A USER-CENTERED DESIGN APPROACH FOR DEVELOPING WEB-BASED INFORMATION SYSTEM FOR STROKE CARE

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ABSTRAK

ABSTRACT

Research shows that stroke becomes the third leading cause of death in world. A lot of information provided online about stroke care is not focused on what the stroke patients really need. Furthermore, stroke patient is not the right person to gather all information about stroke care because of their limited accessibility. As a result, stroke patient did not get the correct information in their hands. The idea of this research is to insure that all the included information given through the internet is according to what the stroke people really need. This research discusses on User-Centered Design (UCD) approach, characteristics and methodologies for designing the web information system for stroke care (WISS). It uses interviews, focus group, observation, questionnaire and card sorting activities as the techniques in conducting the activities for eliciting the requirements among Malaysian users. It also discuss on eight (8) existing web-sites which offer the same information on stroke care to compare their features based on the eight (8) golden rules accordingly. This research covers four groups of users: stroke caregivers, stroke rehab centers, therapists and doctors who handle the stroke patients. Usability testing is used to evaluate the developed system for evaluation purposes. The study presents a web site as the medium to deliver the information as decided by the users. It also presents the navigation structure which is defined by user that has been iteratively design many times during evaluation process. Results of usability testing show that most of the users are satisfied with the system developed.
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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND

Stroke is known as the third leading cause of death among adults in worldwide and this includes Asian countries such as Malaysia and Indonesia. Thammaroj (2003), mentioned that stroke also can affect people of any age. There are many types of stroke and each of them is treated differently. A stroke damages the brain and causes a sudden loss of brain function which controls every single part in human body. A stroke is a kind of brain injury that occurs when the blood supply to a part of the brain is suddenly interrupted or a vessel bursts. How stroke affects a person depends on which part of the brain that the injury occurs. When stroke occurred, the victim may have a weakness on one side of the body or experience trouble to move, talk and think.

Although it is a serious disease, but little known to the public about it. In sharing such information on stroke, the medium that is practical and chosen by most of people are by providing information of stroke care on the Internet where everyone can access it. According to Sripanidkulchai et al. (2004), the reason of this is because Internet gives decision making faster and more accurate. With accurate information, people who receive it tend to react accordingly to any stroke attacks. In addition to this, there are a lot of independent associations and organizations who already published the information on stroke online. Just by one click, a lot of information on stroke awareness and care can be received in hand.
1.1 PROBLEM STATEMENT

Currently, online information on stroke can be accessed anywhere. However, there are some critical issues and problems that have been analyzed regarding stroke care globally. With the Internet in fingertips, more than 8,540,000 hits show information regarding stroke care in the search engine results. When there is a lot of information and sources regarding to stroke care, it can cause confusion among users regarding to stroke care.

Other than that, some user may found that the information provided by the internet is not what they search for. Some of the irrelevant information is put together where it makes them to ignore the information regardless of the importance of the information. The interest of each user to search information on stroke care will be different according to their needs. Some will look on information on rehabilitation, others on stroke facts and many more. For example, Malaysian will be more interested to read information related to their hometown about stroke care. This is because they want to know where is the nearest stroke agency, nearest stroke association, therapist, doctors, nearest pal on stroke to chat on where they find it more relevant compared to the agency that they could not reach for.

On the other hand, different stroke patient characteristics will be treated with different kinds of treatment. Some of the unsolved questions such as, are they the one who search the information on the Internet? Do they need assistance on finding the information? What kind of information that they want to know? These are some of the questions that need to be answered by this research.

This research looks into the criteria of the stroke people who involve directly or indirectly with other stroke patients. These stroke people are doctors, therapists, stroke
caregivers, rehabilitation centers, hospitals and other agencies that need resources and access to the stroke care. Sometimes, stroke patients don’t know whom can they refer when they had minor attacks and stroke symptoms.

1.2 RESEARCH OBJECTIVES

According to the problems identified above, three objectives needs to be fulfill when conducting the research are:

1) **Objective 1:** To review and make comparison of existing web-based information system for stroke care

2) **Objective 2:** To develop web based information system that provides proper and relevant information on stroke care using a User-Centered Design (UCD) approach.

3) **Objective 3:** To conduct a usability testing of the developed system

1.3 RESEARCH SIGNIFICANCE

The main significance of having this research is to investigate issues related to stroke care in Malaysia where it is currently identified as global major problems. A User-Centered Design (UCD) approach is chosen to develop the web information system for stroke care (WISS). This research is able to assist the stroke people to retrieve the information on stroke care more effective compared to the current way.

By developing WISS, people who involve with stroke patients will also get
advantages where they can have a better exposure on resources regarding to the stroke care with the current technology. Doctors and therapists will have the opportunity to express their ideas and motivations through WISS. Not just that, stroke caregivers will have the chance to communicate with other stroke caregivers to share their knowledge and experience of taking care stroke patients. It will also help the independent organization to operates effectively and have a direct communication with the public.

This research will help the community to gain knowledge on the importance of the stroke care in daily life indirectly when people open the website.

1.4 RESEARCH SCOPE

i. Malaysian

The target user focused is among Malaysian people instead of people outside Malaysia

ii. Stroke

The information provided in this research is focusing on the stroke care from users requirements.

iii. Web

Medium of delivery chose to deliver the information is web based system. Users can retrieve the information by accessing the Internet for the url address assigned.
1.5 TARGET USER

The target users that have been identified throughout this research to get involved with are:

a. Stroke Patients
   Stroke patients will vary from the level of stroke that they have and they are the one and the reason what the information is for.

b. Stroke Caregiver
   This is the person who is going to handle and take care about the stroke patient every single day.

c. Rehabilitation Center
   This is the place where stroke people will refer to when they want to find a place to do rehab according to the stroke level.

d. Doctor
   This is the person who takes in charge to consult, treat, and diagnose the stroke patients.

e. Therapist
   This is the person who helps stroke patients in doing therapy to help them recover from stroke.

1.6 RESEARCH MOTIVATION

Stroke is a leading cause of death and a functional impairment among people. While older people are particularly vulnerable to stroke, research suggests that they have the poorest awareness of stroke warning signs and risk factors. This study
examines knowledge of warning signs and risk factors of stroke among community-dwelling older adults. Stroke care becomes vital as the importance of awareness among the stroke people. This research will also help the people to access regarding stroke care effectively.

Looking at existing website that provides information on stroke care, it still does not fulfill what user needs to see on the websites. Besides that, this research focuses studies for Malaysian people who need information on stroke care. It will also help agency, people dealing with stroke care to communicate between each other efficiently.

1.7 **EXPECTED OUTPUT**

The navigation structure design and information for WISS must be designed using UCD approach which involves user by using appropriate technique. WISS must be able to connect stakeholders with each other throughout the forum. It must provide the rehabilitation centre the overview of what government agencies offered and activities conducted for stroke care. This website offers stroke caregivers a complete checklist on what they need to do to handle stroke patients.

1.8 **THESIS ORGANIZATIONS**

This research study is organized in the following way:

**Chapter 1:** Introduction

It gives an overview of research, background of the problem, project objectives, scope and schedule of the project.

**Chapter 2:** Literature Review
This chapter presents the history and background of stroke, issues on User-Centered Design (UCD) and the comparison features of some existing information system available on the web.

**Chapter 3: Critical Analysis**

This chapter discusses the research methods, research process and techniques used in developing the information system. It explains on the most appropriate User-Centered Design (UCD) and the characteristics of stroke caregivers to fulfill the requirements of developing web based information system for stroke care.

**Chapter 4: Research Methodology**

This chapter discusses the research methods, research process and techniques used in developing the information system. It explains step by step the User-Centered Design (UCD) approach used for developing WISS.

**Chapter 5: Establishing needs and requirements**

This chapter describes the system requirements of the WISS based on User-Centered Design techniques apply and the results of UCD approach.

**Chapter 6: System Design**

This chapter describes the system requirements of the WISS using UML diagrams. It explains on requirements specification apply for navigating and developing the web information system structure. This chapter describes the coding aspects of the information system and implementation environments.
Chapter 7: System Coding and Testing

This chapter outlines the various testing conducted with the targeted user is to ensure that WISS developed will meet users’ requirements.

Chapter 8: System Evaluation

This chapter discusses the system evaluation done by the potential users to evaluate functionalities, the structure and features of the WISS. User testing and cooperative evaluation is presented on this chapter. User acceptance testing (UAT) is presented throughout this chapter which shows the percentage of users who are really satisfied with the system developed.

Chapter 9: Conclusion and Recommendation

This chapter highlights the objectives of the system developed. It also emphasizes on strengths of the WISS and problems encountered, system enhancements, comparison with existing system and the chapter ends with conclusion.

1.9 CONCLUSION

The overview presents a broad definition on stroke that leads to issues that will be investigate on stroke care. The objective of conducting the research is listed and research significant shows the importance of conducting the research. Project scope covers in what area the research will be focused on and also identified what type of users who are going to involve in the project. Research motivation highlights issues that give a significance impact to the current stroke care. Thesis organization highlights that WISS will be covered on nine phases of the development of Web Information system for stroke (WISS) by applying User-Centered Design (UCD) approach.
CHAPTER 2
LITERATURE REVIEW

2.0 INTRODUCTION

In this research, literature review covers topics pertaining to the stroke, User-Centered Design approach is selected for designing the web, current issues and previous work related to the develop information system for stroke. Most of the information obtained is from the electronic and non-electronic media. The main objective of this research is to prepare stroke users information regarding stroke on what they need. As one of the solution, User-Centered Design (UCD) is an approach used to develop a web based information system that gathers all of the information on stroke care. In this literature review, it covers the investigation and analysis between the eight existing stroke care which have been found on the internet which giving information on stroke care.

2.1 STROKE

Stroke becomes the third leading cause of death in worldwide, and also in Malaysia among adults as mentioned by Thammaroj (2003). It strikes to everyone without known the age of victims. From the case study conducted by Wong (1999), this covers in China, India, Indonesia, Korea, Malaysia, the Philippines, Taiwan, Thailand, Singapore, and Vietnam. The problem of stroke has a particularly strong impact, not
only because more than half of the world’s populations are in Asia, but stroke is the predominant vascular disease in many parts of Asia. As mentioned by Wong (1999), in 1990 alone, the World Health Organization (WHO) estimated that there were 2.1 million people died of stroke in Asia. The burden of stroke is likely to increase substantially in the future because of the aging population. Thammaroj (2003 suggested that apart from implementing effective stroke prevention programs, identification of factors associated with more severe stroke may help to ease the burden of this coming epidemic.

As mentioned by Wong (1999), knowing that the importance of stroke care in Asia, there have been very a few prospective international studies of stroke within this region. Stroke is identified as a heterogeneous disease which can be categorize into two types which are ischemic and hemorrhagic strokes as mentioned by Schulz et al. (2004), with very different pathogenesis and outcome. Ideally, Wong (1999) did mention on his paper that the risk factors for death in each type of stroke should be study separately because of the risk factor of the stroke patient is different. In addition, there is very limited data is available for them to analyze and study (Sripanidkulchai et al. (2004)). Wong (1999) conducted a study to seek out and investigate the risk factors for early death of patients with ischemic stroke or intracerebral hemorrhage (ICH) by performing a prospective international hospital-based study of consecutive patients with acute stroke in Asia. All the statistics shown that is important for users to know and update their information on stroke.

Lawrence (1992) mentioned that stroke is a form of cardiovascular disease affecting the blood supply to the brain. Also referred to as cerebrovascular disease or apoplexy, stroke is actually represented a group of diseases. When physicians speak of stroke, they generally mean there has been a disturbance in brain function, often
permanent, caused by either a blockage or a rupture in vessel supplying blood to the brain. “Stroke or brain attack is occurred when a blood clot blocks the blood flow in a vessel or artery or when a blood vessel breaks, interrupting blood flow to an area of the brain. When either of these things happens, brain cells begin to die.” (Schwamm, 2005)

It is important to take a good care of stroke patients when they have stroke. A stroke system approach involves coordination of stroke care along the entire continuum, from primary prevention through rehabilitation. A system approach is necessary to positively giving impact change in the way of stroke is treated so that patients have access to the most advanced treatment in centers that are best equipped to deal with the critical and time-sensitive needs of stroke patients. Before victims know that they have stroke, some symptoms that they might have are such as (Salaychik et al., 2007):

- Weakness which refers to sudden loss of strength or sudden numbness in the face, arm or leg, even if temporary
- Trouble when speaking which refers to sudden difficulty speaking or understanding or sudden confusion, even if temporary
- Vision problems where patients have sudden trouble with vision, even if temporary
- Headache with sudden severe and unusual headache
- Dizziness with sudden loss of balance,

When a person had first attack on stroke, they must admit to the hospital so that it will be investigated by team of health-care of professionals who are experts in stroke, preferably in a special unit dedicated to the care of stroke patients. Then, the stroke team will prepare a plan that involves needs, and discuss these with stroke patients. Some of the procedures involved is the stroke patient will be check whether they have
problem in swallowing. Swallowing difficulties are common after stroke and can lead to choking and pneumonia. The stroke patient diet should be assessed as well. If the stroke is caused by a blood clot, stroke patient will be given a blood thinner, and this can help to prevent more blood clots. After that, scanning process will take place and the purpose is to see if the blood vessel in the stroke patient’s neck is blocked and cause of the stroke. Then, it should be checked whether stroke patients’ neck arteries are blocked or not and this needs to be assessed to see if any surgical is needed. High blood pressure also needs to check to make sure that it is not too high. High blood pressure is the leading cause of stroke. Blood sugar needs to be monitored too, if the stroke patients have diabetes. Diabetes is an important risk factor for stroke.

Rehabilitation is the process where stroke patients need to take for recovery purposes. If the stroke patients go to rehabilitation centre either at the hospital or to the specialized centre, they will be instructed to undertake procedure of rehabilitation. A person in charge will be assigned to stroke patients and the in charge person will prepare a plan for stroke care. The plan should always be updated to monitor recovery progress. Mood, memory and the ability to handle personal affairs and ability to think are criteria that need to be assessed. Depression is very common after stroke for both patients and their caregivers. The ability for stroke patients to communicate, use their limbs, walks by their own, carry out personal care and other daily tasks necessary to safely return home should be assessed.

Stroke caregivers also need to work with health-care team to get ready for the stroke patients to return home. At home, stroke patients require additional help from family or other caregivers no matter where the stroke patients have been located. The rehabilitation can either in a day hospital, in a clinic, other community services, or at home. Rehabilitation, recovery and reintegration in the community are continuing for
days, months, or years after stroke.

Normally, stroke patients will not have the information on their hands while they had their first stroke attack. They get the resources on the stroke care from various ways. Techniques or resources they used to gather information for stroke such as resources from stroke caregivers, internet, articles and advice from doctors and therapist.

2.1.1 Stroke Caregivers

Stroke patients tend to rely on someone near to them when they have the stroke attack. Friends, relatives who have the potential to become stroke caregivers whom the stroke patient tends to look into for their recovery process from the point of view of Han and Haley (1999). Stroke caregivers are people who have the information from resources which might be wrong or right. With information that they have, they help the stroke patients for diet, rehabilitation and best health care.

2.1.2 Internet

Internet is the place where people use to access the information easily as being reviewed by Zhang and Chen (2004). Same goes to the stroke patients who use the internet as a place to search and find the information regarding to the stroke care. It depends on the level of the stroke attacks that the stroke patients had and also level of understanding of the technology around them. Whereas, stroke caregivers will look on the Internet and deliver the information to stroke patients depending on what information they found on the Internet.
2.1.3 Newspaper

Newspaper is one of the ways to explore the information regarding to any current issues (Golovchinsky and Chignell, 1997). It is the media where government agencies, and rehabilitation centres announce activities related to stroke care. Sometimes, when a famous people die because of stroke attack, media starts to act on campaign of stroke awareness and promote it on the newspaper. When stroke patient get such resources from the newspaper, information they get is actually quite limited because they receive it only when there is news on stroke.

2.1.4 Articles

Articles can be one medium of delivery that provides information mostly in Library and Information Science Abstracts (LISA) as being analyzed by Alcaide et al., (2008). The medium referrer to articles consists of flyers that have been distributed by responsible agency for campaign on stroke awareness. However, stroke patients and stroke caregivers might ignore the information and just throw away the paper and flyer when they saw it. Furthermore, if they get the information, it might be improperly organized that they unable to understand facts given on the paper. It can be said that, the information provided on flyers is not reliable.

2.1.5 Doctor

Doctor is the trustable person who can give correct information regarding on stroke care. Most of the time, doctor is only available at time that stroke patients had their attacks. They will not be around to monitor stroke patients for the whole process of rehabilitation. Doctors will provide advice to the stroke patient on what they can do for their daily planning and will not be around stroke patients for all the time. For rich
people, it doesn’t matter how many times that they need to see doctors but for the poorer people, they could not afford to pay the consultation time with doctors to guide them on what they should do.

2.1.6 Therapist

Therapist is the professional who guide stroke patients on the process of rehabilitations. Therapist also acts as the person who is near stroke patients and one of the resources of the information on stroke care.

2.1.7 Electronic Medium

Electronic medium such as radio, television is chosen as information delivery for users. A short advertisement played on TV some time ago shows the importance of stroke care. A song composed for the purpose of stroke awareness also has been played on the radio. However, the information published on this electronic medium is rarely heard and saw by stroke patients.

2.2 USER-CENTERED DESIGN (UCD) APPROACH

It has been 20 years since the first conference on User-Centered Design. Time has changed and this reflects how we think on making use of data gathered from users on technology to guide the process of designing and developing new hardware and software systems. Throughout this process, there has been a productive dialog among academic and industry-based researchers and usability engineering practitioners. Academic research has provided insights on methods of understanding and modeling users’ behavior, and the industry has provided a wide range of exciting technology for consideration, thanks to researchers in Human Computer Interaction (HCI). One of the
design methodologies in HCI is User-Centered Design (UCD) approach which is driven by the needs of users.

User-Centered Design (UCD) as described by Mao et al. (2005) is a “is a multidisciplinary design approach based on the active involvement of users to improve the understanding of user and task requirements, and the iteration of design and evaluation“. UCD is one of the approach in the software development that focuses on making the output products usable for users to use. The approach intent is to involve users directly in the planning, design and testing phase of the system that involve feedback mostly from users. Prototypes are usually being employed to do this and designs are modified in light of users’ feedback. There is some approach and initially, it may seem that UCD complicates the software development task, due to the need to make iterative refinements to the software in light of user feedback. However, benefits gained from this are considerable. The process promotes communication between users, and those developing the software and identifies problematic issues early on in the development schedule when it is much cheaper to implement changes. There are spectrums of ways in which users are involved in UCD but the important concept is that users are involved in one way or another for the design purpose.

