MULTI-USERS WORKSTATIONS

MICHAEL LING CHEE SIANG

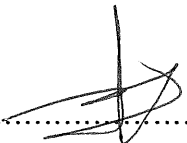## REPORT SUBMITTED IN FULFILMENT OF THE DEGREE OF COMPUTER SCIENCE (COMPUTER SYSTEM AND NETWORKING)

FACULTY OF COMPUTER SYSTEMS & SOFTWARE ENGINEERING, UNIVERSITY MALAYSIA PAHANG

2015

SUPERVISOR'S DECLARATION

I hereby declare that I have read this thesis and in my opinion this thesis/report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Computer Science (Computer System and Networking)

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Date   : ....3 / 6 / 2015.......................

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I would like to express my high appreciation to all lecturers and friends that have guided me throughout the completion of this project. Moreover, I am very grateful to both of my family for their love and endless support.

Thank you very much.

ABSTRACT

The Multi-Users Workstations is special designed for the industry with purpose to minimum the use of the computer on a work place. It also used to improve the computer functionality from a single user to multi-users on one computer on the same time. In order to design a Multi-users workstations for Sati Wealth Consultancy Sdn. Bhd, Rapid Application Development (RAD) has been chosen. RAD has several characteristics that are suitable for the development of Multi-users Workstations. This system is more on configuration to make it work properly. This system was tested with functionality testing, and user acceptance test. The results show the functionality of the system is passed which users satisfy with the system.

ABSTRAK

Multi-user workstations adalah khas direka untuk industry dengan tujuan untuk meminimunkan kegunaan sesebuah computer pada tempat kerja. Sistem ini bertujuan untuk meningkatkan fungsi-fungsi sesebuah computer daripada kegunaan bagi seorang kepada berbilang pengguna dalam masa yang sama. Dalam usaha untuk membangunkan Multi-users workstations untuk Sati Wealth Consultancy Sdn. Bhd, Rapid Application Development (RAD) telah dipilih. RAD mempunyai beberapa ciri-ciri yang sesuai bagi pembangunan Multi-users workstations. Sistem ini terlebih kepada konfigurasi untuk berfungsi dengan lancar. Sistem ini telah diuji dengan ujian unit , ujian fungsi , dan ujian penerimaan pengguna . Keputusan menunjukkan fungsi sistem itu diluluskan yang pengguna berpuas hati dengan system.

Multi-users Workstations

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Abstract— The multi-user workstation is design to make human more easier to interact with the computer. This system is to make a computer can be uses by multi user on the same time. In order to develop a multi-touch workstation Rapid Application Development (RAD) has been chosen. RAD has several characteristics that are suitable for development of this multi-user workstation. That are many type of methodology can be uses in order to develop the project, such as RAD, waterfall and etc. Those methodology are the platform of implemented the project using the certain way. The methodology that has been applied could be reliable and applicable with the system and project that are developed.

I. INTRODUCTION

In this age, technology is constantly become more high technology and moden. The computer is no an exception too. The development of new technologies have realized and focused on the interaction between computer and human.

Multi-user workstation can be the new thing to be uses on a computer. The function of the Multi user workstation is to make a computer can be use by two people on the same time. This system may need the support from the virtual machine to complete the task. This multi-user workstation can be the new direction for the people to build the advanced device and system that can support many user on the same time.

For my final project, I will make a multi-user workstation to use by multi user simultaneously by using the some equipment like virtual machine and s others. This idea I get from last time project which did by my senior and my client requirement. My client request to make a computer that can uses by multi user simultaneously.
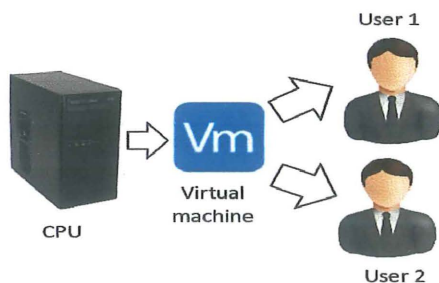
II. PROBLEM STATEMENT

Problem statement are the list why there is the need of multi-user workstations. This does mean that the existing of the computer still can be improve. Problem that arise are:

- Workstation can uses by one person in one time.

- One computer just has one desktop interface.

- Not all computer can use multi-keyboard and mouse on one computer.

III. OBJECTIVE

The following are the objective will be developed according to the development plan and it is to overcome the problem which are like workstation can uses by one person in one time, one computer only has one desktop interface, and not all computer can use multi-keyboard andmouse on one computer.

- To create a workstation to be used by multi-people simultaneously.

- To customize two desktop in one computer.

- To make a computer can use more than one keyboards and mouse on the same time.

IV. SCOPE

The following are the scope that will be cover according to the development plan.

- The User scope of the system:
  - ➢ Multi-user able to use the system simultaneously.

- Computer lab scope of the system:
  - ➢ System can minimize the costing on computer lab.

V.   METHODOLOGY

The software development model that I will use to develop my system is the Rapid Application Development Model (RAD) which I had mentioned and explain in another chapter. The phases of the RAD model contain:

A) Requirement/Planning

B) System Design

C) Development

D) Cutover
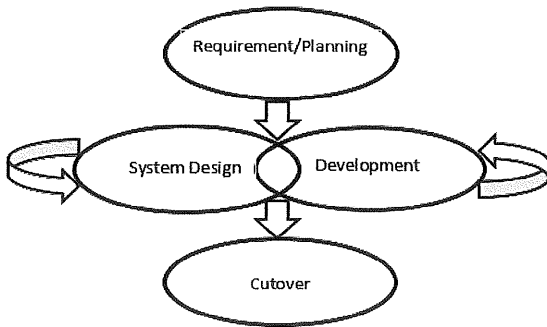
VI.   CONCLUSION

Multi-user workstations can improve the interaction between human and the computer system. This system provides multi-user system on a computer.

One of the advantage of this system is that user can run more than one desktop interface. So by mean a computer can be uses by multi-user on one time.

The disadvantage of this system is, it needs a huge computer storage to run the system.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

This chapter briefly discuss on the overview of the project into three parts. The first part discusses on the problem statement discovered in real situation and findings. Next, the project objective is determined by project's goal and aim; follow by the project scope where the boundary limit is enclosed.

1.1   Introduction

In this age, technology is constantly become more high technology and modern. The computer is no an exception too. The development of new technologies have realized and focused on the interaction between computer and human.

Multi-user workstation can be the new thing to be uses on a computer. The function of the Multi-user workstation is to make a computer can be used by two people on the same time. This system may need the support from the virtual machine to complete the task. This multi-user workstation can be the new direction for the people to build the advanced device and system that can support many user on the same time.

