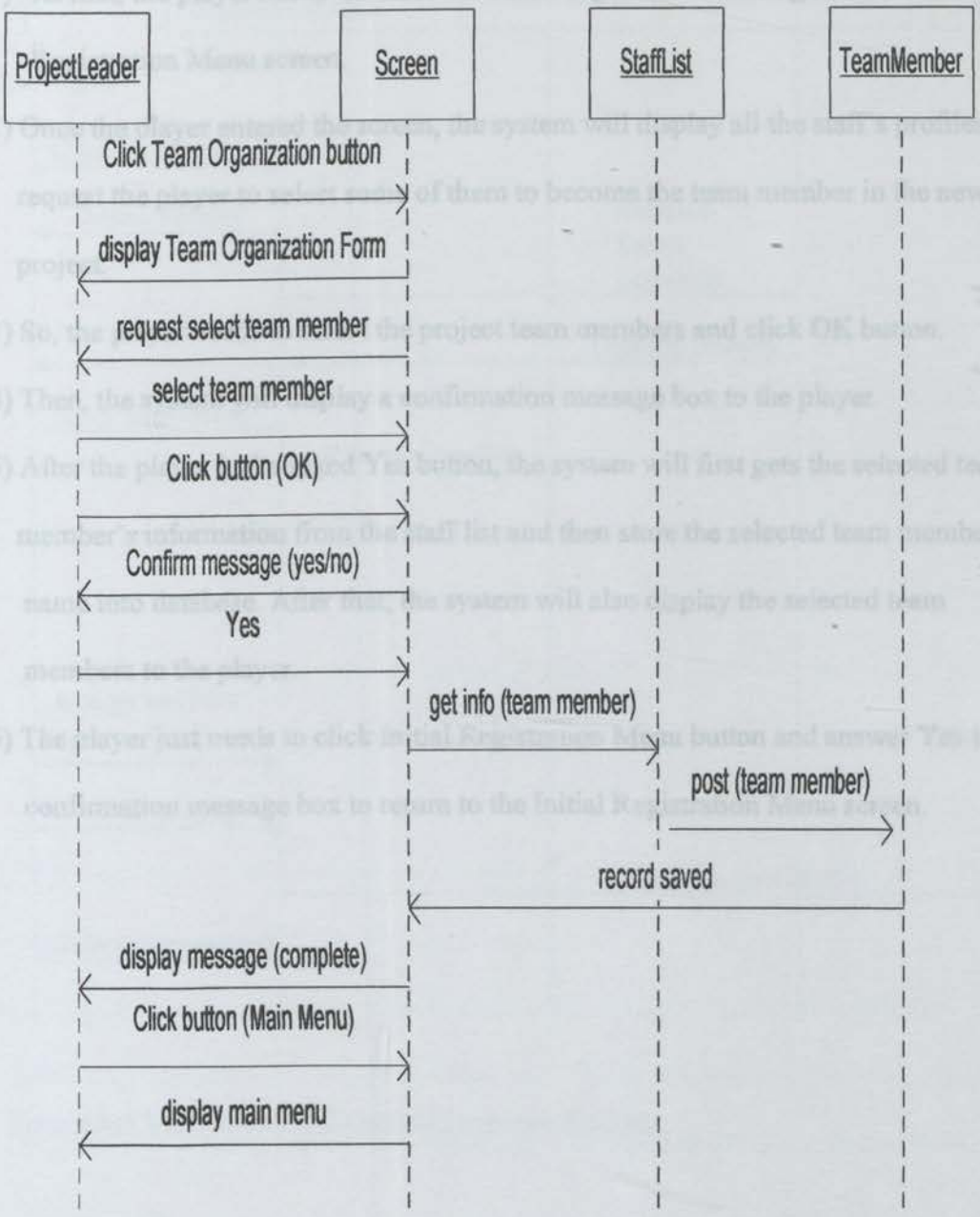

Figure 5-3 Team Member Selection sequence diagram

Explanation for Team Organization sequence diagram

1) At first, the player needs to select the Team Organization through the Initial Registration Menu screen.
2) Once the player entered the screen, the system will display all the staff's profiles and request the player to select some of them to become the team member in the new project.
3) So, the player needs to select the project team members and click OK button.
4) Then, the system will display a confirmation message box to the player.
5) After the player had clicked Yes button, the system will first gets the selected team member's information from the staff list and then store the selected team members name into database. After that, the system will also display the selected team members to the player.
6) The player just needs to click Initial Registration Menu button and answer Yes to the confirmation message box to return to the Initial Registration Menu screen.

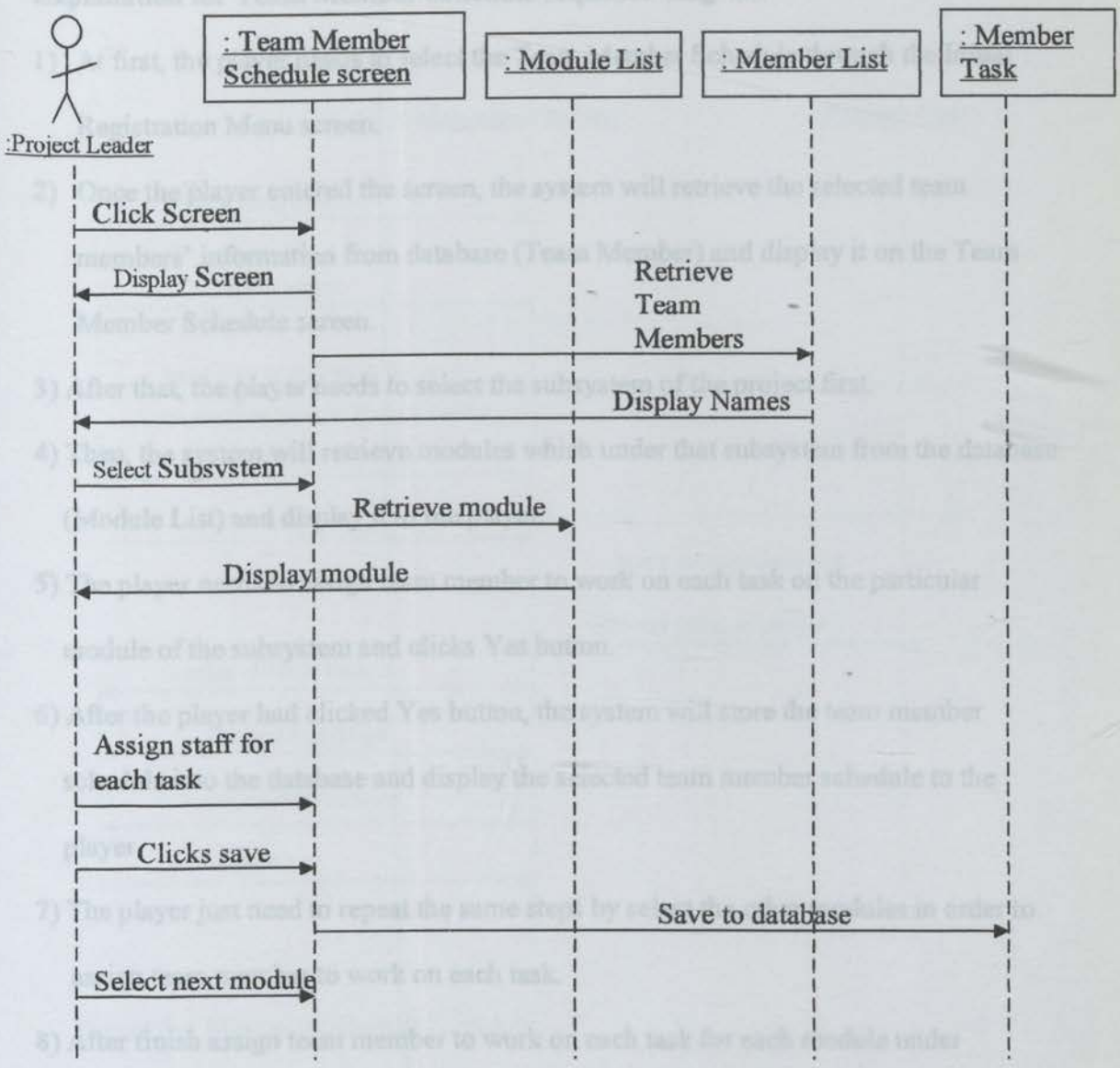

Figure 5-4 Team Member Schedule sequence diagram

Explanation for Team Member Schedule sequence diagram

1) At first, the player needs to select the Team Member Schedule through the Initial Registration Menu screen.
2) Once the player entered the screen, the system will retrieve the selected team members' information from database (Team Member) and display it on the Team Member Schedule screen.
3) After that, the player needs to select the subsystem of the project first.
4) Then, the system will retrieve modules which under that subsystem from the database (Module List) and display it to the player.
5) The player needs to assign team member to work on each task on the particular module of the subsystem and clicks Yes button.
6) After the player had clicked Yes button, the system will store the team member schedule into the database and display the selected team member schedule to the player.
7) The player just need to repeat the same steps by select the other modules in order to assign team member to work on each task.
8) After finish assign team member to work on each task for each module under different subsystem, the player needs to click Initial Registration Menu button and answer Yes to the confirmation message box to return to the Initial Registration Menu screen.