User-Centered Design is a viewpoint and a process that places a person (user) at the center in the design process. UCD also defines as a process of those forces on cognitive factors such as learning, problem solving and human memory, etc. As they come into play during people’s interactions with things, UCD concerns with both usefulness and usability. To design an interface that can induce in users’ mind, a correct model of the system, UCD has to be adopted.

Inspired by the first kiosk designed using UCD method, researchers started to evolve and implement UCD for their information system design. As an example,
Connors and Foreman *et. al* (2007) discussed on issues on designing global information system in corporate and business world base on UCD approach. Meanwhile, Gao *et. al* (2005) focused on the User-Centered Design that created an electronic triage system for mass casualty events for large-scale health information system. On the other hand, Irestig (2000) compared the impact involving UCD by studying on information system prototypes that came from User-Centered Design and participatory contextual design processes. UCD also has been implemented in medical field. Bartlett and Neugebauer (2008) showed how successful the design is, when it is implemented using UCD methodology in development of the bioinformatics analysis system and this supports the needs, goals and objectives of users rather than on the system itself. A previous study shows no matter in what area or field that they are in, implementing User-Centered Design approach shows a good result of the system that achieved objectives, goals and user needs.

2.3 **USER-CENTERED DESIGN (UCD) CONCEPTS**

UCD approach require regular end-user involvement throughout the project lifecycle from the start until the delivery of the project’s final output. The benefit to involve users as collaborator in the software design and built activities is it gives a greater level of usability in the delivered solution. As what has been done by Venturi (2000), they investigate three questions based on the UCD approach and it is advocated that the whole research community from 20 years on has adopted it. He also explained on his next paper how the integration of UCD has been implemented successfully in the industry with his partner, (Venturi & Troost, 2004). On the other hand, Hix & Hartson, (1993) mentioned that User-Centered Design employs the question of who will be the end-user and how it will be used to support the performance of the task. In order to
achieve User-Centered Design approach, there are several things that must be identified which are to know users, what users’ tasks are and what users’ goals are behind the development of web information system. As mentioned by Deaton and Garrett’s (2000), the model of User-Centered Design helps to illuminate how the software interface elements and the hypertext theory element interact with one another—or merge as a user experience is designed.

2.3.1 Identifying User

The main objective of UCD approach is to outline the system based on users’ tasks and goal. This is the driving force behind the development. Users’ behaviour and context of use are studied and the system is designed according to these factors to support the information system. Firstly, users’ characteristics are captured and then, are designed based on the ability of the system. Users then being consulted throughout the development of the system. The consultation is going from the earliest phase to the latest phase and all inputs are seriously taken into account. Elicit feedback via walkthroughs, card sorting, and paper prototypes, think-aloud sessions, and other methods are involved too. This is important to identify their mental models and expectations and this will be discussed further in Chapter 3.

2.3.2 User Characteristics

Users are the most important factor in applying UCD. They are the main key concern for the designing purpose. Users want a site that is easy to use, minimum download of time and allows them to complete their tasks in minimal amount of time with minimal amount of frustration. In a book by Sharp et al. (2007), users want the site
to be “cool” because they do not like it if the web is annoying. The development of applications by “end users” is a widespread phenomenon in at least two vital field of computing applications: scientific/technical computing where information technology has been placed directly on the hands of researchers, designers, and engineers; and business/commercial computing where information technology has been placed directly on the hands of clerks, analysts, and managers. During the 1980s, pressures toward distribution accelerated became a key management and research concern. Known as “end-user computing” (EUC), the phenomena and research associated with this trend cross a variety of disciplines.

In UCD, there are three different types of users and can be categorized as: primary users, secondary users, and the last one is tertiary users. Primary users are the frequent hands-on who need to use the information most. Secondary users are occasional or via someone else. As for tertiary users, they are affected only if there are any purchasing activities. For this project, both three types of user are involved to ensure that content delivery is achieved.

Stroke patients, stroke survivors, stroke caregivers, health professionals, including doctors, nurses, pharmacists, speech and language therapists, as well as occupational physiotherapist are potential users who are involved in development of the stroke information system. As for the characteristic of stroke patients, it is defined in the next chapter.

There are many differences between UCD and the traditional design approach. Table 2.1 below illustrates the differences. The main difference that can be seen from the table is that the UCD approach involve users throughout the design process whereas the traditional approach only allows users’ involvement after the design has been made.
Table 2.1: User-Centered Approach to Design Vs Traditional Approach to Design
(Source from Vredenburg et al., 2002)

<table>
<thead>
<tr>
<th>User-centered approach to design</th>
<th>Traditional approach to design</th>
</tr>
</thead>
<tbody>
<tr>
<td>User driven Technology driven</td>
<td>User focus Component focus</td>
</tr>
<tr>
<td>Multidisciplinary team approach Limited</td>
<td>multidisciplinary interaction</td>
</tr>
<tr>
<td>Specialization in user experience</td>
<td>No specialization in user experience</td>
</tr>
<tr>
<td>User validation prior to development</td>
<td>Development prior to user validation</td>
</tr>
<tr>
<td>User view of quality</td>
<td>Product defect view of quality</td>
</tr>
<tr>
<td>Focus on user measurement</td>
<td>Focus on technical benchmarking</td>
</tr>
</tbody>
</table>

2.4 USER CENTERED DESIGN (UCD) LIFECYCLE MODEL

Star lifecycle model was derived from empirical work on understanding on how designers tackles HCI design problems. This represents a very flexible process with evaluation on its core. This research focused and compare on three different lifecycle models which are: Star lifecycle model, Usability engineering lifecycle model and Interaction design model.

2.4.1 Star Lifecycle Model

Figure 2.1 shows the Star lifecycle model which was proposed by Hartson and Hux(1989). This emerged from some empirical work they did looking at how interface designers went about their work which comprise on two different models of activity: analytic mode and synthetic mode.

Star lifecycles models does not specify any ordering of activities. All the activities are highly interconnected where you can move one activity from one another. Evaluation stated at the centre of the model which stated that for any activities that have been completed, the results of it might be evaluated.
The other methodology called "The Usability Engineering Lifecycle" which idea from Dr. Mayhew teaches this methodology through formal training classes, and/or by directing and coaching project teams as they apply the methodology during software or web site development projects. The methodology represents an engineering approach to achieving usability during design and development which includes:

- Structured usability requirements analysis tasks
- An explicit usability goal setting task, driven directly by requirements analysis data
- Tasks supporting a structured, top-down approach to user interface design that is driven directly from usability goals and other requirements data
2.4.2 Usability Engineering Lifecycle Model

The Usability Engineering Lifecycle can be applied to any development organization and tailor it to integrate with a unique application or website development methodology.

Figure 2.2 shows The Usability Engineering Lifecycle which indicates all lifecycle tasks, and approximately where each one should be applied within either a modern rapid prototyping - or an Object Oriented - software engineering methodology.

Figure 2.2: Usability Engineering LifeCycle Model (Adapted from Preece, 2002)

2.4.3 Interaction Design Model

Preece et al. (2002) describe a basic model for the interaction design process that includes four activities as shown in Figure 2.3 which are:

First Stage: Establishing Requirements: It involves identifying needs and requirements
of the targeted users.

Second Stage: (Re)Designing: Designing alternative designs that meet those requirements.

Third Stage: Building interactive versions: Building of interactive product so that they can be communicated and accessed by users. This product can appear in low-fidelity (paper prototype) or high-fidelity (software prototype) versions.

Fourth Stage: Evaluating: The evaluation involves getting feedback from the users of what is being built throughout the process.

This model allow developers or designers to get feedback from users on designs without formal evaluations. It is a simple model to follow which understandable by designers. User’s ideas and feedbacks provide the designers the solution to a flawless design of a system. Iteration process takes place for any requirements gathered are not clearly stated which require the designer may need to return to requirement stage or designing. The iteration continues as long as the user’s expectation is not achieved until final product delivered.

Figure 2.3 : Interaction design model (Preece et al., 2002)
2.5 INVOLVING USERS IN UCD

User-Centered Design (UCD) approach allows user to participate on each of stages throughout all the design process as mentioned by Nebe and Grotzbach (2006). One way to make sure that this is the best practice, WISS will develop based on the UCD approach. The objectives of implementing UCD is to see and practice on how much user plays a role on the structuring the information system for stroke. As users become more sophisticated, they expect usability to be a key component of information systems when designing complex systems, it is standard systems engineering practice to carefully design the interfaces between subsystems. Yet when designing human/computer systems, the interface between human and system is not usually thought through in such terms. Instead, the human is often given wide access to arbitrary parts of the system, and the result is a complex human/computer system that fails in various ways. Table 2.2 suggests ways to involve users in the design and development of a product/artifact (Preece, et. al, 2002).

Table 2.2. Involving users in the design process (Preece et al., 2002)

<table>
<thead>
<tr>
<th>Technique</th>
<th>Purpose</th>
<th>Stage of the Design Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background Interviews and questionnaires</td>
<td>Collecting data related to the needs and expectations of users; evaluation of design alternatives, prototypes and the final artifact</td>
<td>At the beginning of the design project</td>
</tr>
<tr>
<td>Method</td>
<td>Description</td>
<td>Timing</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Sequence of work interviews</td>
<td>Collecting data related to the sequence of work to be performed with the artifact</td>
<td>Early in the design cycle</td>
</tr>
<tr>
<td>and questionnaires</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Focus groups</td>
<td>Include a wide range of stakeholders to discuss issues and requirements</td>
<td>Early in the design cycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-site observation</td>
<td>Collecting information concerning the environment in which the artifact will be used</td>
<td>Early in the design cycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role Playing, walkthroughs,</td>
<td>Evaluation of alternative designs and gaining additional information about user needs and expectations; prototype evaluation</td>
<td>Early and mid-point in the design cycle</td>
</tr>
<tr>
<td>and simulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usability testing</td>
<td>Collecting quantities data related to measurable usability criteria</td>
<td>Final stage of the design cycle</td>
</tr>
<tr>
<td>Interviews and questionnaires</td>
<td>Collecting qualitative data related to user satisfaction with the artifact</td>
<td>Final stage of the design cycle</td>
</tr>
</tbody>
</table>

UCD approach can be carried out in an iterative fashion, with the cycle being repeated until the usability objective of the project has been attained like what has been discussed in Holtzblatt et al. (2005). This step is crucial as participants of this method
reflect accurately the profile of users identified. Ferre (2003) and Anderson et al. (2001) suggested that UCD approach can be independent or can be integrated with software development process. The most popular UCD methods such as interviews, surveys, focus group, observations and card sorting activity will be discussed later on this chapter.

2.5.1 Interview

Interview is a method to discover facts and opinions held by potential users of the system that is being designed. It is held by an occasion where an interviewer speaks with a user at a time (Beltaine, 2009). The advantage of having an interview session is it can gain an understanding of an individual’s main concerns, follow up responses and clarify statements taken as well as to get detailed information on complex topics. Such information is not suited on group discussion or survey, thus, it is best to choose an interview session. In interview, some of the methods that can be used is by determining what type of data that will be used, presented and recorded is and by writing a short, clear and concise question. Using interview method, participants are selected to represent each user’s type (tailor questions to the group) and test before hand. As the effective way, this method requires questions in advance and limits the observation to one instead of many.

Some of the example of the interview used such as Merrill Lynch in 2004, where he interviewed investment bankers what was the most important information on the new SharePoint site, and Alvarez and Marsal in 2006, where he interviewed business representatives about their requirements for the new Intranet.

2.5.2 Survey

Survey is used to identify what users want and need in a new system, or to
provide understanding about their likes and dislikes with the current system (Beltaine, 2009). Survey helps to get feedback quickly from a large number of people, identify the potential user population, and learn about their characteristics. It will produce system reports with graphical trends (online surveys). The method includes determining how data will be used, presented and recorded, developing the survey, testing the survey, conducting the survey and analyzing results. Some of the example that uses survey method successfully is Cisco where it developed a survey on features of a SharePoint pilot, Alvarez and Marsal where it surveyed business groups about specific SharePoint features in the occasion where they rated the importance and priority of the system, and Merrill Lynch where they surveyed users’ preference of the SharePoint pilot.

2.5.3 Focus Group

In the focus group, a number of users are brought together to provide feedback on a series of topics. The goal is to elicit perceptions, feelings, attitudes, and ideas of participants on certain topic (Beltaine, 2009). Individuals express diverse views and participants learn from each other, and then generate a sense of social cohesion in this technique. This builds an excellent way to generate ideas or quickly gauge users’ impressions on certain topics and get multiple points of view in a short time period. The focus group technique is best operated by determining how the data will be used, presented and recorded and by preparing a list of topics or questions that wish to answers.

This method is conducted less than two hours, and it purposes is to gain opinions, not consensus. An example of this method is such from Russell Reynolds Associates, where they conducted focus groups in Americas, Europe and Asia to elicit feedback about the organization’s IT department.
2.5.4 Card Sorting Activity

Card sorting activity is a popular method to understand users’ opinion on the information, navigation and labeling within the site (White et al. 2006). Typically, the result reflects on the information structure in which users expect the ideas or concepts to be presented. This method helps to find out about missing items, related items, terminology that users prefer. It must follow certain stages which is the first one is by selecting participants, selecting content & preparing cards, and finally conducting sorting activity as well as analyzing results. The participant is asked to sort these cards into groups and then to name these groups. The results of multiple individual sorts are then combined and analysed statistically.

Card sorting is usually used as an input to design. It is an excellent way of suggesting good categories for a site's content and deriving its information architecture. Example for this is such as Pitney Bowes where he used card sort using merged content of an intranet and an HR system. Other examples are from Alvarez and Marsal, on the occasion where they used card sorting to representing the brand new Intranet and Wyndham Vacation Ownership used card sorting to representing existing content in public folders and binders.

2.5.5 Observation

This technique helps system developers to understand the end users’ natural before in the context for their daily routine. It is through observation that such activities like how users engage in everyday’s life, what artifacts are used to support their task and things that they do “automatically” and things that they may not talk about on the firsthand. Well said, it provides a holistic view of the process or domain (Dray, 1996).
This technique includes determining how the data will be used, presented and recorded. It also helps to develop an observation guide, select candidates and schedule visits and finally it includes observation and wrap up by comparing notes with other observers. Some of the examples of observation are from Wyndham Vacation Ownership, which used call observation on call center staff’s field calls in the natural environment, and Rusell Reynols who observed help desk staff’s field calls and tickets management. ISO 13407 Human-centered design processes for interactive systems outlines four essential activities in a user-centered design project:

- Requirements gathering - Understanding and specifying the context of use
- Requirements specification - Specifying the user and organisational requirements
- Design - Producing designs and prototypes
- Evaluation - Carrying out user-based assessment of the site

2.6 RELATED WORK ON WEB INFORMATION FOR STROKE CARE

The aim of this project is to ensure correct medium of delivery is chosen to develop a website and to ensure the structure and content delivery is upon users’ requirements. There have been numerous studies on website design, mainly examining accessibility issues of the website. Ivory and McGraw (2005) studied the evolution of website design and this has given some guidelines for web developer on what they should do in designing the website. On that paper, they studied characteristics of the website design interface from 2000 to 2003 and explained that web designs are becoming increasingly graphical in nature, reliant on browser scripts, and less consistent. Considering that stroke people is varying on age, culture and background, the design of interface and structure of the information system is very important. By
studying several web sources and site navigation structure on the stroke information system, it can give the idea what the information system designed is lacking. The objective is to analyze targeted users on the information that they are focusing on and the content delivery that they are expecting from the website.

Fog et. al (1999) focused on website categories that; (1) common on the Web today, (2) Web credibility relevancy, and (3) consumer focus (created for ordinary Web users instead of website for professionals). Ultimately, from this research they get significant insights regarding factors that affecting perceived credibility of online information and services. It has guided Human Computer Interaction (HCI) practitioners on practical design.

Eight websites that provide information on stroke have been chosen randomly and each of them is analyzed in terms of pros and cons. The analysis will be used to develop web information system for stroke. The summary from the general comparison describes the organization that is responsible on the web and targeted users. It also gives description on the color used, the font size on the web and the accessibility to access the information.
2.6.1 The Stroke Association

Figure 2.4: The Stroke Association

**Figure 2.2** shows the web for the British in stroke care. It provides the information on the stroke care in quite detail. On the main page, it provides short information with images to represent the information inside that. It provides two lines of menu which distinguish the content that related to stroke and the stroke associations. In this site, users can change the size the interface appearance into three sizes; small, medium or large by clicking it at the top of the design. The develop site uses more than five colours to represent the interface design for the system. The font type and size for the design is not synchronized between each of the elements in the site. For ease of use, users need to scroll down 5cm to below to see the overall view of the site.
2.6.2 American Stroke Association

Figure 2.5 American Stroke Association

Figure 2.5 shows the site for the stroke association in America. This website provides a lot of information on stroke that covers most of the aspects on the stroke care. It gives nearly complete information on the stroke care though the information is not in originated way. On the main page, it highlights important information and users need to click on more to go to the next page to have the full information. The font size that they used is quite small and it is not easy for users to read. This site gives full links to other stroke sites and any other links that provide information on stroke care.
2.6.3 National Association Stroke of Malaysia

This is the website designed by a private association named National Association Stroke of Malaysia (NASAM). Operated in Malaysia, NASAM provides information mainly on stroke. NASAM is a body that provides various kinds of rehabilitation services to stroke patients. The design of the website catches the eyes of users who visited the page. This is the only website designed for people in Malaysia and provides users choice of text either in Malay or English. Since it is the single body of association, the site is not link with the any other agency or government hospital. Thus, this website does not really providing users with related content on stroke.

Figure 2.6: National Association Stroke of Malaysia
2.6.4 Stroke Foundation

The website in Figure 2.7 is developed for Australians by a non-profit organization that works and cooperates with the public, government, health professionals, patients, carers and stroke survivors to reduce the impact of stroke on the Australian community. It displays information to reduce the impact of stroke on the Australian community. The design of the web is too wordy, messy and not represented a website on stroke. It does not provide any links to other stroke resources too. Users need to scroll down 10cm below to read the whole page and the submenu is not really organized.

