Online Personal Computer Assembling Troubleshooting

(P-CAT.com)

By

Dayang Suriya Ribai

Dissertation submitted in partial fulfillment of

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CERTIFICATION OF APPROVAL

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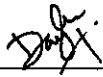
(Information Communication Technology)

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TRONOH, PERAK
July 2007

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

DAYANG SURIYA RIBAI

ABSTRACT

This report describes the research efforts that have been carried out for the Final Year Project. P-CAT.com developed to improve the current way of searching the solution to the PC assembling over the internet. Hence, to educate the PC users about the computer component and solve the PC problem own their own. For the basis of implementation, a literature review is determined the issue involved, how to overcome them and designing graphical user interface based on the previous study on human computer interaction. In the literature review included the lesson learnt from the existing almost similar project. Beside the research have been conducted to determined user requirement and needs, the result have been summarize to determine next step to conduct. This report also explains the planning phase which includes the system architecture design, network architecture and design document. Next, the report describes the strategies and tools used to develop P-CAT.com. Finally, the purpose of gathering data together with its conclusions, recommendations and future enhancement are briefly described in this report. While, the next steps involved in developing P-CAT.com to meet its goals as initially proposed.

ACKNOWLEDGEMENTS

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ABBREVIATIONS AND NOMENCLATURES

UTP	Universiti Teknologi PETRONAS
P-CAT.com	Online Personal Computer Assembling Troubleshooting
ICT	Information Communication Technology
BIS	Business Information Systems
URL	Uniform Resource Locater
Email	Electronic mail
UML	Unified Modeling Language
PHP	Hypertext Processor
CIS	Computer and Information Science
PC	Personal Computer
CPU	Central Processing Unit
VR	Virtual Reality
3D	Three Dimensions
2D	Two Dimensions

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

1.1 Background of Study

1.1.1 Online Personal Computer Assembling Troubleshooting

P-CAT.com is a web based online application that helps PC users to troubleshoot the PC problem. P-CAT will serve as an enhancement of the current ways of troubleshoot PC problem by striving to meet the users need and function as a centralize solution centre pertaining to PC assembling problem. P-CAT.com will direct the users to the problem diagnostic page to identify the root of the PC problem and provide the step-by-step solution to solve the problem. Therefore, P-CAT.com also can help to educate the novice users and save time to search the solution on the search engine by the experience users. P-CAT.com also provides graphical illustration, visual aids and 3D –model of motherboard to help the users who are not familiar with PC component. Furthermore, P-CAT.com enables knowledge sharing whereby the experience user can share knowledge with the novice by post solution and experience in PCs troubleshooting online. Lastly, after the problem being solved users will have choice to print or view back the steps taken to solve the problem.

1.2 Background of the project

This project kicks off by investigating the problems faced by the novice or experience users regarding the PC assembling troubleshooting. Next, a practical solution will be derived to meet the users need and other specification that are not met in the current system. This project aims to fill in the gaps left by the current ways of finding the PC assembling problem by developing new, more effective features that will result in better result, effective and most importantly, fulfilled the users need. The application allows both novice and experience user to move a step ahead by implementing the knowledge management.

1.3 Problem statement

Currently, most household own at least a PC at home. Same goes to the students, whom have own PCs themselves. However not all user knew how to troubleshoot own PCs even though only for a very simple problem. If any problems persist, refer to the computer vendor always be the step taken to solve the problem. This will incur cost; in fact users actually solve the problem themselves. Computer vendor might be cheated the users to spend extra cost to buy extra component that not related to the problem that occurred. Therefore, it is important for the users to at least know the basic knowledge on PC assembling. Even though some solution also can be found on the internet in form of online forum or computer vendor's site but the databases are not centralized and the users have to search one by one to find the best solution for the problem persists. Besides, there's no application that provide step-by-step help or to find the root problem. This might hard for the novice user to understand the solution given to the PC problem. Hence, educate and give confident to the novice users to troubleshoot and repair their own PCs.

1.4 Objectives

P-CAT.com goals:

- Help to educate the PC's novice users on PC assembling troubleshooting. Hence, create confident to PC's novice users to at least open the CPU case and learn the computer component.

- Provide 3D model that make able PC's novice users to learn computer component.

- Make the PC assembling fast and easy by providing step-by-step printable solution and reduce the search time rather than using the search engine.

- Build an application that able to diagnose the PC troubleshooting and identify the root of the problem.

- Share ideas between the experience PC's user and novice user for collective and effective knowledge building. (knowledge sharing)

- The users can request and get the solution for their problem faster

1.5 Scope

1   Plan the scope of the project: To be completed within 1 year period and involves randomly PC's owner. The PC's owner categorized into novice and experience users.

2   Analyze the current system: Evaluate system in terms of efficiency, functionality and user satisfaction levels. Analyze the pros and cons of using the current way of PC assembling troubleshooting.

3   Design: Preparation of design documents (Storyboard, UML diagrams, User interface, support tools, system architecture etc.)

4   Implementation: Development of prototypes: P-CAT.com.

5   Roll Out: Deployment of P-CAT.com to User for field testing and user acceptance testing

6   Training: Training users of the system.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.0 RESEARCH PURPOSES

2.1 Study on similar system

Dell has its own online technical support site mainly to help the customer to solve the problem regarding their product. There are features in the website that can be review as an example in development of P-CAT.com.

Technical Support
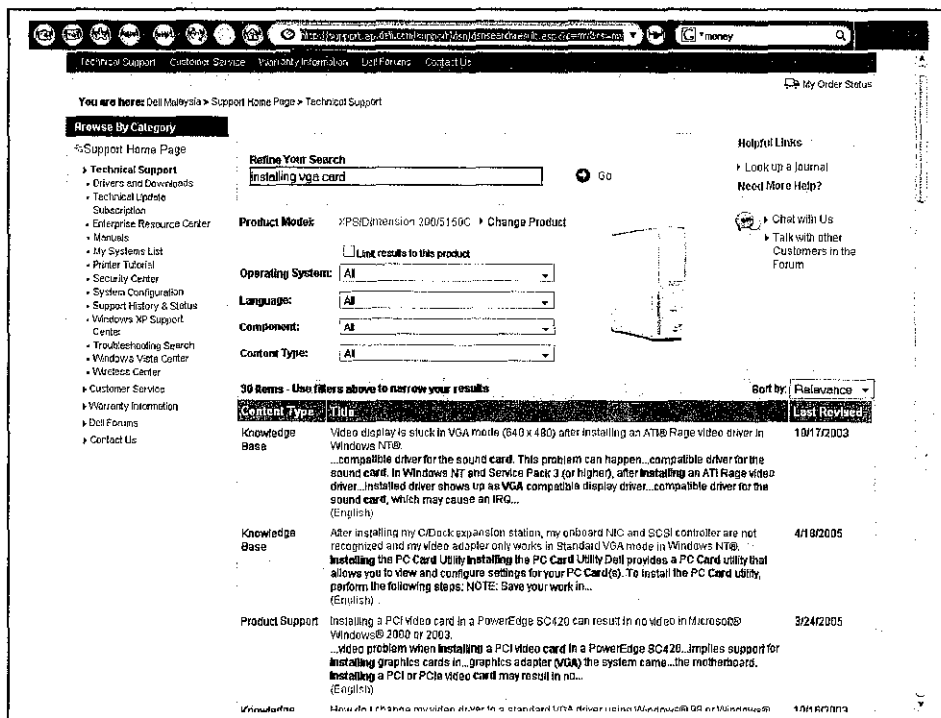
Figure 2.1 Technical support sites

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This site allows the user to search for the problem by key in the keyword in the text box given. User also has choice to select the drop down box given to what operating systems used, language, component and content type. The content differentiates into knowledge base as well as product support. The search result will appear in the table and user can choose any title regarding to the problem.

However the problem of this site is that the database contains of specifically solution for DELL product only. The title is quite wordy and the novice it very hard to choose which one is the best solution as they do not understand the technical term in the search result.

Forum

Figure 2.2 Forum sites

To take part in the forum user have to register their username. It is a two ways forum where user can post and reply the topic posted into the forum. However the

disadvantage of the forum is that if user doesn't guarantee that they will get the reply for the requested solution problem. This style of solution problem still quite wordy and novice user find it very hard to understand.

Graphics
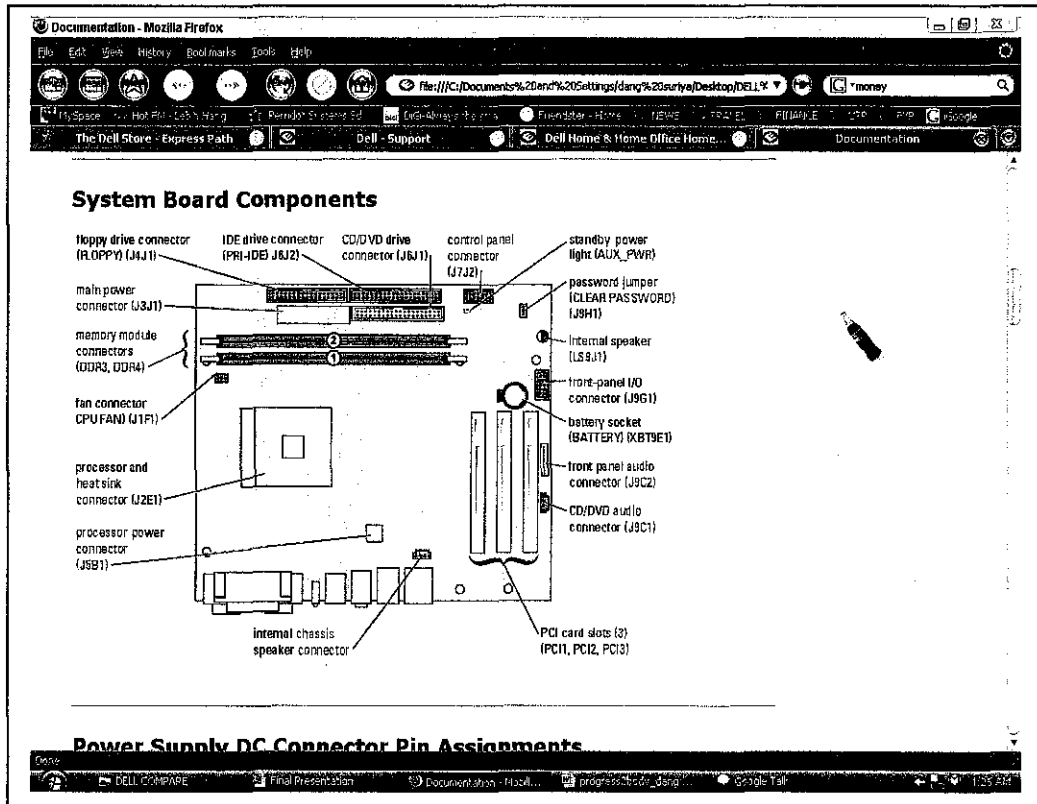
Figure 2.3 Graphical Help

The usage of the graphical illustration is to help the user to understand the component inside the computer. This site only views the 2D graphic and thus far provides the 3D graphical view to make the user to understand more on the computer components.

2.2 Knowledge Management

Knowledge management apply practices relating to various enabling technologies such as knowledge bases and expert systems, help desks, corporate intranets and extranets, Content Management, and Document Management. Knowledge base is a special kind of database for knowledge management. It provides the means for the computerized collection, organization, and retrieval of knowledge. [10]

Capturing all the data, information and knowledge is half the battle--sharing the knowledge. Without compromising security or competitiveness is challenging. The current literature has Examined how, why, when, and where to leverage knowledge assets; they have ignored the question--how to secure knowledge assets (DesouzaandVanapalli, 2005).

2.2.1 Issues

Knowledge sharing

Knowledge sharing is as much of a people issue as it is technological (Riege, 2005); technology can act as both a facilitator and a control mechanism to protect knowledge. Knowledge sharing involves the propagation of information and knowledge through out the organization. Sharing knowledge and establish motivational approaches and Communication mechanisms to share knowledge (Yang,2004).Some of the sharing can be Control through access controls, passwords ,group meetings ,etc. Knowledge has to include security protections and policies that govern access and usage parameters. If managed effectively, sharing can occur within the right context and with the right people. With increasing threats some have suggested a creation of a knowledge management system Security management (Belsisetal. 2005).

Knowledge acquisition

Complex problem are easier to solve if partition into decomposable parts and strategically spaced in time. The knowledge acquisition method should first be analyzed completely before solution methods are selected and applied. This takes lot of time. It is hard to cope with the large amount of new data. It is possible that interpretation of the expert's.

2.3 Desktop VR

A desktop VR environment is a three dimensional perspective display. A perspective display projects 3D information onto a 2D surface, which is the computer screen. [4]Desktop VR could also be described as looking through a window of a world. The most common form on input with the desktop VR is the point and click approach with a mouse. The main forms of feedback are audio and visual feedback with more emphasis on the latter. [5]High speed renderings are very important to achieve in desktop VR, so as to obtain a 'real-time' response with every input.

Sight accounts for most of the information gathering in a virtual environment. The visual sense is used more than any other senses to process information. [5]Many psychology studies show that more information is understood when a visual representation is presented, rather than a non-visual representation. After sight, sound is the next most important sense in order to obtain information from an environment. That is why a visual representation of a system is usually accompanied with an appropriate audio response in desktop VR systems.

The major advantage of a desktop VR system is the cost, being less expensive than other forms of VR systems. The low cost of desktop VR systems makes them extremely attractive for many applications with extremely low budget.

2.4 VR as a Training Tool

Virtual Reality training can dramatically reduce the cost of delivering training by decreasing learning time for student and instructors. The need for expensive and dedicated training equipment in the form of actual laboratories, or extra equipment for training equipment is reduced. [6]Standard multimedia training involves learners visually but with the aid of using VR, the user may also interact and is not just an observer. VR can bring the equipment and actual working conditions to the user for unlimited access in any location. The time spent teaching the subject can be seen to decrease significantly using VR as a training technique.

The benefits of using VR as a training tool are:

- Reduces training time;
- Saves money by using similar models for training;
- Provides unlimited access to expensive unavailable equipment;
- Eliminates traveling expense to training centers;

2.5 Browsing and Searching

Browsing is, therefore, hardly constrained because a user may start browsing with or without a goal, may move, in any moderate size website, to many different locations, and will stop browsing for a variety of reasons such as boredom or time constraints. Moreover, this search activity will probably require different abilities and skills than querying a database, e.g., the ability to recognize what you want and the ability to scan large quantities of text. It is, therefore, important to learn more about such searches and examine how they can be supported by appropriate website designs.

Therefore, to overcome that issue P-CAT.com design will make sure the users do not face the boredom by providing the common solution for their PCs problem. Besides, help the customer to key-in the keyword as the goal of their search and provide instant solution rather than the user to search one by one. Furthermore, P-CAT.com

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users will be proving with graphical information rather than large quantities of text. The benefits of search are:

- **Easier site navigation.**

Search gives visitors a way to quickly find the information they need. This is particularly important if you're using DHTML menus, Flash menus, or other navigation systems that are inaccessible to some browsers.

- **Give visitors more control.**

A search function makes your site interactive and gives visitors more control over their browsing experience. Someone in a hurry may not want to slowly browse through your entire Web site, so search allows them to quickly find what they're looking for.

- **Reveal the hidden Web.**

Many search engine spiders avoid dynamically-generated pages, so a lot of your product information won't appear in the search engine's index. Since those pages won't act as entry points into the site, visitors need to search to find exactly what they want.

2.6 Troubleshooting Basis

Troubleshooting a system is as much an art as it is a science. You must arm yourself with as much knowledge as possible, and then apply common sense. Experience also plays a bit role. This guide has attempted to provide some of that experience in an easy-to-follow format. Rather than spend many frustrating hours hanging on the phone only to find that the solution was very simple, your time is better spent in eliminating the easy and obvious possible causes of your problem, and only call for support when all of your personal resources have been exhausted.[11]

These theories support how important is troubleshooting. The basis of troubleshooting as P-CAT.com can provide solution on searching for the problem solution. Hence, reduce time effort to figure out solution for only simple problem. P-CAT.com can be centralize resource, fast and easy solution to troubleshoot personal computer problem.