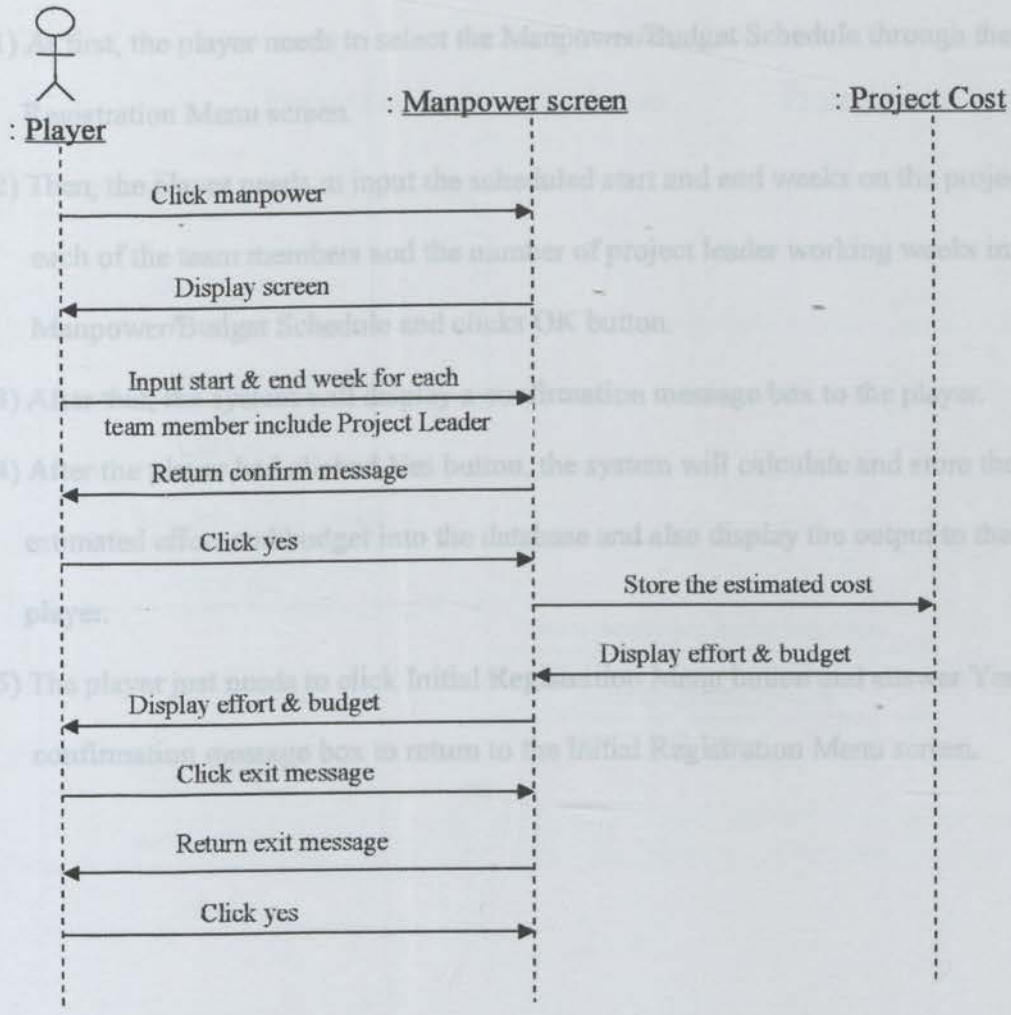

Figure 5-5 Manpower/Budget Schedule

Explanation for Manpower/Budget Schedule sequence diagram

1) At first, the player needs to select the Manpower/Budget Schedule through the Initial Registration Menu screen.

2) Then, the player needs to input the scheduled start and end weeks on the project for each of the team members and the number of project leader working weeks into the Manpower/Budget Schedule and clicks OK button.

3) After that, the system will display a confirmation message box to the player.

4) After the player had clicked Yes button, the system will calculate and store the estimated effort and budget into the database and also display the output to the player.

5) The player just needs to click Initial Registration Menu button and answer Yes to the confirmation message box to return to the Initial Registration Menu screen.

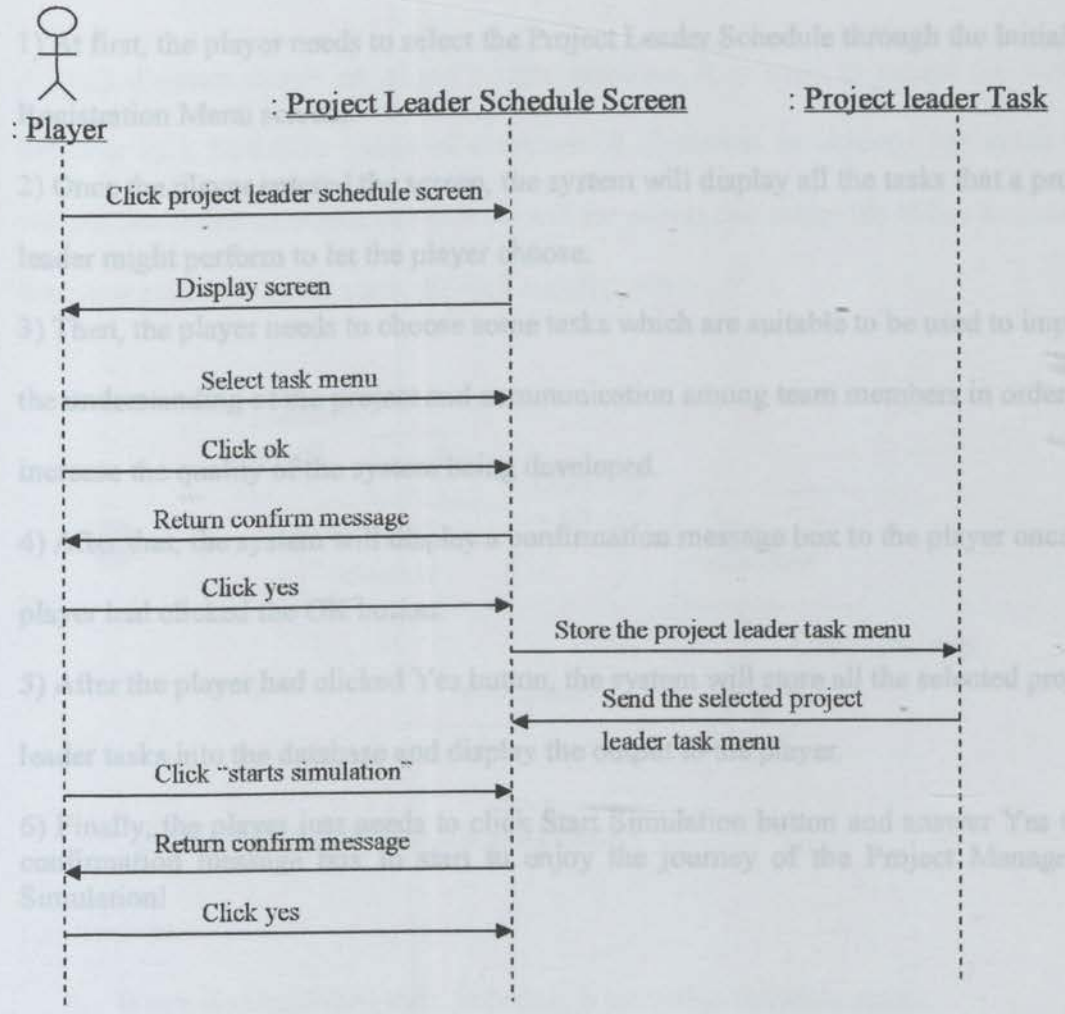

Figure 5-6 Project Leader Schedule

Explanation for Project Leader Schedule sequence diagram

1) At first, the player needs to select the Project Leader Schedule through the Initial Registration Menu screen.

2) Once the player entered the screen, the system will display all the tasks that a project leader might perform to let the player choose.

3) Then, the player needs to choose some tasks which are suitable to be used to improve the understanding of the project and communication among team members in order to increase the quality of the system being developed.

4) After that, the system will display a confirmation message box to the player once the player had clicked the OK button.

5) After the player had clicked Yes button, the system will store all the selected project leader tasks into the database and display the output to the player.

6) Finally, the player just needs to click Start Simulation button and answer Yes to the confirmation message box to start to enjoy the journey of the Project Management Simulation!

5.1.3 State chart diagrams

A state diagram shows an object's state machine. It is used to model the dynamic behavior of a particular object of a system. It illustrates an object's life cycle – the various states that an object can assume and the events that cause the object to transition from one state to another state. (Scott,Kendall ,2001)

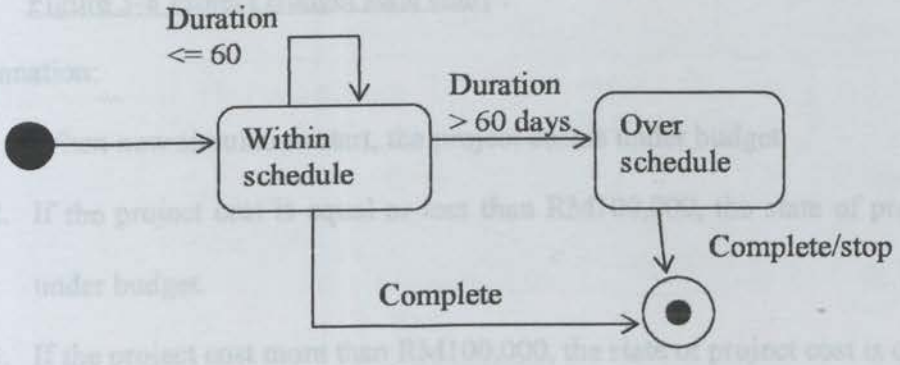

Figure 5-7 Project schedule state chart

Explanation:

1. When the simulation start, Schedule is on within schedule state.
2. If the project duration is equal or less than 60 days, the Schedule is on within schedule state.
3. If the project duration is more than 60 days, the Schedule is change to over schedule state.

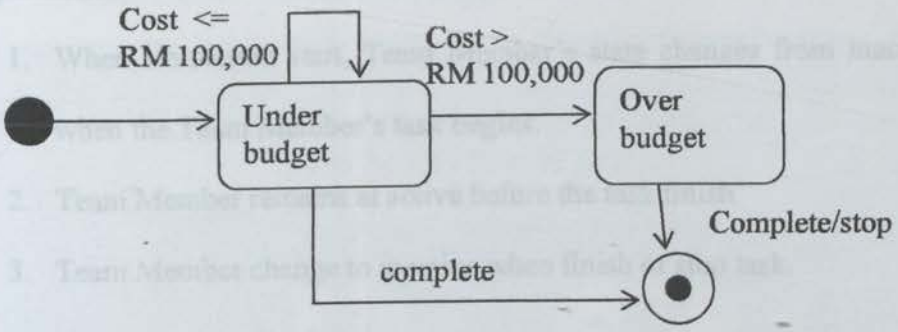

Figure 5-8 Project Budget state chart

Explanation:

1. When new simulation start, the project cost is under budget.
2. If the project cost is equal or less than RM100,000, the state of project cost is under budget.
3. If the project cost more than RM100,000, the state of project cost is over budget.