For my final project, I will make a multi-user workstation to use by multi user simultaneously by using the some equipment like virtual machine and so others. This idea I get from last time project which did by my senior and my client requirement. My client request to make a computer that can uses by multi user simultaneously

1.2   Problem Statement

In this age, the computer become more powerful and modern, the hardware and the software using is more far greater from the past time. Even though, computer become more modern or using the high specification but so far computer just can uses by one person in one time and not all software can operate the workstation uses by multi-users simultaneously, normally all work is depend on the hardware to make it operate multi-user workstation.

Besides that, computer now only has one desktop and use it directly. The computer still don't have the ability to operate two desktop to work on one screen for multi-user uses simultaneously. Even, now already got software that can operate multi operating system on a computer but the computer still not able to work simultaneously.

Furthermore, not all computer can use multi-keyboard and multi-mouse on one computer. Almost all the computer just able to run one mouse and keyboard on the same time. Without the virtual machine, the computer may have face the problem on connecting with the multi-mouse and keyboard.

1.3   Objectives

The following are the objective will be developed according to the development plan and it is to overcome the problem which are like workstation can uses by one person in one time, one computer only has one desktop interface, and not all computer can use multi-keyboard and mouse on one computer.

- To create a workstation to be used by multi-people simultaneously.
- To customize two desktop in one computer.
- To make a computer can use more than one keyboards and mouse on the same time.

1.4 Scope

The following are the scope that will be cover according to the development plan;

- User

  Multi-users able to use the system simultaneously.

- Computer lab

  This system can minimize the costing on computer lab.

1.5 Thesis Organization

This thesis is disjointed into two chapters where each chapter denotes different details in this project. Below displays a brief summary of the content for each respective chapters.

i. Chapter 1

  Introduction of the project background follow with the project problem statement, project objectives and project scopes.

ii. Chapter 2

  Research and literature review relevant to the project.

iii. Chapter 3

  Project analysis, design and methodology are presented.

iv. Chapter 4

  Design of the diagram presented.

v. Chapter 5

  Discuss on the system implementation phase.

vi. Chapter 6

  The testing result of the system and discussion on the result are presented.

vii. Chapter 7

  Conclusion of the thesis presented.

CHAPTER 2

LITERATURE REVIEW

In this part, the existing and current system, operation environment, regards to this project is reviewed as research finding output. This chapter will also review on the software development methodology of the project concisely.

2.1 Review on Existing System

2.1.1 Window Virtual PC

Windows XP Mode works in two ways both as a virtual operating system and as a way to open programs within Windows 7. It runs in a separate window on the Windows 7 desktop, much like a program, except it's a fully-functional, fully-licensed version of Windows XP. In Windows XP Mode, you can access your physical computer's CD/DVD drive, install programs, save files, and perform other tasks as if you were using a computer running Windows XP

2.1.2 VirtualBox

Virtual Box was designed to be modular and flexible. The Virtual Box service process which always runs in the background. This process is started automatically by the first Virtual Box client process (the GUI, VBoxManage, VBoxHeadless, the web service or others) and exits a short time after the last client exits. The service is responsible for bookkeeping, maintaining the state of all VMs, and for providing communication between Virtual Box components. VirtualBox consists of many more or less separate components.

2.1.3 QEMU

QEMU is an open source emulator capable of running another operating system in a window. QEMU is faster than most emulators because it uses dynamic recompilation, meaning it translates entire pages and keeps the translated pages around (sort of like a Java JIT compiler, or Transmeta's code morphing layer). The translation overhead is similar to the pause fetching code from disk, or the latency of copying DRAM into L2 cache. It occurs exactly at the places systems are already slow, and thus the places any modern software that cares about performance is optimized to do as little as possible.

2.1.4 Summary of existing system

The existing system that have been review in the previous subchapter above are related to the system that will be design and configure for the company Sati Wealth consultancy sdn. Bhd. Table 0.1 shows the comparison between the Window Virtual PC, VirtualBox and QEMU.

System Name	Advantages	Disadvantages
Window virtual PC	-Easy installation -Low cost	- Complexity.
VirtualBox	-Simple, menu-driven screens -Create and sequence standard	- High cost
QEMU	-Using dynamic recompilation -Open source emulator	-System work slow

Table 0.1 Comparison between 3 Systems

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2.2 Software Development Methodology

2.2.1 Waterfall Model Overview

The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In waterfall model phases do not overlap.
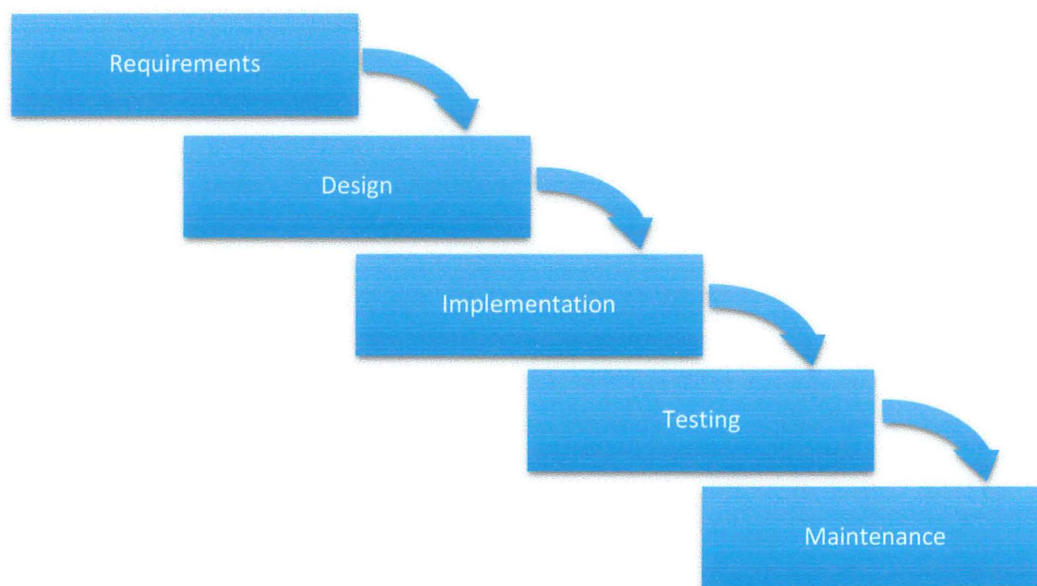
Figure 1 Waterfall Model Design

Waterfall Model Five Phases

i.   Requirements

Requirements of a user are gathered, analysed and documented for preparation in the development process.