2.8 Diagnosis and troubleshooting

There are two types of method in the field of equipment diagnosis and troubleshooting [12]. The first method involves reasoning from the first principles, or model based reasoning., An expert system which implements the above methodology uses a model or simulation of the system that is being reasoned about. It has many advantages and highly suitable for domains where the individual components, their interconnection, and their behaviors are well know. Expert system for troubleshooting electronic modules up to component level can be implemented using this approach [13]. The other approach is to build an expert system without any deep knowledge of the domain under consideration. Such expert system is built using only general and specific facts about the domain concerned.

In computer PC diagnosis and troubleshooting, the diagnostic task is approached using qualitative consideration and compiled form of knowledge. That was implemented in the expert system under developed.

Diagnosis and troubleshooting can be identified by an expert. Based on that, expert systems were developed. Finally, the knowledge engineer should know the hardware and software configuration in the computer system. As a result, identifying the computer problem and solution become easily and smoothly. [14]

2.7 Analysis on common ways of troubleshooting

There different methods that users normally use if the PC problems occurred. The analysis covered the online methods such as:

Search engine
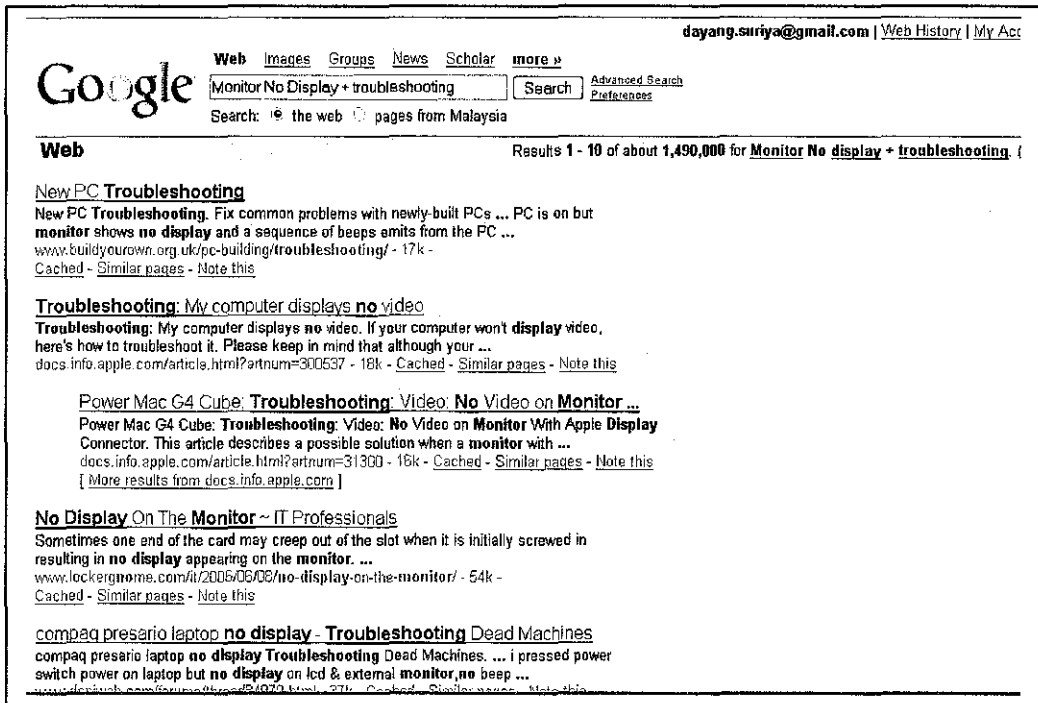
Figure 2.4 Searching use the search engine

Search engine most common way used by the users to get information. These methods required the users to search for the solution one by one in order to find for the best solution. The chosen solution not necessarily the exact solutions needed in fact the users have to choose the best websites that provide the best solution to the problems.

Troubleshooting sites

The search engine normally directed users to the troubleshooting website. Example taken from the "Build your own PC" website which needs the user to read all the possible solutions given before choosing the appropriate solution for the problem. This is not effective in terms of time consuming whereby the user have to search the

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whole solutions instead of redirect to the root of the problem. There is also no graphical information that could help the users to identify the specific hardware components.
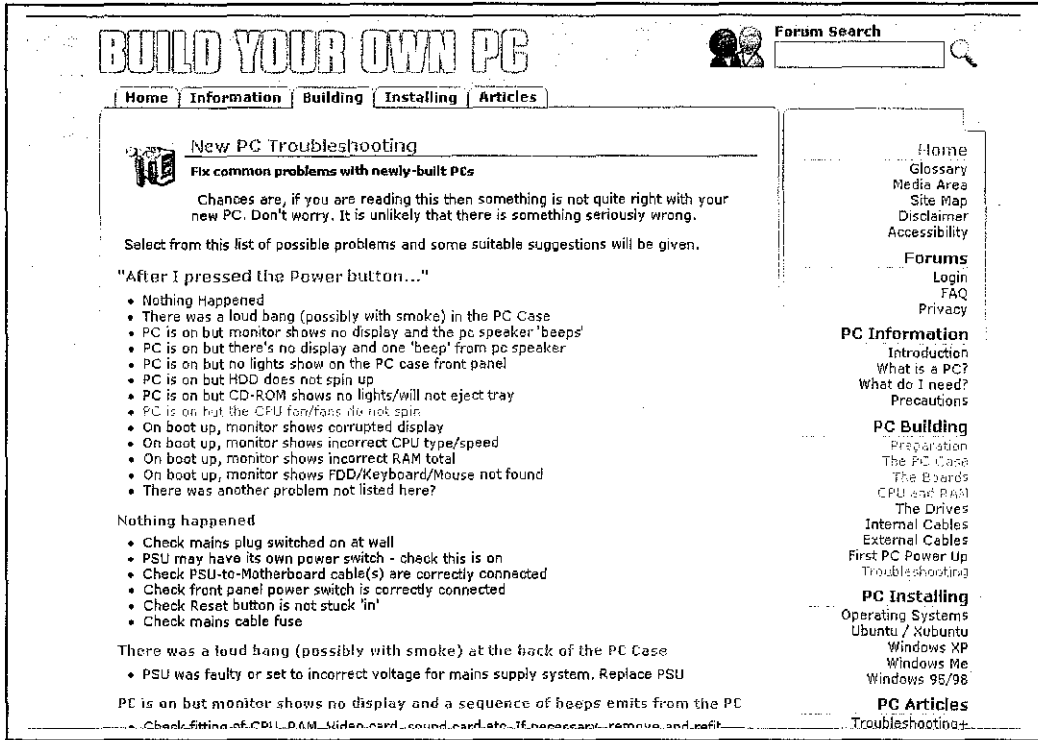
Figure 2.5 Find solutions using the troubleshooting sites

Online Forum or Chat

A recent trend in customer service is web-enabled synchronous dyadic chat, which supports text-based discussions between company representatives and customers. Despite promise as a useful and relatively inexpensive organizational communications venue, including customer relationship management [15], text-based chat is prone to miscommunication [16], at times leading to customer dissatisfaction and the dissemination of erroneous information. A common criticism of chat is its propensity for conversational incoherence and disorderliness because contributions to the discussion may appear out of logical sequence [17]. Since people increasingly use computer-mediated communication (CMC) technologies like chat, short message service (SMS), and instant messaging (IM) to accomplish

complicated, meaningful organizational tasks, it is important to understand why some exchanges succeed and others result in miscommunication.

Figure 2.6 Example of online forums

The innovation of P-CAT.com optimistically can enhance the current way of troubleshooting besides also avoiding the ambiguous problem solutions in fact provide the diagnostic to root of the problem. Furthermore, P-CAT.com is engaging as a new learning experience especially to the novice PC users.

CHAPTER 3

METHODOLOGY / PROJECT WORK

3.0 DATA GATHERING

The project embarks on by conducting a background study to obtain data necessary to validate users' current needs and to serve as input for the developed product. A summary of the processes involved in methods used to complete this project is shown in **Figure 3.1.**
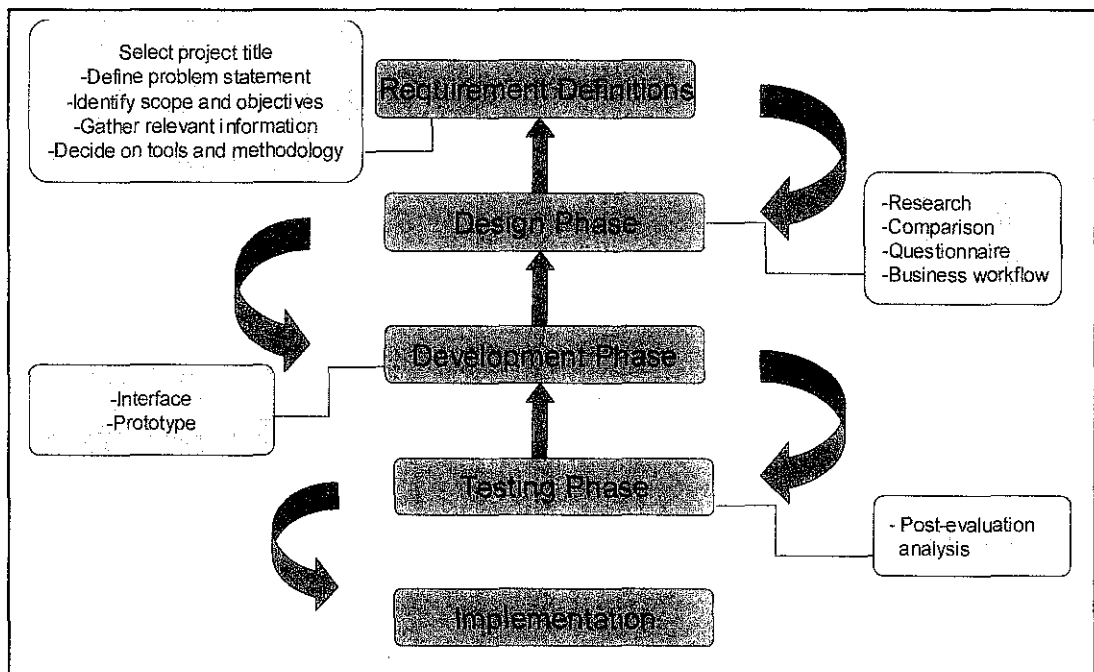
Figure 3.1 Project Methodology

The procedures to obtain the feedback from a sample of PC's users is an adaptation of the methods introduced in (Sekaran, 2003, p. 223) The following describes the steps involved in each phase:

3.1 Questionnaire creation

A questionnaire consisting of 2 parts were prepared and have been given to PCs users (**Appendix 1-1**). The first part sought to obtain standard demographic and background information of name, telephone number, e-mail address and occupation. Names and contact details were left optional for respondents and its purpose explained as merely for contacting respondents who did not complete the questionnaire or there was a need to clarify certain opinions pertaining to the answered questionnaires.

The second part of the questionnaire had 8 questions, which sought to understand respondents' perspective on the implementation of P-CAT.com as centre of solution to troubleshoot PCs assembling problem. The questions in this part can be categorized into the following:

Control Questions

There are two control questions, namely Question 1 and Question 7 in the questionnaire, which will be used to determine whether feasibility of implementing proposed system.

Perception and awareness

For question 1, respondents were asked to select the criteria which would determine the effectiveness and the usability of the proposed system. Meanwhile, Question 5 asks whether there were any similar tools available in the market that was currently known to users that has the functionalities as proposed by P-CAT.com. If their answer was Yes to the previous question, Question 6 requires respondents to

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choose/give their point of view over the existence system. Lastly, Question 8 required respondents to suggest any functionality as addition to the proposed system to further meet their specific needs as users of the system.

Level of interest

Question 4 requires respondents to rate their level of interest on a scale of 1 to 7 (1 for least interested and 7 for very interested) for the five modules proposed in the system. In addition, they were asked to comment on their reasons for providing such ratings.

Quantitative measures for causality

Question 2 and 3 provides several possible reasons for users to determine why the user can't diagnoses own PC problem and step taken if any problem occurred. The possible reason created based on the researchers' own assumptions from previous experiences. Respondents were asked to select their reasons and to specify their answers if there were none in the list which describes their answer(s) to this question.

3.2 Questionnaire distribution

Sample selection

The questionnaire also has been distributed among the thirty novices and experience PCs user randomly. There are among novice as well as the experience users. This satisfies the need of the respondents from different level of experience in using PCs.

Distribution and collection strategies

The researcher chooses the representatives randomly among the novice and experience PCs users. The main weakness of this procedure was that some respondents did not understand the questions posed and therefore did not respond accordingly. For the novice PCs user, one cause would be lack of knowledge on

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computer hardware and technical terms used in the questionnaire, or lack of exposure to methodologies such as data analysis and predictions in business applications.

Furthermore, the information gathered from this questionnaire is also used to observe the effectiveness of the current system exist as part of the analysis. This is to ensure that the system will be developed solely to serve an existing need in the users. However, the suggestions could clarify the user needs and help in the system development stage later.

3.3 Data analysis and interpretation

For Question 4, the 7-point scale system was re-coded into a three point scale of not interested "1", neutral "2" and very interested "3" as explained in (Abouchedid and Nasser, 2002, p. 201).

For quantitative measures of causality and perception and awareness, data is summarized by categorizing PC user's opinions into similar answers and relevant points.

3.4 System architecture design

System architecture shown the graphical explanation on how does the propose system works. **Appendix 3-1.**

3.4.1 Design documents

Design documents are explained in **Figure 3.2** that describes the use of each document and the scope of the document

No.	Document	Purpose	Scope
1	System Requirement Specification	To detail out the requirements of the proposed system in terms of functional requirements and also specify non-functional requirements for the system.	Hardware and software specifications, system functions and conditions to determine satisfactory usage of the proposed system
2	Use Case Specification	To summarize system interaction with users and the external environment and to specify the situations where each function is used	System stakeholders, external systems, relationships, non-functional requirements
3	Structural Model Specification	To represent each object, whether a function or a user as specified in the Use-Case specification as an object with attributes and methods (specific functions that is associated with the object). Objects with same attributes and methods are grouped into classes and relationships between classes are determined.	System stakeholders information, access level granted to each stakeholder and functions available for each stakeholder groups (novice and experience PC users)
4	Behavioral Model Specification	To specify the flow of interaction between an object and system functions by triggering the methods available in the object and show how system functions respond to users' requests	System stakeholders, system functions, methods

Figure 3.2 Design document specifications

3.4.2 User Interface design and storyboarding

A standard web template will be created for the system and the storyboard will elaborate on the actual program flow and interaction designs for the system.

3.4.3 Prototype design and creation

A prototype of the system will be used to validate the ideas proposed in this project and used as a means to evaluate the feasibility of implementing the system.

3.4.4 Network architecture design

Internet

P-CAT.com is proposed to be initially deployed over the Internet. P-CAT.com can be accessible from any host connected to the network as described in **Appendix 3-2**.Users connect to the internet and access P-CAT.com through the application server. Next, the application server retrieves necessary data from the data centre which may be integrated with PCs users' database to promote effective content management and knowledge sharing. The application server then retrieved required functionalities as requested by users currently specified in P-CAT.com functionalities. For the effectiveness of the knowledge sharing, P-CAT.com allow user to request for the solution that does mot exist in the database. Mail server will send the request to alert the P-CAT.com community through their email before adding the new solution into P-CAT.com. Deployment over the internet is currently the most feasible so that P-CAT.com can be access anywhere.

Network constraint issues

Issues to be taken into consideration are identified as acceptable bandwidth, latency, multicasting and broadcasting capabilities and document caching capabilities to ensure internet can be used effectively across the internet. In addition, database constraints over distributed environment include concurrency, data integrity, and consistency when considering whether users are allowed to retrieve data via real time. Besides, the implementation of the virtual reality for 3D model rendering might caused the system legging and may takes sometimes to load the whole model.

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3.5 Tools selection

3.5.1 Comparative study of available tools and implementation strategies

Since the system will be developed as a web based system, the following issues should be taken into consideration when evaluating the identified tools and implementation strategies:

Current hardware and software requirements

The proposed system has to be developed on a compatible platform based on the host system where it will be accessed by PC users. Therefore, a background study should be conducted to determine its specific hardware and software requirements in order to develop the system to suit the underlying host system without any complications. The information required to be obtained include all hardware and software specifications currently used by the faculty to host their individual web pages and current database server that can be used to accommodate the storage needs and further maintenance of the proposed system.