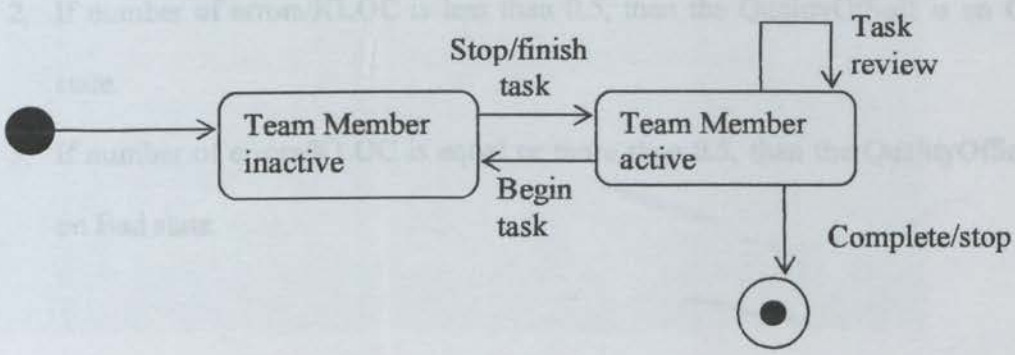

Figure 5-9 Project Resource state chart

Explanation:

1. When simulation start, Team Member's state changes from inactive to active when the Team Member's task begins.
2. Team Member remains at active before the task finish.
3. Team Member change to inactive when finish or stop task.

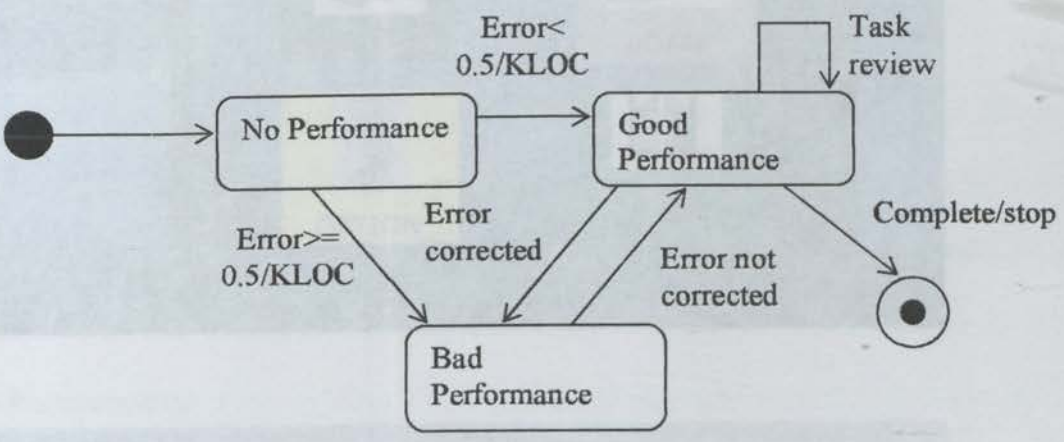

Figure 5-10 Project Quality state chart

Explanation:

1. When new simulation start, the QualityOfSoft is on none performance state.
2. If number of errors/KLOC is less than 0.5, than the QualityOfSoft is on Good state.
3. If number of errors/KLOC is equal or more than 0.5, than the QualityOfSoft is on Bad state.

5.2 Graphic User Interface (GUI)

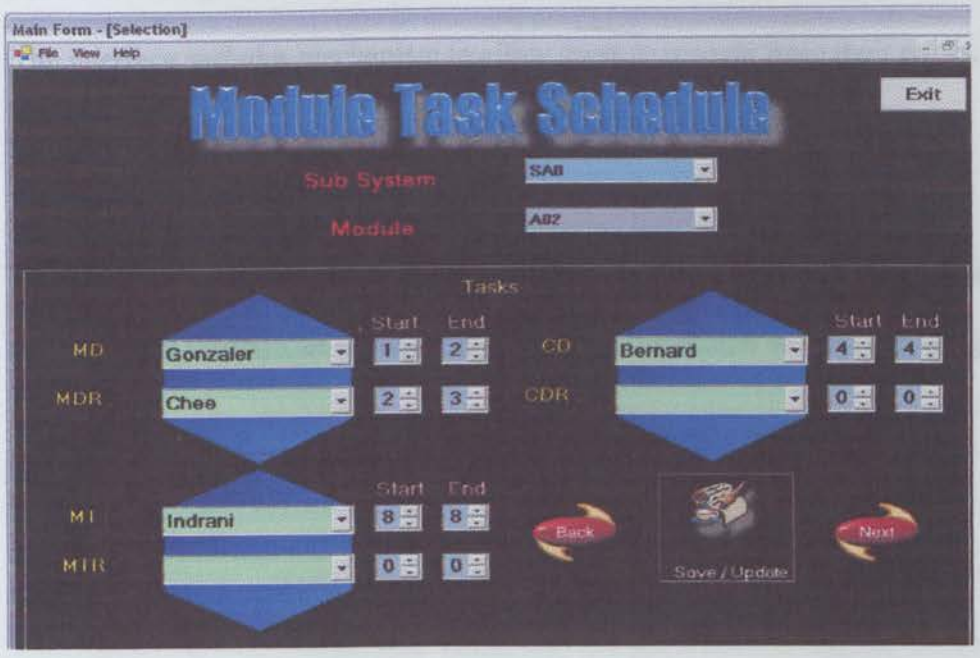

Figure 5-11 Interfaces on the Project Management Simulation

The user interface of the Simulation of Project Management was designed to help player gain rapid access to the content of the system. The user interface was designed following these principals:

- Consistency

The interface has to be consistent and therefore the comparable operations should be activated in the same way.

- User Familiarity

The interface uses terms and concepts that are common and easy to understand.

- Recoverability

The interface includes mechanism to allow users to recover from their errors.

- User Guidance

The interface incorporates come form of context-sensitive guidance and assistance. The splash screen displays an introduction about the Simulation of Project Management.

Basically, the Simulation of Project Management was formed by the combination of 4 main modules which are Initial Registration Menu, Project Leader Schedule, Team Member Management Menu and Progress Table Menu. Each of these modules was further divided into subcomponents.

5.3 Database

Data storage is the heart of the Simulation of Project Management. The data has to be available when requested by the user. Besides, data must be up-to-date and consistent. Database design should comprise well-organized storage of the data and efficient retrieval of data. The information obtained from the database should be in a form where it is easily manageable or controlled. The objectives of database design are as follow:

- Purposeful information retrieval
- Efficient data storage
- Data availability
- Efficient updating and retrieval
- Data integrity

The Simulation of Project Management database was constructed using Access 2000. A systematic and well thought-out design was designed considering the above-mentioned objectives.

Listed in Table 5-1 are the attributes related to the database.

Table 5-1: Database Attributes

Database Name	Attribute
Data Source Name (DSN)	SOPM.mdb
Type	Microsoft Access
Usage	Maintains and keeps the records of the player and system.

5.3.1 Data Dictionary

Data Dictionary describes the content of the data stored in the database. The data dictionary tables in the Simulation of Project Management are as follow:

Table 5.2 Table Design view

Field Name	Data Type	Description
Name	Text	Selected team member's name
Position	Text	Staff's position
Salary	Number	Staff's salary

3.4 *Summary*

This chapter described the system design of Project Management Simulation. The description includes the system design overview and the data flow of the system.

The system design overview elaborates the main modules of Project Management Simulation. The main modules of the system namely the database, Simulation module and graphic user interface. Every module has their own functions to run the system. The database contains the traveling information. The Resources module generates the problems and deducts marks then keep in the result storage. The GUI interact the system with the user.

The data flow of the system start from the database where the information on project is kept. The data transferred to the Project Management Simulation as the parameter and saved. Finally, the data is transferred to the GUI for the users' viewing.

Chapter VI: System Implementation

CHAPTER VI: SYSTEM IMPLEMENTATION

6.1 Introduction

System implementation is a phase of realization of the designed modules to develop a system based on the requirements which have been planned earlier. This phase describes how the initial and revised process design put into the real work. Therefore, system development, coding methodology and development tools will be defined more detail in this phase.

The quality of this implementation of the system or modules is measured on how it is developed as it is tailored in the design phase. In other words, an implementation is considered bad, if it doesn't follow the routine or architecture of the design, even though the outputs are still the same. The quality of implementation of a system is closely related to the software quality.

Besides that, it also depends on the techniques of writing codes, handling resources, time consumed and documentation. This system uses a naming convention to ensure uniformity of the control and object names. The purpose of this naming convention is to increase the readability of the codes. Table 6.1 shows the example of the naming convention.

Control	Control Name	Example
Command Button	btn	btnBack

Table 6.1 : Naming Convention

6.2 Coding Methodology

There are many coding methodologies that can be used to develop a system. Among them are Top-Down Approach and Bottom-Up Approach. The coding methodology used for developing the proposed system is more towards the Top-Down Approach. The reason for using this approach is to enable the testing activities in the proposed system to be carried out on the main completed modules while others are still being coded.

6.2.1 Top-Down Approach

Top-Down coding allows the high level modules to be first and leaving the lower-level modules in skeleton form, to be filled later (Pressman, 1997).

One of the advantages in using this approach in developing this proposed system is that it ensures the most important module is developed earlier to get feedback from the users and testing is done first on the main modules. This will also get a preliminary version of the proposed system sooner.

6.3 Coding Tools

Coding perform tasks, which translates design into a machine-readable form. If design is performed in a detailed manner, code generation can be accomplished mechanistically (Pressman, 1997).

The riches of programming languages are an important factor to produce a high quality system. To develop the proposed system, a windows-based GUI programming tool from scratch was needed. Therefore, Visual Basic .NET was used. All the source codes are kept in files in a directory which created using VB.NET.

6.4 Coding Style

Coding style is an important attribute of source code and it determines the intelligibility of a program. In the proposed system, an easy way to read source code is implemented for easier maintenance and enhancement.