ii.   Design

The requirements gathered in the above phase are evaluated and a proper implementation strategy is formulated according to the software environment. The design phase is further categorized into two sections, i.e. system design and component design. The system design contains details and specifications of the whole system and explains how each component of the system will interact with others. The component design contains specifications as to how each component will work separately and how results from one component will travel to another. Individual coders are usually assigned to develop each component.

iii.   Implementation

Now is the time to actually start creating the components. The information gathered in the first two phases is applied in this step to create the actual working parts of the system. The design generated in the above phase is converted into machine language that the computers can actually understand and process.

iv.   Testing

The testing phase is where the software is checked for any errors or discrepancies. The testing of the software actually starts after the code is finished which is usually in the ending stages of implementation phase. Various different tools, software and strategies are used for testing the solution in order to make sure that it is error free.

v.   Maintenance

Maintenance is an ongoing process which may stretch from a few months to many years. It is a fact that all software has bugs no matter how cautiously it has

been developed and tested. Furthermore, with the passage of time, requirements will also change and modifications or additions will be required to keep it effective. All this work comes under the umbrella term - maintenance.

Waterfall Model Pros and Cons

Table 1 Waterfall Model Pros and Cons

Pros	Cons
Simple and easy to understand and use	No working software is produced until late during the life cycle.
Easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.	High amounts of risk and uncertainty.
Phases are processed and completed one at a time.	Poor model for long and ongoing projects
Works well for smaller projects where requirements are very well understood.	Not suitable for the projects where requirements are at a moderate to high risk of changing. So risk and uncertainty is high with this process model.
Clearly defined stages.	It is difficult to measure progress within stages.
Well understood milestones.	Cannot accommodate changing requirements.

2.2.2   Rapid Application Development (RAD) Model

RAD Model Overview

RAD model is Rapid Application Development model. It is a type of incremental model. In RAD model the components or functions are developed in parallel as if they were mini projects. The developments are time boxed, delivered and then assembled into a working prototype.   This can quickly give the customer

something to see and use and to provide feedback regarding the delivery and their requirements.

Professor Clifford Kettemborough of Whitehead College, University of Redlands, defines Rapid Application Development as "an approach to building computer systems which combines Computer-Assisted Software Engineering (CASE) tools and techniques, user-driven prototyping, and stringent project delivery time limits into a potent, tested, reliable formula for top-notch quality and productivity. RAD drastically raises the quality of finished systems while reducing the time it takes to build them."

RAD Model Design
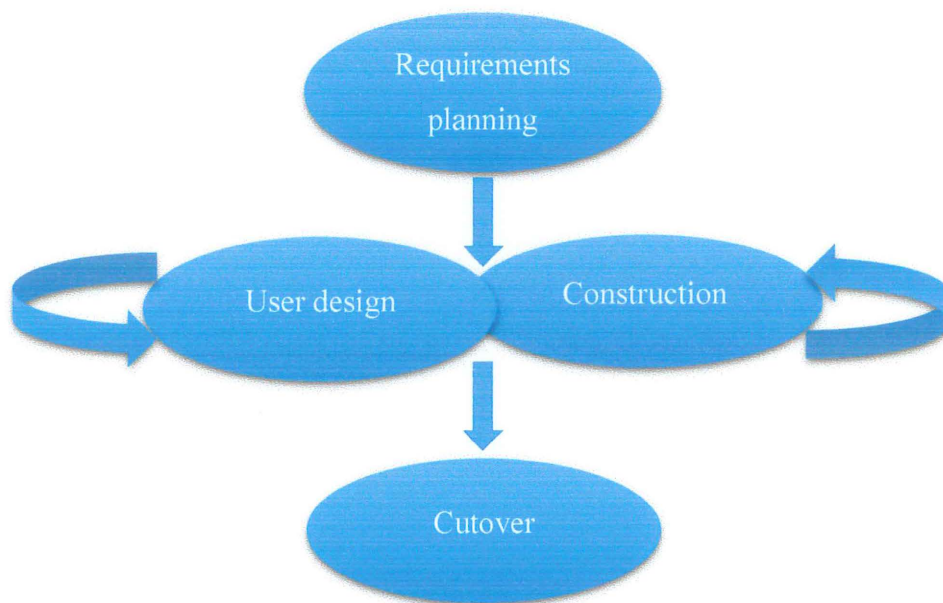
Figure 2 RAD Model

RAD Model Four Phases

i. Requirements planning phase

In requirements planning phase, it combines elements of the system planning and systems analysis phases of the Systems Development Life Cycle (SDLC). Users, managers, and IT staff members discuss and agree on business needs, project scope, constraints, and system requirements. It ends when the team agrees on the key issues and obtains management authorization to continue.

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ii.   User design phase

During this phase, users interact with systems analysts and develop models and prototypes that represent all system processes, inputs, and outputs. The RAD groups or subgroups typically use a combination of Joint Application Development (JAD) techniques and CASE tools to translate user needs into working models. User Design is a continuous interactive process that allows users to understand, modify, and eventually approve a working model of the system that meets their needs.

iii.   Construction phase

This phase focuses on program and application development task similar to the SDLC. In RAD, however, users continue to participate and can still suggest changes or improvements as actual screens or reports are developed. Its tasks are programming and application development, coding, unit-integration and system testing.

iv.   Cutover phase

Cutover phase resembles the final tasks in the SDLC implementation phase, including data conversion, testing, changeover to the new system, and user training. Compared with traditional methods, the entire process is compressed. As a result, the new system is built, delivered, and placed in operation much sooner.

prototype is usually not complete systems and many of the details are not built in the prototype. The goal is to provide a system with overall functionality.
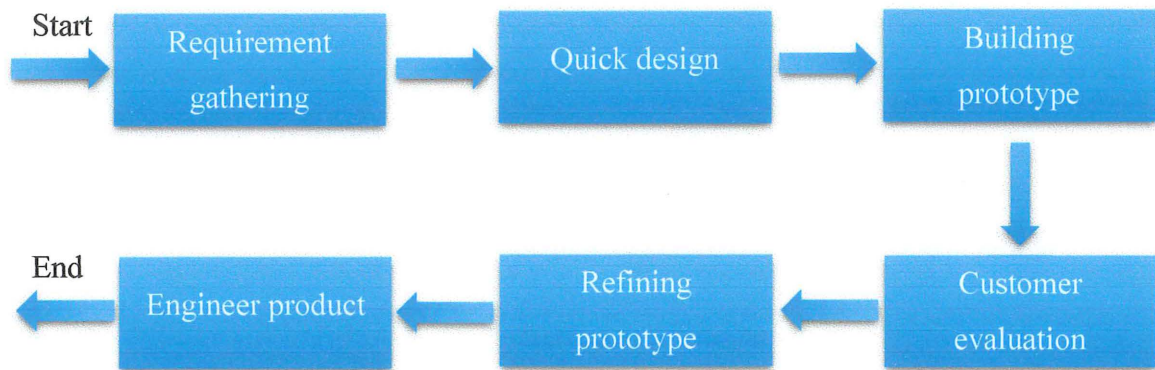
Prototyping Model Design