Currently software development methodologies

There are many available software process models as explained in (Sommerville, 2004) and the Waterfall model has been identified as feasible and relevant to be used as a framework to develop the proposed system. As a result, the phases of system development is identified as abstracted in the Waterfall model and is to be deployed phase by phase in the order specified which are:

Requirements Specification

The process of obtaining the necessary information to substantiate the need for implementation of the proposed system and to obtain background information on current relevant business processes in order to come up with detailed specifications

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of corresponding requirements as a means to achieve the objectives for developing the system.

Software Design

This phase requires all design documents to be specified as detailed in **Appendix 3-3.**

Software Implementation

The process of developing the system based on the specified requirements and constraints. This phase includes development of prototypes to be verified by system stakeholders in the testing phase.

System Testing

This phase verifies that the system is working as expected in the environment to be deployed and has satisfied all the necessary requirements of system stakeholders in a satisfactory manner. After the system has been approved by this phase, the system is ready to be released to the end user.

System Training and Roll out

The necessary skills and knowledge on how to use the system effectively to meet users' needs should be communicated to users through training, user manuals or dynamic help functions included in the system. Meanwhile, notification of the availability of the system within the faculty should be in place to inform all system users of the existence of such system.

3.5.2   Tools currently available

The tools to be chosen are highly dependent on the hardware and software specifications where the system will be deployed on. For decision making purposes, **Appendix 3-4** summarizes the available tools and its corresponding hardware and

software requirements, conditions and environments where such tools is recommended to be used together with its advantages and disadvantages.

3.6 Post-implementation Evaluation by Target Users

Upon development of a working prototype, a post-test survey questionnaire is designed and scales used to measure ease of use, usefulness, compatibility of the system. This exercise will be conducted among target audience which are novice and experience users of PC. Respondents will be granted access to P-CAT.com prototype to determine their satisfaction levels via the questionnaire. Analysis of results from this post-evaluation exercise will be discussed in the next chapter. A sample questionnaire can be referred in **Appendix 3-5**.

CHAPTER 4

RESULTS & DISCUSSION

4.0 RESULTS & DISCUSSION

4.1 Survey Questionnaire

From the survey questionnaire distributed among PC users who will be primary users of the system, the results are analyzed as follows based on each category as explained in the methodology section.

4.1.1 Control Questions

In Question 1, the respondents were asked the basic question whether they ever tried to operate their own PCs. 17% of respondents answered YES while 83% answered NO. Respondents who answer NO required proceeding with question 2. The results are represented in charts below.
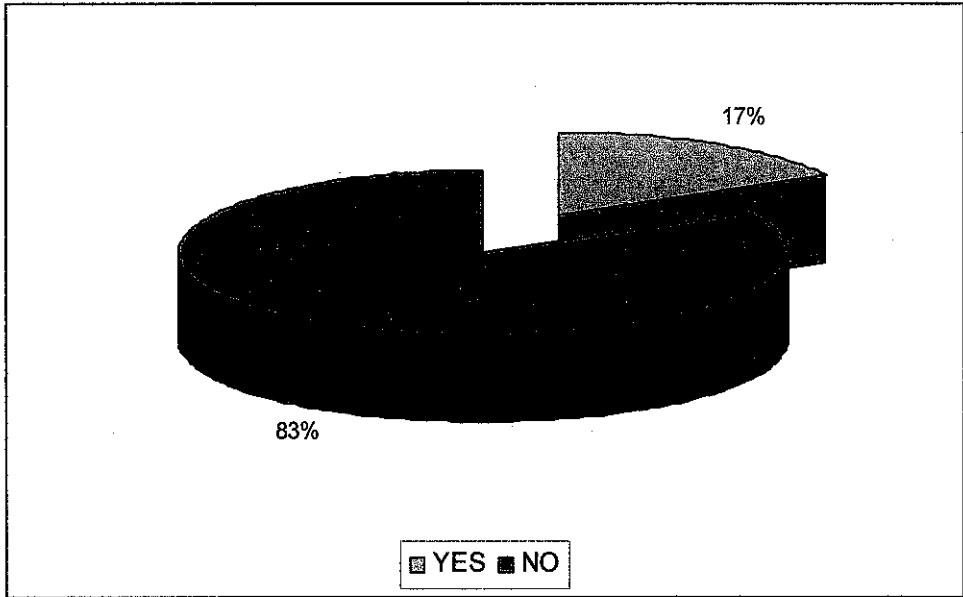
Figure 4.1 Percentage of PC users have tried to operate own PCs

Next, in Question 7, respondents were asked whether they would be interested in using interested in using P-CAT.com as a tool to finds help or solution for PC problem. Besides, help the user to understand PC hardware and able to fix problem own their own. 92% of respondents answered YES while 8% answered NO. The results are represented in a chart below
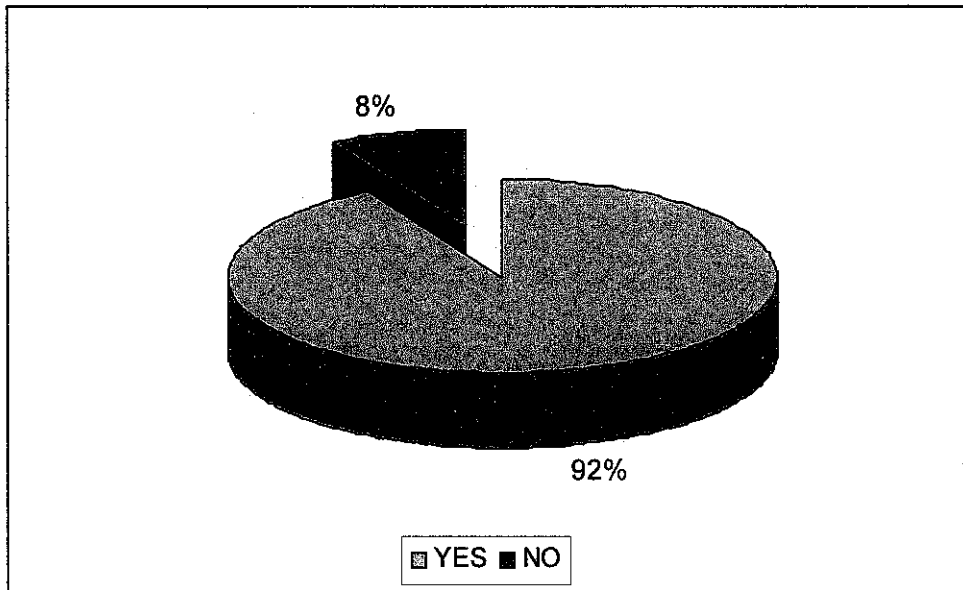
Figure 4.2 Interested in using P-CAT.com

4.1.2 Perception and Awareness

Question 5 asked respondents whether they were aware of any similar systems available in the market that has similar functionalities as proposed in P-CAT.com. The results are represented in the chart below.
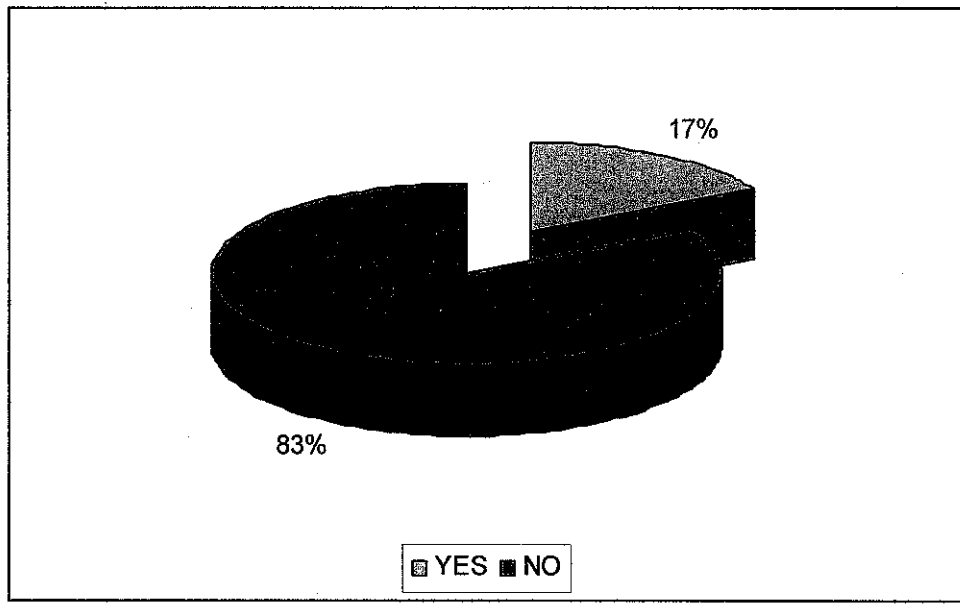
Figure 4.3 Availability of similar systems

17% of respondents answered YES and therefore were required to proceed to Question 6 while 83% of respondents answered NO and were required to proceed to Question 7. Answers with N/A were considering as irrelevant.

Next, Question 6 asked respondents were asked to select the criteria of the similar tool that exist in the market. The results from respondents are represented in a chart as follows.
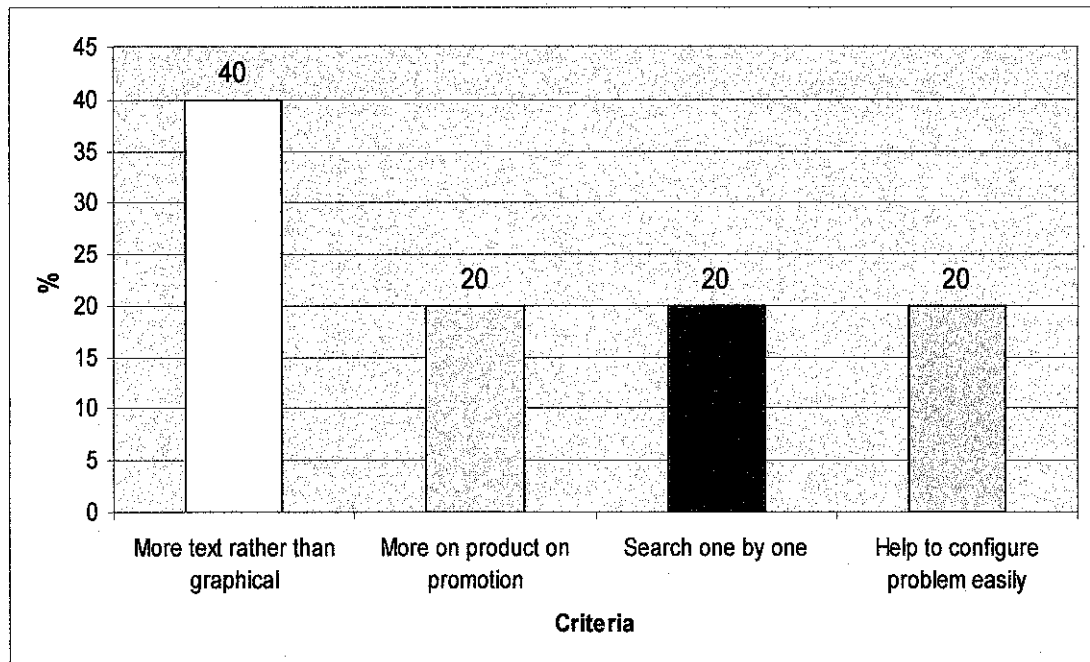
Figure 4.4 Criteria of the existence system

40% of respondents think that the available system contains more text rather than graphical information. Another 20% think that they have to search the site on by one to fin the best solution to solve the problem. While 20% think that the system could help them configure problem easily. The remainders 20% respondents think that most of the site promote product and sell products rather help to configure PC problem. Answers with N/A were considering as irrelevant.

This question was specified for the case where users are already familiar with currently available systems that are meeting certain needs and provide a means for them to suggest areas where such systems can be improved.

Lastly, Question 8 asked respondents whether they had any suggestions in addition to the functionalities proposed in P-CAT.com that would further meet their needs as users of the system. Respondents' answers are summarized in the table below.

No.	Category/Area of interest	Suggestion
1	Additional functionalities	- Register user of the system to create the online community and easier to monitor - Need membership to access the forum and request the solution from other users. - Inform the members if any users request for problem solution so that the problem can be solve faster. - Deployment over the wireless environment so that the site can be surf anywhere via the mobile phone.
2	Relevant issues	- Maintenance - User Friendliness - Different brand of hardware that might have different configuration - Experience user that willing to share knowledge in P-CAT.com - Performance

Table 4.1 Additional suggestion for P-CAT.com

4.1.3 Level of interest

Question 4 required respondents to rate their level of interest on a scale of 1 to 7 (1 for least interested and 7 for very interested) for five function proposed in P-CAT.com (Troubleshoot, Solution, Problem Diagnostic and 3D-model . The 7-point scale system was re-coded into a three point scale of not interested "1", neutral "2" and very interested "3" as explained in (Abouchedid and Nasser, 2002, p. 201). The results are represented in the figure below.

	Troubleshoot	Solution	Problem Diagnostic	3D-Model
▣ Interested	17	17	7	17
■ Neutral	33	27	33	33
☐ Not Interested	50	57	60	50

▣ Interested ■ Neutral ☐ Not Interested
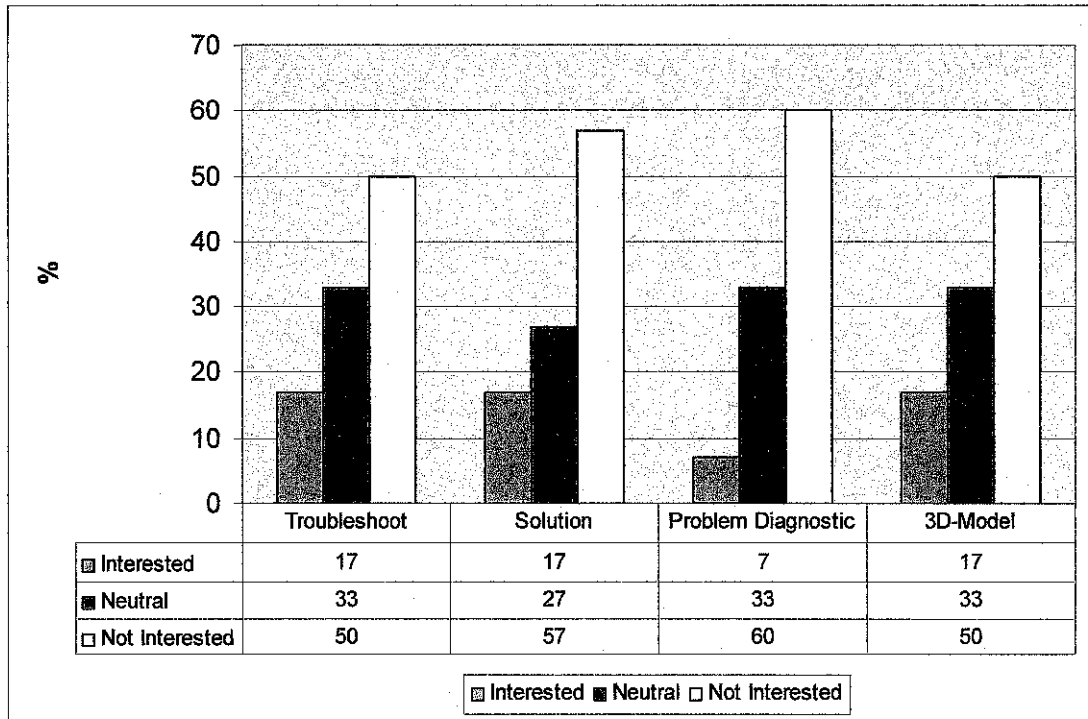
Figure 4.5 Level of interest in P-CAT.com functionalities

Majority respondents stated that they were interested in Solution and Problem Diagnostic proposed in P-CAT.com. These results show that the two functionalities proposed with P-CAT.com are practicable to be implemented. It suits the needs of future users of the system. These functionalities can therefore be used to promote P-CAT.com as an effective system to meet the specific needs of system users. Meanwhile, 50% of respondent interested on the Troubleshoot and 3D-Model about 10% lower than the other two functionalities. 3D-Model and troubleshoot also possible to be implementing as the users understand how and what the terms and their function is all about.