The elements of style included in the proposed system's internal (source code level) documentation are the methods for data declaration and approach to statement construction. The following lists some of the style used using the proposed system coding.

- Selection of meaningful identifiers (variables and labels) name.
- Description and appropriate comments written in source code.
- Indention of codes increases the readability of source code.

6.5 Accessing Database

This system uses the ActiveX Data Object (ADO) to access the database which store all the information of the game. Every record are being retrieve using SQL command and uses a record source to capture the command

There are a few objects under this Algorithm:

Recordset object- to stored data selected by record source

Connection object – to start a connection to database

(1 connection cannot not open more than 1 times while the first 1 is still opened)

example:

```
Dim rsOPS As New ADODB.Recordset()
Dim rsProjectLeader As New ADODB.Recordset()
```

```
recordsource = "SELECT * FROM Manpower WHERE PLid=" & "'" & PLID.Text
& "'" & ""
rsManpower.Open(recordsource,DBS,,
ADODB.LockTypeEnum.adLockPessimistic,)
```

6.6 Processing Form

To create a MDI form where only 1 parent form exist and the others bind to it as child form is by declaring all forms with public initialization

Then the forms' name are being set as child in the parent form. They can me call by form.show() function .To close those child form , I need to use .hide function so it remains as child form

Public frmQuality1 As New Quality

```
frmQuality1.MdiParent = Me
frmQuality1.Show()
```

6.5 Summary

System implementation involves the translation of the software representation produced by the design phase into a computer-readable form. Coding is a process that translates a detail design representation of software into a programming language realization. Coding convention such as program labeling, naming, conversion, comments, and indention should be adhered too. Codes should be easy to understand, easily revised or corrected and readable to facilitate maintenance.

The codes should be able to handle user error by responding appropriately; perhaps with a diagnostic error message and system failure should not result.

CHAPTER IV: SYSTEM TESTING

7.1 Introduction

System testing was performed to check whether the system is working according to the design and requirements. The system-testing phase also ensures that the system is bug free and performs as expected. System testing was carried out throughout the system development cycle. Many types of tests were performed to ensure that the errors were detected and corrected. This increased the reliability and integrity of the system and consequently assured the quality of system. The testing process also ensured that the system requirements specifications met the user's expectations.

Figure 7.1 shows the testing steps that perform in the testing of Simulation of Project Management program.

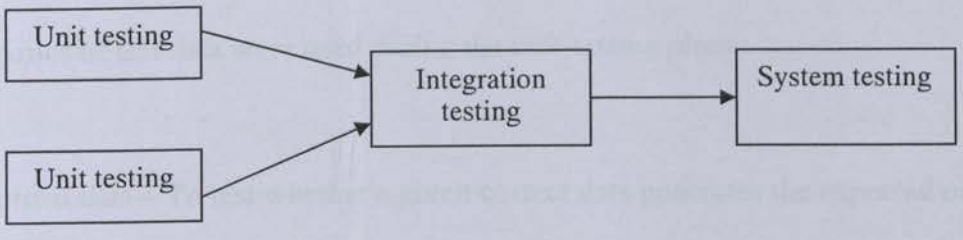

Figure 7.1: Testing steps

7.2 Testing Methods

A set of testing techniques was used as the guide in this phase. Several principals suggested by Davis (1995) were followed when testing the Simulation of Project Management. Those were:

- Tests should be planned long before testing begins. The planning process could begin as soon as the requirement model is completed.
- Testing should begin 'in the small' and progress towards testing 'in the large'. The first test phase should generally focus on individual components. Then, as the testing progresses, the focus should move on to detect the errors in the integrated clusters of components and subsequently to the performance of the entire system.

7.3 Unit Testing

Unit testing verifies that the components functions properly with the types of input expected from studying the component's design. Each program component is tested individually, isolated from the other components in the system. The following categories of test data were used during the unit-testing phase:

- Normal data – To test whether a given correct data generates the expected output.
- Erroneous data – To test on the system's ability to detect the incorrect data given.
- Boundaries value analysis – To test the system with the data that are out of the specified range in order to avoid the occurrence of error at the extreme point.
- Condition testing data – To test a set of data on all the possible conditions as some functions may only be active under certain conditions.

The following explains on how the unit testing was carried out on the Simulation of Project Management:

- The programs were manually examined by reading through the codes to detect algorithmic faults, data and syntax errors.
- The codes were then compared with the specifications and design to ensure that all relevant cases are considered.
- The progress bars, combo box, command buttons, text boxes and other control objects were also tested to check on its functionality.

During the unit testing, majority of the faults were rectified. The faults were caused by syntax errors, incomplete codes, wrong functions or incompatible data format especially in database. Even a small spelling mistake could lead to a major headache.

7.4 Integration Testing

Integration testing is the process of verifying that the system components work together as described in the system and program design specifications. The modules were combined into a working system once the individual components are functioning correctly. The integration testing was used for constructing the system's program structure and at the same time to detect and eliminate errors associated with integration. Any system with integrated modules like the Simulation of Project Management must go through integration testing to ensure that the relationships between modules and sub-

modules are systematic in the entire system. The integration method that was used in the Simulation of Project Management was bottom-up testing. Each module was tested in small segments. Encountered errors and problems were corrected and solved. Then the whole module was tested to ensure that it was functioning as expected. Therefore each component, at the lowest level in the system was tested first. Then the next component to be tested would those that would the previous one. This approach was followed until all components are comprised in the testing.

For instance, the Overall Process Schedule consists of three functions. The estimated schedule by player were created, edited and can be retrieved as well when the player quits the game and loads it again. The integration testing ensures that each of this function work collaboratively when they are integrated. The Overall Process Schedule did produce the desired progress bar chart using the data entered in text boxes. All the modules were tested to ensure that the integrated components in the system functioned as expected.

7.5 System Testing

System testing is difference from unit testing and integration testing. System testing is ultimate testing procedure. It studies all the concerns issue and behaviors that can only be exposed by testing the entire integrate system or major part of it. The testing process is also concerned with validating the system meets its functional and non-functional requirements. The following testing description has been carried out:

7.5.1 Functional Testing

System testing begins with function testing which is based on the functional requirements. A function test checks that the integrated system perform its function as specified in the system analysis. In Simulation of Project Management, functional testing will be carried out on five input forms and four output forms.

Aspects	Tested	Evaluation
Overall Project Schedule		
Display Gantt chart according to the inserted data.	✓	Fair
Can insert new data and update existing data.	✓	Good
Data of "start day" and "end day" control by the interdependency function.	✓	Good
Team Organization		
Display all staff profile information	✓	Clear
Click "next" button to view the next staff information and click "pervious" button to view pervious staff information.	✓	Easy browse
Can review and select team member from the staff profile	✓	Good
Can remove the selected team member from combo box.	✓	Flexible

Manpower/ Budget Schedule		
Display selected team member into combo box.		Good
Display budget according to the position into bar chart.		Clear
Display each team member assigned working day.		Good
Calculate the total of estimated budget.		Functional
Team Member Schedule		
Assign team member for each module.		Fair
Assign start day and end day for each task.		Good
		
Project Leader Schedule		
Add and remove task from the project leader schedule table.		Good
Display 60 working days and task name in the project leader schedule table.		Good
Enable to add working day when simulation days exceed 60 days.		Functional
Subsystem Quality Review		
Display updated record.		Good
Print report.		Good

MD/CD/MT Progress Table		
Displays update record.	✓	Clear
Print report.	✓	Functional
	✓	
IT Progress Table		
Display updated record.	✓	Clear
Print report.	✓	Functional
	✓	
Simulation Result		
Display all the simulation result	✓	Good
Print report	✓	Functional

7.5.2 Performance Testing

Performance testing compares the integrated components with the non-functional system requirement. The non-functional that have been stated during system analysis and design phases will be tested one by one with all function. Thus, the performance test will be focus on the aspect of graphic user interface (GUI), reliability and usability.

Non-functional aspects	Tested	Evaluation
Attractiveness	✓	Fair
Readability of text	✓	Clear
Form layout / design	✓	User friendly
Error handle completely	✓	Fair
Run application successfully	✓	Good

Table 7.2: Performance testing evaluation

7.6 Summary

Through the testing stage, there were a few errors being found in the newly developed Simulation of Project Management program. The errors were mostly from the programming coding and the functional design of the system. Those errors caused the system run incorrectly and also invoked bugs and problems to the other functions of the system. Therefore, testing is one of the most important stages in developing of Simulation of Project Management.

There are many techniques that can be used to test the code components. The goal of testing in Simulation of Project Management is to find faults, not to prove correctness. Indeed, the absence of faults does not guarantee correctness.

A complete system is the system that is without any fault and can be function well as expected by the system user.

8.0 CHAPTER VIII: DISCUSSION

8.1 Introduction

In the system evaluation phase, the system's effectiveness and efficiency was evaluated. This chapter analyzes the system and identifies its strengths and limitations. The problem encountered and the solutions for the system are also explained.

8.2 Problem Encountered & Solutions

• Unable to decide on the development tools

Deciding on the right and most suitable hardware and software was indeed a very big dilemma. The operating system and programming tool that was chosen during the system analysis phase in the previous semester was Microsoft Windows XP Professional and Visual Basic.NET respectively. This was because they are newer technologies with better features and they were more flexible especially to develop a windows-based application like the Simulation of Project Management.

• Inadequate experience in database design

Due to insufficient knowledge and experience in creating a good database, the database design had go through a lot of changes before the final product was completed.

• Unfamiliar with certain development tools

My inadequacy with the Microsoft Access 2000 and Visual Basic.NET programming tools was quite a drawback at first. Thus a lot of time was spent on learning the tool itself before building the system.

8.3 System Strengths

• Simple and user friendly interface with a consistent looks and feel

The Simulation of Project Management provides a very simple and consistent interface to the user. The user can easily familiarize themselves with the application within minutes. Besides, the Tutorial menu guides the new user about the system and its features.

• User and password validation

This system is a password-protected application for the player. Therefore the security feature ensures that unauthorized players are prohibited from playing the simulation.