Figure 3 Prototyping Model

Prototyping Model Phases

i.   Requirements gathering and analysis

A prototyping model begins with requirements analysis and the requirements of the system are defined in detail. The user is interviewed in order to know the requirements of the system.

ii.   Quick design

When requirements are known, a preliminary design or quick design for the system is created. It is not a detailed design and includes only the important aspects of the system, which gives an idea of the system to the user. A quick design helps in developing the prototype.

iii.   Build prototype

Information gathered from quick design is modified to form the first prototype, which represents the working model of the required system.

iv.   User evaluation

Next, the proposed system is presented to the user for thorough evaluation of the prototype to recognize its strengths and weaknesses such as what is to be added or removed. Comments and suggestions are collected from the users and provided to the developer.

v.   Refining prototype

Once the user evaluates the prototype and if he is not satisfied, the current prototype is refined according to the requirements. That is, a new prototype is developed with the additional information provided by the user. The new prototype is evaluated just like the previous prototype. This process continues until all the requirements specified by the user are met. Once the user is satisfied with the developed prototype, a final system is developed on the basis of the final prototype.

vi.   Engineer product

Once the requirements are completely met, the user accepts the final prototype. The final system is evaluated thoroughly followed by the routine maintenance on regular basis for preventing large-scale failures and minimizing downtime.

Prototyping Model Pros and Cons

Table 3 Prototyping Model Pros and Cons

Pros	Cons
Increased user involvement in the product even before implementation	Risk of insufficient requirement analysis owing to too much dependency on prototype
Since a working model of the system is displayed, the users get a better understanding of the system being developed.	Users may get confused in the prototypes and actual systems.
Reduces time and cost as the defects can be detected much earlier.	Practically, this methodology may increase the complexity of the system as scope of the system may expand beyond original plans.
Quicker user feedback is available leading to better solutions.	Developers may try to reuse the existing prototypes to build the actual system, even when it's not technically feasible
Missing functionality can be identified easily	The effort invested in building prototypes may be too much if not monitored properly
Confusing or difficult functions can be identified	

2.3   Tools Used

2.3.1   Microsoft Word 2013

Microsoft Word 2013 is a word processing software used to manage document contents including text, images, and videos material. This software is included inside Microsoft Office Professional 2013 suite installed in my workplace computer.

2.3.2   Microsoft PowerPoint 2013

Microsoft PowerPoint 2013 is a slide presentation software used to manage slide deck contents and allow user to customize the slide design. This software is included inside Microsoft Office Professional 2013 suite installed in my workplace computer.

2.3.3   Microsoft Project 2013

Microsoft Project 2013 is a project management tool used to produce timeline-based diagrams for instance, Gantt chart, etc. This software is included inside Microsoft Office Professional 2013 suite installed in my workplace computer.

2.4   Conclusion

This chapter is discuss the existing system and development methodology. There are pros and cons in each part and included explanation on development methodology. Based on the explanation, it could help us to make the better solution and decision for develop the system.

CHAPTER 3

METHODOLOGY

This chapter discuss the overall approach and framework of research which covers the method, technique, or approach to be used. The first part discusses on the selected methodology during the development of research and explained about the method, techniques, tools, instruments, etc. which were used in this research. The second part defines both the hardware and software that are used in this project. Also, justification on the importance of selected hardware and software. The last part includes a Gantt chart to illustrate the phases' projection till project completion with estimated duration for each phases.

3.1   Methodology

The software development model that I will use to develop my system is the Rapid Application Development Model (RAD) which I had mentioned and explain in another chapter. The phases of the RAD model contain:

A)   Requirement Planning

B)   User Design

C)   Construction

D)   Transition / Cutover

The figure below show the phases of the RAD model.
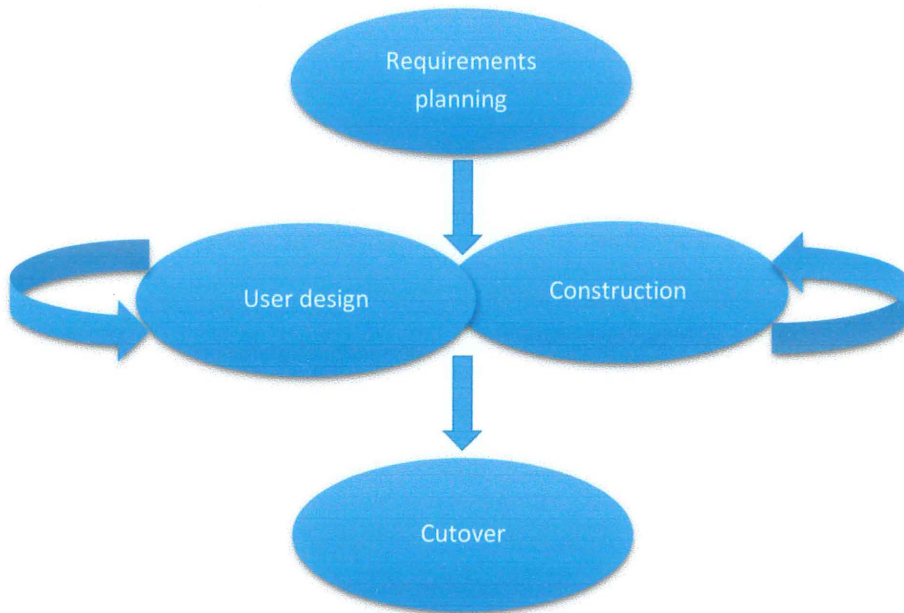

Figure 3.2 – RAD life cycle phases.

3.2   Requirement planning

On this phase, I have taken the requirement and some information from the client to do the multi-user workstation. As we know that multi-users workstation can be a new thing for the user to interact with the computer. But, so far no market that sell the workstation with multi user used simultaneously. In this phase I also need to do some research on how to make the computer can be uses with more than one person simultaneously. Software and hardware needed for the project also plan on this phase.