4.1.4 Quantitative measures for causality

Next, in Question 2, respondents were asked why they hesitate to operate their own PCs. 20% of respondents answered that they afraid of making mistake while 40% respond that they illiterate about computer hardware. 32% choose to refer to the computer vendor if any problem persists. The remaining 8% choose other reason. The results are represented in a chart below.

29
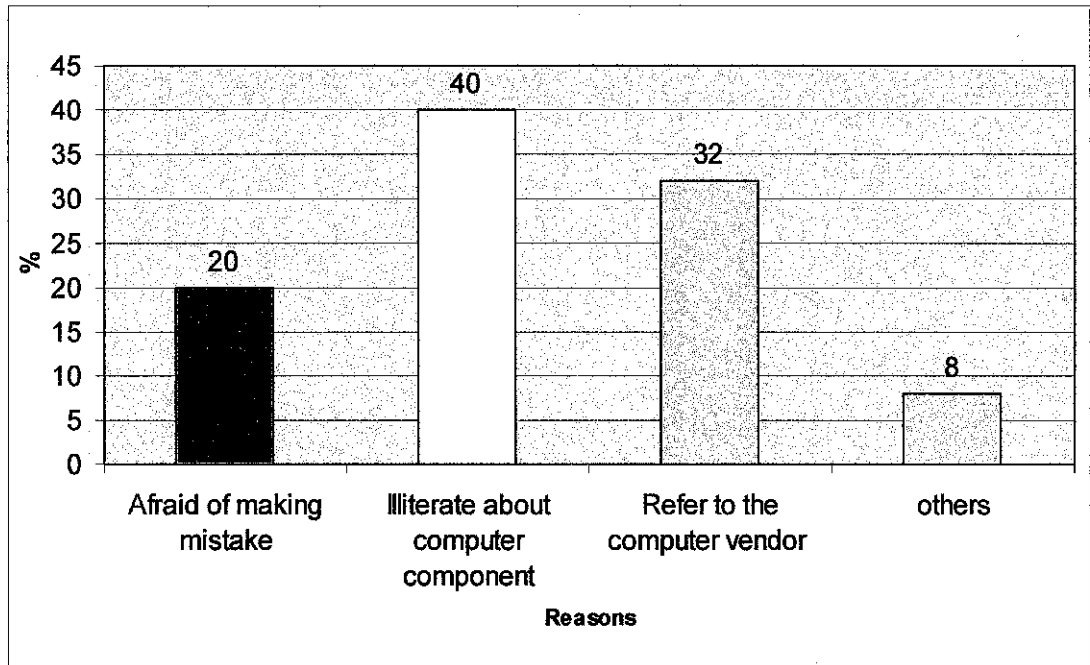
Figure 4.6 Reason why the PC user doesn't want to operate own PCs

In Question 3, respondent were asked what is their first step if the problem occurred. The results from respondents are represented in a chart as follows.
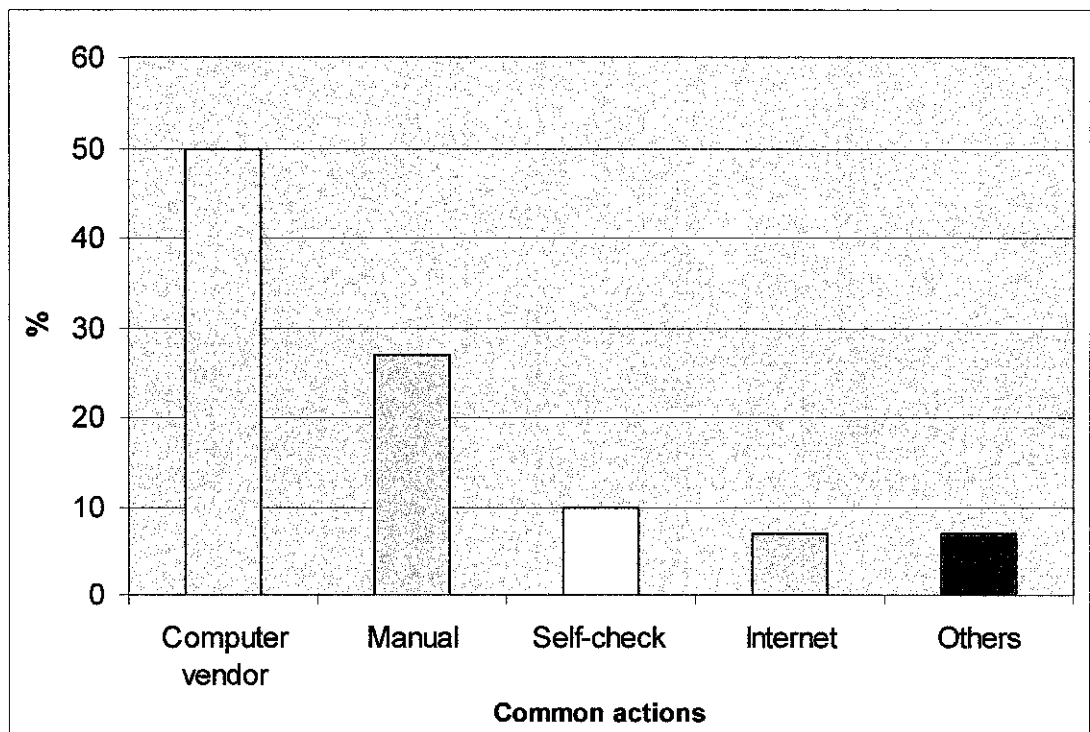
Figure 4.7 Common action when problem persist

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4.2 Data Analysis and Interpretation

4.2.1 Additional notes

For Question 4, supporting reasons for their response towards the deployment proposed in P-CAT.com is summarized in the figure below.

No.	Module	Reasons for being interested	Reasons for being uninterested	Reasons for being neutral
1	Troubleshoot	• Improve knowledge sharing among the novice and expertise where the experience can share the solution	• Can't have access if the network down • Can always refer to computer vendor	• Don't really understand how the knowledge sharing can be applied to the system.
2	Solution	• Reduce time to search one by one on the internet • Easy selected solution	• Can find the solution on the internet • Don't care about the cost incurred to repair the PC.	• Get use to search on the internet, do mind to try new system.
3	Problem Diagnostic	• Get to troubleshoot the problem faster • Can figure out until the root of the problem • Create confident for novice users	• Refer to hardware manual and able to configure the problem manually. • Trust the computer vendor more.	• Already have basic knowledge on how to troubleshoot PC
4	3D-Model	• Can learn about the computer easily • Graphical information that could help to increase the understanding	• Can't understand how the 3D-Model works and can help to teach the users.	• Can learn about the computer component trough reading as well as by the help of graphical information

Table 4.2 Reasons for rating

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4.3 Selection of Proposed Tools and Strategies for Implementation

4.3.1 Software

Having performed a comparative evaluation on the tools available, P-CAT.com will build based on WAMP software concept used which represent the development of P-CAT.com within the Windows environment using Macromedia Dreamweaver to develop the graphical user interface and will deployed on a local Apache server with database running on MySQL as well as PHP. The tools used and specifications stated as follow:

- Apache 2.2.4
- PHP 5.2.1
- MySQL 5.0.7
- Macromedia Dreamweaver MX
- Adode Photoshop CS
- Macromedia Flash MX
- VRMLpad
- Cortona3D Viewer

4.3.2 Hardware

- Operating System: Microsoft Windows XP Professional Edition
- Processor: Intel Pentium 4, 1.70 GHz
- Memory: 512 MB of RAM
- Display : ATI Mobility Radeon M7
- Input: Mouse and Keyboard
- Hard Disk Requirement: Minimum 100 MB

4.4 Prototype of P-CAT.com

For this project, the author has developed the interface of the P-CAT.com. The user interface has been kept on simple and structure manner. This is to let users have an impression that this system is easy to use and can provide information and knowledge that they needed.

There are 7 links on the top of the homepage: Home, Troubleshoot, Solution, Problem Diagnostic, 3D Model and Contact Us. These links represent each page of the main functionalities in P-CAT.com. This will allow the user to click on any links they wish to explore at anytime on any pages according to their preferences. Process involved in P-CAT.com is described through a process flowchart in **Appendix 4-1.** Following are the functionalities that P-CAT.com has:

4.4.1 Main Page
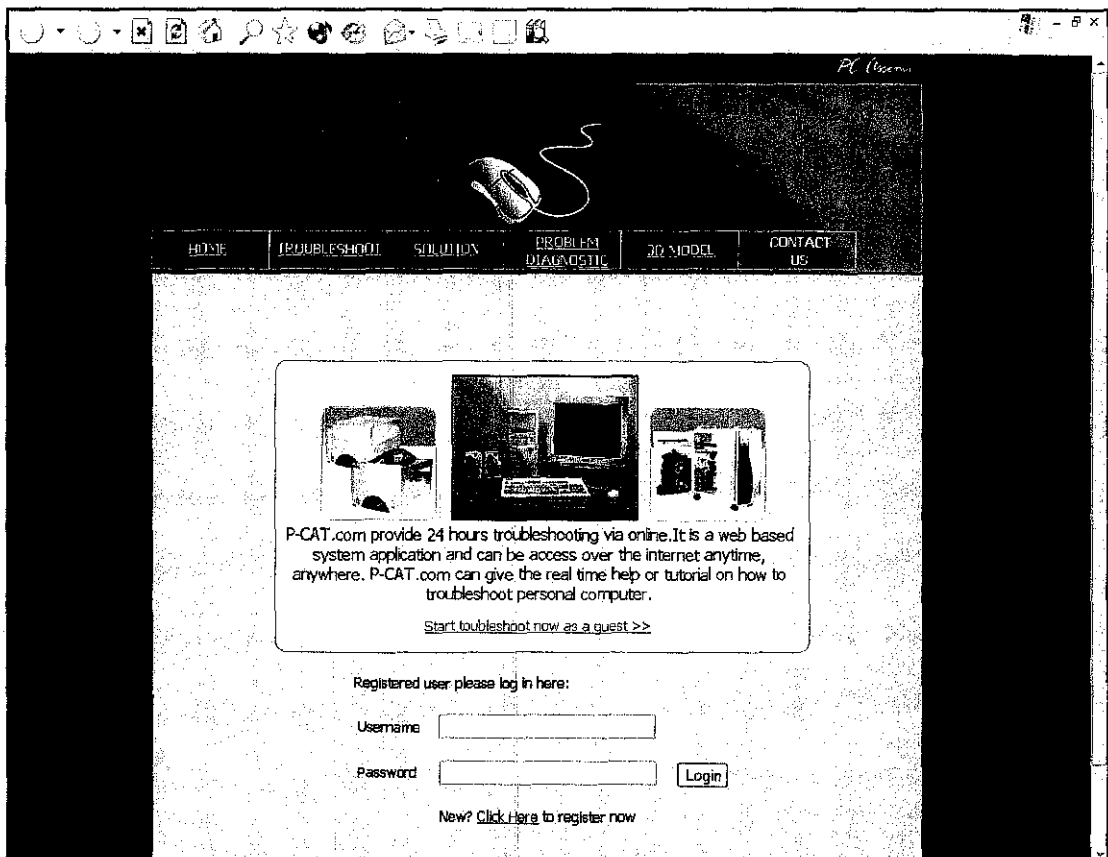
Figure 4.8 Main Page

The main page consist of the brief description on what is P-CAT.com as well as what the system can do and provide link to the main troubleshooting page.

Registered user can directly key in the username and passwords to start troubleshoot using P-CAT.com while the unregistered user can log in as a guest. To create account in P-CAT.com, users can click on the link at the bottom of the main page and will be redirect to the register page (Figure 4.9).

4.4.2 Register Page

Figure 4.9 Registration Form

To have the privileges that P-CAT.com offered user must registered or create an account to become member in P-CAT.com community. Once registered, the same login information can be used to access any area on the system based on right permission of access.

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4.4.3 Troubleshooting

After the login is successful with the user enter username and password, the user will then redirect to the troubleshooting page (Figure 4.10).At this page user have three choices to choose. Firstly, the user can type in the keyword of the PC assembling problem and secondly choosing the solution from common problems list or existence solutions. Experience user can add own way to solve problem by clicking on the add new solution button, then fill in the add solution form. (Figure 4.11)
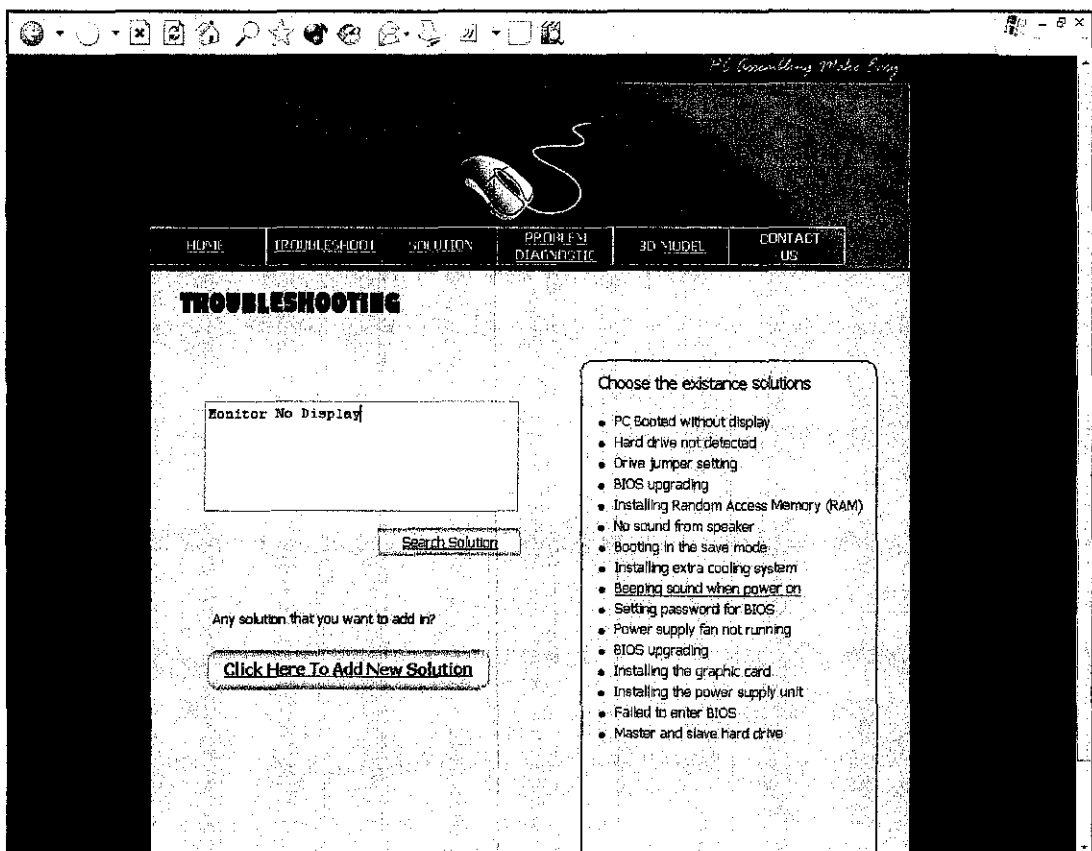
Figure 4.10 Troubleshooting Page