• Reliable system with effective error recovery

The system caters for any possible error. The Visual Basic.NET programming language generates an appropriate feedback during the occurrence of any error. For instance, if the player inserts a wrong username and password, the system notifies the player with a friendly message.

• Tutorial as a guideline for player

The system is incorporated with a guideline for player on how to play the Simulation of Project Management successfully. Simple explanation on its features helps new players to learn and use the application instantly.

8.4 System Limitation

• Non-portability

This system can only run on Windows operating system.

8.5 Future Enhancements

• User Interface

The user interface could be given a face-lift or more 3D animation to give the simulation a much more attractive appearance and professional-look.

• More Functions

More functions could be added to make this application a better Simulation of Project Management. For instance, a function to display a calendar for the player to view the estimated schedule instead of the continuous working days would be an advantage.

• Provide Resources

A help file that containing links to project management web sites would benefit the player. It would help them to learn more about project management and become more confident to score high mark for the Simulation of Project Management.

8.6 Knowledge and Experienced Gained

This entire project had provided a great deal for knowledge and experience to me. This project gave me great opportunity to apply the knowledge learned from books to use. The various techniques, paradigms and software development approaches in system analysis and design were well read. Likewise programming tools and application such as Visual Basic. NET, Microsoft Access, Ulead PhotoImpact and also Macromedia Flash MX were also learned in detail. Therefore accomplishing this project had given me an excellent privilege and opportunity to widen my knowledge in the respective field. During the entire system development phase, the sense of responsibility to complete a task on time and the attitude to give the best developed in me.

Besides, in the midst completing this system, I also manage to identify my weaknesses in windows-based application development technologies and improve myself in whatever that was lacking to accomplish the desired system successfully.

8.7 Conclusion

In a nutshell, the expected outcome of this project was to develop a 'simple' Simulation of Project Management that is fully stand-alone application and easy-to-use. Basically, the project has accomplished the listed prerequisites and had achieved all of the objectives. The Simulation of Project Management is stable and provide user-friendly interface. Therefore, the player should not find any difficulty in using this system.

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APPENDIX

VB.NET Code for Team Organization

```
Public Class Profiles
    Inherits System.Windows.Forms.Form
    Public imageNumber = -1

    Windows Form Designer generated code

    Private Sub btnClose_Click(ByVal sender As System.Object, ByVal e As System.EventArg

    Private Sub cmbChoose_Selected_dbClick(ByVal sender As System.Object, ByVal e As Sys

    Private Sub btnNext_Click(ByVal sender As System.Object, ByVal e As System.EventArgs

    Private Sub btnChoose_Click_1(ByVal sender As System.Object, ByVal e As System.Event
    Private Sub btnChoose_MouseEnter(ByVal sender As Object, ByVal e As System.EventArgs
    Private Sub btnChoose_MouseLeave(ByVal sender As Object, ByVal e As System.EventArgs

    Private Sub btnBack_Click(ByVal sender As System.Object, ByVal e As System.EventArgs

    Private Sub btnNext1_Click(ByVal sender As System.Object, ByVal e As System.EventArg

End Class
```

VB.NET Coding for Team Selection

```
    Private Sub Save_Upd_Click(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles Save_Upd.Click
        Dim rsExist As New ADODB.Recordset
        'Validate form*******************

        If cmb1.Text = "" Then
            MsgBox("Please select a sub system",
MsgBoxStyle.Exclamation, "")
            Exit Sub
        End If

        If cmb2.Text = "" Then
            MsgBox("Please select a module", MsgBoxStyle.Exclamation,
"")
            Exit Sub
        End If

        If MD.Text = "" Then
            MsgBox("Please assign staff to MD task",
MsgBoxStyle.Exclamation, "")
            Exit Sub
        End If

        If MDT.Text = "" Then
            MsgBox("Please assign staff to MDT task",
MsgBoxStyle.Exclamation, "")
            Exit Sub
        End If

        If CD.Text = "" Then
            MsgBox("Please assign staff to CD task",
MsgBoxStyle.Exclamation, "")
            Exit Sub
        End If

        If MDR.Text <> "" Then
            If num3.Text < num2.Text Then
                MsgBox("MDR can only start after MD finished",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
            If num4.Text < num3.Text Then
                MsgBox("Invalid MDR end date !",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
        Else
            If num9.Text < num2.Text Then
                MsgBox("CD can only start after MD finished !",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
        End If
```

```
        If CDR.Text <> "" Then
            If num11.Text < num10.Text Then
                MsgBox("CDR can only start after CD finished",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
            If num12.Text < num11.Text Then
                MsgBox("Invalid CDR end date !",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
        Else
            If num5.Text < num10.Text Then
                MsgBox("MT can only start after CD finished !",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
        End If

        If MTR.Text <> "" Then
            If num7.Text < num6.Text Then
                MsgBox("MTR can only start after MT finished",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
            If num8.Text < num7.Text Then
                MsgBox("Invalid MTR end date !",
MsgBoxStyle.Exclamation, "")
                Exit Sub
            End If
        End If



        '*************************************************************
        'Save to database
        '*************************************************************

        Dim taskarr() As String = {"MD", "MDR", "MDT", "MTR", "CD",
"CDR"}
        Dim tmidar() As Label = {tmid0, tmid1, tmid2, tmid3, tmid4,
tmid5}
        Dim numara() As NumericUpDown = {num1, num3, num5, num7, num9,
num11}
        Dim numarb() As NumericUpDown = {num2, num4, num6, num8,
num10, num12}
        Dim i As Integer = 0



        With rsTmTask

   '.........New table ....no database************************
            If .BOF Then
                While (i < 6)
                    .AddNew()
```

```
                    If tmidar(i).Text = "" Then
                        .Fields("TMID").Value = 0
                    Else
                        .Fields("TMID").Value = tmidar(i).Text
                    End If

                    .Fields("subsystemName").Value = cmb1.Text
                    .Fields("moduleName").Value = cmb2.Text
                    .Fields("task").Value = taskarr(i)
                    .Fields("startDate").Value = numara(i).Text
                    .Fields("finishDate").Value = numarb(i).Text
                    .Update()
                    .MoveNext()
                    i += 1
                End While

            Else

        '***********Existing data found and replace**************
                recordsource = "SELECT * FROM RealPlay WHERE PLID = '"
& PLID.Text & "' "
                rsExist.Open(recordsource, DBS, , , )
                If Not rsExist.BOF Then
                    rsExist.MoveFirst()

                    While Not rsExist.EOF
                        If rsExist.Fields("moduleName").Value <>
cmb2.Text Then
                            rsExist.MoveNext()

                        Else
                            .MoveFirst()
                            While Not .EOF
                                If .Fields("TMID").Value =
rsExist.Fields("TMID").Value Then
                                    Exit While
                                End If
                                .MoveNext()
                            End While

                            While (i < 6)

        'assign tm000 to task if nobody *****************
                                If tmidar(i).Text = "" Then
                                    .Fields("TMID").Value = 0
                                    .Fields("startDate").Value = 0
                                    .Fields("finishDate").Value = 0
                                Else
                                    .Fields("TMID").Value =
tmidar(i).Text
                                    .Fields("startDate").Value =
numara(i).Text
                                    .Fields("finishDate").Value =
numarb(i).Text
                                End If
```

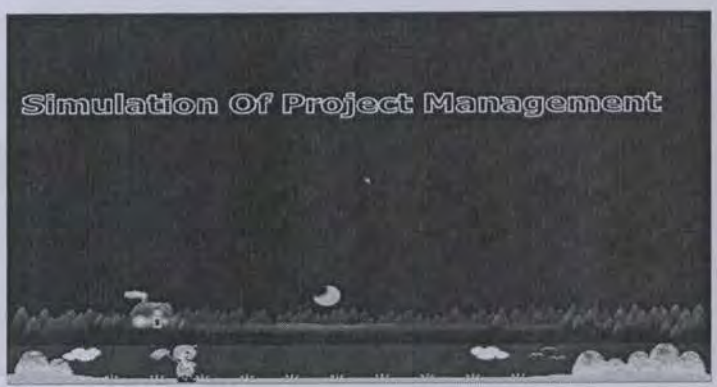
```
                                .Update()
                                .MoveNext()
                                i += 1
                            End While

                            GoTo jump
                        End If

                    End While
                End If

'New record for New Project Leader*****************************
                While (i < 6)
                    .AddNew()
                    If tmidar(i).Text = "" Then
                        .Fields("TMID").Value = 0
                    Else
                        .Fields("TMID").Value = tmidar(i).Text
                    End If

                    .Fields("subsystemName").Value = cmb1.Text
                    .Fields("moduleName").Value = cmb2.Text
                    .Fields("task").Value = taskarr(i)
                    .Fields("startDate").Value = numara(i).Text
                    .Fields("finishDate").Value = numarb(i).Text
                    .Update()
                    .MoveNext()
                    i += 1
                End While

            End If

jump:
            MsgBox("Datasave !", MsgBoxStyle.Information, "")
        End With
    End Sub
```

Appendix

User Manual

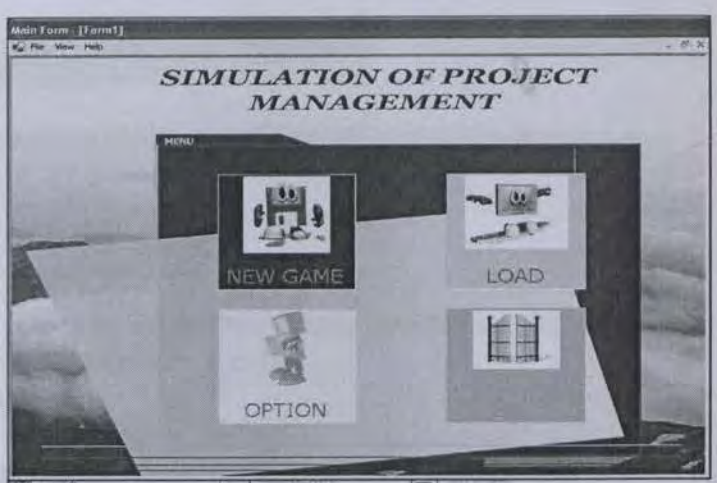
Splash Screen

Figure below shows the Splash screen for Simulation of Project Management. Then Splash screen will appear for 3 seconds before display the Main Form of this application.