3.3   Modern existing system

Based on the research studies, before this users need to interact with the computer is by typing computer language. On that era, user was using the language like C language to give an instruction to the computer. Besides that, the language was difficult to memorize and difficult to understand because the language were uses for computer and only computer will understand it. After year by year, comes to the era of the mouse and joy pad, and user can start interact with the computer easily by using the

human language and the pointer of the mouse to click the icons. However, this method does not fulfil the natural way for an interaction between human and the computer.

3.4   Analyzing and finalize requirement

For the multi-user workstation, we find out how to make it work and we need some software and hardware to make it work properly. For the hardware part, we found out that extra keyboard and mouse is needed to make this multi-user workstation work. If for software, plan to use the software like virtual machine to make it boot more than an operating system on a computer, from that users can use it with simultaneously.

3.5   User Design

On this phase, the user will interact with system analyst and develop prototypes that represent the function of the multi-user workstation and can be uses from more than one user on a computer. After done the prototypes it will be show for the user or client to give the comment and modify prototypes will happen on this phase if the client not satisfies with the prototypes. Modify will stop after achieve client requirement and just will continue to the next state.

3.6   Hardware Requirement

Device	Specification
Desktop	Acer- T3600
	Processor intel corei5 -3330M 3.3 GHz
	Memory 8GB DDR3 RAM
	Storage 750GB serial- ATA Hard Disk
	Graphics 1GB NVIDIA
	Optical Drive DVD Writter
	Ports 4 x USB
	1 x VGA
	Operating System window 7 ultimate -64bit

3.7 Software Requirement

Software interface	Software description
Window 7 home premium	A personel uses computer operating system -64bit(x86) Hardware Requirements : -1 (GB) RAM (32-bit) or 2 GB RAM (64-bit) -16 GB available hard disk space (32-bit) or 20 GB (64-bit) -DirectX 10 graphics device with WDDM 1.0 or higher driver
Visual Studio 2010 ultimate professional	-64bit
Virtual machine Manager	Vmware Workstation
Microsoft office word 2010	A word processor
Microsoft PowerPoint 2010	Slide for the presentation program

CHAPTER 4

DESIGN

4.1   Logical Design

In this figure below, the multi-users workstation will involve the virtual machine. The figure shows that role of the computer that running the virtual machine and display the output to the user. The virtual machine produce some process and make the workstation can be used by multi-user.
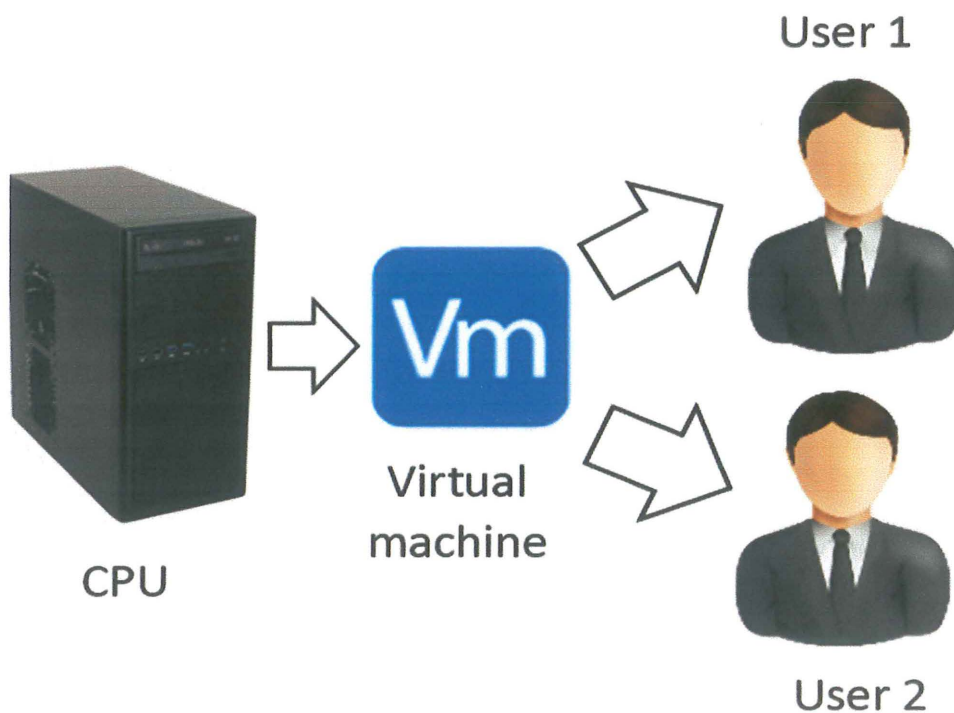
Complete context diagram of multi-users workstation

4.2 Logical Flowchart

Flow charts show the flow of activity that involve with the system. This flow chart design is for user to look further inside the system.
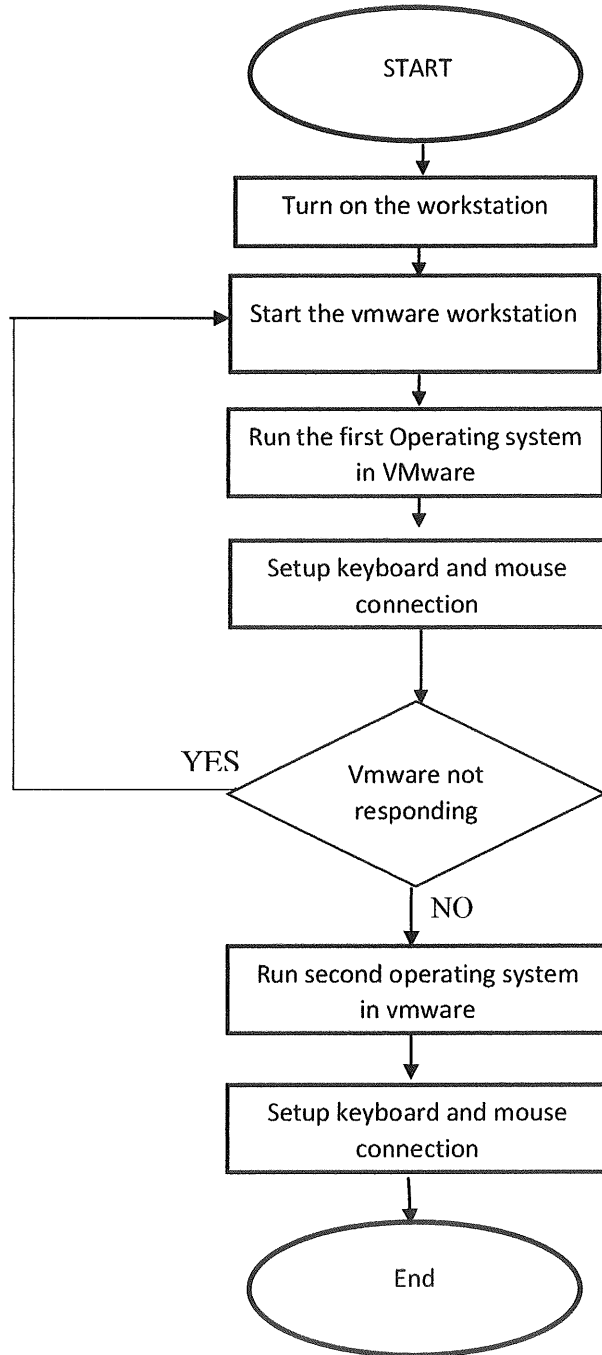
CHAPTER 5

IMPLEMENTATION

The chapter 5 in the system will discuss about the proses of the system. All of the main function will be show to achieve with the objective of the system.