Figure 2.7 Stroke Foundation
2.6.5 Peninsula Stroke Association

**Figure 2.8 Peninsula Stroke Association**

**Figure 2.8** shows the stroke care of the Peninsula Stroke Association. This is an independent stroke association in a peninsular area of Northern California that provides information on stroke focuses on stroke survivors, stroke patient and stroke caregivers. At first glance on the website shows that the site designed full of words and users might get confuse where to click on the web since every part of the website looks similar with each other. The website uses few colours but there is no standardization on each page or in the same page.
Figure 2.9: National Stroke Association

Figure 2.9 is the National Stroke Association by E. Easter Lane Centennial, provides information to support stroke caregivers, survivors and link to another sites. What makes this site really different is it comes out with the “STAR” (Steps Against Recurrent Stroke) that attracts users once they enter the site. User can login and register to subscribe and shop for stroke equipments on the site it is quite limited. Other than that, too many information with lengthy text provided in one single page makes user confuse which one should they read.
2.6.7 Stroke Association of Southern California

The site designed in Figure 2.10 is Southern California people, specifically for stroke caregivers and stroke survivors. The web design seems aged and the information is not updated. The information given is more on storytelling instead of highlighted on what users should do. It gives bonus to those people who want to read a story on stroke survivors who are recovered from stroke. Other than that, it takes longer time for users to search what they are looking for. It does not provide links to other sites on stroke care too.
2.6.8 Chest, Heart & Stroke Scotland

Figure 2.11: Chest, Heart & Stroke Scotland

Figure 2.11 shows information provided on stroke care in Scotland. It covers a wide area of health care where it emphasizes related information to take care of health and chest. The website design is interactive enough with varieties of colours and it is organized in table which separates submenus according to their related information. This site does not only emphasize on stroke care but also focusing on other health care too.
2.7 OVERALL SUMMARY OF THE CHAPTER

Literature review discusses on stroke, stroke care, method that stroke patients use to get the information, UCD approach and the review results on the existing information system. As discussed above, this research investigates on the impact of the UCD approach, and focusing on how it has been integrated into the stroke. The hypothesis is that the UCD integration improves the impact of the information delivery on the website through UCD infrastructure. The existing website shows some of the strengths and weaknesses and this will be improved through the research and will be discussed in detail at Chapter 3.
CHAPTER 3
CRITICAL ANALYSIS

3.0 INTRODUCTION

Critical analysis section involves analytical evaluation based on the research conducted and collection of analysis from Chapter 2. It is vitally important as to be able to critically analyze research reports and this is to determine the validity of methods and results of this research as well as level of professionalism. Based on the literature review mentioned above, some findings will be discussed throughout this chapter. In this chapter, people, activities, contexts and technologies (PACT) are used to conduct analysis related to WISS. It will also discuss on the critical issues related to stroke care and users’ involvement in this area. Based on Chapter 2, several existing web based applications for related stroke care have been reviewed for analyzing purposes. The comparison between these web based applications and the potential criteria will be discussed later on this chapter.

3.1 CURRENT ISSUES ON STROKE CARE

Even though there are a lot of systems related to the stroke that can help stroke patients in their recovery process, there are still a lot of issues arise. Kyriacou et al. (2007) explained in his paper that the tendency of users to have stroke is higher. This is collected from the findings, in which they have successfully built a system that integrates clinical data and identifies risk factor of stroke using ultrasound image. Since morbidity and mortality after acute stroke is unacceptably high, it is very important to recognize and to treat patients with carotid bifurcation disease before they develop
symptoms of strike. Even though an advance tool or equipment is provided for stroke patients, if they do not get accurate information, it makes it hard for them make use of the tools for stroke recovery. Apart from that, it is hard for them too to follow their rehabilitation schedule as they do not know how to make use information and methods to recover. And of course, this makes it impossible to recover quickly.

Stroke patients will use the source whichever they find it is very easy for them to access. Some of the methods that they will choose to access the information are from the Internet, newspaper, pamphlet, friends, and stroke caregivers and many more.

From Chapter 2, eight web applications designed to deliver information on stroke care have been reviewed and discussed generally. Nevertheless, several issues have been identified. Thus, this research will discuss on those issues and any output will be used to provide a better solution in delivering information for stroke care.

3.1.1 Conflict of information

From research conducted by Schwamm et al. (2007), it discussed on the recommendation for stroke care and highlighted issues on stroke system (in what way it should be reflected) and stroke prevention (how to prevent stroke). Whilst, this paper is focusing on improving stroke care based on the integrated system developed in the hospital rather than giving out the information for another users. Improving stroke-related knowledge may advance stroke preventions and treatment and has been declared as a health priority. However, there is a lot of information and resources that stroke patients acquire from unknown sources. Furthermore, when dealing with a lot of information, it makes stroke patients become confused with the sources provided. They might end up neglect and ignore the information given. Some solution for this is using complex technique investigated by Park et al. (2004). In the research, it focused on
lexical signatures for finding relevant information on the several web. Other past literatures such as Tziviskou et al. (2007) and Oberle et al. (2005) focused on investigating semantic web that can examine contents in the web that has been published on the Internet to extract the information.

3.1.2 Limited information for Malaysian People

Research on the Internet shows that the information provided on stroke is quite limited for Malaysian compared to Europe and Africa’s country. They have their own strong stroke association which exposes them to be aware importance to take care on stroke. However in Malaysia, there is only one website from independent stroke association known as (National Stroke Association of Malaysia) NASAM which acts as private rehabilitation centre that provides variety services in stroke care. They promote and deliver the information about their centre and stroke care through their website. However, with the limitation of the information provided by NASAM itself, since they operate independently, they required more information from other resources such as government, public sectors and private hospital. The reason why they need external resources is because hospital is the first place that stroke patients are referred and allocated when they had the first stroke attack.

Apart from that, two-way interaction between stroke patients is one of the successfully of sharing idea and information. Not just that, professional doctors and therapists from Malaysia who are working independently need a place where they can share their experience and communicates with stroke patients. This will be examined later in the rest of the chapter.
3.1.3 Develop by a single body of organization and association

Nowadays, independent bodies and associations of stroke are developing their own website to introduce their place to public. Besides that, their own objective is for marketing purpose rather than trying to give public the information on stroke. It is an obvious example as today’s websites only focus on promoting themselves to public. This is not the correct way since such informational website needs to cooperate with each other since most of them are working independently which let them to get limited resources on stroke patient and other information. What this research needs to cater is to gather all information and application from stroke websites and combine it to a comprehensive information system. This may result a single site where users, especially stroke patients can go to find information.

3.1.4 User requirements and expectation

At present, the design of information system for stroke does provide all the information needed by users. However, with the presence of user as the first priority on this research, the analysis using appropriate techniques to identify what user needs and expect is carried out to investigate how user responds through the information provided on website. Analysis on several selected online website which provided information on stroke revealed that there are still lacking on how they organize and structure the information. This will be discussed later on the next part. When a lot of information is required to be published on the web, there is a process and techniques which designer’s have to follow in order to make web design attractive. Dealing with too many and redundant information on stroke care where they found on the Internet will make user confused to focus on which type of information they need to follow. Durham (1999) did mentioned in his paper, in order to develop web based information, professional
Communicators are able to incorporate the kinds of textual and structural support for readers that are impossible to achieve in hardcopy. It is to be noted that some stroke patient deal with the language impairment. Durham also did examine the issue of special needs by describing problems that language impaired users may face in getting information from the Internet. This research attempt to create the web site dedicated to the appropriate user and designed in different way which is focusing on user needs.

3.1.5 Medium of delivery

Most of users spend time looking for information in various ways such as newspaper, friends, radio, television, books, friends and Internet. From research conducted by Europian Commision (2010), stated that Internet is nowadays by far the most important vehicle for data exchange and the world-wide-web the most important source of information as it is reflected by recent statistics. As the objectives of this research to make sure that information of stroke care deliver in their hands, this research will looks into the medium of delivery to the dedicated user in stroke care. Since most of the stroke patient has impairments problem, the method use to deliver the information must be appropriate to make sure the information is effective. The analysis covers on the finds the ways to leading the systems that deliver the right information at the right time as well as provide appropriate ways to information space. In today’s information society, there is a need to access to an enormous amount of information. Without theories and technologies that allow the researcher to obtain the information for stroke patient in a clear and useful ways, there is increasing in information overloaded that leads to poor information use and inefficiencies of decision making.
3.2 PEOPLE, ACTIVITIES, CONTEXT AND TECHNOLOGIES (PACT)

People use technologies to undertake activities in contexts. In all these settings for WISS, this research will see people using technologies to undertake activities in contexts and it is the variety of each of these elements that makes designing interactive systems a difficult but interesting challenge. Technologies are there to support a wide range of people undertaking various activities in different contexts. If the technology is changed then the nature of the activities will also change. Based on engagement over two years with around forty academics on a range of commercialization ideas, a PACT analysis performed by Benyon et al. (2005) illustrates the human factors involved in UCD approach.

3.2.1 People

There are many ways in which people differ from one another, from physical appearance to the attributes they have. People have different personalities and react to things in different ways. This depends largely on the five senses i.e. hear, sight, smell, taste, and touch, so it is important for my website to be friendly, usable, pleasurable for all kinds of people. The website should cater for this too. People also differ in psychological terms and so it is necessary for my website to be accessible to those people who are not so able. People differ in their desires and capabilities, so it is important that the website caters for all levels of cognitive ability. The website is a heterogeneous website as the users will be based all around the world. The users will most probably have different levels of computer literacy/knowledge, different language skills and different cognitive and physical abilities. Other than all these features, a detail
characteristic of user is analyzed to dig out their personality. In computer literacy/knowledge, users accessing WISS may be beginners, intermediate or experts, it is therefore, essential for the website to cater for all its users. So, it is most probable that even those users that are very computer/Internet literate may still be beginners when they visit WISS.

Cognitive abilities are the abilities of people to that operation of the mind process by which we become aware of objects of thought and perception, including all aspects of perceiving, thinking, and remembering (Wikipedia, 2009). Because people are better at recognizing things than remembering them, our site will be primarily 'see and click'. This is so that users will be able to easily interact with the website. One of the important criteria is the ability of user to read in English. Since English is the universal language, it will be the chosen language for the content in WISS. It will be a problem if people do not know how to read in English. A multilingual web based application for WISS will take into consideration, as it can serve to different type of people who could not read in English.

Physical abilities are the ability to perform some physical act; contrasting with mental ability. It is essential for our website to be accessible for those users that are physically challenged. With regards to our site, one of our goals is to cater for users with sight difficulties. There are different types of visual impairment. The first is the difficulty of seeing small things. We will need to make sure that the contents in our site can be magnified for such users. WISS needs to ensure that the quality of the site is undisturbed when the information is magnified as this may cause confusion for many users. The second difficulty is colour blindness. Colour blind people have a great difficulty distinguishing between certain colours, such as yellow, blue, red and green. This research will need to make sure that colours that can affect colour-blindness are not
mixed. As for other impairments, it will not include for consideration as this research is focussing on stoke patients who can use WISS.

3.2.1.1 User Characteristics

Users are the most important part of UCD. They are the main key concern in the design purpose. Users want a site that is easy to use and with minimum download time as well as site that allows them to complete their tasks in minimal amount of time with minimal amount of frustration. Users want the site to be “cool” too and such interesting website will easily attract visitors. Development of applications by “end users” is a particularly widespread phenomenon in at least two vital fields of computing application: scientific/technical computing where information technologies have been placed directly in the hands of researchers, designers, and engineers, together with business/commercial computing where information technologies have been placed directly in the hands of clerks, analysts, and managers. As mentioned by Brancheau and Brown (1993), during the 1980s, pressures toward distribution accelerated and became a key management and research concern which is known as “end-user computing” (EUC), that the phenomena and research associated with this trend cross a variety of disciplines. It shows how important to emphasize on user concern in any discipline.

In UCD, there are 3 different types of user can be considered on which are primary user, the secondary user, and the last one is the tertiary user. Primary user is the frequent hands-on which mean who need to use the information most. The secondary user is occasional or via someone else. Tertiary user is affected by its introduction and influence the system if there any purchasing activities. For this project, both three type of user are involved to ensure that content delivery is achieved.

Stroke patient, stroke survivors, stroke caregivers, health professionals, including doctors, nurses, pharmacists, speech and language therapists, occupational,
physiotherapist are potential users involved in developing the stroke information system. The characteristics of stroke patient are defined next.
3.2.1.1 (a) Stroke patient characteristics

Even though stroke patients will not become one of the stakeholders in this research, their opinion is important because they are the main reason why we need to develop the system. The aim of the research is to help stroke patients handle their situation depending on the level of stroke. This research was conducted to find out how the stroke patient can use the Internet as their medium for information with regard to accessibility. “Human factors engineering is the area of engineering positing that design of technology should begin by identifying human needs and then tailor the technology to the target audience based on relevant human factors or needs” , Jung et al.(2006). As regards the characteristics of stroke patients, however, they are often unable to read and understand the information published on the Internet to help them. That is why this research focuses on giving caregivers and stroke rehab centres the right information for them to handle the stroke patient base at the appropriate stroke level. Taken into consideration is the stroke patient characteristic, aphasia. Aphasia is a cognitive disorder that impairs speech and language. The need was identified for a daily planner that allows aphasic users to manage their appointments independently which resulted from interviews with aphasic individuals, their caregivers, and speech-language pathologists, Mofat et al.(2004). The stroke caregiver will become the person in charge who can help them manage the daily planner that includes the health information required.

3.2.1.1 (b) Stroke caregivers’ characteristics

Caregivers have an important role in the care of people with a cognitive disability, such as stroke patients as mentioned by Carmien et. al (2005) Caregivers vary in terms of background, age and race. Analyzing their background helps us to know what
information they need in order to help them handle the stroke patient. This is to insure that they can understand and practice the information given through the medium chosen. The Internet is one medium of communication that they normally use to interact with other people and get more information (Sullivan, 1991). Websites can be one such choice to publish information for caregivers and give them directions on how they can really take good care of a stroke patient. In fact, the Internet Chen et al. (2000) is the correct medium to give the right information, but studying all the websites available can mean that they strain their eyes and take longer to receive the correct information. It means that even if the correct information is on those websites, its accessibility does not reflect user needs Wilson (2005). This research evaluates the feasibility of an information appliance with the goal of alleviating repetitive questioning behavior and contributory factors to caregiver stress, as mentioned in Hawkey et al. (2005). One of our major interests is to obtain the caregivers’ ideas to make sure that they really get what they want in terms of information with a correct medium of delivery.

3.2.1.1 (c) Rehabilitation center characteristics:

Rehabilitation centres provide rehab programs for stroke patients to help them handle the stroke. As registered centres, they have their own website to publicize information about themselves and give news on stroke itself. When they work independently, however, they need more information from the government side to help introduce themselves to stroke patients who, after treatment at the hospital, need continuous rehab. Even though useful information is published on their websites, they only provide online communications to each other, which is one-sided communication.
3.2.1.1 (d) Therapist characteristics

Therapists are people who act as the professional back-up to the medical side. There are three different types of therapist: occupational therapist, speech therapist and physiotherapist. These three therapists use the Internet as their daily communication between themselves and stroke patients. Most of them work independently and receive information about the stroke patients online.

3.2.2 Activities

Since WISS is a web based information system, the most important activity is identified first. The most important activity for WISS is:

“When user enter the URL address given, user will be able to read and view all the content inside the WISS”

In order to support this activity, the main features are temporal aspects and cooperation. In temporal aspects activity, it shows how frequent the user wants to click on the page to view the contents. Problem can happen when there is no navigation shows to them what kind of activity that they are doing.

The main activity also needs to be support by sequence of activity that they can do. For example, in order for them to post the message they need to login, click on compose button and type the messages. Other important activity is the response time which must be considered. For WISS, it must able to deliver a response when the server still busy which might be devastating from the normal query but it also can be crucial when the user want the information immediately which referring to the emergency cases. This might be happen since stroke is a sickness that can be occur anytime and
anywhere where user needs to take action immediately. As a general rule people expect a response time of about 100ms for hand-eye coordination activities and 1s for a cause-effect relationships such as clicking a button and something happening. Anything more than 5s and they will feel frustrated and confused.

3.2.3 Context

From the activity that has been identified above that possibly happen in certain context. WISS context will be looking at examining the context and analysis. In WISS, there will be on the psychical environment. This shows how the activity conducted by people in the certain activities.

For example; WISS should cater the people from different background that will use various activities in one time. This will be a problem if we are considering all the user have the same interest and only can do one activity in one time. WISS should able to play the video if user wants to see the video even in slow bandwidth. WISS should be accessible for those visitors that use different operating system, resolutions, browser and colour depths platform.

3.2.4 Technologies

The last elements of the PACT framework are the technologies. WISS is an interactive system which constitutes the medium that interactive system designers work with. Some important features of technologies related to the WISS are input, output, communication and content.

In the input for technology in PACT, physical impairment of the stroke patient will not be considered in the system since they are not the main target user that will use the system. Somehow, input devices are concerned with how people enter data and
instructions into a system securely and safely. The characteristics of the data are important for choosing input methods. Only keyboard is considered as the matter of input for the WISS. This is the suitable methods for the web based application and applicable with the people, activity and context. While the output for the system is considered on the screen display in different resolution either in personal computer, laptop or mobile phone. The output considered for the WISS are texts, images and videos. Communication between people and devices is another important consideration in WISS.

The content concerns the data in the system and the form it takes to represent it into. Being accurate, up-to-date, relevant and well-presented is some of the characteristics of good content. There is little point in having a sophisticated information retrieval system if the information, once retrieved, is out-of-date or irrelevant. In WISS, it is all only about content for the user to view.

3.3 COMPARING THE THREE MODEL

Three (3) life cycle model from Chapter 2 represent the lifecycles models for implementing UCD approach. Each models stated that it involves that the designers will present to users the design and get feedback from users. All the three models enable users to understand how to interact with designs and develop the prototypes. It also helps to clarify user expectations for the system developed.

Star lifecycle model is very flexible where it allow the designers to start at any point they want to. The flexibility of the models allow the designers to control all the process. Somehow, for the novice designers, it is quite tough for them because they could not really understand the whole process. Sometimes, it is very difficult to plan ahead because of the other process is highly depend on the evaluation process. Changes
will take place most of the time through the design process. Designers also have difficulty to estimates on the schedule of the design process. The star model also supports odd and wasteful processes that sometimes are unbeneﬁcial to the designers.

Usability lifecycle models focusing on the engineering usability concepts. The design controls the designers in order to complete the whole process of the design. It becomes a complex design for the designers if the designers could not really understand on what the lifecycle is all about. Each part of the process emphasizes and need to tailor on the usability characteristics.

Interaction design models comprise on four process which is very easy for the user to understand. It allow user to control the whole process. It involves iterative process which allow user to repeat the design until it meets user’s expectations.