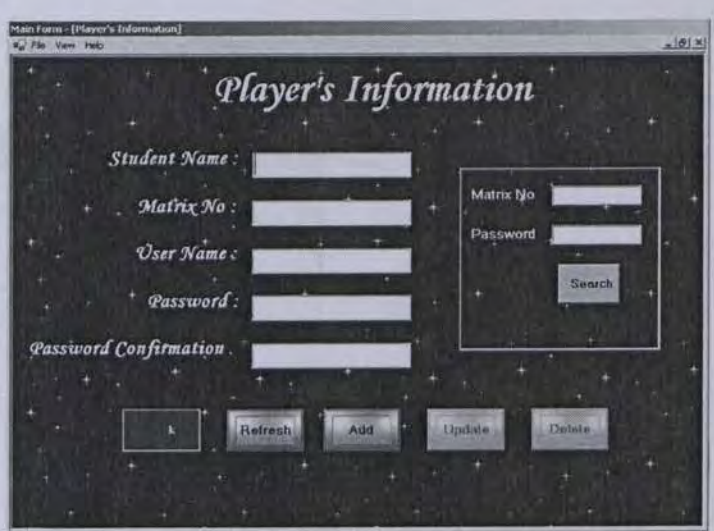
Main Form

After the Splash screen, the Simulation of Project Management's main page will be shown:

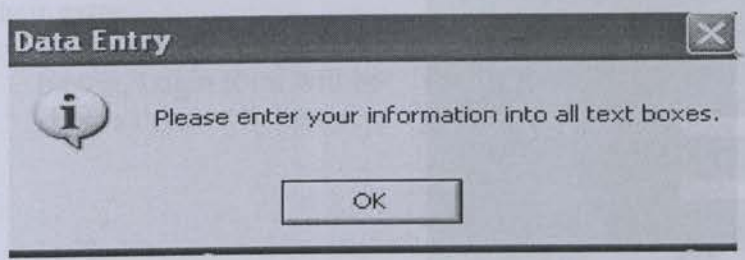


i. New Game button is used to register as a new player.
   a. When user click the New Game button, Player's Information form will be show as shown in below.

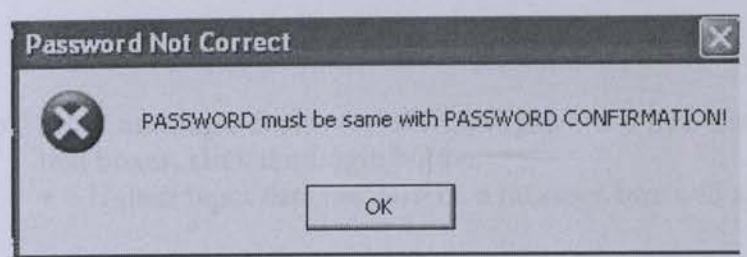
   b. In Player's Information form, user needs to input their information into all text boxes.
   c. After user click the Add button, a message box will pop up as shown in below if user:



- Successfully add their record.
- Not input their information into all text boxes.



- Input a different password into Password and Confirmation Password text box.

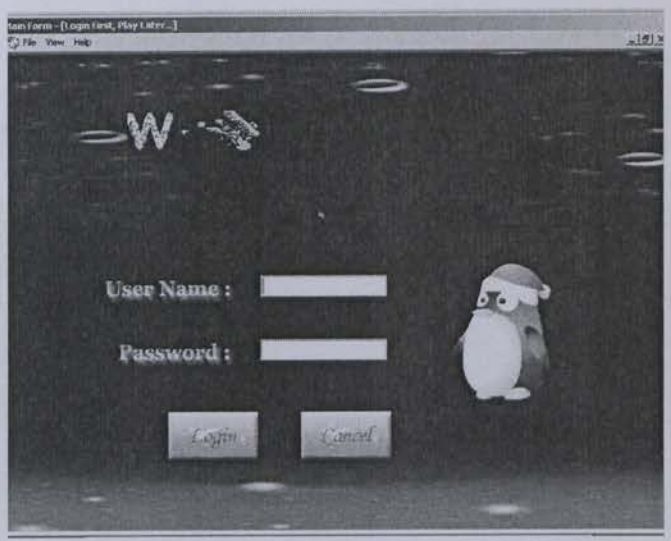


d. User can also search existing record by input their matrix number into Matrix No's text box and Password into Password's text box.

e. After user click the Search button:
   - If data existing,
     - Their information will be displayed out in all text boxes as shown in below.
     - User can edit all text boxes except Matrix No's text box to update or delete the current record by clicking Update or Delete button.
   - If data not existing, a message box which inform user that no existing data were found will be shown as below.

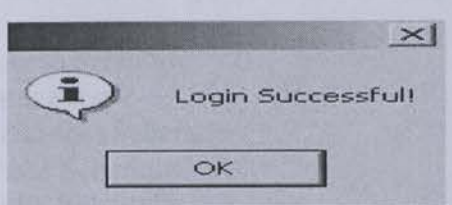
ii. Load button is used for user to login in into Simulation of Project Management and start their game.

a. When user clicks the Load button, Login form will be show as shown in below.

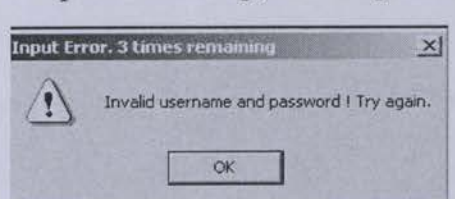


b. After user input their user name and password into User Name and Password text boxes, click the Login button.

- If their input data are correct, a message box will appear as below.



- Click OK to enter to Initial Registration Menu.
- If their input data wrong, a message box will appear as below.



- Click OK to input their data again.

iii. Exit button is for user to exit the Simulation of Project Management application.

Initial Registration Menu

Initial Registration Menu is load when user login in successfully.

Input Screen

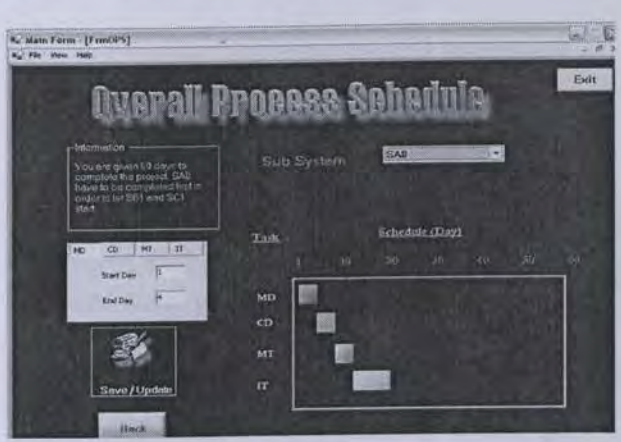
The Simulation of Project Management contains 5 input screens for the player to input the plan to develop the simulation project. These 5 input screens are:

- Overall Process Schedule
- Team Organization
- Manpower/Budget Schedule
- Team Member Schedule
- Project Leader Schedule

The following will briefly describe the function provided by each of these input screens.

1.1 Overall Process Schedule

The Overall Process Schedule contains the estimated start and finish day for the Module Design (MD), Coding (CD), Module Test (MT) and Integration Test (IT) phases of development. The Overall Process Schedule is registered through the Initial Registration Menu at the initial registration time. However, it cannot be accessed after the simulation is in progress.



Steps:

1. At first, the player needs to select the sub system, SA0 from the combo box, which located at the top-center of the screen.

2. Then, the player have to input the planned start day and finish day in the "Start Day" and "Finish Day" text box as a digit range from 1 to 60 for the Module Design (MD), Coding (CD), Module Test (MT) and Integration Test (IT) process, which under the SA0 respectively.

3. The player must make sure that all the start day and finish day for the processes under SA0 have been input before clicks the "Save/Update" button, which located at the bottom-left of the screen.

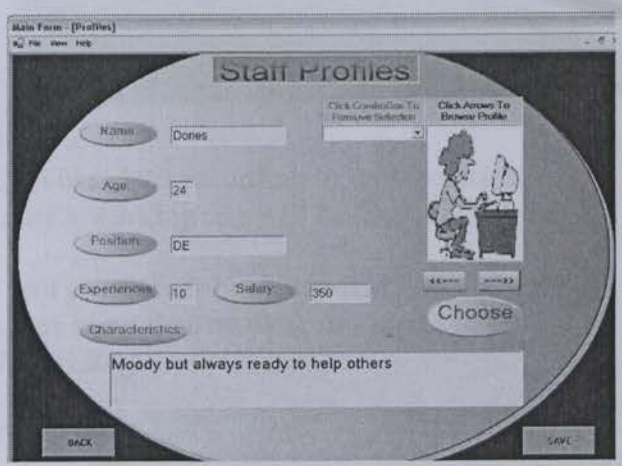
4. After that, four bars marking the start and finish day will appear in the MD, CD, MT and IT row of the bar chart.

5. Repeat step 1 to step 3 for sub system SB1 and SC1.

6. After the start and finish day have been input for all of the processes under sub system SA0, SB1 and SC1, the player just need to click the "Back" button to go back to the Initial Registration Menu.

7. A circle indicator will automatically move to "Team Organization" button to show that the player is going to the next stage or next input screen in the Simulation of Project Management.

Team Organization



This form will display the available staff and their personal details.

The user needs to browse through the picture by pressing the arrows button under the picture.

Then user can click the "Choose" button to hire the selected person

If user decide to remove his/her selection , it can be done by clicking the name in the "remove combo box ".