5.1   System Interface
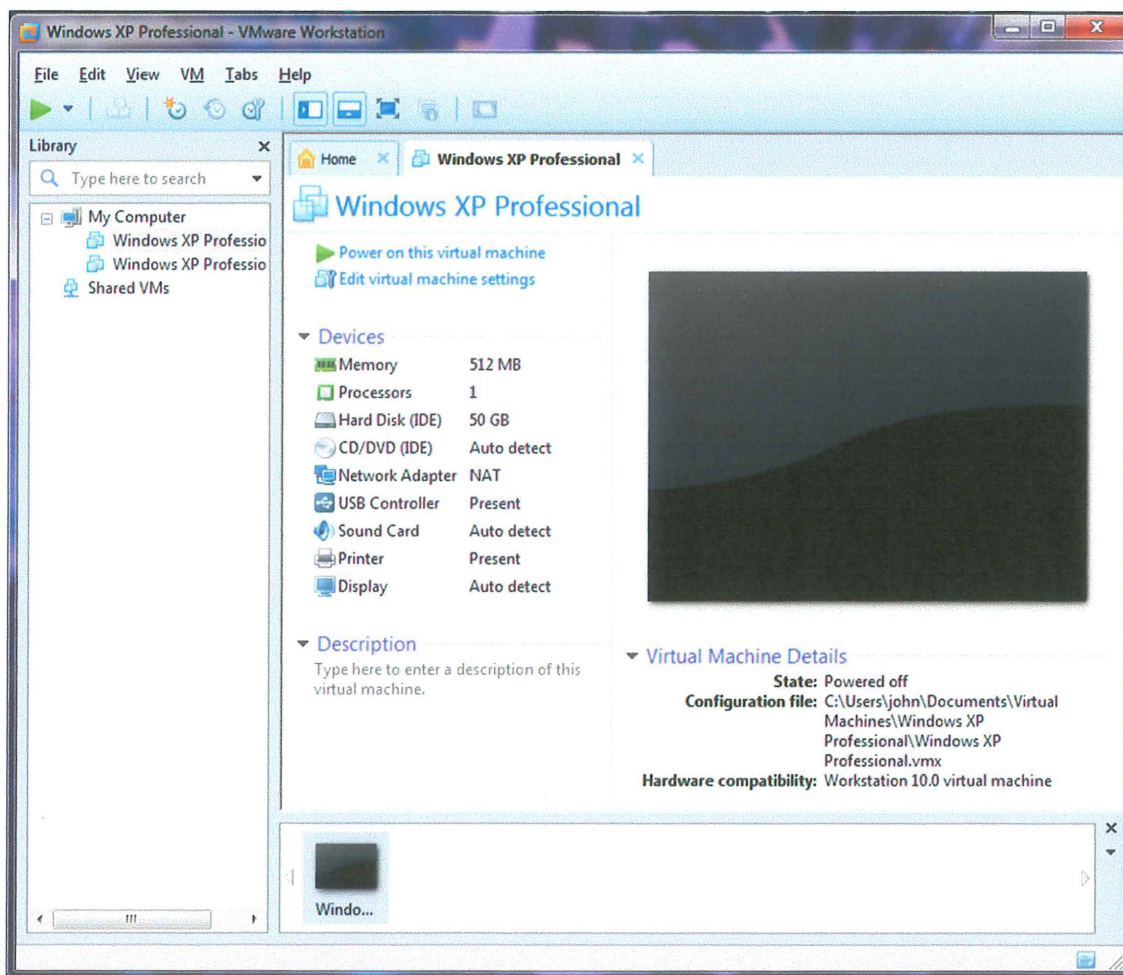
This will be display after the user run the Vmware workstation. This is the main page of the Vmware. On the left side interface it display list of the operating system that have been install on the Vmware and the middle of the interface show the specification that been set to run the operating system.
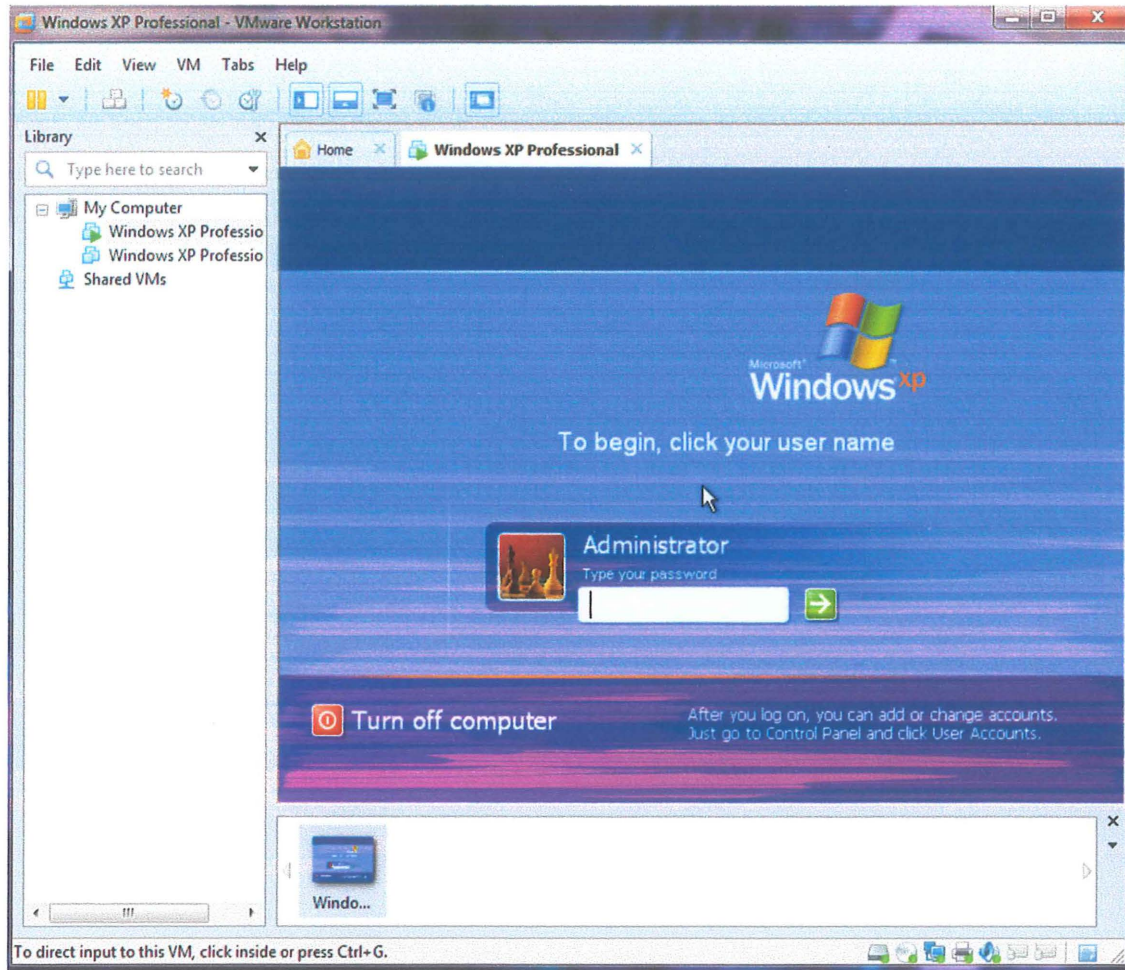
This is an interface that will be show to the user after installation of the operating