Between these three models, interaction models is the best model to accommodate with WISS. This is because the model offer iterative process on each of the process. Even though the other two models also offer iterative process but this model is very direct and easy to understand. It suitable with the objectives of WISS which allow the design to be repeated until it meets user’s need and requirements.

3.4 ANALYSIS ON RELATED STROKE CARE

Eight (8) web site from chapter 2 that provide information on stroke care is chosen as the best web for stroke care which deliver the information related to stroke. From the web site which has been chosen, eight (8) criteria are examined accordingly. This follows the golden rules of interface design by Shneidermen’s (1998) which comprised on eight golden rules for informing design;
Rule 1: Strive for Consistency

For example in every screen have a ‘File’ menu in the top left hand corner. For every actions that results in lost the data, it asks for confirmation of the user to give chance to user to change their mind.

Rule 2: Enable frequent users to use shortcuts

For example, in most word processing packages, users may move around the functions using menus or shortcut “quick key” or function button

Rule 3: Offer information feedback

Instead of simple saying “error 404”. make it clear on what is error is all about “the URL is unknown”. This feedback is also influenced by the kind of users, since what is meaningful to a scientist may not be meaningful to a manager or an architect.

Rule 4: Design dialogues to yield closure.

For example, make it clear when an action has successfully completed:”printing completed”

Rule 5: Offer error prevention and simple error handling

It is better for the user not to make any errors for the interface to prevent the users from making any mistakes. However, mistakes should be inevitable and the system should be
forgiving about the error made and support the user in getting back on track.

Permit easy reversal action:, For example, provide an undo key when possible.

**Rule 6: Support internal focus of control**

Users feel more comfortable if they feel in control of the interaction rather than the device being in control.

**Rule 7: Reduce short-term memory load**

For example, whenever possible, offer users options rather than ask them to remember information from one screen to another.

**Rule 8: Widgets**

Interface are made up of widgets elements such as dialogue boxes –menus icons, toolbar and etc. Each element must be designed or chosen from a predesigned set of widgets.
Table 3.1: Comparison on Related Existing System

<table>
<thead>
<tr>
<th>Web Sites</th>
<th>The Stroke Association</th>
<th>American Stroke Association</th>
<th>National Association Stroke of Malaysia</th>
<th>Stroke Foundation</th>
<th>Peninsula Stroke Association</th>
<th>National Stroke Association</th>
<th>Stroke Association of Southern California</th>
<th>Chest &amp; Heart Foundation Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 1</td>
<td>Consistent which each page gives different menus on top and the left side of web page</td>
<td>Consistent enough by making sure that the header will be on top all the time</td>
<td>Consistent whereby it provides user by search button wherever page user will be.</td>
<td>Less consistent where each page gives different layout</td>
<td>Not consistent which each page gives different look and feel</td>
<td>Consistent which each page provide menu on top of the web page</td>
<td>Consistent with each page provides menu on top of the page</td>
<td>Very consistent which each page provides menus on top and on the left side of the web page</td>
</tr>
<tr>
<td>Rule 2</td>
<td>User can easily click on menu or any place they desire on each web page</td>
<td>User can easily click on menu or any place they desire on each web page. For example, they can click button language to switch the language in any web page</td>
<td>It takes some time to find the shortcut key to go to dedicated page</td>
<td>Do not provide any shortcut key where user need to go to “Home” to do an action</td>
<td>No shortcut key</td>
<td>Provides shortcut key where user can easily click on the menus or link provided</td>
<td>Provide only few shortcut keys</td>
<td>A lot of shortcut key provided for user to do a quick action</td>
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</tr>
<tr>
<td>Rule 3</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
<td>Not included</td>
</tr>
<tr>
<td>Rule 4</td>
<td>Included in the registration process and after comments being added</td>
<td>Included when you already finish updated the feedback</td>
<td>Not provided</td>
<td>Not provided</td>
<td>Not provided</td>
<td>Included when you finish registration process and after comments being added</td>
<td>Included in the registration process and after comments being added</td>
<td>Included in the registration process and after comments being added</td>
</tr>
<tr>
<td>Rule 5</td>
<td>Provided undo key for each page</td>
<td>Provided undo key for each page</td>
<td>Provided undo key for each page</td>
<td>Does not provided any undo key for any page</td>
<td>Does not provided any undo key for any page</td>
<td>Provided undo key for each page</td>
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<tr>
<td>Rule 6</td>
<td>Using the same layout on each web page which allow user to feel that they have an interaction with the web page</td>
<td>Using the same layout on each web page which allow user to feel that they have an interaction with the web page</td>
<td>Using the same layout on each web page which allow user to feel that they have an interaction with the web page</td>
<td>Do not have interaction with the user</td>
<td>Less interaction with the user</td>
<td>Using the same layout on each web page which allow user to feel that they have an interaction with the web page</td>
<td>Using same color on each web page which keep user in control of the web site</td>
<td>Using the same layout on each web page which allow user to feel that they have an interaction with the web page</td>
</tr>
<tr>
<td>Rule 7</td>
<td>Provides a navigation menu so the user can remember which page they are in</td>
<td>Provides navigation link so the user can remember which page they are in. This websites offers click and view where user can easily read what they have open</td>
<td>Each web page highlights on the announcement</td>
<td>Not provided</td>
<td>Not provided</td>
<td>Provides navigation link which offers the user to remember their location on the web site</td>
<td>Not provided</td>
<td>Provide navigation page. Provide a short story on main page which describe most of the story</td>
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</tr>
<tr>
<td>Rule 8</td>
<td>Provide menus and icons for user</td>
<td>Provide a long list of menu and icon</td>
<td>Provides a big size menus and icons for user to see</td>
<td>Do not have any icons</td>
<td>Do not have any icons</td>
<td>Provide an attractive menus and icon to represent the information</td>
<td>Do not provide ant widgets</td>
<td>Provide an interactive icon and menu to remember</td>
</tr>
</tbody>
</table>
Table 3.1 showed the comparison between eight website based on the eight golden rules followed. For the first rule, most of the websites represent consistency in most of the elements. Chest and heart foundation Scotland showed the most consistent web page in terms of the elements. Only five of the websites follows rule number 2 whereas the others do not provide any shortcut key for user to click on the page they wish to go. All websites do not provide any information feedback upon user request which is not applicable for the website. Rule number 3 is followed by five out of the 8 websites. Most of them provided dialogue box when user complete the registration process. Rule number 5 applied on the six websites where it allows user to reverse their work by clicking undo button within the page. Rule number 6 is followed by almost all the websites where they provides navigation page which allow user to feel control on the page they clicked on. Rule number 7 is applied to 6 websites where it allows them to use a shortcut, button to remember on what page they are and a summary on what have they being doing before. Rule number 8 focusing on the interactivity of the web sites to interact with the user. Six of them apply some icons, menus and toolbox on their websites.
3.5 OVERALL SUMMARY OF THE CHAPTER

This chapter discusses the critical analysis conducted related to this research area. The lists of issues and drawbacks from the existing stroke care have been listed which is emphasized on the overall structure of the website that derives on what the target user really need. PACT analysis helps to draw out an issue related to WISS and how it able to harmonize on UCD approach in WISS research development. The target users which are going to be involved in this research have been summarized throughout this chapter. The UCD lifecycle models are discussed throughout this chapter where the interaction design model is chose for the WISS. Based on the stroke care websites from Chapter 2, the criteria and elements from the information given are analyzed. A table that represents the comparison of the existing websites based on the eight golden rules are discussed in this chapter.

CHAPTER 4

RESEARCH METHODOLOGY

4.0 INTRODUCTION

In this project, several processes have been included in the research methodology. The process includes are; select an appropriate software development life cycle model,
research methodology and investigate the topics which are related to the model implements on the system. The task is involved in each phase of WISS and is determined by the testing strategy used in the testing phase.

4.1 INTERACTION DESIGN LIFECYCLES MODEL

Interaction design lifecycle model by Preece (2002) is the model use for developing WISS. It incorporates of four stages as shown in Figure 4.1. Each of the process involves the methodology use as stated in the figure. In Chapter 5, the process of establishing requirement is described. Techniques applied are discussed later on this chapter.

Summary of findings gathers a list of user interface requirements. These outcomes are embedded at the design stage. In Chapter 4, it also stated the re-design process where it involves low- fidelity prototyping from establishing requirements process and high fidelity prototyping from evaluation process. Chapter 6 and Chapter 7 covered the build interactive design process where the system design and system coding and testing are discussed throughout this chapter. In Chapter 8, system evaluation is conducted to on the WISS to know the success of implementing the UCD approach. The details of each process are discussed later on this chapter.
4.1.1 Establishing Requirements

In this stage for data gathering and analysis, a set of activities involved to achieve the process. User-centered design approach are applied throughout the process of data gathering and analysis. The phase involve from UCD approach for WISS are: Initial interview, questionnaires, focus group discussion, naturalistic observation, card sorting activity finally low-fidelity prototyping.

Figure 4.3 shows the process flow for data gathering and analysis. The process flow shows the data flow from initial interview until low fidelity prototyping. The input from the first approach is continuously moving until finalize output of card sorting activity.
4.1.1 (a) Literature Review

Literature review conducted is based on stroke care and issues related to the stroke. The review focuses on applying the User-Centered Design to develop WISS. The investigating process is held by reviewing several existing information system for stroke care whether they deliver information on current features as compared to WISS. Most of the useful information was obtained from the ISI Web of Knowledge, Scopus, WSEAS journal, IEEE, the ACM and SpringerLink digital library. In addition, the Main Library of the University of Malaya also provides a lot of valuable information to accomplish research works. The gathered information is useful for scope planning and definition for WISS project. In Chapter 2, the literature review has discusses in details which feature is related
and suitable. It has been evaluated to create an interactive design using User-Centered Design (UCD) approach.

4.1.1 (b) Initial Interview

The purpose of having this activity in data gathering and analysis is to have some rough idea and background on users who are going to involve in the system. This includes the process of determining and analyzing user characteristics that directly and indirectly interlink with the system.

4.1.1 (c) Questionnaire

A set of questionnaire is prepared for stroke people who are going to use the system. Some of the questionnaire is derived from the initial interviews that have been conducted on the earlier phase and some of the questions are developed from analyzing the question which is related to the stroke care.

4.1.1 (d) Interview

Interview is one technique that has been chose in order to know the user view on the stroke care. In such a context the use of interviews is frequent and pointed out as the major technique for getting the requirements from the actors in the organization.

Interview technique chose is indirect interview where the question is set up during the interview session itself.

4.1.1 (e) Focus Group Discussion
In this research, the idea of having a focus group is to combine ideas that have been gathered from the interview sessions which have been conducted before. The interview conducted earlier must have been answered in a long essay. Based the results, the most highlighted criteria are on focus group. Focus group goes further to produce an opportunity to collect data from groups discussing topics of interest to the researchers.

4.1.1 (f) Naturalistic Observation

In naturalistic observation, it is quite understandable since we can see daily activity of the target user to understand more on the stroke care. In naturalistic observation, an observation at the rehabilitation centre is conducted to observe and see the actual process of rehabilitation. The results of this observation is discussed on the Chapter 5.

4.1.1 (g) Card Sorting Activity

Card sorting activity is a knowledge-elicitation technique often used by information architects, interaction designers and usability professionals to establish or assess the navigation hierarchy of a Web site. Card sorting is the activity where it involves a few people to select the card on what they really think that is necessary for them. The content of these card sorting comes from interview and the focus group that have been done before. The total of card that we created is 120 cards written the content of information that they required from the previous session.

The total of four respondents who are 3 respondents of stroke caregivers and one stroke patient did the card sorting activity. The background of respondents is considered when
they did the card sorting which gave us different views of arranging the card. The hierarchy of the card and results of the card is shown in the Appendix.

4.1.1 (h) Requirements Identification

From the activities of UCD approach have been conducted earlier, a set of requirements are identified. The output of the activities conducted which are from interview, questionnaire, focus group, card sorting activities report and low fidelity prototyping are combined to picture the set of requirements for WISS. Basically the set of requirements identified here is the navigation structure of WISS. A hierarchy of web navigation structure in main page is presented for the first prototype that will be design for WISS.

4.1.2 Re-Design

This phase is concerned with the design of WISS based on the requirements that have been identified earlier. This research employs low-fidelity prototyping and high fidelity prototyping for the design phase.

4.1.2(a) Low Fidelity Prototyping

Low fidelity prototyping is one that does not look very much like the final product since it normally use materials that are very different from the intended final version of the development. Low fidelity prototype is chosen since it is simple, cheap and quick to modify which they able to support the exploration of alternative design and ideas in many ways. The sketches of this prototyping is discussed later on Chapter 8.
4.1.2 (b) **High Fidelity Prototyping**

High fidelity prototyping is the sketch design of the final product using the tools for re-design purposes. High fidelity prototyping is chosen since it is quite similar with the final products which allow user and developer to test the functionality of the system developed. This will be discussed on Chapter 8.

4.1.3 **Build an interactive version**

This phase is concerned with the final development of WISS products based on the Re-design phase which can go back to re-design phase if the products does not fulfill the user requirements. System design, coding and testing is the phase involved for this process which involved the final development of WISS product.

4.1.3 (a) **System Design**

The phase is concerned with the design and development of the proposed system to fulfill for the WISS projects of system requirements. The design process includes architecture design, system design, system architecture and coding implementation. These processes consist of developer’s time to complete the design in what user needs. Chapter 5 discusses the interface, coding and architecture design of the WISS.

4.1.3 (b) **System Coding and Testing**

This phase addressed the implementation of coding towards WISS. It also discussed on the testing technique apply for the WISS. The testing involved is system testing, unit
testing, module testing with a set of test case. A set of test cases have been chose for the testing purposes. Testing is performed at University Malaya institution itself.

4.1.4 Evaluation

Formative evaluation is done at different stages of development to check that the product developed meets users’ needs. It refers to the process of evaluating the design process until the product meets user expectation.

4.1.4 (a) User Testing

User testing is a technique use to evaluate the interface design for WISS. It includes four stages of evaluation that will be discussed in this part. This involves four high fidelity prototyping demonstrated to the user. The techniques includes in this process which throughout the design, that proceeds through iterative cycles of ‘design-evaluate-redesign’. User testing helps designer to come out with the interface that fulfills user requirements.

4.1.4 (b) Cooperative evaluation

"Cooperative evaluation" is a variant of think aloud, in which the user is encouraged to see himself as a collaborator in the evaluation rather than just a subject. As well as getting the user to think aloud, the evaluator can ask such questions as "Why?" and "What if.....?"; likewise, the user can ask the evaluator for clarification if problems arise. This more relaxed approach has a number of advantages. It is less constrained and therefore easier for the evaluator, who is not forced to sit in solemn silence; the user is encouraged to actively criticize the system rather than simply suffer it; and the evaluator can clarify points of confusion so maximizing the effectiveness of the approach. Note that it is often not the
designer who is the evaluator, but an independent person. The results of cooperative evaluation will be discussed on the Chapter 8.

4.1.4 (c) User acceptance testing

This testing is conducted with 80 respondents from different background. A set of questionnaire that has been expanded from the prototype evaluation is been given out. There are several places that we chose to conducted the testing since the most of the target respondents that this research comes from rehabilitation centre, hospital and their own home. Before conducting the testing, the representative users who able to do the testing are selected based on their background. This is to ensure that the testing is properly performed by the suitable user to ensure the successfulness of the system. The result of the testing conducted is discussed in Chapter 8.

4.2 RESEARCH METHODOLOGY DESCRIPTION

Figure 4.2 shows the process flow of research methodology follows in order to complete WISS project from initial until the end project delivery. Each of the process involved have the activity to ensure the successfulness of the project. Research methodology involve is Literature review, Establishing Needs and Requirements, Requirement identification, System design and coding, system testing, finally system evaluation. UCD approach are used in almost every stages of the research methodology that will be explained later on this chapter.
Figure 4.3 Research Methodology Flow

- Feasibility Study
  - Review on existing system
  - Review on related literature
- Critical Analysis
- Establishing Needs and Identifying Requirements
  - Lifecycle Model
- Requirements Identification
- Design and model the system
- System Development
- Conduct system evaluation with users

Figure 4.3 Research Methodology Flow
4.2.1 Feasibility Study

At first stage of research methodology, the feasibility study is conducted to ensure that the overview of WISS can be understand. The study is conducted to fulfill all the requirements related to WISS. Study by reviewing on the existing system is important since that a lot of information has published information about stroke care, however the study need to be conducted to makes sure the flaws on the existing one can be corrected.

Before coming out with the title of WISS, the study on the related literature is done to make sure that the title is appropriate with the research conducted.

4.2.2 Critical Analysis

In this stage, an analysis related to the current stroke care information system and related literature is conducted, the results of comparison on related stroke care is presented on this stage. This stage also represent the analysis conducted for user who going to use the system using UCD techniques

4.2.3 Establishing needs and requirements

From the critical analysis, one of the criteria is the lifecycle model chosen for WISS. By using the lifecycle model chose, all the requirements can be achieved throughout the process. The result of the needs and requirements for WISS is gathered and the output is the requirements identification of that.
4.2.4 **Requirements identification**

From the requirements that have been identified, a set of module is identified to fulfill the user requirements. This follow the needs that user require which then mapped into the module of WISS. These modules consists different sets of requirements.

4.2.5 **Design and model the system**

*The module of the system developed is model using object oriented design concepts. This include use case, activity, sequence and class diagram.*

4.2.6 **System development**

*The development of the WISS is carried out to ensure all the modules identified are working out according to the user needs. The prototyping and final products of system is developed as the working models of WISS.*

4.2.7 **Conduct system evaluation with users.**

After the final product of WISS is developed, the system is demonstrated to the user to measure the satisfactions of user according to the system developed. This is important process where the feedback of the user can be taken into account for future enhancements.
This chapter discussed on the lifecycle models used to develop WISS. The four process involved in the interaction design models which give the details of the UCD approaches for WISS. It involved establish requirements which on the literature review, a set of comparison and analysis for the stroke information system has been presented in chapter 2. In step of data gathering and analysis, all the data collected have been compiled to produce a set of requirements in steps for the process of requirements specification. For re- (design) process, it involves the input from evaluation of high fidelity prototyping and establishing requirements for low fidelity prototyping. For build interactive version process it involves system design and coding, which has
been determined that three tier architectures will be chosen and PHP is used for the coding purpose.

Evaluation process are described in system evaluation on Chapter 8. The research methodology discussed on general the seven process involved in WISS development. This consists of several activities which given the final output of WISS is the product from the evaluation process.