Figure 4.11 Add New Solution Form

4.4.4 Solution

After keying the keywords for their problem, user will be given choices of possible solution. User also can select solution added by other user. (Figure 4.12) If the solutions don't exist user can request solution by clicking the link to the request solution form. (Figure 4.13) Only the registered user has privileges to request for the solution. The request will then alert the members in P-CAT.com community via email. The experience user in community will then reply to this alert by adding in the new solution to the system.
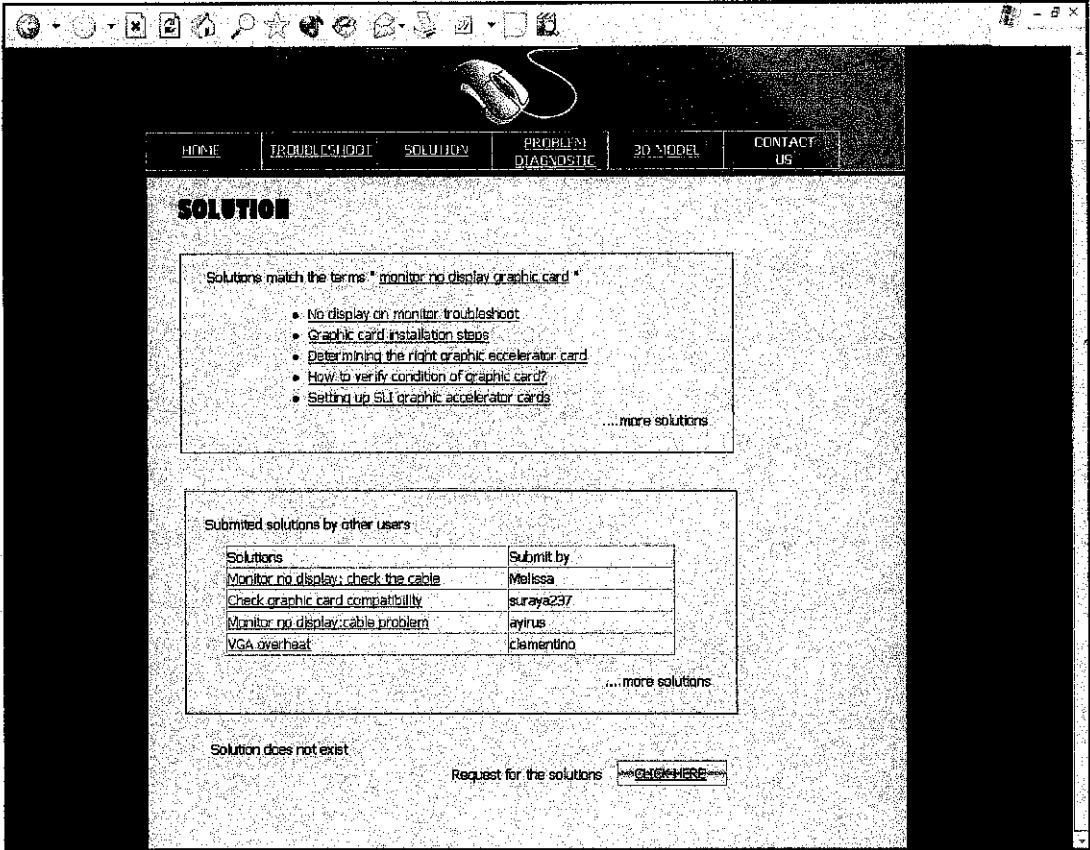
Figure 4.12 Solution Page
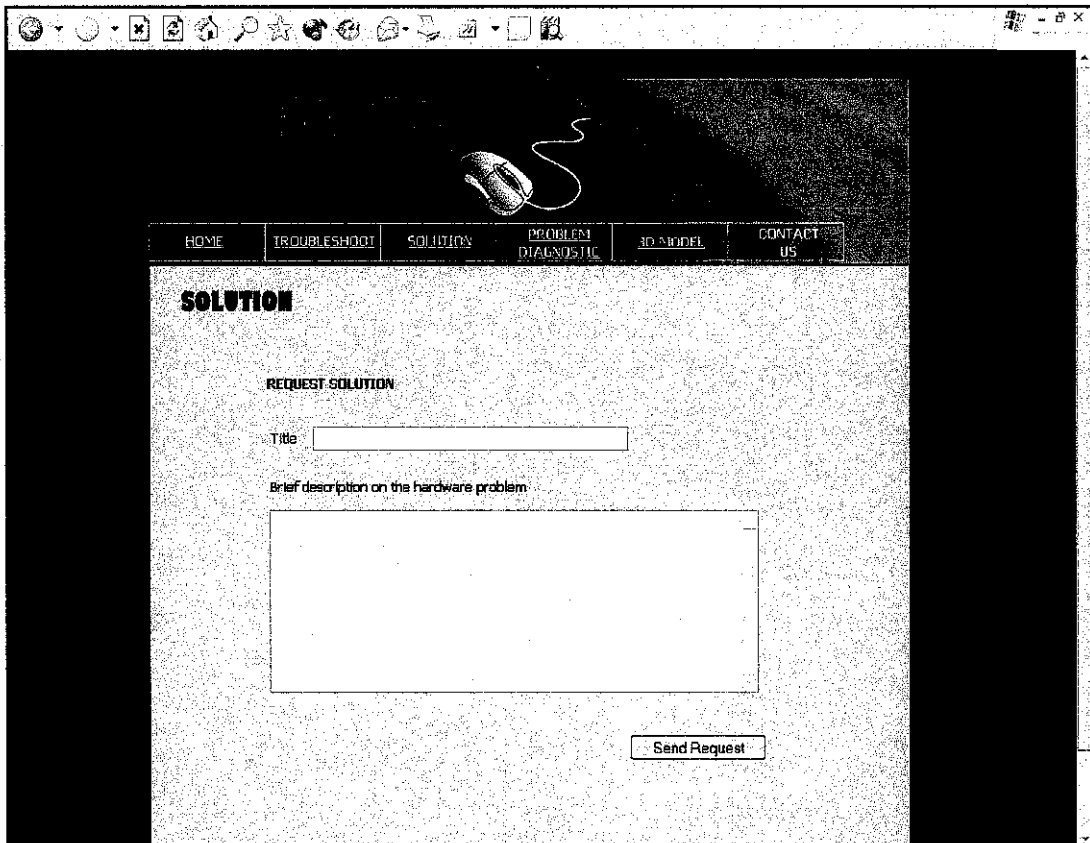
Figure 4.13 Request Solution Form

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4.4.5 Problem Diagnostic

In the problem diagnostic page, user will be asked question throughout the page to identify root of the problem. There will be text box, which prompt user to input data related to the problem (Figure 4.14). The Radio buttons are also use to identify the nature of the problem (Figure 4.15). P-CAT.com also provides visual aids to help user who are not familiar with computer hardware components. (Figure 4.16)

After the problem being solved, user will be given the choice to view the step taken.(Figure 4.17) If the option selected, user will be directed to the other page that shows the flowchart of steps have taken to solved the problem. User then can to choose to print the solutions given. (Figure 4.18)
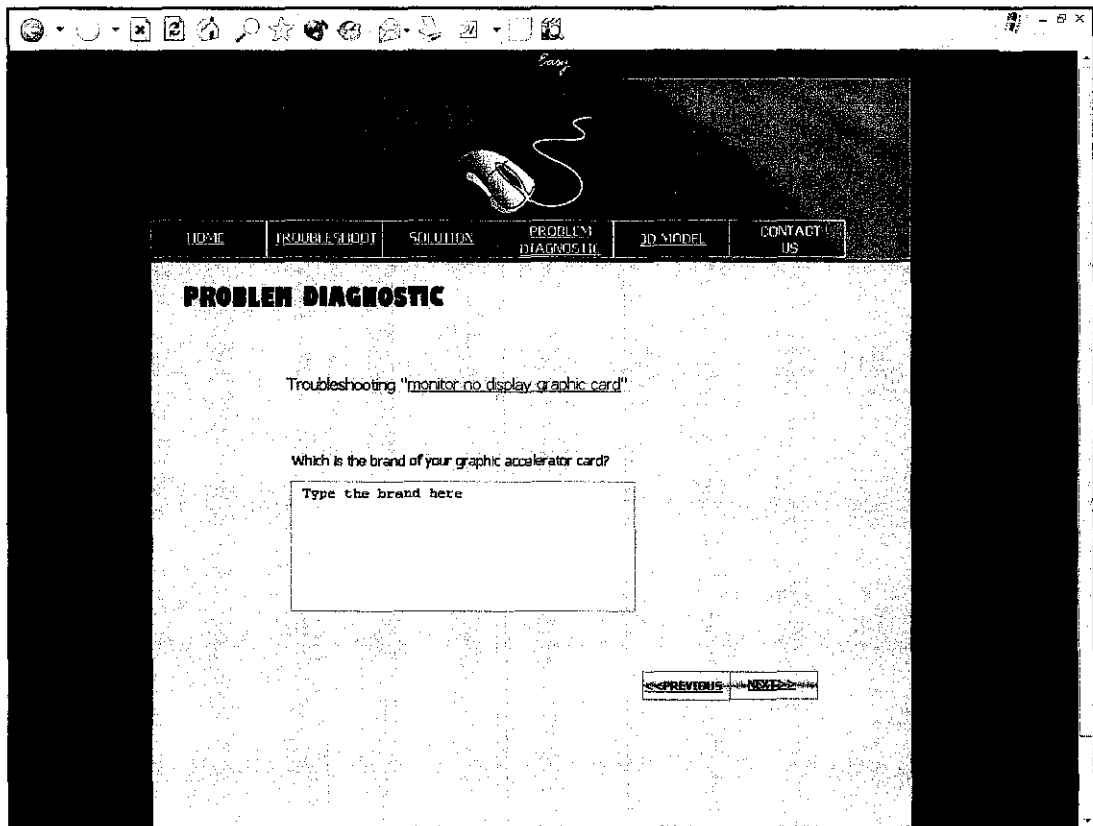
Figure 4.14 Text Box

38
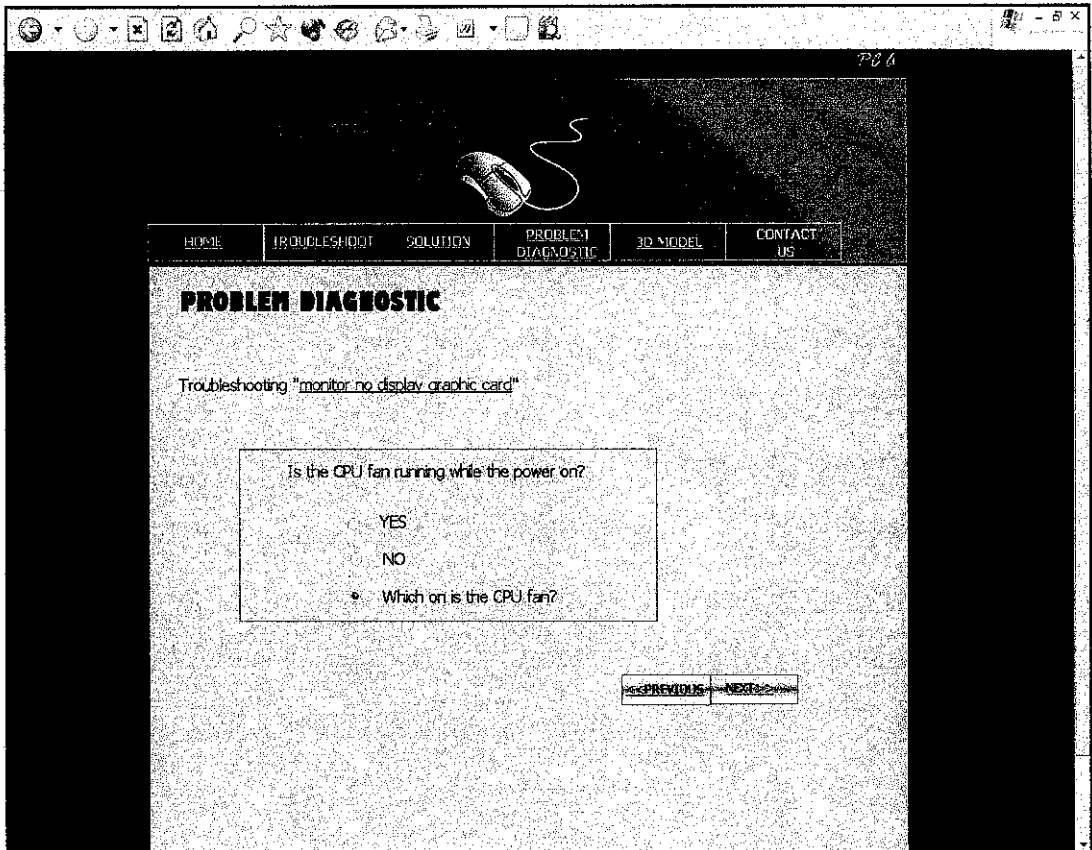
Figure 4.15 Radio Buttons
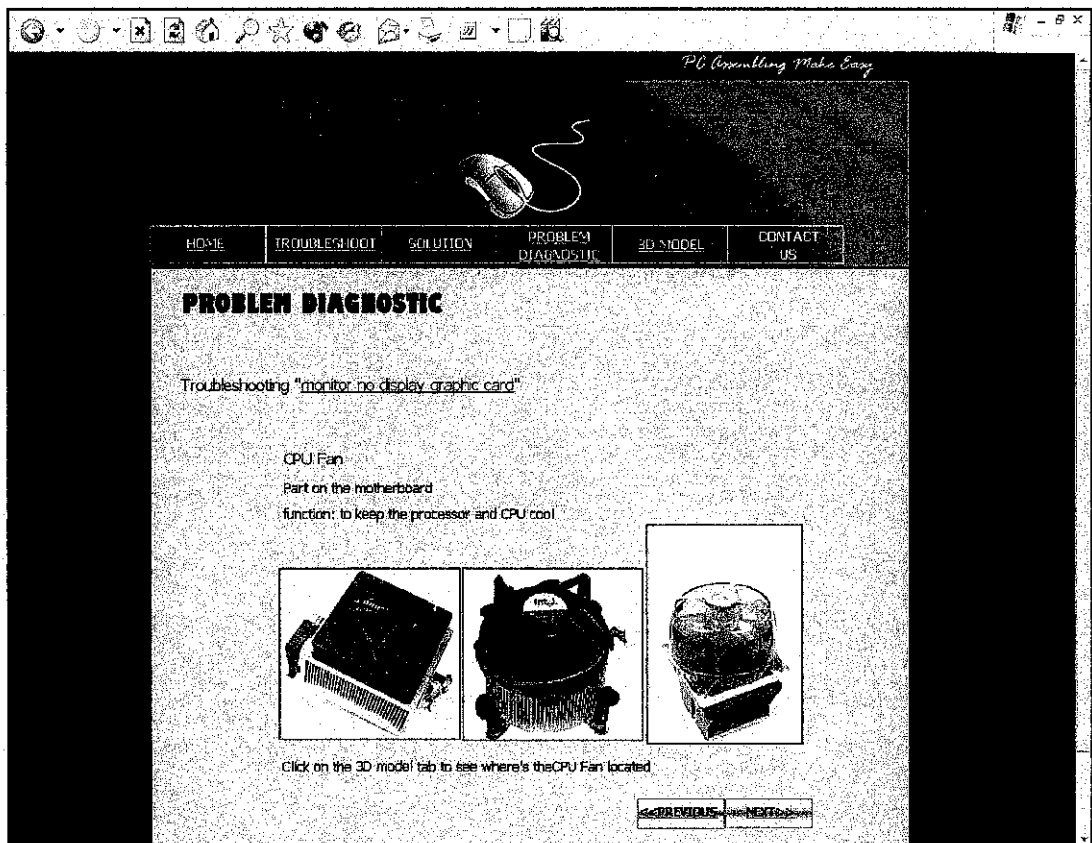
Figure 4.16 Visual Aids