system complete and click power on button to run. This picture is running the operating system Window XP.
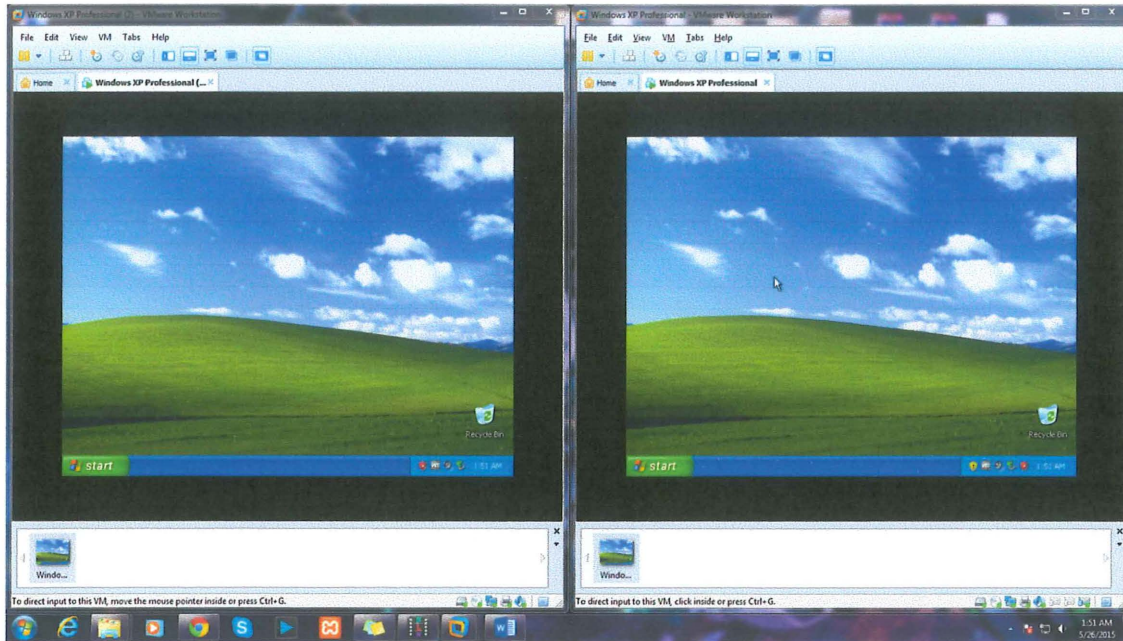
This interface displays the output of vmware running two operating systems. To run the second operating system, user just need to set the partition and install the second operating system. Then click the button "new window" to make the screen split to two. User also needs to do some configuration to make the mouse and keyboard detect to the system.