CHAPTER 5

ESTABLISHING NEEDS AND REQUIREMENTS

5.0 INTRODUCTION

Previously in Chapter 4, several processes are involved on the methodology for WISS. One of the processes is establishing needs and requirements and this is discussed in detail in this chapter. In Chapter 4, stages of establishing needs and requirements represent as initial interview, interview, questionnaire, focus group discussion, card sorting activity,
low fidelity prototyping and finally high fidelity prototyping. This chapter explains further
the results on each of the process conducted and summarizes the output of the process.

5.1 INITIAL INTERVIEW

This initial interview is conducted between two therapists, who are really familiar
with stroke patients and work at stroke rehabilitation centre. From the two hours interview
session with both therapists, it has given some rough idea about stroke. The interview takes
place in the rehabilitation centre at NASAM and MIND, and both are located in Petaling
Jaya, Kuala Lumpur. Among things that have discussed are regarding to the medium on
information system to deliver information on stroke. Earlier, among options for the delivery
medium is either using mobile phone or web based. Further results of interview are
presented in the Appendix.

The first interviewee at MIND gives a good response on this project. He agrees on
the main objective mentioned for WISS. He also voices out a lot of ideas related to WISS.
One of the important ideas that he mentioned which is the intention to develop a system on
mobile phone is not really applicable. He argues that Malaysian people tend to resist on
changing from old- fashioned to high-fashioned lifestyle which is to use technology on the
phone. He also agrees that there is no specific portal is available for stroke patients to get
the information on stroke care. Regarding to the medium of Information delivery, he argues
that stroke patients are not main person who needs the information on stroke over the
Internet, whilst it is the caregiver who needs a lot more information regarding on the
Internet. This is because most of stroke patients who get into the rehabilitation at MIND has
no ability to talk, move their hands and even could not move. Therefore, they are not able to use the Internet. He also mentions that the stroke is the third main cause of death in Malaysia.

The second interview at NASAM last for two hours in centre itself. The interviewee works as a therapist there and she is also the coordinator for NASAM. When she knew that WISS is going to be developed, she agrees on some objectives and disagrees on some of the issues. Since she deals with the rehabilitation centre operation, she has her own view regarding to the development of WISS. However, she agrees on the medium of delivery used for WISS and has the same opinion with the first interview that the information on stroke is not suitable to be delivered using mobile phone.

5.2 QUESTIONNAIRE

This question is given out to 30 stroke caregivers and five stroke patients. This activity is conducted in NASAM, Petaling Jaya and also in the University Malaya. The limited number of respondents is because the purpose of having this questionnaire is only as part of the process to capture what users’ intent to have in the system, as well as to get some idea for interview questions.

5.3 INTERVIEW
This interview session involves three groups of people which are therapists, stroke caregivers and stroke patients. This activity is conducted in NASAM, Petaling Jaya and also in the University Malaya. The interview result is illustrated on the Appendixes.

The first interview is carried out with two people who work for NASAM as therapist and administrator. Most of the opinions they give are based on their rehabilitation centre. They explain how stroke patients get treatment at hospital compared to their rehabilitation centre. Basically, they mention that stroke patients come to the rehabilitation centre after they had their treatment at hospital or any medical centre. Most of stroke patients did not know about NASAM and they only heard of it from friends or surfing on the Internet.

NASAM also have their own website but they only provide basic information on stroke care. They do not provide any specific guideline how to take care of stroke patients either. Hence, they wish that WISS will be a place where all the specific information on stroke care in Malaysia will be featured on the website. They suggest materials related to the stroke care are made available on the website. They also request a CD can be produced, where they can show to stroke patients and assist them in rehabilitation care. This includes physiotherapy, occupational and speech therapy.

Finally, they propose a pamphlet is included on the website and it can be printed out directly from the website so that they can distribute it to the public. The pamphlet is contained with information on stoke care such as steps of exercise and so on.

The second interview is conducted with speech therapist who received her degree from London. She works independently with rehabilitation centre such as NASAM, Special Children Association and Damansara Specialist Hospital. In this second interview, the aimed is to get her opinion on stroke care from speech therapist’s perspective. In her
opinion, she describes speech therapy as a broad aspect where a year to study it is not enough. She suggests that this research should have specific module on speech therapy since stroke patients can be either in language disorder or dysphasia or other symptoms related to speech problems.

For her therapy program, she uses materials to teach stroke patients. Some of the materials that she used are photograph, picture, cards, and videos. She does not use any VCDs for her rehabilitation program, instead she uses mirror. The mirror helps stroke patients to see their own gesture when they speak. On the other hand, when asking her what are the materials or documents she used for her assessment, she admits that all of the process is not in any formality and she just memorized the assessments she have used on stroke patients.

According to her, other than focusing on specific speech therapy, she suggests that there is a need for a forum where she can see other stroke therapists online. This allows her to communicate with other stroke therapists online. The reason why she needs this because of most of the stroke therapists are working independently, so it is quite hard for her to see other therapists and exchange the information.

The third interview is conducted with stroke caregiver who takes care of his 65 years old mother for about three months. The interviewee is chosen because to access the views of stroke caregivers from his experience. The first question that has been asked to him is his opinion on using mobile phone as a medium of information delivery. He seems to view that the idea is not practical as phone used to communicate with others not as a platform to deliver information. What he wishes for is an educational guide and management guide for stroke. He suggests this based on his experience, when his mother had her first stroke attack, he didn’t have any idea at all what to do and just sent her mother
to the hospital. He also said that, doctors in the hospital do not brief or guide him anything on stroke or to suggest for rehabilitation center.

Therefore, he opts for information on the Internet and found a website from America Association. Although it is an informative website, it does not cater the need of Malaysian people. On the Internet also, he doesn’t manage to find any information on rehabilitation stroke. Upon hearing from his friends about NASAM, he directly sends his mother to do rehabilitation. Furthermore, he also mentions a lot of things that he does not know on stroke care management. He always refers to the Internet to see some available information. He wishes that he could get in touch with any stroke caregivers where he can share the story with them. He says that to help stroke patients in daily life, it involves a lot of efforts and emotional feeling. He hopes there is a site where a story of stroke survivor in Malaysia could share and such story can encourage him to gives full attention to his mother on stroke care.

The fourth interview is carried out with a stroke patient who survives 90% from stroke. She can be classified as stroke survivor and has fought with stroke for 5 years. In this interview session, she shares her story and journey how she survived from stroke. Some common problems that she had from stroke such as could not walk, talk or eat as normal as she was. She fights with emotions and has been very determined to do the rehabilitation.

However, for a woman like her who is quite rich, she has no problem to get a consultant or therapist to guide her always. She also has the some information where you can buy some stroke equipments for the house modification. The house modification is to help her to walk around and recover from stroke at home. She renovated her house, from
the kitchen until the bathroom and this is one of the reasons why she can recover quickly compared to the others.

She suggests on the WISS, there should have a list of directory where people can easily get the information on stroke recovery. She also says that people do not know how important is the house renovation to help stroke patients recover from stroke. Some samples of kitchen, bathroom or house renovation would be enough if this thing can be put available on the WISS. She also agrees that a support group is needed by stroke caregivers where they can share their feeling on taking care of stroke patients.

As a summary from the interview session, there are a lot of things that can be summarized in here and much information this research caters on. Some of the details provided by the interview are taken since they are the main users who need the information. Furthermore, stroke patients are not the person who is going to get the information on the Internet, but stroke caregivers, therapist and rehabilitation centers are the one who needs it.

5.4 FOCUS GROUP DISCUSSION

Focus group for WISS project involves two groups which are Mandarin group and English group. Mandarin group is a group of people who can only speak Mandarin which involves eight respondents of stroke patients. The translation process from Mandarin to English is done by one of the stroke caregivers who 80% survives from the stroke.
Meanwhile English group is group of people who can only speak English and it involves four respondents of stroke patients.

Three questions that have been asked which are:

1. When you had your first stroke attack?
2. What type of rehabilitation that you did here (NASAM)?
3. What type of information that you need at home?

There are different views that this project cater for questions asked above. Each group’s gives their own opinion based on the focus group conducted. The result is then analyzed and combined together to so that the type of information to be put on WISS is accessed.

All the results for the focus group activity are discussed below.

5.4.1 GROUP 1 (Cantonese Group)

This group consists of 10 persons and the average age for stroke patients are between 50-70 years old. They are unable to speak in English, thus, one translator is assigned help us translating the Cantonese language spoken to English. This translator is one of the stroke survivors who have partially recovered from stroke.

<table>
<thead>
<tr>
<th>Stroke Patient Characteristics</th>
<th>Stroke Condition</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age : 55</td>
<td>Early</td>
<td>2005</td>
<td>Physiotherapy</td>
<td>Schedule from NASAM</td>
</tr>
<tr>
<td>Gender : M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Gender</td>
<td>Job</td>
<td>Year</td>
<td>Field</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>-----</td>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td>63</td>
<td>F</td>
<td>U</td>
<td>2002</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>57</td>
<td>F</td>
<td>U</td>
<td>2004</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>56</td>
<td>F</td>
<td>U</td>
<td>2001</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>67</td>
<td>F</td>
<td>U</td>
<td>2005</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>52</td>
<td>F</td>
<td>U</td>
<td>2003</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>60</td>
<td>F</td>
<td>U</td>
<td>2004</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>54</td>
<td>F</td>
<td>U</td>
<td>2001</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>63</td>
<td>F</td>
<td>U</td>
<td>2003</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>58</td>
<td>F</td>
<td>U</td>
<td>2001</td>
<td>Physiotherapy</td>
</tr>
</tbody>
</table>

### 5.4.2 GROUP 2 (English Group)

This group is carried out with three patients and they were accompanied by stroke caregivers because of their impairments. Most of the answer is given by stroke caregivers.
Table 5.2: Details of focus group 2 output

<table>
<thead>
<tr>
<th>Stroke Patient Characteristics</th>
<th>Stroke Condition</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret</td>
<td>Early</td>
<td>2005</td>
<td>Physiotherapy</td>
<td>Give more support group to share each other feelings.</td>
</tr>
<tr>
<td>Age : Early 50</td>
<td>Gender : F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job : U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shirley</td>
<td>Middle</td>
<td>2004</td>
<td>Physiotherapy</td>
<td>Counseling session or us where we need to know on how to handle everything related to the stroke patient</td>
</tr>
<tr>
<td>Age : Early 60</td>
<td>Gender : F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job : U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age : Early 70</td>
<td>Final</td>
<td>2005</td>
<td>Physiotherapy, Occupational Speech</td>
<td>More information for caregivers to handle emotional feeling</td>
</tr>
<tr>
<td>Gender : M</td>
<td>Job : Doctor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks
*U: Unknown

The first group gives different opinion on stroke. The first group has three stroke patients accompanied by three stroke caregivers. Basically, the first group is consisted of stroke patients who had major stroke attack. The group discussion is ongoing as stroke caregivers share the information on their loved one. However, they could not answer the three questions above but they discuss on how hard they had to handle with the emotional feeling with stroke patients. They need some encouragement to deal with stroke patients. Most of the time when the focus group is conducted, they just share their feeling toward stroke patients.

The second group consists of eight mandarin speakers of stroke who have had their first stroke attack. Basically all eight stroke patients could not speak in English and they can only speak Mandarin. In this case, a translator who can understand both languages is assigned. This person also is a stroke caregiver assisted. Most of them are being accompanied by their caregivers, maid, son or daughter. The three question had been answered by them are shown in the Appendix. Most of them had the first attach and had
received physiotherapy from NASAM. They need a friend at home to accompany them all the time.

This focus group discussion also strengthens the point that stroke patients will not be the main person who needs the information. Instead, stroke caregivers are the person who handles everything and guides stroke patients.

5.5 NATURALISTIC OBSERVATION

In naturalistic observation, it is quite understandable since we can see daily activity of the target user to understand more on the stroke care. In stroke care, NASAM and MIND is chose to be a place for to conduct the observation process. The result of the observation is shown in the Appendix.

The result in the naturalistic observation prove that the stroke caregivers who needs to know a lot on the stroke care instead of stroke patients. The result shows that, they could not do something on their own. But, they need stroke caregivers to guide them to do some action. It proves the research when stroke patients are not the main target user for WISS.

Other than that, the result shows that all the therapy that they are conducted are not using a well known technology such as CD, video or any media method that will ease the therapist in doing their work. Sometimes, the caregivers lead the wrong way to stroke patients to do some action while they do not have any updated pamphlet provided by the rehabilitation centre.

5.6 CARD SORTING ACTIVITY
Card sorting activity is a knowledge-elicitation technique often used by information architects, interaction designers and usability professionals to establish or assess the navigation hierarchy of a Website. Card sorting is the activity where it involves a few people to select the card on what they really think that is necessary for them. The content of these card sorting comes from interview and the focus group that have been done before. The total of card that we created is 120 cards written the content of information that they required from the previous session.

The total of four respondents who are three respondents of stroke caregivers and one stroke patients did the card sorting activity. The background of respondents is considered when they did the card sorting which gave us different views of arranging the card. The hierarchy of the card and results of the card is shown in the Appendix.

The results of card sorting activity show that the first respondent just sorts the card according to what he understands. But it gives complete picture of stroke care. The second respondent who is Chinese lady understands the objectives of the card. She tries to sort according to what she wants WISS going to be. But some of the classified things such as video and images, she did not put all together. Meanwhile, the Malay guy who is stroke caregivers partially understand the words, sometimes he refereed to the card coordinator to see the meaning of the card since he did not understand English so much. One stroke patients who did the card sorting is a student from University of Malaya itself who comes from computer science background. She able to complete the card within the timeframe given and shows the logic on arranging the card.

In order to find the best match and potential card to apply in WISS, there are certain things to consider. To quickly derive easily-read, quantitative results from a card-sort activity, it can be done by entering data into a spreadsheet template that is adaptable to any
set of cards and categories provided. But this is only applicable if the card sorting respondent is more than 30. Since only four respondents involved in WISS for the card sorting activity, we considered certain things which are 1) respondent background, 2) logical, 3) similarity. The fourth respondent is the most suitable to be referred to in terms of those three criteria.

Some similarity from the cards sorted by the respondents are also taken into consideration.

Figure 5. shows the result of the web navigation structure used for card sorting activity. Others output and results of the card sorting is shown in the Appendix.

1. General Information on stroke

2. Emergency and education for patient
   i. Emergency
      o Helpline for emergency and questions regarding stroke
      o What MUST do daily
   ii. Therapy that the patient need
      o Getting support for post-stroke
      o Information on communication & swallowing
      o Marketplace for modification tools (budgets, where to get)
      o Finding supplies (bed)
      o Financial resources
      o Social welfare support
      o Stroke patients personal stories
   iii. Videos
      o Video on how to carry stroke patients
      o Video on how to help patient swallow food
      o Video on how to move patients from bed
      o Video on how to take care of patient’s shoulder
      o Video on how to turn patient around
      o Video on how to walk in a correct way

3. Life after stroke
   o Rehab and regaining independence
     ▪ Therapies
       ➢ New and alternative therapies
       ➢ What to expect in rehabilitation
       ➢ When to begin rehabilitation
       ➢ Chart from initial step to final step in rehabilitation
       ➢ Occupational therapy
       ➢ What programs of rehabilitation are available
       ➢ Highlighted activities (do and don’t do for stroke patients)
     ▪ Speech Therapy
     ▪ Step in speech therapy
     ▪ Therapy that the patient need (different types)
     ▪ Effect
       ➢ Warning signs of stroke
       ➢ Information on the fact that family history is a predictor of stroke
     ▢ Media statistics
     ▢ Media stroke news
     ▢ Stroke connection magazine
   o Preparation of home for patient
     ▪ What to prepare in the house
     ▪ Mobility aid application (e.g., people living in 4th floor of an apartment with no elevator
     ▪ Example picture of bathroom modification
Figure 5.1: Final results of card sorting activity

- How to avoid another stroke
  - Exercise and fitness
  - Diet plan
  - Improving patient care

4. Information from professional
   - Information on advice centre by professionals
   - Psychiatry/psychology information to handle stroke
   - Motivational talk by professional
   - Motivational talk by doctors
   - Motivational talk (by volunteer)

5. Connecting others
   - Common thread Pen-Pals
   - Patients feedback to therapists
   - Pediatric Stroke Resources (Links for family who experienced strokes)
   - Discussion board for speech therapy

6. Caregivers
   - Information on national organization for empowering caregivers
   - Educational information or caregivers
   - Discussion forum for caregivers
   - Caregivers’ personal stories
   - Handling emotion for caregivers
   - Support group for caregivers
   - Information on the caregiver’s marketplace
   - Caregiver’s health management
   - Information on national organization for empowering caregivers

7. Research findings

8. Program provided
   - Program organized for stroke patients & caregivers

9. Downloadable
   - Downloadable information on rehab centre (NASAM, MIND)
   - Downloadable information on daily activities at home
   - Downloadable information that they need at home
   - Downloadable information on schedule of diet plan

10. Contact
    - Links to government hospitals and rehab centers
    - List of Donor
    - Directory of nursing home
    - Directory of volunteers
    - Directory of doctors
    - Directory of care centre
5.6 LOW FIDELITY PROTOTYPING

Low fidelity prototyping is one that does not look very much like the final product since it normally use materials that are very different from the intended final version of the development. Low fidelity prototype is chosen since it is simple, cheap and quick to modify which they able to support the exploration of alternative design and ideas in many ways. The method chose for WISS in low fidelity prototyping is sketching.

Sketching is one way that developer can use to indicate the first design of the WISS. By using pencil, rubber and a piece of paper, sketching of the main page of the WISS is drawn. It has been refine by FIVE (5) times before it goes to the high fidelity prototyping in interface evaluation for evaluation purposes. Figure shows the sample of sketching of main page of WISS.

Figure 5.2 : Sample of Low fidelity Prototyping
5.8 REQUIREMENTS IDENTIFICATION

From the activities of UCD approach have been conducted earlier, a set of requirements are identified. The output of the activities conducted which are from interview, questionnaire, focus group and card sorting activities report as well as low fidelity prototyping are combined to picture the set of requirements for WISS. Basically the set of requirements identified here is the navigation structure of WISS. A hierarchy of web navigation structure in main page is presented for the first prototype that will be design for WISS.

Other functional requirements gather from the data gathering analysis are the user who is involved with the system. From the analysis conducted, different types of user require different type of information. For example, rehabilitation centre require a CD and pamphlet for them to download and print to distribute it to the user. They also require different languages will be used to develop the system. Apart from that, speech therapists require a communication medium inside the WISS. They need to know about other therapist and connect with them. This provides the idea on creating a discussion board as a platform for the therapist to discuss among them.