Figure 4.17 View steps
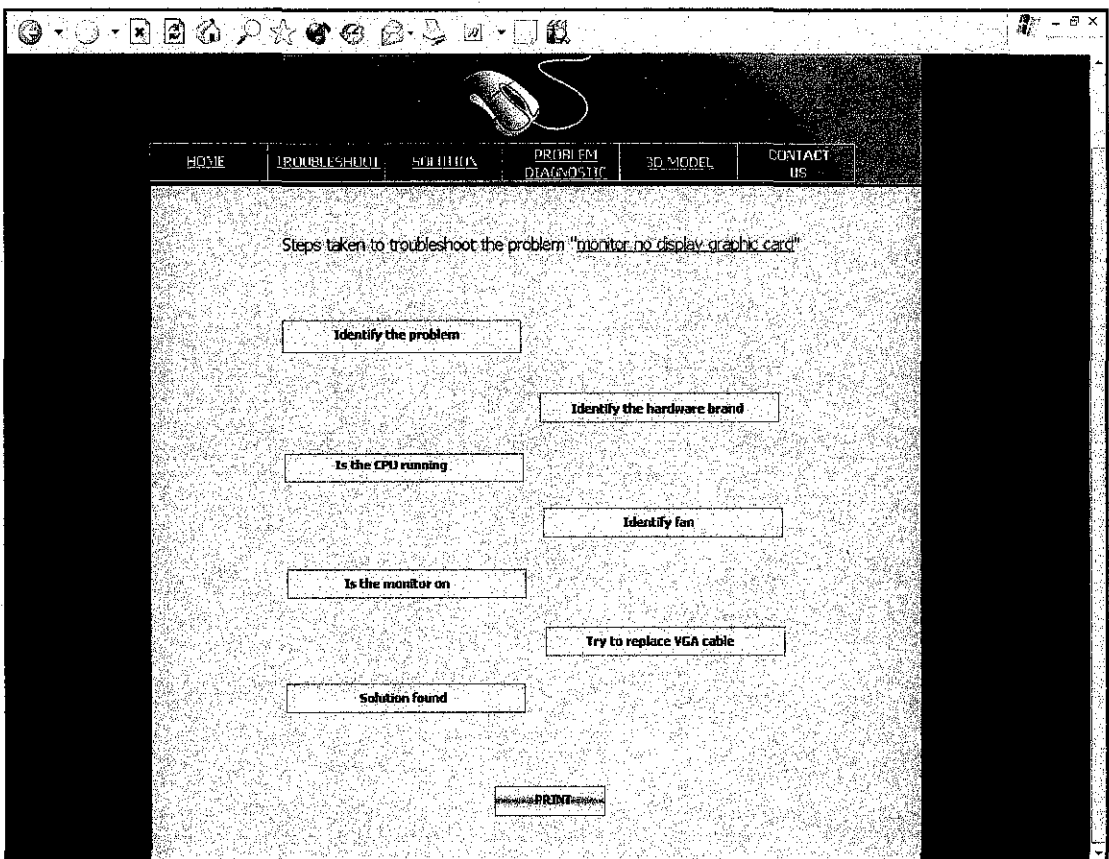
Figure 4.18 Printable steps taken

4.4.6 3D Model

P-CAT.com also provides the 3D Model that allow user to see the computer hardware in 3D as well as the location of hardware on the motherboard. Main purpose on putting the 3D Model in P-CAT.com is to help to educate the novice user who does not familiar with computer component.
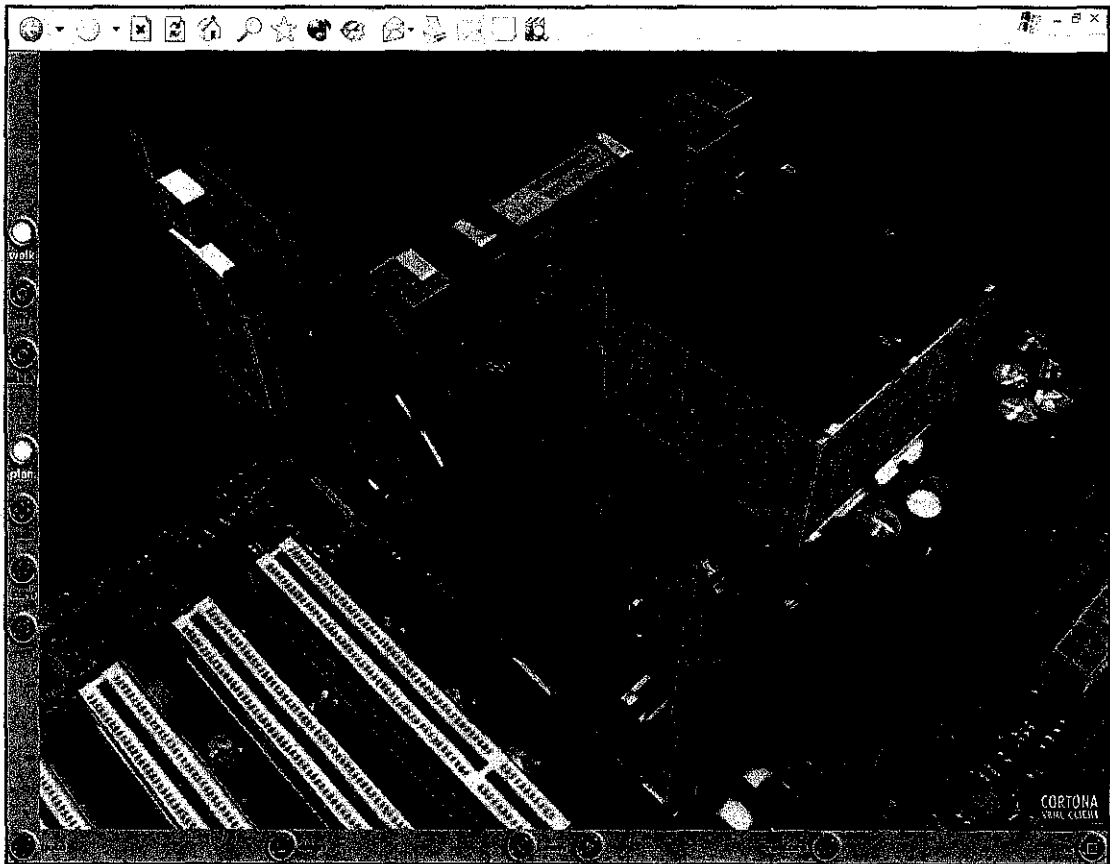
Figure 4.19   3D-Models

4.5 Results from Post-evaluation

For the post evaluation questionnaires, the 7-point scale system was re-coded into a three point scale of totally disagree "1", neutral "2" and totally agree "3" as explained in (Abouchedid and Nasser, 2002, p.201).For this system evaluation, I've re-coded ratings 1,2,3,4 as strongly disagree, rating 5 as neutral and ratings 6,7 as strongly agree. Below are the results of the post test based on each aspect in the usability test.

4.5.1 Ease of Use

For this usability aspect, respondents are asked to evaluate the straightforwardness of the system. The results are represented in the chart below:

	Easy to learn to use P-CAT.com	Screen element listed clearly	Can get info quickly	Easy to navigate within P-CAT.com
Strongly disagree	10	16.7	10	10
Neutral	30	33.3	40	50
Strongly agree	60	50	50	40
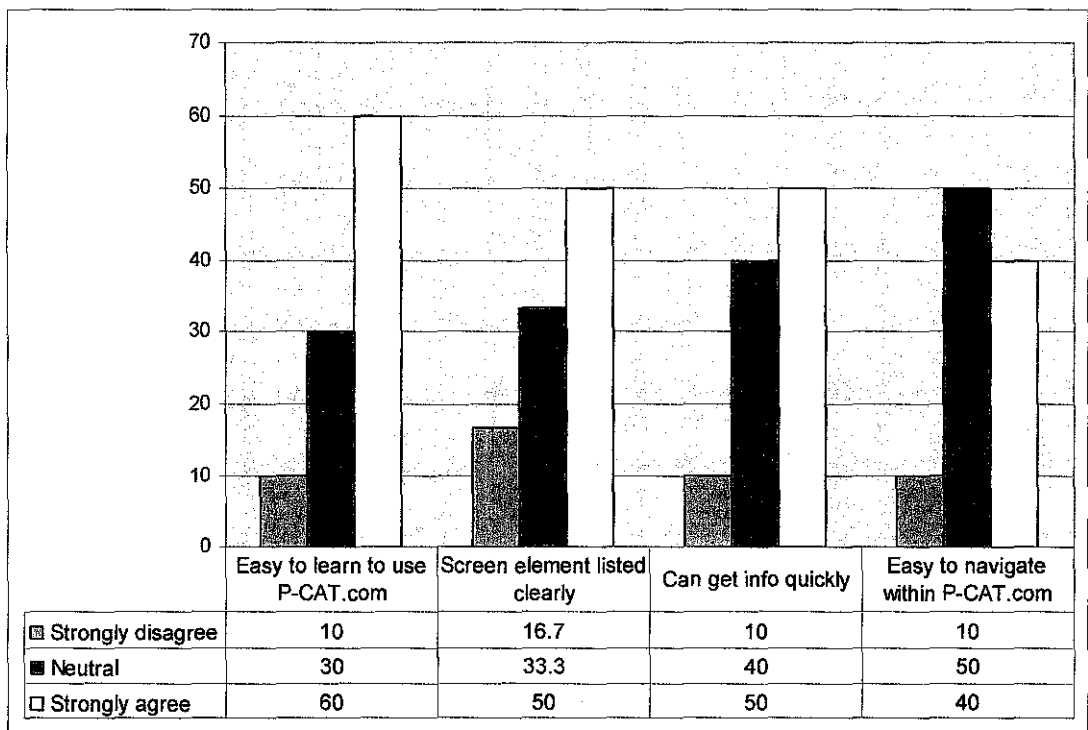
Figure 4.20 Ease of use

60% of the respondents strongly agree that learning how to use P-CAT.com is easy, while, 30% of them are neutral. 40% of the respondents strongly agree that it is easy to navigate in P-CAT.com, while 50% of them are neutral. 50% of the respondents find that screen element listed clearly, while 33.3% of them are neutral about it and 16.7%of them stongly disgaree on this matter. 50% strongly agree that they can find the information they want quickly while 10% disagree. Easy to learn is the utmost criteria for ease of use based on the usability test.

4.5.2 User Friendliness

For this aspect, respondents have to gauge the friendliness and usefulness of the system. Aspects such as colors, GUIs and design layout are being tested here. The results are presented in the chart below:

	Color	Font	Suit first time user	Image clearly shown
Strongly disagree	16.7	33.3	16.7	10
Neutral	16.7	26.6	33.3	30
Strongly agree	66.6	40	50	60
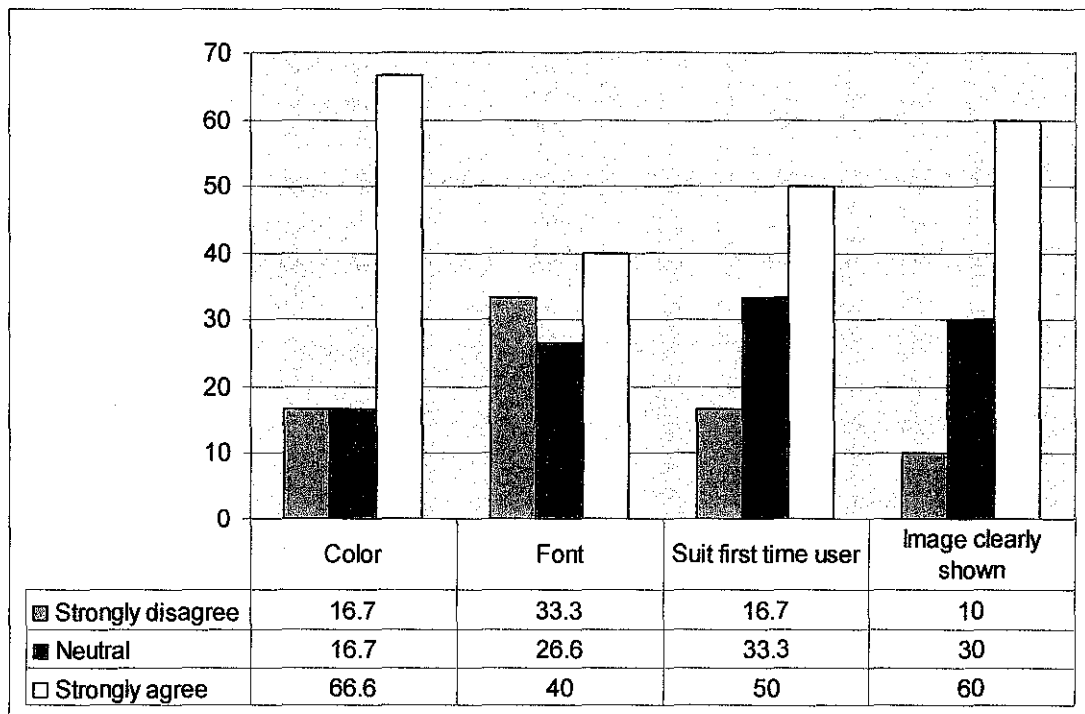
Figure 4.21 User Friendliness

Based on the chart, 16.7% of the respondents find that the colors used in P-CAT.com is unattractive, 66.6% of them find the graphical user interface (GUI) is attractive, 40% strongly agree that the font is easy to read, 50% strongly agree that P-CAT.com is well suited for first time users. 60% stated that the image represent clearly and understandable. Overall, 54% of the respondents strongly agree that P-CAT.com is user friendly.

4.5.3 Effectiveness

For this aspect, 66.7% of the respondents strongly perceive that P-CAT.com is engaging as a new learning experience. 60% strongly agree that the solution steps clearly stated and easy to follow. 76.7% of the respondents stated that they learn faster through the help the 3D Model. Meanwhile, 33.3% of the respondents stated that P-CAT.com allows novice and experience user can exchange knowledge easier while the 43.3% remains neutral.

	New learning experience	Learn faster through 3D model	Solution steps easy to follow	exchange knowledge more easier
▥ Strongly disagree	16.7	6.7	16.7	23.3
■ Neutral	16.7	16.7	40	43.3
□ Strongly agree	66.7	76.7	60	33.3
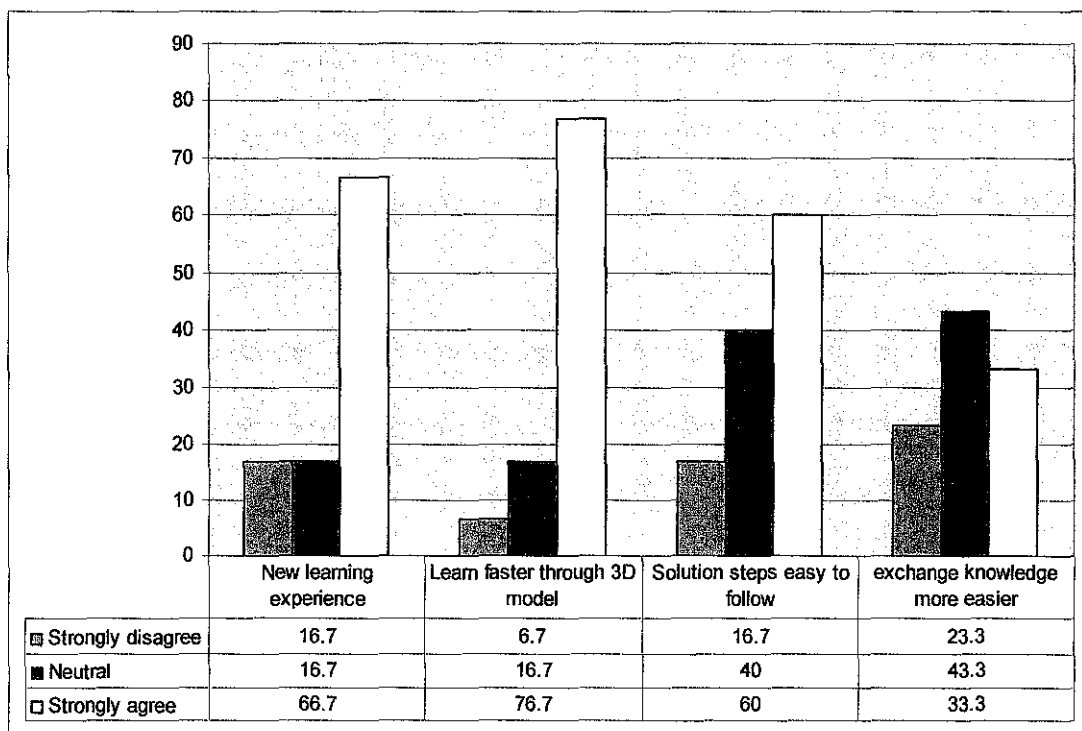
Figure 4.22 Effectiveness of P-CAT.com

4.5.4 Use Intention

73% of the respondents intend to use P-CAT.com when it is deployed. The remaining 26.7% remain neutral. 66.7%of the respondents believe that they would learn efficiently using P-CAT.com. Most of the respondents strongly agree that P-CAT.com would benefit them.