CHAPTER 6

RESULT & DISCUSSION

6.1   Introduction

This chapter will discuss about the result of the system that achieved this objective of this research. Besides that, this chapter also will discuss about the constraint of the system.

6.2   Result analysis
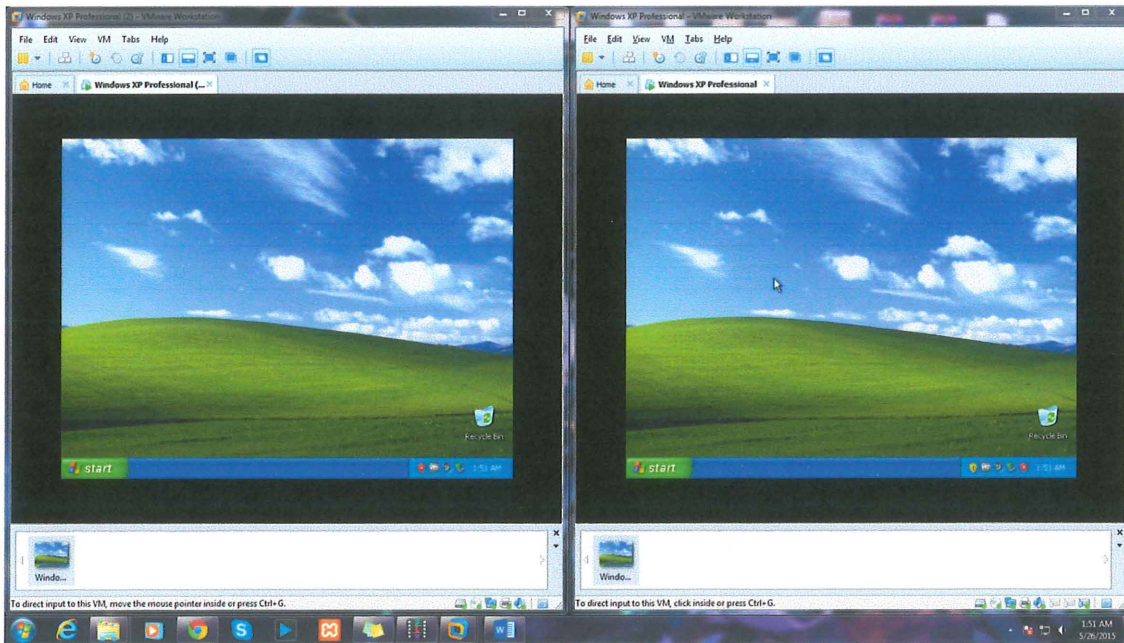
This is the result of the Vmware workstation show after some configuration enable to run two operating systems on same time. This make the workstation can use for multi-user.
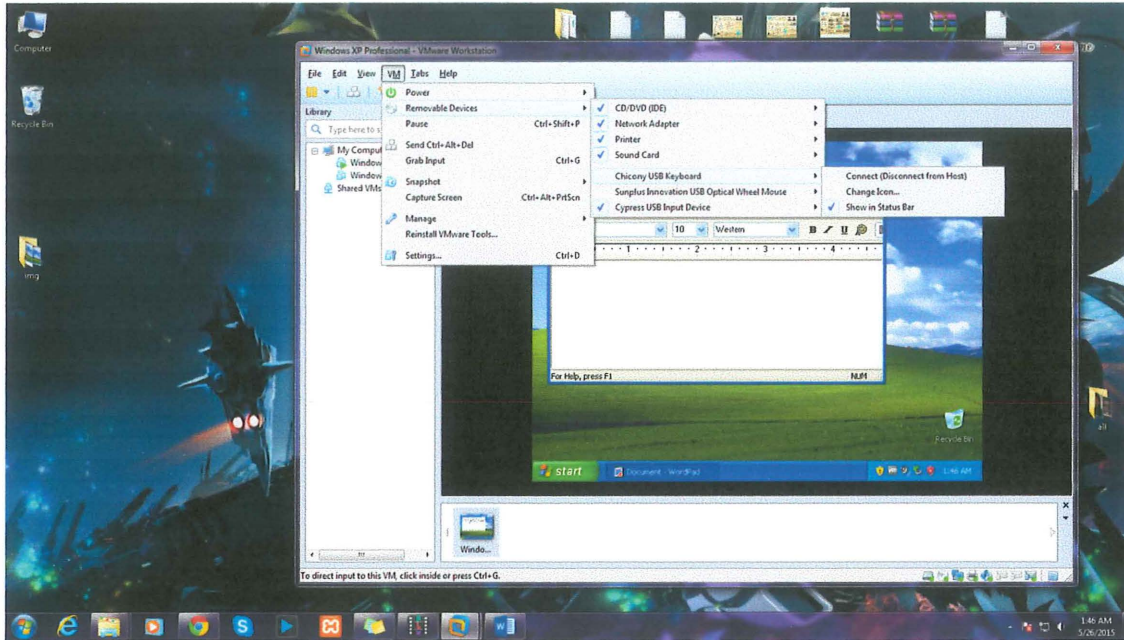
This is the interface show the process to make the vmware to detect the mouse and keyboard.

6.3   Advantage and Disadvantages

There are few advantages of this system. Firstly, this VMware workstation provide the system can make multi-user used on the same time. Secondly, the design interface of the vmware is easier to understand compare to other virtual machine.

The disadvantage of the Vmware system is the system all already been built in with the license. User need to pay to get the license to use it.

CHAPTER 7

CONCLUSION

7.1 Conclusion

As a conclusion, I hope this project end product will result practically in community and public. By using this application it is very simple and easy to use because the vmware is not complicated like the existing software. User only needs to click few step to create a virtual operating system and make used by multi-user. So that all kind range of user can used it meaningful and without worry.

REFERENCES

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APPENDIX A

CLIENT AGREEMENT FORM

SATI WEALTH CONSULTANCY SDN. BHD.

(CO. NO. 833623-H)

No. 5670 B/1, Tingkat Dua,

Jalan Sri Cemerlang,

15400 Kota Bharu, Kelantan.

Mr. Michael Ling Chee Siang

Univesity Malaysia Pahang

Lebuhraya Tun Razak

26300 Kuantan

Pahang Darul Makmur   29 March 2015

Dear Mr. Michael Ling Chee Siang,

Confirmation of request on participating in your project (Multi-User workstation)

We are from SATI WEALTH CONSULTANCY SDN BHD, We hereby wish to inform you that we are

Interested in participating in your project work. We agree to be your client in this project (Multi-user

Workstation).

We are looking forward in working with you.

 Thank you.

Yours Faithfully,

SATI WEALTH CONSULTANCY
5670B/1, TINGKAT 2
JALAN SRI CEMERLANG
15400 KOTA BHARU, KELANTAN.

CHUA WEI KEAT

(SALES EXECUTIVE)

APPENDIX B

GANTT CHART

	Task Name	Duration	Start	Finish
1	▲ Requirements planning	10 days	Mon 9/8/14	Fri 9/19/14
2	Meet with customer	5 days	Mon 9/8/14	Fri 9/12/14
3	Delegation of tasks	5 days	Mon 9/15/14	Fri 9/19/14
4	▲ Analysis	30 days	Mon 9/22/14	Fri 10/31/14
5	Meet with customer	5 days	Mon 9/22/14	Fri 9/26/14
6	Analyse requirements	15 days	Mon 9/29/14	Fri 10/17/14
7	Analyse Outsource product	10 days	Mon 10/20/14	Fri 10/31/14
8	Milestone 1	0 days	Mon 9/22/14	Mon 9/22/14
9	▲ Design	40 days	Mon 11/3/14	Fri 12/26/14
10	Meet with customer	5 days	Mon 11/3/14	Fri 11/7/14
11	Design diagram	15 days	Mon 11/10/14	Fri 11/28/14
12	Produce Tutorial Video	15 days	Mon 12/1/14	Fri 12/19/14
13	Meet with supervisor	5 days	Mon 12/22/14	Fri 12/26/14
14	Milestone 2	0 days	Fri 12/26/14	Fri 12/26/14
15	▲ Implementation	65 days	Mon 12/29/14	Fri 3/27/15
16	Study Software	20 days	Mon 12/29/14	Fri 1/23/15
17	Study mechanism	25 days	Mon 1/26/15	Fri 2/27/15
18	Study system interface	20 days	Mon 3/2/15	Fri 3/27/15
19	▲ Testing	30 days	Mon 3/30/15	Fri 5/8/15
20	Integration testing	15 days	Mon 3/30/15	Fri 4/17/15
21	Acceptance testing	15 days	Mon 4/20/15	Fri 5/8/15
22	▲ Maintenance	15 days	Mon 5/11/15	Fri 5/29/15
23	User support	15 days	Mon 5/11/15	Fri 5/29/15