Manpower / Budget Schedule

Click the Manpower/ Budget Schedule button to estimate the budget based on Project Leader and other team member's working day:

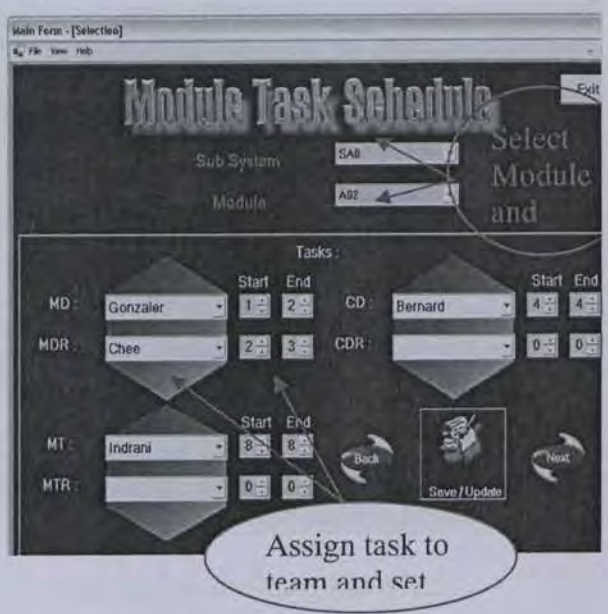
a. Form Manpower/ Budget Schedule will be shown.
b. By default, Project Leader's working day had been stored based on the Overall Process Schedule form. User can't modify it.
c. Select a member's name on Member combo box.
d. Input the working day of the member and click the Save button to estimate the budget required.
e. Estimated budget will be displayed on bar chart according to their position.
f. Each team member and Project Leader's working day will be displayed at the right bottom side.
g. If user input a working day, which will cause over-budget (>RM 100,000), then a message box will appear to inform user input that working day again.
h. Click the Back button to return to Initial Registration Form.

Team Selection

For the Module Task Schedule, the project leader needs to assign the staff to every task in each module.

If they choose sub system SA0 then the module combo box will list A01 & A02
By choosing the module combo box, game will retrieve any existing schedule or if there are none it will clear the combo box.

Every completed Module must be saved by clicking the save/update button on the bottom right.



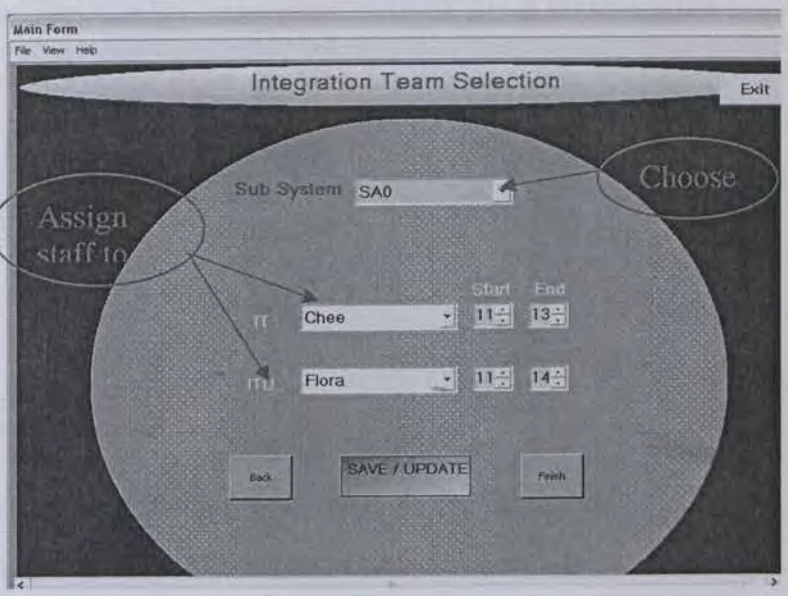
The 3 main tasks such as Module Design (MD), Coding (CD), and Module Testing (MT) must be assigned before data can be save.

Click back to go back to the page that call it and click Next to go to Integration schedule.

Integration Team Selection

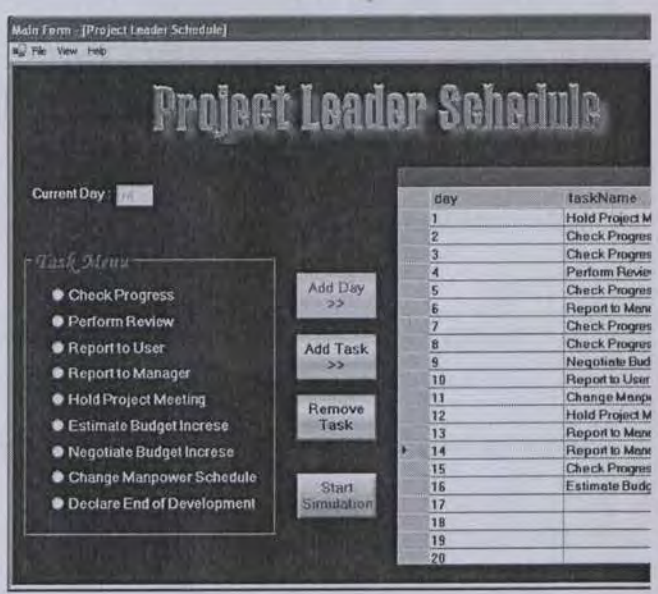
This form is same as the Select form but the project leader only need to assign integration task for the 3 sub system only.

After saving the required staff for all the task, the user should click the finish button to proceed to the Register Form and the Project Leader form



Project Leader Schedule

Explanation:



- In the project leader schedule table, the task name in the first working day is set as "Hold project meeting" task.
- Select a task from task menu and click "Add Task" button to add the selected task to the table expect the first working day.
- Task can be removed from table with select the task in the table and click "Remove Task" button.
- Click "Add Day" button to add working day.

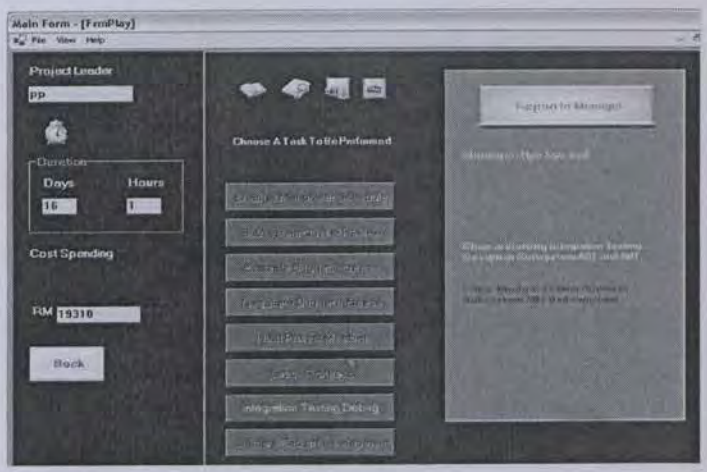
- "Add Day" button become enable when simulation working day is 60 and at the same time, project leader need to add more working days to complete the project.
- Click "Simulation Start" button to start or continue the simulation game.
- Current day is show the current simulation day.

Task menu description

Task Name	Description
Check progress	Review the project progress through the MD/CD/MT progress table and IT progress table.
Perform review	Review the current number of errors found in a subsystem.
Report to user	Report current project status to the user.
Report to manager	Report current project status to the manager.
Hold project meeting	Meet the entire project team member to discuss project current status and problems.
Estimate budget increase	Project leader can estimate the budget when need to change manpower or add working day.
Negotiate budget increase	Project leader can negotiate the budget with customer after estimated the increase budget.
Change manpower schedule	During the simulation time, project leader may assign this task to change team member of the project task.
Declare end of development	The simulation ends. The simulation result screen appears.

Play Form

1. When Play form is loaded, the simulation time for Simulation of Project Management will be starting.



2. On the left hand side of the Play form, there is information displaying current time (show in days and hours) and cost which had been spent by the player (project leader).

3. During the simulation time, project leader need to perform task by clicking the task button, which is Change Manpower Schedule, Subsystem Quality Review, Estimate Budget Increase, Negotiate Budget Increase, Hold Project Meeting, Check Progress, Integration Testing Debug, and Declare End of Development.

4. However, these tasks can only perform based on the Project Leader's schedule in form Project Leader Schedule. The simulation time will be paused every time user click the task button (except Hold Project Meeting), and it will continue again when user had finished perform that task.

5. User can always click the Back button to display the Project Leader Schedule form. Simulation time will be paused when user clicks the Back button and it will be continue again when user clicks the Continue Simulation button in Project Leader Schedule form.

6. Finally when player complete the project , the player can click the "Declare End Of Development" button which is enabled already to access the simulation result screen.

Change Manpower Schedule

Please refer to Team Selection and Integration Selection screen... ... .

Subsystem quality review

Player review the current documentation of the modules in a subsystem about the number of errors found at the tasks module design review, coding review and module test review. According to this information, the project leader can determine the quality of a subsystem.

Explanation:

- Select subsystem name that need to review from the Subsystem Name combo box.
- The numbers display under the labels of MDR, CDR and MTR are the numbers of error found.
- Character " * * " is meaning that task is on the progress.
- The numbers under the Total label is the total of error found on the module.
- The Current State label is the quality status of the module.

Function:

- Click button "Correct Error" to correct the error.
- Click button "Print" to print the subsystem quality report.

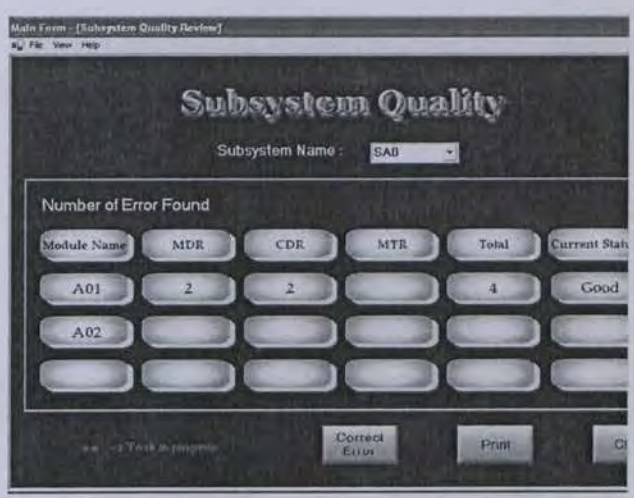


Figure: Subsystem quality review form

Correct Module Task Error

Explanation:

- Select value from the all combo box in the form.
- After select a team member to perform the correct error task, beside the combo box will display "Available Now" or "Not Available Now".
    - Available Now = free status
    - Not Available Now = busy status
- Click "Correct" button to perform the correct error task.
- Click "Cancel" button to cancel a correct error task.
- Correct 1 error per time.