Stroke caregivers also need a forum where they can share their experiences on taking care of stroke patients with others caregivers. Stroke caregivers sometimes can be really depressed to take good care of stroke patients. They need someone who is in the same shoes to inspire them.

Besides, a platform to deliver the information is determined where they insist not to use PDA or mobile phone as a place for them to get the information on stroke for some certain reason such as expensive and is not applicable for them.
From the data gathering and analysis, what are the most important thing that they could not find any information system that provides information on stroke care are available at one portal in Malaysia. They wished that Malaysia could have one portal to provide the information on stroke since most of the resources that they acquire is from international.

All the information gathered from data gathering and analyses are summarized as the set of requirements as general below:

- Medium of delivery use is the website
- Language use in Multilanguage
- Provide the video and pamphlet for stroke rehabilitation centre
- Discussion board or forum for stroke caregivers and therapist
- A target users who will become the primary user of WISS
- A detail step by step guideline on stroke care
- Key points for the stroke caregivers as keynote to act fast after stroke strikes to stroke patients
- A guideline for stroke caregivers
- A list of directory of stroke rehabilitation centre, hospital, therapist and doctors
- An advice from doctors to stroke patients
- A list of successful story from stroke survivors as motivation to stroke patients
- A navigation structure from the various user as the contents need to be fill in

All the set of requirements discussed above will become the input on the design phase for the next chapter,
5.9 OVERALL SUMMARY OF THE CHAPTER

This chapter summarizes the results of the seven steps discussed in Chapter 4 in order to conduct the research methodology. It gives the details and output results of the research methodology identified in Chapter 4. Each of the steps is summarized and describes in details. Finally a set of requirement identification is given as a summarize output from this chapter.

CHAPTER 6

SYSTEM DESIGN

6.0 INTRODUCTION

System requirements and design is a process that refines project goals into defined and detailed functions and operations by analyzing the current system. The analysis task will be focused on behaviors of the current system.

In this chapter, functional and non-functional requirements, system requirements and application used will be discussed. Functional and non-functional requirements are those requirements that will be included in the project. System requirements will be the system specification that is required to execute the project. System architecture designed
for WISS is designed. UML diagram such as use case, sequence and class diagram is designed regarding to the functional requirements that have been identified. Software that has been involved in system development will be discussed in this chapter also.

### 6.1 GENERAL ASSUMPTION

Based on the research conducted, general assumption has been made which are:

- The targeted user can write in English since the web-based developed is for universal access and use for all
- The information on the web will be used for stroke awareness and stroke care
- The system availability is 24/7 which is available wherever and whenever user needs to access the site
- User know the function included in the web
- User know that they can communicate with other user through out the forum website
- The user must have the internet connection with supported browser and flash player to run the video and view the content on the web

### 6.2 SCOPE OF THE PRODUCT

WISS should be designed for users of stroke patients whoever have a direct or indirect contact with them such as doctors, therapist, stroke caregivers and person in
charge for rehabilitation centre. The foundation of WISS to make sure the stroke patients gets the best information which will be guided by their guardian. Moreover, data consistency is also guaranteed, whereby the user did not have to frequently go to the professional or specialist to have all the information regarding stroke care on their hand. This idea gives the advantages when there are an emergency situation is going on. Besides, WISS should be able to deal with various characteristics of the user in any way. Furthermore, the information will always be updated and user will receive the latest information on their hand. By implementing UCD methodology, it shows how importance to involve user from beginning until final state of the design. It also gives the user the “look and feel” design at the end of the system delivery.

Another important features, WISS has been evaluated by different types of user which resulted that it its meets users expectation, goal and standards. WISS implemented UCD techniques where it shows the advantages of combining all the techniques of UCD methodology.

In order to guarantee user privacy and maximize the ability of user to communicate online, WISS provide security through access authentication for user who enter the discussion board section. The access authentication mechanism should require a valid personal password that is associated with a username for each user to access the data and personal measures. The discussion board allow the user to send message, view message, post topics and manage their profile in there. On the other hands, they also can share their stories regarding on the recovery of the stroke since most of the stroke patient are unable to get involve with the outside world.

To guarantee consistency, accuracy, reliability, and minimization of workload
and time, the system will be updated from time to time for the user to get the latest information regarding stroke care.

Many users favor an automated system that can provide analysis or statistical report at their fingertips rather than having to search and go to the rehabilitation centre to get the advice from doctors. Thus, besides having the text-only version, WISS also provide user with the videos where they user needs to install the flash player when they need to watch or download videos showing the important steps on rehabilitation. Besides that, user able to download the pamphlet in pdf format and print it out anytime they need it.

<table>
<thead>
<tr>
<th>Module ID</th>
<th>Module Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISS_1</td>
<td>Registration</td>
</tr>
<tr>
<td>WISS_2</td>
<td>Authentication</td>
</tr>
<tr>
<td>WISS_3</td>
<td>Content</td>
</tr>
<tr>
<td>WISS_4</td>
<td>Discussion Board</td>
</tr>
<tr>
<td>WISS_5</td>
<td>Media</td>
</tr>
<tr>
<td>WISS_6</td>
<td>User</td>
</tr>
</tbody>
</table>

### 6.3 FUNCTIONAL REQUIREMENTS

Functional requirements capture the intended behavior of the system. Based on the list of modules shown in Table 6.1, each module will be investigated to capture the system requirement, while Figure 6.1 shows the package diagram which consist of modules that
the WISS should have. Since the task associated with a new system is a complex one, this analysis is aimed at building the use case model for each of the module listed. The functional requirements will use a top down approach where the sign-up module will be analyzed first.

![Package diagram of WISS](image)

**Figure 6.1: Package diagram of WISS**

### 6.3.1 Registration Module

A user should sign-up as a user first before he or she can enter the discussion board. The registration process is important to ensure that the user of the system is uniquely
named and also to provide each user and administrator with a valid username associated with the password. The username entered by the user should be verified first by the system to avoid duplication value in the database. Figure 6.2 illustrates the use case diagram for the registration module while Table 6.2 gives the description in relation to the use case.

![Figure 6.2: Use Case Diagram for the Registration Module](image)

Based-on the use case diagram and its description, the following requirements are derived as shown in Table 6.2:

**Table 6.2: Requirements Description for the Registration Module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a registration form to allow user to sign-up.</td>
<td>WISS-Mod01-01</td>
</tr>
<tr>
<td>2.</td>
<td>Each registration form of the WISS shall consist of a username, password, password confirmation, name and e-mail fields.</td>
<td>WISS-Mod01-02</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall ensure the username stored is uniquely named.</td>
<td>WISS-Mod01-03</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall ensure that the password and password confirmation value must be the same before it can proceed and</td>
<td>WISS-Mod01-04</td>
</tr>
</tbody>
</table>
store the information into the database.

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>WISS shall verify the data prior to storing the data in the database by triggering an alert to the user if the value is impossible, in invalid format or blank.</td>
</tr>
</tbody>
</table>
| Register personal information | **Actor:**  
User  
**Goal:**  
Sign-up as a user of the system  
**Pre-condition:**  
User has yet to register  
**Success post-condition:**  
The user signs-up as a user of the system successfully, and each user is granted with the username associated with its password and personal information which has been stored in the database.  
**Failure post-condition:**  
The user fails to sign-up as a user of the system and none of personal information including username and password is stored by the system.  
**Main Success Scenario:**  
1. The user clicks the ‘Sign-up Here’ hyperlink, and the Sign-up Page displayed by the system.  
2. The user inserts an input that consists of the name, e-mail, username, password and password confirmation, and then presses the ‘Register Now’ button.  
3. As each input is successfully entered, the information is stored by the system. A message will show that the account is successfully created and the engineer is able to login the system by entering the username and password.  

**Extensions:**  
2a. Data input is cancelled. Sign-up process does not succeed.  
2b. If the user leaves blank any of the input fields, an alert is triggered and the sign-up process is abandoned.  
2c. If the user fills in the incorrect e-mail format, an alert is triggered and the sign-up process is abandoned.  
2d. If the user fills in unmatched between ‘Password’ and ‘Password Confirmation’ fields, an alert is triggered and the sign-up process is abandoned.  
2e. If the user fills in the username which has been used by other user, an alert is triggered and the sign-up process is abandoned. |

*Table 6.3: The Use Case Description for the Registration Module*
6.3.2 Authentication Module

Authentication module addresses the login and logout functions as well as authenticates the accesses and requests made by computer clients’ computer. In view of the fact that the registered user is unique, there is no way of more than one user can share one username. All the requests made by the user should be verified first to ensure that they are the authorized user. Moreover, the tool should block the “direct access”. Direct access is where the user directly types the URLs address without going through the hyperlink or button provided by the system. Figure 6.3 illustrates the use case diagram for the authentication module while Table 6.3 gives the description in relation to the use case.

![Use Case Diagram for the Authentication Module](image)

**Figure 6.3: Use Case Diagram for the Authentication Module**

Seven requirements must be fulfilled to implement the Authentication module, as described in Table 6.4 below:

**Table 6.4: Requirement Description for Authentication Module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a login interface form that consists of the username and password fields.</td>
<td>WISS-Mod02-01</td>
</tr>
</tbody>
</table>
2. Both inputs shall be verified first by the system in order to authenticate the user before entering the system. WISS-Mod02-02

3. WISS shall ensure that there is no way of more than one user sharing one username. WISS-Mod02-03

4. WISS shall destroy the current session of the operation and switch to the latest one if there is more than one session of the operation using the same username. WISS-Mod02-04

5. WISS shall provide a logout function to enable the user to close his or her operation. WISS-Mod02-05

Table 6.5: The Use Case Description for the Authentication Module

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
</table>
| Login    | **Actor**: User  
Goal: An authorized user log-in into the system  
*Pre-condition*: The prior session has been destroyed  
*Success post-condition*: An authorized user successfully enters into the system with a valid username and password entered.  
*Failure post-condition*: An authorized user fails to enter the system  
**Main Success Scenario**:  
1. The user enters a valid username associated with a password in the Login Page.  
2. When the user finishes the entry, he or she clicks ‘Login’ button.  
3. The system checks with database of the username and password entered.  
4. As both fields are verified and valid, the user successfully enters the system.  
**Extensions**:  
2a. If both of the inputs are invalid, system rejects and login |
### Process does not succeed.

| Logout | **Actor**: User  
| **Goal**: An authorized user logout from the system  
| **Pre-condition**: An authorized user already login into the system  
| **Success post-condition**: An authorized user successfully logout and quit from the system  
| **Failure post-condition**: An authorized user fails to quit from the system  
| **Main Success Scenario**:  
| 1. The user clicks ‘Logout’ hyperlink  
| 2. The system destroys the current session and redirects the user to the login page  
| 3. The user successfully quits from the system  
| **Extensions**: User can go back to the main page of WISS |

### 6.3.3 Content Module

Content module is meant for the administrator to tackle the process of managing the content. This module allow administrator to manage the entire content for the WISS. This module refers to the activity and process conducted by administrator to edit and managing the entire content. Administrator able to modify and update the content included in the WISS.

**Figure 6.4** illustrates the use case diagram for the process module while **Table 6.4** gives the description in relation to the use case.
Figure 6.4: Use Case Diagram for the Content Module

Table 6.6: Requirement Description for Authentication Module

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface on the list of content that administrator can modify or edit.</td>
<td>WISS-Mod03-01</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall allow the administrator to create new list of the content</td>
<td>WISS-Mod03-02</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall allow the administrator to view the details of selected content to be edited.</td>
<td>WISS-Mod03-03</td>
</tr>
</tbody>
</table>
4. WISS shall allow the administrator to update an existing content definition from the list. | WISS-Mod03-04

5. WISS shall allow the administrator to rename the menu for each of the content | WISS-Mod03-05

6. WISS shall allow the user to read and view content | WISS-Mod03-06

7. WISS shall allow the user to print the content | WISS-Mod03-07

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
</table>
| View Content List | **Actor**: Administrator  
**Goal**: View content list  
**Pre-condition**: An authorized user login into the system and already have the account  
**Success post-condition**: The user successfully view content list that have been created  
**Failure post-condition**: The user fails to view content list that have been created  
**Main Success Scenario**:  
1. The user clicks ‘Open Content’ hyperlink.  
2. List of the project created by the user is displayed by the system.  
**Extensions**: None |

| Select Content | **Actor**: Administrator  
**Goal**: Select Content  
**Pre-condition**: An authorized user already created the content for the WISS  
**Success post-condition**: The user successfully view content details that have been created  
**Failure post-condition**: The user fails to view project details that have been created  
**Main Success Scenario**:  
1. The user clicks ‘Edit’ hyperlink at the list of content entry |
<table>
<thead>
<tr>
<th>Action</th>
<th>Actor</th>
<th>Goal</th>
<th>Pre-condition</th>
<th>Success post-condition</th>
<th>Failure post-condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete Content</td>
<td>Administrator</td>
<td>Delete existing WISS content</td>
<td>An authorized user already created the content for the WISS</td>
<td>The user successfully delete his or her own WISS content</td>
<td>Deleting WISS content does not succeed</td>
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<tr>
<td>Create new content</td>
<td>Engineer</td>
<td>Enter ‘Create New Project’ page</td>
<td>An authorized user already login into the system</td>
<td>The user successfully enters ‘Create New Project’ page</td>
<td>The user fails to enter ‘Create New Project’ Page</td>
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<tr>
<td>Update content details</td>
<td>Administrator</td>
<td>Update the content details of the selected content</td>
<td>An authorized user already login into the system and the ‘New Project’ form already displayed by the system</td>
<td>The user successfully enter the details of updated content</td>
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<tr>
<td>Read Content</td>
<td>Actor: User</td>
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<tr>
<td>Goal: Read Content</td>
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<tr>
<td>Pre-condition: An authorized user can enter the website</td>
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<tr>
<td>Success post-condition: The user successfully read the contents</td>
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<tr>
<td>Failure post-condition: The user fails to view read the contents</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Main Success Scenario: 3. The user clicks any hyperlink. 4. List of the content 5. Extensions: None</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Print Content</th>
<th>Actor: User</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal: Print selected Content</td>
<td></td>
</tr>
<tr>
<td>Pre-condition: An authorized user can view the content</td>
<td></td>
</tr>
<tr>
<td>Success post-condition: The user successfully can print the content</td>
<td></td>
</tr>
<tr>
<td>Failure post-condition: The user fails to print the contents</td>
<td></td>
</tr>
<tr>
<td>Main Success Scenario: 1. The user clicks on print menu 2. User have the printout version of content</td>
<td></td>
</tr>
<tr>
<td>Extensions: None</td>
<td></td>
</tr>
</tbody>
</table>
6.3.4 Discussion Board Module

Discussion Board module is a place where user can share their information using online communication. An online discussion area, often focused on a certain topic, to which user can freely send their own messages using the form in the discussion board. Discussion boards usually feature an archive from which you can search for subjects on user want using search words. It also allow user to view the current topic posted by another user and also allow user to post their own topic.

Figure 6.5 illustrates the use case diagram for the process module and Table 6.5 gives the description in relation to the use case.

![Use Case Diagram for the Discussion Board Module](image)

Figure 6.5: Use Case Diagram for the Discussion Board Module
Table 6.8: Requirement Description for the Discussion Board Module

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface where user can open messages that they received.</td>
<td>WISS-Mod04-01</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall allow user to post message to any intended user.</td>
<td>WISS-Mod04-02</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall allow user to view the current topic posted by another user</td>
<td>WISS-Mod04-03</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall allow the administrator to post the comment regarding to the topic selected</td>
<td>WISS-Mod04-04</td>
</tr>
<tr>
<td>5.</td>
<td>WISS shall allow the user to add new topic</td>
<td>WISS-Mod04-05</td>
</tr>
<tr>
<td>6.</td>
<td>WISS shall allow the user to delete the message received</td>
<td>WISS-Mod04-06</td>
</tr>
</tbody>
</table>

Table 6.9: The Use Case Description for the Discussion Board Module

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
</table>
| View Message List      | **Actor**: Administrator or User  
                        | **Goal**: View Message list  
                        | **Pre-condition**: An authorized user login into the system and already have the account  
                        | **Success post-condition**: The user successfully view messages in their profile  
                        | **Failure post-condition**: The user fails to view message list in their profile  
                        | **Main Success Scenario:**  
                        | 1. The user clicks ‘Inbox’ hyperlink.  
                        | 2. List of the Messages in user profile is displayed by the system.  
                        | **Extensions**: None                                                                                                                                 |
| Open Message           | **Actor**: User  
<pre><code>                    | **Goal**:                                                                                                                                                                                                     |
</code></pre>
<table>
<thead>
<tr>
<th>User case</th>
<th>Actor</th>
<th>Goal</th>
<th>Pre-condition</th>
<th>Success post-condition</th>
<th>Failure post-condition</th>
<th>Main Success Scenario</th>
<th>Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open message received</td>
<td>User</td>
<td>View Topic</td>
<td>An authorized user already open the message in their inbox</td>
<td>The user successfully open message details that have been created</td>
<td>The user fails to open messages that have been received</td>
<td>3. The user clicks the message hyperlink at the list of project entry that he or she wants to view 4. The message popped-up by the system and the system displays the message details</td>
<td>None</td>
</tr>
<tr>
<td>View Topic</td>
<td>User</td>
<td>View Topic</td>
<td>An authorized user already posted the topic</td>
<td>The user successfully view topic details that have been created</td>
<td>The user fails to view topic details that have been created</td>
<td>5. The user clicks on topic hyperlink at the list of project entry that he or she wants to view 6. The topic details popped-up by the system and the system displays the topic details</td>
<td>None</td>
</tr>
<tr>
<td>Post Topic</td>
<td>User</td>
<td>User post new topic for the discussion board</td>
<td>An authorized user already created the topic</td>
<td>The user successfully post the topic on the discussion board</td>
<td>Post topic did not succeed</td>
<td>4. The user clicks ‘Post Topic’ hyperlink at the discussion board 5. The system updated the new posted topic 6. List of updated discussion board topic by the system.</td>
<td>None</td>
</tr>
</tbody>
</table>
### Post Message

**Actor**: User  
**Goal**: User post new topic for the discussion board  
**Pre-condition**: An authorized user already created the message  
**Success post-condition**: The user successfully post the message to the intended recipients  
**Failure post-condition**: Post message did not succeed  
**Main Success Scenario**:  
1. The user clicks ‘New Message’ hyperlink at their message box  
2. The enter the message to the intended recipients  
3. A message pop-up said “Message Sent” is displayed.  
**Extensions**: None

### Post Comment

**Actor**: User  
**Goal**: User post new comment for the topic posted on for the discussion board  
**Pre-condition**: An authorized user already created the comment  
**Success post-condition**: The user successfully post the comment on the selected topic of the discussion board  
**Failure post-condition**: Post comment did not succeed  
**Main Success Scenario**:  
1. The user clicks ‘Topic’ hyperlink at the discussion board  
2. The user enter comments for the discussion board  
3. The system updated the posted comment  
4. List of updated comment posted by an authorized user is displayed  
**Extensions**: None

### 6.3.5 Media Module

Media Module focusing on any media file uploaded on the WISS. This include text file which in .pdf format and also video file. The pamphlet which in .pdf format allow user to download and save it which then can be opened by acrobat reader. The user have the
option either want to print the file or not in brochure format. The video is available in the .wma format where user needs to have adobe flash player installed to play it online. Otherwise, user can download the video and save the video in .wma format and play it using any-plug ins.