	Would learn efficiently using P-CAT.com	Believe that P-CAT.com give benefit	Intend to use P-CAT.com when it is deployed
Strongly disagree	6	6	0
Neutral	26.7	20	26.7
Strongly agree	66.7	73	73
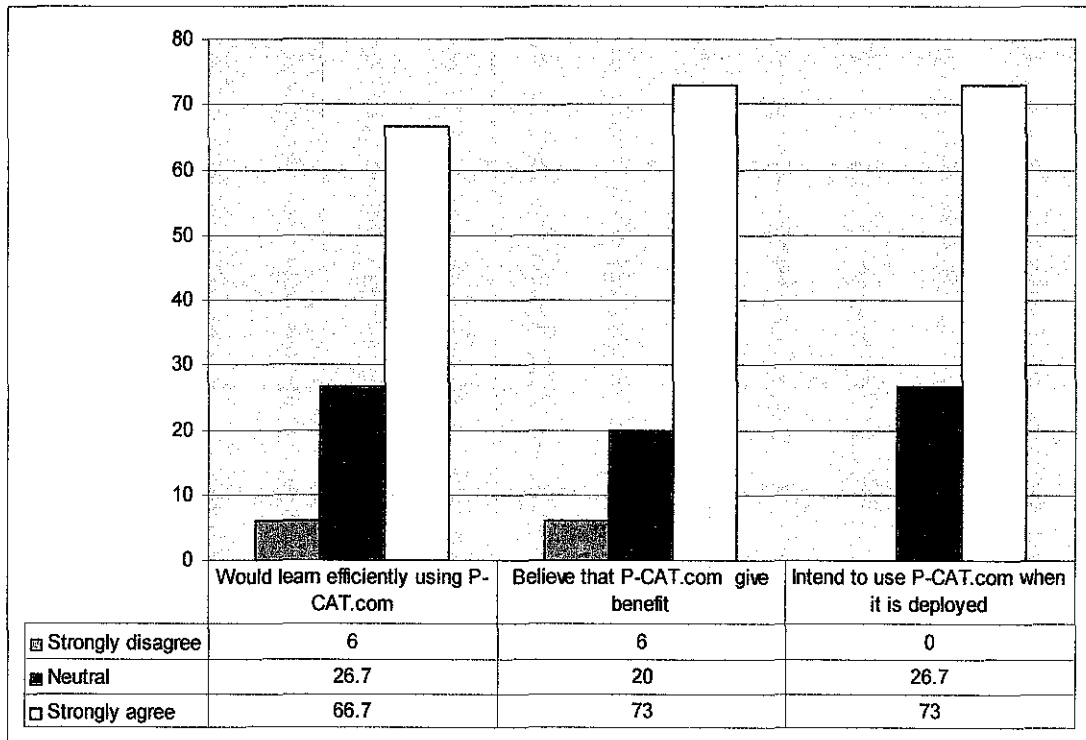
Figure 4.23 Use Intention

4.5.5 Realism

For this aspect of realism, the study focuses on the 3D Model only. 66.7% of the respondents agree the model was rendered at adequate speed. On the other hand, for the textures and lighting, most respondents strongly agree that they are realistic.

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	Model rendered at adequate speed	Texture look realistic
Strongly disagree	10	10
Neutral	40	20
Strongly Agree	66.7	70
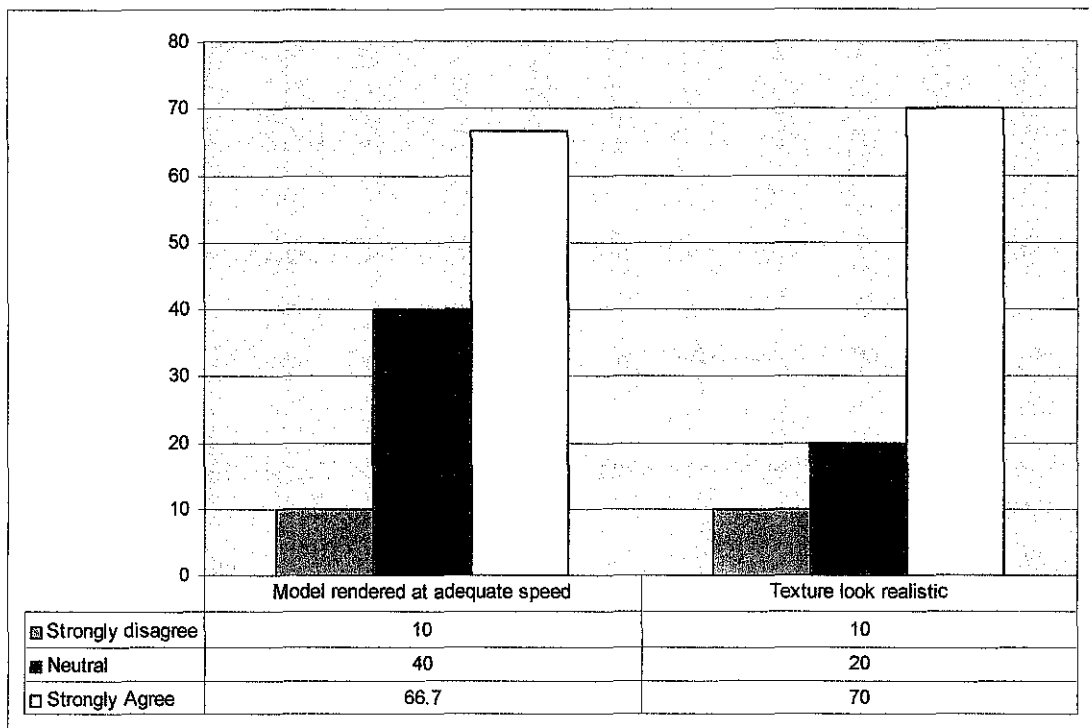
Figure 4.24 Realism

4.5.6 Comparison between Usability Aspects

From the chart, it can be interpreted that P-CAT.com received positive feedback from most respondents as they perceived it as effective, easy to use, user friendly and intend to use it when it is deployed. Almost more than 70% of the respondents perceived P-CAT.com to be effective and benefit them as most of them expressed that they would employ P-CAT.com as their new learning medium.

CHAPTER 5

CONCLUSION & RECOMMENDATION

5.0 Conclusion

P-CAT.com develops to provide online help to troubleshoot PC problem. Besides, P-CAT.com also helps user to diagnose and identify the root of the PCs problem. Furthermore, P-CAT.com helps to educate the novice user to learn about the computer component by providing the graphical illustration as well as the 3D-Model. P-CAT.com has make PC assembling fast and easy by providing step-by-step printable solution and reduce the search time rather than using the search engine. Experience PC's user and novice user able to share ideas more effectively user can whereby the user able request and get the solution for their problem faster. This also contributes towards the collective and effective knowledge building. Thus, P-CAT.com has proven to meet specific needs of user requirements enhancing the efficiency of the online help and troubleshooting.

5.1 Recommendation and future enhancement

5.1.1 Centralize data and administration

All files and data (troubleshooting files, graphical information) P-CAT.com should be centralized and have the main administrator. This is important for maintenances purposes: deleting the old solution that rarely used, control the added solution share

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by the experience user. Besides the centralized data centre would help the users to search or add the troubleshoot solution to the same source.

5.1.2 Multilingual application

P-CAT.com currently develops in English. To enhance the same functionalities of P-CAT.com will be developing in other languages. This might be useful for the user who doesn't understand English.

5.1.3 Deployment of P-CAT.com on the wireless environment

The propose system, P-CAT.com currently planned to be deployed on the internet. In the future P-CAT.com might be implemented on wireless environment and support the wireless application and gadgets such as Portable Digital Assistants (PDA), laptop, mobile phone and others. The PC users will be able to access to P-CAT.com anytime and anywhere possible when being provided with the necessary hardware and network accessibility.

5.1.4 Membership account

The users that use P-CAT.com will have to register themselves so that the administrator can keep track of usage of the system as well as to manage the users. Furthermore, if there is any update on P-CAT.com the users can easily be informed via e-mails. The update might be in terms of problem solution. If the problem solution doesn't exist in the database users can request for the solution. The members within the P-CAT.com community then are alert of this request and allow the users to post the new problem solution that solve the problem. This will allow collaboration and knowledge sharing. Besides, can help to solve the problems even faster compare to other forum that exist on the site that not necessary the other forum members will answer the request straight away.

5.1.5 Education and business purposes

In the future, teacher can use the P-CAT.com to teach the student at school on computer hardware. The 3D-Model might help. Hence, P-CAT.com can be easily too access over the internet as long as the school has the internet connection despite of the geographical area: urban or rural.

As for business purposes P-CAT.com can have a deal with the computer hardware vendor such as INTEL, DELL and others. The vendor can promote and configuration for their new product on P-CAT.com. Users that browse through P-CAT.com can find solution according to the hardware brand.

5.2 Next Steps

To proceed in implementing P-CAT.com, the following steps have been identified and will be pursued towards the successful completion of the system:

1. Analysis: Analysis/ research the PC users point of view of the implementation proposed system of P-CAT.com

2. Design: Development of initial design and planning documents help the development of P-CAT.com's implementation, preparation of design documents (Storyboard, UML diagrams, User interface, proposed algorithms, support systems, etc.)

3. Implementation: Development of prototypes based on Waterfall model concept.

4. Roll Out: Deployment of P-CAT.com over the internet for field testing and user acceptance testing

5. Training: Training users of the system (PC users).

6. Future enhancement: enhance functionalities of P-CAT.com according to the recommendation stated.

REFERENCES

Books, Journals and Articles

1. Sommerville, I. (2004). Software Engineering, 7th Edition

2. Collins, George W. II (2003), Fundamental Numerical Methods and Data Analysis

3. Sekaran,Uma (2003). Research Methods For Business, A skill building Approach 4th Edition

4. Sherman & Judkins, P. (1992), Glimpses of Heaven, Visions of Hell: Virtual Reality and its implications. London: Hodder and Stoughton

5. Angus, I & Sowizral, H. (1995). Embedding the 2D Interaction Metaphor in a Real 3D Virtual Environment. In Proceedings of SPIE, Stereoscopic Displays and Virtual Reality Systems

6. Psotka, J. (1995). Immersive Tutoring Systems: Virtual Reality and Education and Training, Instructional Science, U.S Army Research Institute

7. Alavi,M.andLeidner,D.E.(1999),"Knowledge management systems: issues, challenges, and benefits",Communication of the Association for Information Systems,Vol.1No.7,pp.1-37.

8. Davenport, T. and Prusak, L (1997), Working Knowledge, Harvard 1998, ISBN 0-87584-655-6.

9. Bakos J. Y. "Reducing Buyer Search Costs: Implications for Electronic

Marketplaces,Ó Management Science (43:12), 1997

10. Dov Teleni and Ron Feldman (2001) "Performance and satisfaction in adaptive website: An experiment on searches within a task adapted website."Vol.2No3,p.5

11. Dean Kent (2002) "Real world technologies.In-Depth Technical Analysis and help for professional: Troubleshooting Basics"

12. T. Satyanarayana, et al , (1995) Implementating An Expert System For Fault Diagnosis Of Electronic Equipment. Engng. Applic. Artif. Intell. Vol 8. No. 3.Pp 355-364.

13. Davis. R.. (1984) Diagnosis Reasoning Based On Structure And Behaviour. Artif. Intell. 24. Pp 347-410.

14. Daud Bin Isa and Othman Bin Sidek (2000) PC Diagnosis and troubleshooting expert system based on computer response during power self test (POST) –PCDIASHOOT Pp 458-460

15. Feinberg, R. A., R. Kadam, L. Hokama and I. Kim. (2002) "The State of Electronic Customer Relationship Management in Retailing", International Journal of Retail and Distribution Management, (30)10, pp. 470-481.

16. Cornelius, C. and M. Boos (2003) "Enhancing Mutual Understanding in Synchronous Computer-Mediated Communication by Training", Communication Research, (30)2, pp. 147-177.

17. Herring, S. (1999) "Interactional Coherence in CMC", Journal of Computer-Mediated Communication, (4)4.

WEBSITES

18. http://en.wikipedia.org/wiki/Knowledge_management

19. www.aveva.com

20. http://www.clir.org/pubs/reports/pub106/web.html

21. http://technet.microsoft.com

22. http://dvshop.ca/dvcafe/web/webbuild.htm

23. http://www.infosecuritynetbase.com

24. http://www.onlinetroubleshooting.com

25. http://geodsoft.com/book/basics/dynstat.htm

26. http://www.dell.com.my

27. http://www.netmechanic.com/news/vol5/design_no16.htm

28. http://www.buildyourown.org.uk/

29. http://www.hardwarecentral.com/hardwarecentral/

APPENDICES

APPENDIX 1-1 Pre-Analysis questionnaire

Name	
Telephone number	
Email address	
Occupation	

Hello.My Name is Dayang Suriya Ribai and I am a final year student in pursuing **Information Communication Technology.** I am currently conducting a study to understand your perspective on how PC users can finds help or solution for PC problem easier. Besides, to identify the best way to educate the PCs user that they can actually diagnose own PC problem and Do-it-yourself (DIY) to fix the problem.

The proposed system is P-CAT.com which stands for Online Personal Computer Assembling Troubleshoot. The following are the proposed functionalities for the system:

Troubleshoot
- User type in the keyword of the PC assembling problem
- User choose from common problems list
- Experience user can add own way to solve problem

Solution
- User will be given choices of possible solution
- Can select solution added by other user
- Request solution
- Experience user can add own way to solve problem

Problem Diagnostic
- User will be asked question to identify root of the problem. There will be:
  - Text box – prompt user to input data related to the problem
  - Radio button – identify the nature of the problem
  - Visual Aids – help user who not familiar with computer hardware

3D Model
- Allow user to user to see the computer hardware in 3D and location of hardware on the motherboard.
- Help to educate the novice user who does not familiar with computer component.

The users of this system would be PC users.
I would appreciate if you could comment on this proposed system by filling in this questionnaire.

1. Do you have personal computer (PC) or desktop? Have you ever tried to open your CPU case?

☐ YES (If Yes, please proceed to Question 3)
☐ NO (If No, please proceed to Question 2)

2. Why?

☐ Afraid of making mistake that may caused harm to the CPU
☐ Don't have any idea about the computer component
☐ Always refer to the computer vendor if any problem occurred
☐ Others (Please specify)...

3. If any problem occurred, your first step is…

☐ Refer to the computer vendor, don't care how much money I would spend
☐ Refer to the manual
☐ Check the problem on my own
☐ Search on the internet
☐ Others (please specify)...

4. Please look at the detailed functionalities as listed in the given attachment, and rate your level of interest of having these modules implemented by using the scale of **1 to 7**, where **1** is **least interested**, and **7** is **most interested.Could you please provide the reason(s) for your rating?**

Module	a) Rating Scale (Circle one answer)							b) Reason(s) for Rating
Troubleshoot	1	2	3	4	5	6	7	
Solution	1	2	3	4	5	6	7	
Problem Diagnostics	1	2	3	4	5	6	7	

3D model	1	2	3	4	5	6	7

5 P-CAT.com helps the PC users to finds help or solution for PC problem easier: troubleshoot and find step-by-step solution to diagnose PC problems. Beside help to educate the novice user by the help of the visual aids and 3D model. Currently, are there any systems/troubleshooting site available similar or related to this system? If **YES**, proceed to **Question 6**. If **NO**, proceed to **Question 7**.

Answer:...

6. What do think of the effectiveness system?(Please select **at least one**)

☐ Too many text rather than provide the graphical information
☐ Promote product rather than help to troubleshoot the PC problem
☐ Have to search one-by-one the site on the internet to find the best solution
☐ Help to configure the problem easily
☐ Others (Please specify)..

7. Would you be interested in using P-CAT.com as a tool to finds help or solution for PC problem easier. Besides, to help you to understand your PC hardware and able to fix problem own your own?

☐ YES ☐ NO (Please Specify Why).......................................

8. Do you have any suggestions or ideas to be added to the functionalities of the system to further meet your needs as users of the system?
....
....
....