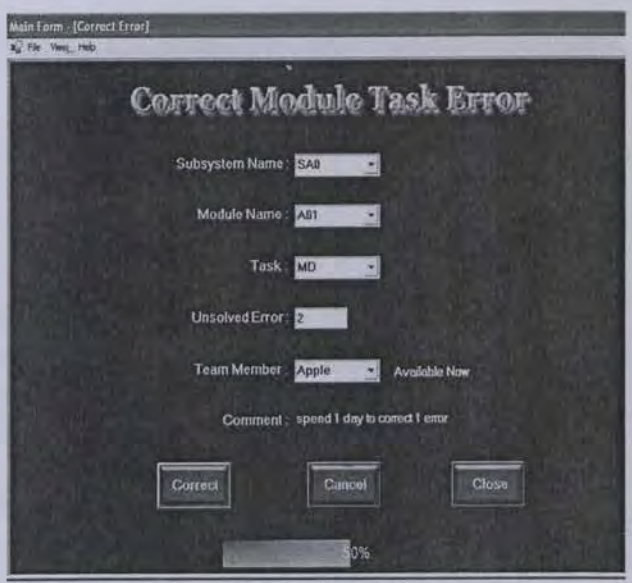


Figure: Correct Module Task Error form

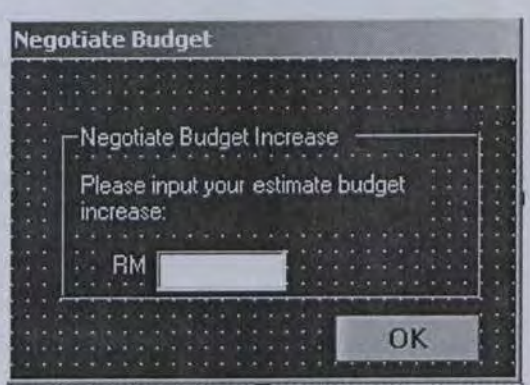
Estimate Budget Increase

Please refer to Manpower/Budget Schedule ... ...

Negotiate Team Budget

After player estimated the project budget in the "Manpower/ Budget Schedule" form, the player can negotiate the budget with customer through this screen

If their request is beyond customer limit then it will be rejected



If successful their budget will be updated .

Hold Project Meeting

Self generated conversation between project leader and team member.

Check Progress

MD/CD/MT Progress Table

Steps:

1. At first, the simulation timer will be paused. To obtain the results of simulation progress, when the task "Check Progress" is simulated, the player just need to click the "Check Progress" button, which is enabled already according to Project Leader Schedule on Play screen to view the MD/CD/MT Progress Table.

2. From the MD/CD/MT Progress Table, it is possible to obtain information, i.e. who does which task, start day, end day and also the status whether the task is "In Progress" (I) or "Completed" (C) on the progress of the module design (MD), module design review (MDR), coding (CD), coding review (CDR), module test (MT) and module test review (MTR) for each module, such as module A01, A02, B11 and so on.

3. The player can also print the MD/CD/MT Progress Table by click the "Print" button, which is located at the bottom-center of the screen.

4. The player need to click "Back" button in order to return to the Play screen after obtaining the results of simulation progress. Then, the simulation timer will be continuing to go on.

Figure: MD/CD/MT Progress Table

IT Progress Table

Steps:

1. The IT Progress Table displays:

- The information, i.e. who does which task, start day, end day and also the status whether the task is "In Progress" (I) or "Completed" (C) on the progress of the Integration Test Design (ITD) and Integration Test (IT) for each sub system, such as SA0, SB1 and SC1.
- The number of errors found through the testing process.
- The number of these errors solved and unsolved through the Integration Test Debugging (ITB) task.

However, because the Integration Test (IT) has not started yet, this table is still empty.

2. This table can be displayed through the MD/CD/MT Progress Table when the player click the "View IT Progress Table here" button.

3. The player need to click "Back" button in order to return to the MD/CD/MT Progress Table after obtaining the results of simulation progress on IT.

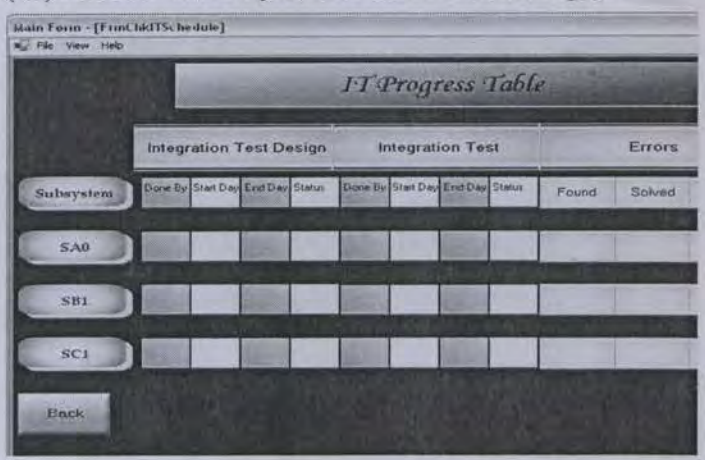
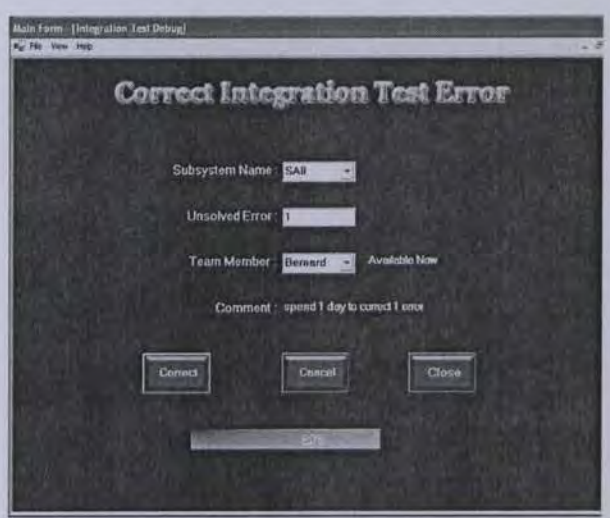


Figure: IT Progress Table

Correct Integration Testing Error

Explanation:

- Select value from the all combo box in the form.
- After select a team member to perform the correct error task, beside



the combo box will display "Available Now" or "Not Available Now".

- Available Now = free status
- Not Available Now = busy status

- Click "Correct" button to perform the correct error task.
- Click "Cancel" button to cancel a correct error task.
- Correct 1 error per time.

Declare End Of Development

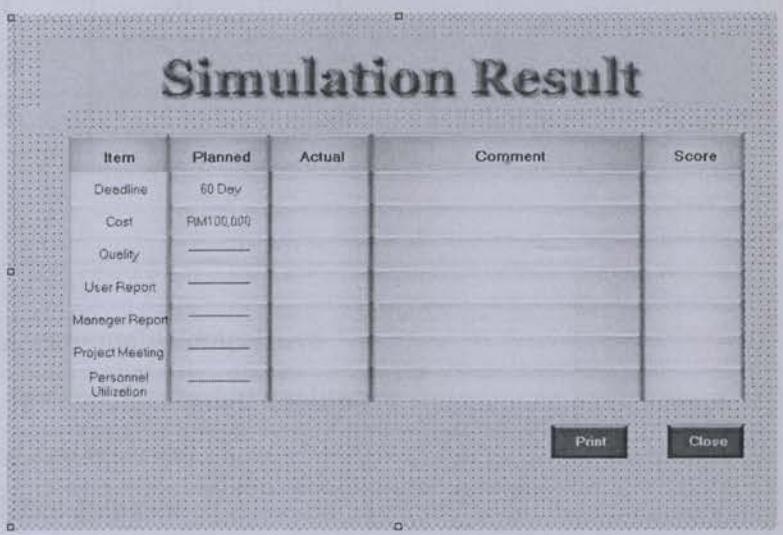


Figure: Result Screen

This screen will display the result for the player from different perspective such as schedule task and marks given

Appendix B

Team Member Profile Data

Name	Position	Experience		Skill
		MD (KLOC)	CD/MT (KLOC)	
A (Apple)	SA	25	20	A
B (Bernard)	SA	30	30	A
C (Chee)	D	20	25	C
D (Dories)	D	10	30	B
E (Elvis)	PG	2	20	C
F (Flora)	PG	5	28	B
G (Gonzalez)	TE	1	30	A
H (Henry)	TE	1	20	C
I (Indrani)	SA	28	26	A
J(Jalani)	PG	9	15	B

Name	Profile
A (Apple)	- Open, confident, extremely competitive
B (Bernard)	- Ambitious and spirited, leadership qualities
C (Chee)	- Very introverted and reserved
D (Dories)	- Adequate, but lacks ambition
E (Elvis)	- Good, but a little arrogant
F (Flora)	- Very motivated and cooperative
G (Gonzalez)	- Serious and diligent
H (Henry)	- The simulation project leader
I (Indrani)	- Very responsible, likes to finish her work before dateline
J(Jalani)	- Self-motivated and stand firm on his decision

Key to profile chart

- **Name:** Team member name

- **Position:** Job classification. Team member is System Analysis, Designer, Programmer or Test Engineer.
- **Experience:** Team member's experience in module design (MD) and coding/module test (CD/MT) in kilo steps developed. A coding/module test (CD/MT) kilo steps is equivalent to a 1000 lines of code written and tested. A module design (MD) kilo steps is the amount of module design necessary to design the logic for a 1000 lines of code.
- **Skill:** Basic skill. Manager's evaluation of team member's basic system development skill based upon the following scale:

  A: Good B: Average C: Fair

Team Member	Salary (per day)
Apple	RM 400
Bernard	RM 400
Chee	RM 330
Dories	RM 350
Elvis	RM 300
Flora	RM 310
Gonzaler	RM 380
Henry	RM 360
Indrani	RM 400
Jalani	RM 310

Standard Cost of Each Team Member