![Figure 6.6: Use Case Diagram for the Media Module](image)

**Table 6.10: Requirements Description for the Media Module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface where user can see the list of the videos available</td>
<td>WISS-Mod05-01</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall allow user to play the video</td>
<td>WISS-Mod05-02</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall allow user to download the video and save it into</td>
<td>WISS-Mod05-03</td>
</tr>
</tbody>
</table>
the user’s own directory

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>WISS shall provide a user interface where user can see the list of the pamphlet available</td>
</tr>
<tr>
<td>5</td>
<td>WISS shall allow user to open the pamphlet from the list</td>
</tr>
<tr>
<td>6</td>
<td>WISS shall allow user to download the pamphlet in brochure format and save it into the user’s own directory</td>
</tr>
<tr>
<td>7</td>
<td>WISS shall allow the administrator to upload the video</td>
</tr>
<tr>
<td>8</td>
<td>WISS shall allow the administrator to delete the video</td>
</tr>
</tbody>
</table>

Table 6.11: The Use Case Description for the Media Module

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
</table>
| Open List of video        | **Actor:** User  
 Goal: Open list of video  
 **Pre-condition:** The user successfully already view the list of Video  
 **Success post-condition:** The user successfully view list of video  
 **Failure post-condition:** The user fails to view the video list  
 **Main Success Scenario:**  
 1. The user clicks on the video link  
 2. List of the video uploaded in the WISS  
 **Extensions:** None |
| Open list of pamphlet     | **Actor:** User  
 Goal: Open list of pamphlet  
 **Pre-condition:** The user successfully already view the list of pamphlet  
 **Success post-condition:** The user successfully view list of pamphlet  
 **Failure post-condition:** |
The user fails to view the pamphlet list

**Main Success Scenario:**
1. The user clicks on the brochure link
2. List of the pamphlet uploaded in the WISS

**Extensions:**
None

| Play Video | **Actor:** User  
**Goal:** Play Video from the list  
**Pre-condition:** User experience on play the video  
**Success post-condition:** The user successfully play the video  
**Failure post-condition:** Play video does not succeed |
|---|---|
| **Main Success Scenario:**  
1. The user clicks “Play” icon on the playlist  
2. The system can play the video to the user  
**Extensions:** None |

| Download Video | **Actor:** User  
**Goal:** Download video to the targeted directory  
**Pre-condition:** The user have already download the file  
**Success post-condition:** The user successfully download the file to the targeted directory  
**Failure post-condition:** Download video does not succeed |
|---|---|
| **Main Success Scenario:**  
1. The user click on the video hyperlink  
2. The system display a pop-up menu to ask on the directory file to be saved into  
3. The completed status of downloading file is displayed/ 
**Extensions:** None |

| Open pamphlet | **Actor:** User  
**Goal:** Open pamphlet  
**Pre-condition:** The user click on the pamphlet  
**Success post-condition:** The user successfully open the pamphlet  
**Failure post-condition:** Open pamphlet does not succeed |
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Main Success Scenario:</th>
<th>Extensions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Success Scenario</td>
<td>1. The user click on the selected pamphlet to opened</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2. The system display a pamphlet to the user</td>
<td></td>
</tr>
<tr>
<td>Play Video</td>
<td><strong>Actor</strong>: User</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Goal</strong>: Play Video from the list</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Pre-condition</strong>:</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td>User experience on play the video</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Success post-condition</strong>: The user successfully play the video</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Failure post-condition</strong>: Play video does not succeed</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td>Upload Video</td>
<td><strong>Actor</strong>: Administrator</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Goal</strong>: To upload the video to the WISS</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Pre-condition</strong>:</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td>An authorized user already login into the system for admin</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Success post-condition</strong>: The user successfully uploaded the video to the WISS</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Failure post-condition</strong>: The user fails to upload the video on the system</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td>Delete Video</td>
<td><strong>Actor</strong>: Administrator</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Goal</strong>: Delete existing WISS content</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Pre-condition</strong>:</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td>An authorized user already created the video</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Success post-condition</strong>: The user successfully delete video</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Failure post-condition</strong>: Deleting video does not succeed</td>
<td><strong>Actor</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>Main Success Scenario:</strong></td>
<td><strong>Actor</strong>:</td>
</tr>
</tbody>
</table>
1. The user clicks ‘Delete’ hyperlink at the list of project that he or she wants to delete
2. The system delete that video from the database
3. List of updated video displayed by the system.

Extensions:
None

6.5 ADDITIONAL FUNCTIONAL REQUIREMENTS

The following modules are additional requirements that are not elicited in the use case analysis, but must be incorporated in order that the proper operation of WISS.NET is fulfilled.

6.5.1 Online Help

For each of WISS components module as well as system component, WISS shall provide an online help which can be accessed at anytime by pressing the “Help” button. The online help shall describe the purpose of the WISS and the system component, as well as the guidance on how to fill in the fields.

6.5 PLATFORM AND BROWSER REQUIREMENTS

WISS shall be platform-independent as well as compatible with the most recent browser as illustrated in Table 6.12:
Table 6.12: Platform and Browser Requirements

<table>
<thead>
<tr>
<th>Platform</th>
<th>Browser Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>WINDOWS Based</td>
<td>1. Internet Explorer 5.X or higher</td>
</tr>
<tr>
<td></td>
<td>2. Netscape 7.X or higher</td>
</tr>
<tr>
<td></td>
<td>3. Opera 7.23</td>
</tr>
<tr>
<td></td>
<td>4. Mozilla Firefox 0.9.X</td>
</tr>
<tr>
<td>MacOS Based</td>
<td>1. Internet Explorer 5.2.3</td>
</tr>
<tr>
<td></td>
<td>2. Netscape 7.1</td>
</tr>
<tr>
<td>UNIX Based</td>
<td>1. Netscape 7.X or higher</td>
</tr>
</tbody>
</table>

6.6 CLASS DIAGRAM

Class diagram represents a set of classes, interfaces, and collaborations and such relationships as dependency, generalization, and association. It is used to model the static design view of a system which primarily supports the functional requirements of a system (Booch, Rumbaugh, Jacobson, 1999). However, detail information on the interfaces, attributes and methods for each class will be included in low level design instead. Therefore, class diagram in high level design will only contains the class diagram and their relationships. Figure 6-19 depicts the class diagram of high level design. A class diagram is used to describe the static view of WISS with the respect to the schema and the relationships among classes.
**6.7 SEQUENCE DIAGRAM**

Sequence diagram shows an interaction between objects arranged in a time sequence. It can be drawn at different levels of detail and to meet different purposes at several stages in the development life cycle (Bennet, McRobb, Farmer, 2002). The detail interaction that occurs for one use case or one operation is represented by this diagram. Following are the sequence diagrams that describe the interactions that happen for all primary use cases.

![Class diagram for WISS](image)
Figure 6.8: Sequence diagram Update Content - Administrator

Figure 6.9: Sequence diagram for Post Message - User
6.8 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirement is the requirement that specify the criteria that can be used to evaluate the functions of the system. NFR presents a systematic and pragmatic approach to `building quality into' software systems. NFR defines overall quality and attributes o resulting system. place restrictions on the product being developed, the development process, and specify external constraints that the product must meet. NFRs may be classified n terms of qualities that a software must exhibit (Boehm). For WISS, stakeholder is becoming one of the concerns for determining the NFR.
6.8.1 Usability

The most important non-functional requirements defined for system developed. Usability requirements concern with specifying the user interface and end-user interactions with the system. Since the system developed is based on the HCI approach, the usability requirements is identified effectively form a contract that the HCI design of the system must meet. For WISS, user acceptance test is conducted to measure usability applied in the system developed. Usability for WISS is measured from the interface design aspects of the system. WISS developed for different level of user, because of that the system should be able to be used by them. Well structured user manuals, informative error messages, help facilities and consistent interfaces enhance usability Measurable attributes of usability requirements include:

- *Entry requirements* Measured in terms of years of experience with class of applications or simply age
- *Learning requirements* Denotes the time needed to learn the facilities of the system. This could be measured in terms of speed of learning, say hours of training required before independent use is possible
- *Handling requirements* Denotes the error rate of the end-users of the system. This could be measured in terms of the errors made when working at normal speed
- *Likeability* Denotes ‘niceness’ to use. The most direct to measure user satisfaction is to survey actual users and record the proportion who ‘like to work with the product’
6.8.2 Performance

One of the WISS criteria must be able to exhibit in software quality attribute of the performance. Performance here refers to the constrain of the speed for operation of a system. For WISS, video, content, pamphlet and image lading is the criteria to be measure in terms of performance. Table below shows the time measurement in terms of response, throughput and timing requirements. It also depends on the speed of connection used by user.

6.8.3 Portability

WISS portal is a web-based application, and thus it can run on different computer platform as Windows XP(Professional and Home Edition), Windows 2000 Professional, Linux, Unix and Macintosh. Thus, WISS should be able to run on different platform as long as the internet connection is established.

6.8.4 Accuracy

The objective of developing WISS is to deliver correct information to the identified user. Each of the content deliver in WISS should be accurate for user to be followed. In determining the accuracy o the requirements, the consultant should be hired to ensure that the correct information is given out for the user. For example, in diet food section is the
guidance for the stroke therapist or stroke patient to follow what they should took every day. If incorrect information is given out to the user, the results might no be good.

6.9 SYSTEM REQUIREMENT

Table 6.13: Software Requirements

<table>
<thead>
<tr>
<th>Software</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>Windows XP Professional and above</td>
</tr>
<tr>
<td>Database</td>
<td>MySQL</td>
</tr>
<tr>
<td>Web Browser</td>
<td>Internet Explorer 6.0 or above, Mozilla Firefox</td>
</tr>
</tbody>
</table>

Table 6.14: Hardware Requirements

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Intel® Pentium® 4 Processor with Hyper-Threading Technology or higher</td>
</tr>
<tr>
<td>Memory</td>
<td>512 MB RAM or higher</td>
</tr>
<tr>
<td>Disk Space</td>
<td>1 GB or higher</td>
</tr>
<tr>
<td>Monitor</td>
<td>800x600 or higher resolution; 256 colours or above</td>
</tr>
<tr>
<td>Network Card</td>
<td>1 unit</td>
</tr>
<tr>
<td>Drive</td>
<td>16x CD-ROM</td>
</tr>
<tr>
<td>Input Device</td>
<td>Keyboard and mouse</td>
</tr>
</tbody>
</table>

6.10 APPLICATION TOOLS
Several commercial products were used to support the certain activities during project development. These tools are described in the following table.

Table 6.15: Application Tools

<table>
<thead>
<tr>
<th>No</th>
<th>Software Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Microsoft Word 2003</td>
<td>It is used as a tool to read, write and manage the project documentation.</td>
</tr>
<tr>
<td>2</td>
<td>Microsoft Excel 2003</td>
<td>It is used as a tool to support the reporting tasks.</td>
</tr>
<tr>
<td>3</td>
<td>Microsoft Visio Professional 2003</td>
<td>It is used as a tool to design the process flow diagrams used in the project documentation.</td>
</tr>
<tr>
<td>4</td>
<td>Macromedia Dreamweaver</td>
<td>Tools for developed the system</td>
</tr>
<tr>
<td>5</td>
<td>Acrobat Reader</td>
<td>It is used to read and view document in PDF format.</td>
</tr>
<tr>
<td>6</td>
<td>Ultra Edit</td>
<td>Is used to view and edit text file format document</td>
</tr>
<tr>
<td>7</td>
<td>MySQL</td>
<td>It is a tool used to store and manage the database file.</td>
</tr>
</tbody>
</table>

6.12 DATABASE DESIGN

A database management system consists of collection of interrelated data and a collection of programs to access the data McHugh and Widem (1995). The database system enables efficient way to store, search, sort and retrieval of data. MySQL is chosen as a database to store data in WISS.

Table 6.16: Administration Table
<table>
<thead>
<tr>
<th>Entity</th>
<th>Field</th>
<th>Data Type (length)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>Admin_id</td>
<td>Tinyint(2)</td>
<td>Number that identifies the administrator of WISS</td>
</tr>
<tr>
<td></td>
<td>Admin_name</td>
<td>Char(20)</td>
<td>Administration’s name</td>
</tr>
<tr>
<td></td>
<td>Admin_username</td>
<td>Varchar(10)</td>
<td>Administration’s username</td>
</tr>
<tr>
<td></td>
<td>Admin_password</td>
<td>Varchar(10)</td>
<td>Administration’s password</td>
</tr>
<tr>
<td></td>
<td>Admin_access</td>
<td>Char(2)</td>
<td>Access rights of an administrator</td>
</tr>
</tbody>
</table>

Table 6.17: Registration Table

<table>
<thead>
<tr>
<th>Entity</th>
<th>Field</th>
<th>Data Type (length)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>User_id</td>
<td>Tinyint(2)</td>
<td>Number that identifies user number of WISS</td>
</tr>
<tr>
<td></td>
<td>User_name</td>
<td>Char(50)</td>
<td>User’s name</td>
</tr>
<tr>
<td></td>
<td>User_role</td>
<td>Varchar(10)</td>
<td>User’s role in stroke</td>
</tr>
<tr>
<td></td>
<td>User_access</td>
<td>Varchar(10)</td>
<td>Access right of user</td>
</tr>
<tr>
<td></td>
<td>User_age</td>
<td>Char(2)</td>
<td>User’s age</td>
</tr>
<tr>
<td>Class</td>
<td>Entity</td>
<td>Field</td>
<td>Data Type (length)</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Information</td>
<td>Articles</td>
<td>Fdate</td>
<td>int(11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Title</td>
<td>text</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Detail</td>
<td>text</td>
</tr>
<tr>
<td>Activities</td>
<td>Fdate</td>
<td>int(11)</td>
<td>Date for editing content</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>text</td>
<td>Editing title of the content</td>
</tr>
<tr>
<td></td>
<td>Detail</td>
<td>text</td>
<td>Detail of editing Content</td>
</tr>
<tr>
<td>Caregivers</td>
<td>Fdate</td>
<td>int(11)</td>
<td>Date for editing content</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>text</td>
<td>Editing title of the content</td>
</tr>
<tr>
<td></td>
<td>Detail</td>
<td>text</td>
<td>Detail of editing Content</td>
</tr>
<tr>
<td>Contact</td>
<td>Fdate</td>
<td>int(11)</td>
<td>Date for editing content</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>text</td>
<td>Editing title of the content</td>
</tr>
<tr>
<td></td>
<td>Detail</td>
<td>text</td>
<td>Detail of editing Content</td>
</tr>
<tr>
<td>Entity</td>
<td>Field</td>
<td>Data Type (length)</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>--------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Discus Board</td>
<td>module_id</td>
<td>Tinyint(2)</td>
<td>Number that identifies user number of WISS</td>
</tr>
<tr>
<td></td>
<td>module_enabled</td>
<td>Char(20)</td>
<td>User’s name</td>
</tr>
<tr>
<td></td>
<td>module_display</td>
<td>Varchar(10)</td>
<td>User’s role in stroke</td>
</tr>
<tr>
<td></td>
<td>Module_basename</td>
<td>Varchar(10)</td>
<td>Access right of user</td>
</tr>
<tr>
<td></td>
<td>module_class</td>
<td>Char(2)</td>
<td>User’s age</td>
</tr>
<tr>
<td></td>
<td>parent_id</td>
<td>Varchar(10)</td>
<td>User’s address</td>
</tr>
</tbody>
</table>

Table 6.19: Discussion Board Table
<table>
<thead>
<tr>
<th>left_id</th>
<th>right_id</th>
</tr>
</thead>
<tbody>
<tr>
<td>module_langname</td>
<td>Varchar(10)</td>
</tr>
<tr>
<td>User’s email address</td>
<td></td>
</tr>
<tr>
<td>strokeposts</td>
<td>post_id</td>
</tr>
<tr>
<td>The unique id define for each post message</td>
<td></td>
</tr>
<tr>
<td>topic_id</td>
<td>mediumint(8)</td>
</tr>
<tr>
<td>The unique id define for each topic</td>
<td></td>
</tr>
<tr>
<td>forum_id</td>
<td>mediumint(8)</td>
</tr>
<tr>
<td>Unique id define for each forum define</td>
<td></td>
</tr>
<tr>
<td>poster_id</td>
<td>mediumint(8)</td>
</tr>
<tr>
<td>Unique id for posted poster</td>
<td></td>
</tr>
<tr>
<td>icon_id</td>
<td>mediumint(8)</td>
</tr>
<tr>
<td>Icon depends on the topic id</td>
<td></td>
</tr>
<tr>
<td>poster_ip</td>
<td>Varchar(40)</td>
</tr>
<tr>
<td>The title of poster for have been shouted</td>
<td></td>
</tr>
<tr>
<td>post_time</td>
<td>Int(11)</td>
</tr>
<tr>
<td>The time that message been posted</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Type</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>post_approved</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>post_reported</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>enable_bbcode</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>enable_smilies</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>enable_magic_url</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>post_username</td>
<td>Varchar(225)</td>
</tr>
<tr>
<td>post_subject</td>
<td>Varchar(100)</td>
</tr>
<tr>
<td>post_text</td>
<td>Mediumtext</td>
</tr>
<tr>
<td>post_checksum</td>
<td>Varchar(32)</td>
</tr>
<tr>
<td>post_attachment</td>
<td>tinyint(1)</td>
</tr>
<tr>
<td>bbcode_bitfield</td>
<td>Varchar(225)</td>
</tr>
<tr>
<td>bbcode_uid</td>
<td>Varchar(8)</td>
</tr>
<tr>
<td>post_postcount</td>
<td>varchar(8)</td>
</tr>
<tr>
<td>post_edit_time</td>
<td>int(11)</td>
</tr>
</tbody>
</table>
6.13 SYSTEM ARCHITECTURE

Architecture is a set of rules that defines a unified and coherent structure consisting of constituent parts and connections that establish how those parts fit and work together. The architecture of a system consists of the structure(s) of its parts, the nature and relevant externally visible properties of those parts, and the relationships and constraints between them (D’Souza and Wills, 1999). It is the initial part of a system design whereby the main components and sub-systems are identified.
Figure 6.11: System Architecture

**Figure 6.11** shows the system architecture for WISS. When user sends request in the client machine, it will connect with the application server and retrieve data from database. Database server connects between Database and application server to complete the Command. After application server receives the data from database server, it will send back request from user in Graphical User Interface Design.