APPENDIX 3-1 System Architecture
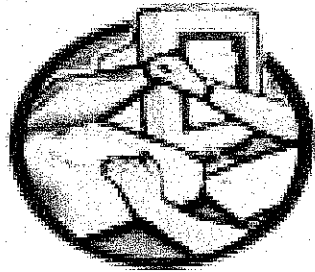
P-CAT. com

Troubleshoot | Solution

Problem Diagnostic | 3D Model

ADMINISTRATOR
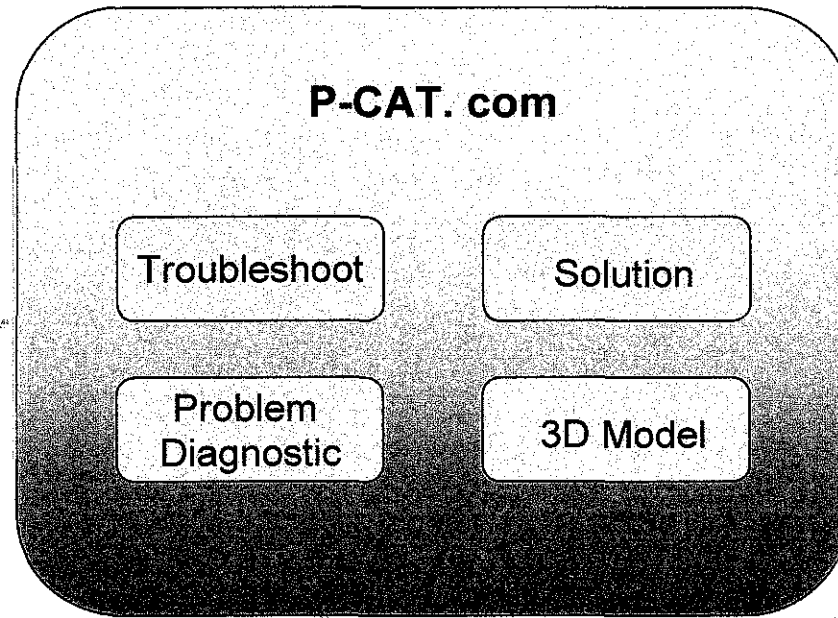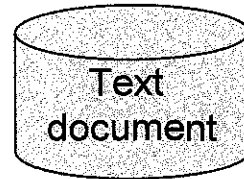
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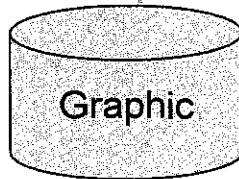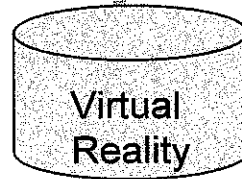
Graphic | Virtual Reality

Scanned Content

PC Users
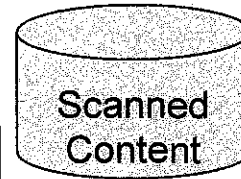
System Architecture

APPENDIX 3-2 Network architecture

NOVICE   **EXPERIENCE**   **ADMINISTRATOR**

Contains
P-CAT. Com
Files

PCs USER

Contains
P-CAT. Com
Files

INTERNET

Network Architecture

Contains
P-CAT. Com
Files

P-CAT.com SERVER   **Data Center**
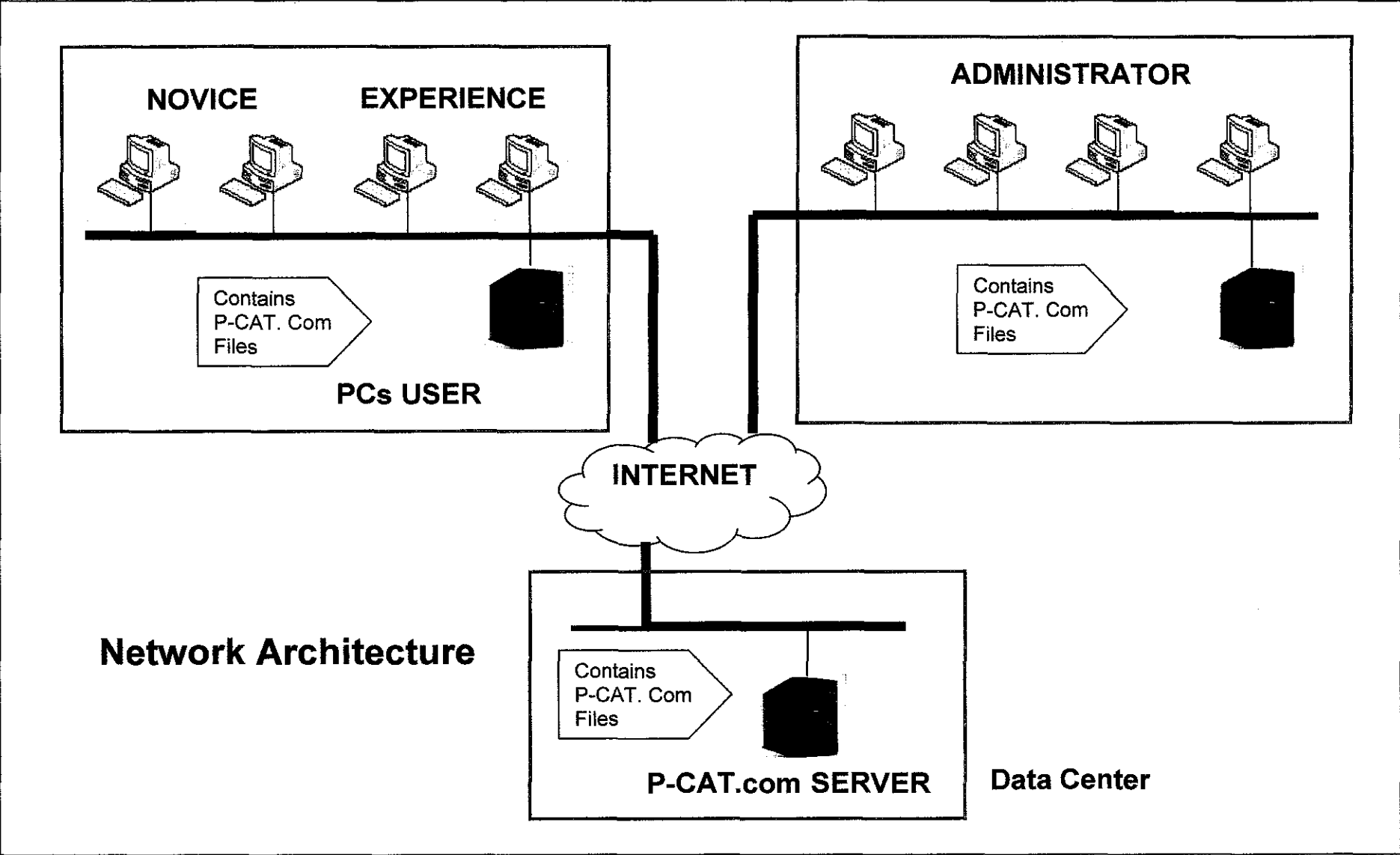
APPENDIX 3-3 Design Document

No.	Document	Purpose	Scope
1	System Requirement Specification	To detail out the requirements of the proposed system in terms of functional requirements and also specify non-functional requirements for the system.	Hardware and software specifications, system functions and conditions to determine satisfactory usage of the proposed system
2	Use Case Specification	To summarize system interaction with users and the external environment and to specify the situations where each function is used	System stakeholders, external systems, relationships, non-functional requirements
3	Structural Model Specification	To represent each object, whether a function or a user as specified in the Use-Case specification as an object with attributes and methods(specific functions that is associated with the object). Objects with same attributes and methods are grouped into classes and relationships between classes are determined.	System stakeholders information, access level granted to each stakeholder and functions available for each stakeholder groups (Students, faculty management, system administrators)
4	Behavioral Model Specification	To specify the flow of interaction between an object and system functions by triggering the methods available in the object and show how system functions respond to users' requests	System stakeholders, system functions, methods

APPENDIX 3-4   Tools/ Systems justification

No.	Tool	Hardware Requirements	Software Requirements	Usage	Constraints	Advantages	Disadvantages	Additional notes
1	MySQL	hardware specification	Cross platform operating system	Web applications and acts as the database component of the (Linux/Mac/Windows-Apache-MySQL-PHP/Perl/Python)	N/A	Open source database Consistent fast performance, high reliability and ease of use	N/A	runs on more than 20 platforms (Linux, Windows)
2	PHP	host server hardware specification	Oracle 9i client, secure shell client	To host the proposed system to allow centralized access to system by system stakeholders	Web pages have to be developed with PHP language only, hosted on Apache server	Small file size, sufficient documentation and online support, open source	Knowledge on JavaScript is required for advanced data manipulation, JavaScript language not stable and has limited functionalities	To be selected based on which platform is used on the host server
3	Macromedia Dreamweaver	HTML and web scripting editor	N/A	To develop the web pages through a GUI interface	N/A	GUI, allow automatic uploads to remote server	N/A	HTML, CSS, ASP and PHP editor
4	Oracle 9i	Database server	Oracle 9i client, secure shell client	For data storage	Large storage space	Powerful and flexible	Expensive	Enterprise version can be used for educational purposes
5	Apache	Stand alone computer, host server or database server	collaborative with MySQL and PHP	For data storage	N/A	freely available, featureful	N/A	N/A

APPENDIX 3-5 Post-Implementation Questionnaire

Name	
Telephone Number	
Email Address	
Occupation	

Hello. My Name is Dayang Suriya Ribai and I am a final year student in pursuing **Information Communication Technology.** I am currently conducting a study to understand your perspective on how PC users can finds help or solution for PC problem easier. Besides, to identify whether this system can benefit user to educate them so that they can actually diagnose own PC problem and Do-it-yourself (DIY) to fix the problem.

The system is called P-CAT.com which stands for Online Personal Computer Assembling Troubleshoot. The following are the functionalities for the system:

Troubleshoot
- User type in the keyword of the PC assembling problem
- User choose from common problems list
- Experience user can add own way to solve problem

Solution
- User will be given choices of possible solution
- Can select solution added by other user
- Request solution
- Experience user can add own way to solve problem

Problem Diagnostic
- User will be asked question to identify root of the problem. There will be:
  - Text box – prompt user to input data related to the problem
  - Radio button – identify the nature of the problem
  - Visual Aids – help user who not familiar with computer hardware

3D Model
- Allow the user to see the computer hardware in 3D and location of hardware on the motherboard.
- Help to educate the novice user who does not familiar with computer component.

The users of this system would be PC users (novice and experience user).
I would appreciate if you could comment on this proposed system by filling in this questionnaire.

Measurement Items	a) Rating Scale (Circle one answer)1-Strongly Disagree; 7-Strongly Agree							b) Reason(s) for Rating
Ease of Use								
Learning to use P-CAT.com is easy	1	2	3	4	5	6	7	
It is clear how the screen element are listed	1	2	3	4	5	6	7	
I can get the information quickly	1	2	3	4	5	6	7	
It is easy to navigate within P-CAT.com	1	2	3	4	5	6	7	
User Friendliness								
The color use is attractive	1	2	3	4	5	6	7	
The font can be easily read	1	2	3	4	5	6	7	
P-CAT.com suited the first time user	1	2	3	4	5	6	7	
The image clearly shown and understandable	1	2	3	4	5	6	7	
Effectiveness of P-CAT.com								
P-CAT.com is engaging as a new learning experience	1	2	3	4	5	6	7	
Learn faster through the help of the 3D model	1	2	3	4	5	6	7	
Solution steps clearly stated and easy to follow	1	2	3	4	5	6	7	
Novice and experience user can exchange knowledge more easier	1	2	3	4	5	6	7	
Use Intention								
I would learn efficiently using P-CAT.com	1	2	3	4	5	6	7	
I believe that P-CAT.com would benefit me	1	2	3	4	5	6	7	
I intend to use P-CAT.com when it is deployed	1	2	3	4	5	6	7	
Realism (3D model only)								
Model was rendered at adequate speed	1	2	3	4	5	6	7	
Texture look realistic	1	2	3	4	5	6	7	

APPENDIX 4-1   Business process flow

```
                        ┌──────────┐
                        │  Start   │──────────┐
                        └────┬─────┘          │
                             │                │
                             ▼                │
        ┌──────────────────────────────────┐ │
        │  Find solution for PC problem by  │ │
        │  key-in the keyword or choose     │ │
        │  common problem column            │ │
        └────────────────┬─────────────────┘ │
                         ▼                    │
        ┌──────────────────────────────────┐ │
        │  Select the possible solution     │ │
        │  provided                         │ │
        └────────────────┬─────────────────┘ │
                         ▼                    │
        ┌──────────────────────────────────┐ │
        │  Identify the root of the problem │ │
        │  in Problem diagnostic page       │ │
        └────────────────┬─────────────────┘ │
                         ▼                    │
        ┌──────────────────────────────────┐ │
        │  View/ Print the steps to solve   │ │
        │  the problem                      │ │
        └────────────────┬─────────────────┘ │
                         ▼                    │
        ┌──────────────────────────────────┐ │
        │  View 3D-Model for hardware       │ │
        │  positioning                      │ │
        └────────────────┬─────────────────┘ │
                         ▼                    │
                   ┌──────────┐               │
                   │   End    │───────────────┘
                   └──────────┘
```
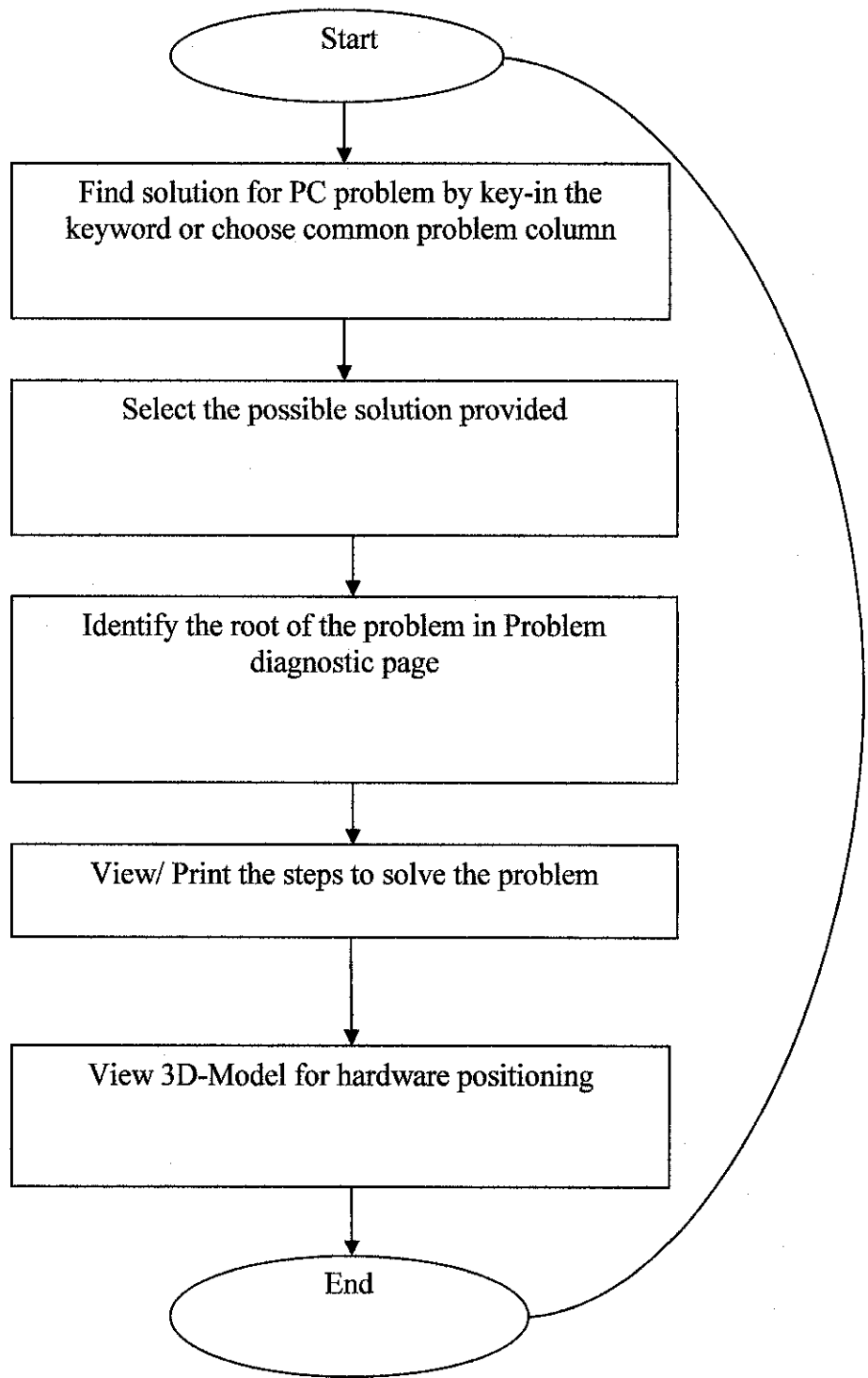
Business process flow of P-CAT.com