### 6.14 OVERALL SUMMARY OF THE CHAPTER

This chapter summarizes the functional requirements which represent a set of module that reflected the system operates. Non-functional requirements identified are
usability, performance, portability, reliability and accuracy. System and hardware requirements are identified in this chapter. UML diagrams such as use case, class diagram and sequence diagram are depicted in this chapter to show the functional aspects of the system. Part of database design is represented in this chapter. Screen design for the respective module also is determined. System architecture is represented in the last section of the chapter that represents client-server application is implemented for the system developed.
CHAPTER 7

SYSTEM CODING AND TESTING

7.0 INTRODUCTION

In system coding and testing phase, the documented design definition is translated into code. Coding stage describes the realization of implementation of an application or execution of the specification, standard, model and design that have been established during the software development process. It is commonly known as the process of translating the technical specification into a program, software component or computer system.

Testing is the process of executing a program with intention of finding errors” (Daniel, 2004). It is one of the software quality assurance tool that used to control the software quality before moves to the installation phase. In this chapter, software testing strategy and its testing stages will be discussed. System testing is important and critical phases in the software development life cycle, which can use to assure the quality of the developed software system and provide adequate confidence to the end-user that the developed system is conform to its explicitly stated functional and non functional requirements. The objective of software testing is to execute the developed software system with the intention to discover defeats and vulnerabilities in the software and to ensure that developed software system meets its requirements and the functional specification.
Furthermore, the outcome of this phase that produced the final product is demonstrated accordingly.

Since WISS is developed from user-centered design approach, the design of the interface should be tested effectively. This includes how the first page appear, how the site navigation fulfill on what user needs and the location of the content appear on the page.

This system testing will consist of two different testing which are usability testing as well as the acceptance testing for different purposes. All these testing will have different goals to achieve and it is necessary to be carried out to provide adequate confidence to the end user that this developed software is meeting its requirements and specifications, and to assure the quality of the system.

7.1 IMPLEMENTATION TOOLS

Implementation tools assist software engineer to conduct their job easily. Below is the list of tools that are used to support the implementation tasks of this study.

7.1.1 Apache Web Server

Apache is generally recognized as the world's most popular Web server (HTTP server). Originally designed for Unix servers, the Apache Web server has been ported to Windows and other network operating systems (NOS). The name "Apache" derives from the word "patchy" that the Apache developers used to describe early versions of their software. The Apache Web server provides a full range of Web server features, including CGI, SSL, and virtual domains. Apache also supports plug-in modules for extensibility. Apache is reliable, free, and relatively easy to configure. is an established
standard in the online distribution of website services, which gave the initial boost for the expansion of the World Wide Web. It is an open-source web server platform, which guarantees the online availability of the majority of the websites active today.

7.1.2 PHP

PHP has been chosen as the programming language to develop this tool since it provides several advantages over other languages. PHP offers server-side, HTML embedded scripting language that lets you create dynamic web pages. PHP-enabled web pages are treated just like regular HTML pages and you can create and edit them the same way you normally create regular HTML pages. PHP is mainly focused on server-side scripting which let the CGI program able to collect form data, generate dynamic page content, or send and receive cookies. PHP is the programming language used with the MySQL programming language to create this web-based application. Since the application developed for server-side scripting, PHP is the best language where the PHP program output written will be able to view in web browser, through the server and support must user interface design developed.

7.2 USER INTERFACE

This section provides the results produced after the coding activities complete. It divides the snap shots on some of the screens of the main functions as well as the generated components created through the system.

7.2.1 Registration Module
Registration module provides a registration interface to the user before he or she can make use of the discussion board as illustrated in Figure 7.1 and Figure 7.2. While, Table 7.1 describes the implementation of the access authentication module as elicited in the requirement list in Chapter 6 based on the Requirement ID provided.

Figure 7.1: Agreement page for user
**Figure 7.2: Registration Form**

**Table 7.1 : Requirements description for Registration Module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WISS shall provide a registration form to allow user to sign-up.</td>
<td>WISS-Mod01-01</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 7.1)</td>
</tr>
<tr>
<td>2</td>
<td>Each registration form of the WISS shall consist of a username, password, password confirmation, name and e-mail fields.</td>
<td>WISS-Mod01-02</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 7.1)</td>
</tr>
<tr>
<td>3</td>
<td>WISS shall ensure the username stored is uniquely named.</td>
<td>WISS-Mod01-03</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 6.2)</td>
</tr>
<tr>
<td>4</td>
<td>WISS shall ensure that the password and password</td>
<td>WISS-Mod01-04</td>
<td>Done</td>
</tr>
</tbody>
</table>
confirmation value must be the same before it can proceed and store the information into the database.

5. WISS shall verify the data prior to storing the data in the database by triggering an alert to the user if the value is impossible, in invalid format or blank.

| Implemented using the verifyData() method |
| WISS-Mod01-05 |
| Done |

If the user leaves blank any one of the fields or invalid e-mail format, alert triggered

7.2.2 Authentication Module

Authentication module is dedicated for user of WISS for the discussion board purposes. The user needs to login first before he or she can enter the discussion board as shown in Figure 7.3.
### Figure 7.3: Authentication for User

#### Table 7.2: Requirements description for Authentication Module

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a login interface form that consists of the username and password fields.</td>
<td>WISS-Mod02-01</td>
<td>Done (Refer to Figure 7.3)</td>
</tr>
<tr>
<td>2.</td>
<td>Both inputs shall be verified first by the system in order to authenticate the user before entering the system.</td>
<td>WISS-Mod02-02</td>
<td>Done (Refer to Figure 7.4)</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall ensure that there is no way of more than one user sharing one username.</td>
<td>WISS-Mod02-03</td>
<td>Done (Refer to Figure 7.5)</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall destroy the current session of the operation and switch to the latest one if there is more than one session of the operation using the same authentication method.</td>
<td>WISS-Mod02-04</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>username</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. WISS shall provide a logout function to enable the user to close his or her operation.</td>
<td>WISS-Mod02-05</td>
<td>Done Refer to Figure 7.6</td>
<td></td>
</tr>
</tbody>
</table>

### 7.2.3 Content Module

Content module is dedicated to the administrator who is going to update the content of the system and user who view WISS. Admin needs to login first before he/she can get into the content module as illustrated in Figure 7.4. While, Figure 7.5 shows the exception handling provided by the WISS if the username entered by the user and password is not valid. Table 7.3 describes the implementation of the access authentication module as elicited in the requirement list in Chapter 5 based on the Requirement ID provided. Figure 7.6 shows the list of the content that can be edited by the administrator. Figure 7.8 shows the details of the content that can be edited based on the selected content by administrator.

![Figure 7.4: Login for administrator](image-url)

Figure 7.4: Login for administrator
Figure 7.5: Exception Handling for invalid username or password

Figure 7.6: List of the contents that can be edited
Figure 7.7: Details of the WISS content

Figure 7.8: Main Page for WISS
<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface for the admin to login</td>
<td>WISS-Mod03-01</td>
<td>Done (Refer to Figure 7.4)</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall provide a user interface on the list of content that administrator can modify or edit.</td>
<td>WISS-Mod03-02</td>
<td>Done (Refer to Figure 7.5)</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall allow the administrator to view the details of selected content to be edited.</td>
<td>WISS-Mod03-03</td>
<td>Done (Refer to Figure 7.6)</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall allow the administrator to update an existing content definition from the list.</td>
<td>WISS-Mod02-04</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
<tr>
<td>5.</td>
<td>WISS shall allow the administrator to rename the menu for each of the content</td>
<td>WISS-Mod03-05</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
<tr>
<td>6.</td>
<td>WISS shall provide user to read the content</td>
<td>WISS-Mod03-06</td>
<td>Done (Refer to Figure 7.8)</td>
</tr>
<tr>
<td>7.</td>
<td>WISS shall allow user to print the content</td>
<td>WISS-Mod03-07</td>
<td>Done (Refer to Figure 7.8)</td>
</tr>
</tbody>
</table>

**7.2.4 Discussion Board Module**

Discussion Board module is dedicated to the user who want to connect with other stroke caregivers. Figure 7.9 shows the control panel for user who log in to the system and
want to use the forum. Table 7.4 describes the implementation of the discussion board module as elicited in the requirement list in Chapter 5 based on the Requirement ID provided. Figure 7.10 shows the posted topic by another user. It allow users to click on the add comments to add the comments based on the topic selected. Figure 7.11 shows the list of the topic posted to be viewed by the user. Figure 7.12 shows the form that user can used to compose the message to another user.

Figure 7.9 : Control Panel for User
Figure 7.10: Interface for the topic posted

Figure 7.11: List of the topics posted

Figure 7.12: Interface for Compose Message
<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface where user can open messages that they received.</td>
<td>WISS-Mod04-01</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall allow user to post message to any intended user.</td>
<td>WISS-Mod04-02</td>
<td>Done (Refer to Figure 7.10)</td>
</tr>
<tr>
<td>5.</td>
<td>WISS shall allow user to view the current topic posted by another user</td>
<td>WISS-Mod04-03</td>
<td>Done (Refer to Figure 7.8)</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall allow the administrator to post the comment regarding to the topic selected</td>
<td>WISS-Mod04-04</td>
<td>Done (Refer to Figure 7.9)</td>
</tr>
<tr>
<td>5.</td>
<td>WISS shall allow the user to add new topic</td>
<td>WISS-Mod04-05</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
<tr>
<td>7.</td>
<td>WISS shall allow the user to delete the message received</td>
<td>WISS-Mod04-06</td>
<td>Done (Refer to Figure 7.7)</td>
</tr>
</tbody>
</table>

**7.2.5 Media Module**

Media module is dedicated to the user who wants to view media and for the administrator to upload the media contents for user to view. User will redirect to the page
as shown in Figure 7.13. While, Figure 7.14 shows video played by the browser when user click on it. User also can select to view on the windows media player or other plugs-in that they want. Furthermore, Figure 7.15 and Figure 7.16 shows the interface for the administrator to upload the brochure in .zip format and upload the video in .wma, .wav and .mpeg. Table 7.5 describes the implementation of the media module as elicited in the requirement list in Chapter 6 based on the Requirement ID provided.
Figure 7.15: Interface for upload video and brochure

Table 7.5: Requirements description for Media Module

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement Description</th>
<th>Requirement ID</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WISS shall provide a user interface where user can see the list of the videos available</td>
<td>WISS-Mod05-01</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 7.13)</td>
</tr>
<tr>
<td>2.</td>
<td>WISS shall allow user to play the video</td>
<td>WISS-Mod05-02</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 7.13)</td>
</tr>
<tr>
<td>3.</td>
<td>WISS shall allow user to download the video and save it into the user’s own directory</td>
<td>WISS-Mod05-03</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Refer to Figure 7.14)</td>
</tr>
<tr>
<td>4.</td>
<td>WISS shall provide a user interface</td>
<td>WISS-</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>where user can see the list of the pamphlet available</td>
<td>Mod05-04</td>
<td>(Refer to Figure 7.14)</td>
<td></td>
</tr>
<tr>
<td>5. WISS shall allow user to open the pamphlet from the list</td>
<td>WISS-Mod05-05</td>
<td>Done (Refer to Figure 7.14)</td>
<td></td>
</tr>
<tr>
<td>7. WISS shall allow user to download the pamphlet in brochure format and save it into the user’s own directory</td>
<td>WISS-Mod05-06</td>
<td>Done (Refer to Figure 7.14)</td>
<td></td>
</tr>
<tr>
<td>7. WISS shall allow the administrator to upload the brochure</td>
<td>WISS-Mod05-07</td>
<td>Done (Refer to Figure 7.15)</td>
<td></td>
</tr>
<tr>
<td>8. WISS shall allow the administrator to upload the video</td>
<td>WISS-Mod05-08</td>
<td>Done (Refer to Figure 7.15)</td>
<td></td>
</tr>
</tbody>
</table>

7.3 TEST ENVIRONMENT

The operating system that recommended by WISS includes Windows Me, Windows NT, Windows 2000, Windows Vista, Windows XP Home Edition and Windows XP Professional Edition. Thus, a series of testing will be run on these five operating systems, in order to test the compatibility of the Windows Security Tool with the listed operating system.
Table 7.6: WISS Testing Environment - Software

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Screen Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows ME</td>
<td>800 x 600 and 1024, 768</td>
</tr>
<tr>
<td>Microsoft Windows NT</td>
<td>800 x 600 and 1024, 768</td>
</tr>
<tr>
<td>Microsoft Windows 2000</td>
<td>800 x 600 and 1024, 768</td>
</tr>
<tr>
<td>Microsoft Windows XP Home</td>
<td>800 x 600, 1024, 768 and</td>
</tr>
<tr>
<td></td>
<td>1152 x 864</td>
</tr>
<tr>
<td>Microsoft Windows Professional</td>
<td>800 x 600, 1024, 768 and</td>
</tr>
<tr>
<td></td>
<td>1152 x 864</td>
</tr>
<tr>
<td>Microsoft Vista</td>
<td>800 x 600, 1024, 768 and</td>
</tr>
<tr>
<td></td>
<td>1152 x 864</td>
</tr>
</tbody>
</table>

Table 7.7 Web Browser for Testing Purpose

<table>
<thead>
<tr>
<th>Web Browser</th>
<th>Screen Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Explorer</td>
<td>800 x 600 and 1024, 768</td>
</tr>
<tr>
<td>Mozilla Firefox</td>
<td>800 x 600 and 1024, 768</td>
</tr>
<tr>
<td>Safari</td>
<td>800 x 600 and 1024, 768</td>
</tr>
</tbody>
</table>

7.4 TESTING APPROACH

Testing approach refers to the approach and associated techniques that have been conducted to make sure that the function in the page is functions properly.

The functional testing will focus on the functional requirements which described as business functions and business rules in the various available functional requirement documents. The purposes of this test are to verify proper data acceptance,
processing and retrieval, and the appropriate implementation of the business rules. Parts of the testing techniques used within this research are the white box, black box, unit testing, usability testing and performance testing. These techniques are described in the following topics respectively. The outline of the testing identified as below:

Table 7.8 : Testing Approach

<table>
<thead>
<tr>
<th>Test Objective</th>
<th>Ensure proper target of test functionality, including navigation, data entry, processing and retrieval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technique</td>
<td>Execute each test case using valid data to verify the following:</td>
</tr>
<tr>
<td></td>
<td>▪ The expected results occur when valid data is used</td>
</tr>
<tr>
<td></td>
<td>▪ Each business rule is properly applied</td>
</tr>
<tr>
<td>Completion Criteria</td>
<td>All planned tests have been executed</td>
</tr>
<tr>
<td></td>
<td>All identified defects have been addressed</td>
</tr>
</tbody>
</table>

7.4.1 Testing Methodology

There are five stages being implemented in the testing phase of PSP.NET and they are:

1. Unit Testing
2. Module testing
3. System testing
4. Security testing

7.4.1 (a) Unit Testing
Unit testing is conducted to ensure that proper functionality and code coverage of WISS have been achieved during coding. This stage of testing verifies that each component functions correctly with proper input and output expected based on the component designs and requirements. During the development of WISS, there were several steps being carried out which are:

- Code review which intended to examine the correctness of program codes by reading line by line and attempt to spot algorithm, data and syntax faults.
- Performs a test to each button and link to ensure that it functions as required
- Develop test cases to show the input is properly processed to expected output.
- Boundary conditions are tested to make sure the functions run at boundaries established for limiting process.
- Test all errors handling paths.
- Database including tables, indexes and connection.

The exit criterion for this milestone is code-complete. All functionality and logical and physical components of the application were completed and made available for module testing.

7.4.1 (b) Module Testing

A module is a collection of dependent components unit which encapsulates related components unit. Testing can be carried out on every module that was defined in the requirement phase. Based on Chapter 6, WISS consists of 5 modules, starting from the
registration module until the media module. Each module is tested to ensure that the desired functions can run successfully and as expected, and also to verify the correctness of the flows of events. **Figure 7.16** illustrates a sample of a Test Plan for the access authentication module.
<table>
<thead>
<tr>
<th>No</th>
<th>Test Scenario</th>
<th>Expected Result</th>
<th>Actual Result</th>
<th>Remarks</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter valid username and password</td>
<td>- Session created</td>
<td>Same as expected</td>
<td>32-bit session ID seeded using username, password and microtime</td>
<td>12/08/09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Login Successfully</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Enter invalid username and password</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>3</td>
<td>Leave both username and password field blank</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>4</td>
<td>Leave blank for username field</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>5</td>
<td>Leave blank for password field</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>6</td>
<td>Check POST VALUE for password (HTTP connection)</td>
<td>-32 bit scrambled value</td>
<td>Same as expected</td>
<td>Scramble using MD5 function</td>
<td>12/08/09</td>
</tr>
<tr>
<td>7</td>
<td>Check POST VALUE for password (HTTPS connection)</td>
<td>-128 bit scrambled value</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>8</td>
<td>Logout function( Cycle 1)</td>
<td>- Redirect to main page</td>
<td>Redirection successfully but session failed to destroy</td>
<td>Fixed and tested in cycle 2</td>
<td>12/08/09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Unregistered session ID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Destroy session ID</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.16: Test cases for authentication module
Figure 7.17 : Test cases for Registration Module

<table>
<thead>
<tr>
<th>No</th>
<th>Test Scenario</th>
<th>Expected Result</th>
<th>Actual Result</th>
<th>Remarks</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Click on Sign Up button</td>
<td>- Register page displayed</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>2.</td>
<td>Enter details appears on the screen and submit</td>
<td>- Registration id appear</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>3.</td>
<td>Leave both username and password field blank</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>4.</td>
<td>Enter an existing username</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>5.</td>
<td>Leave blank for username field</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>6.</td>
<td>Leave blank for password field</td>
<td>- Error message</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>7.</td>
<td>Check POST VALUE for password (HTTP connection)</td>
<td>-32 bit scrambled value</td>
<td>Same as expected</td>
<td>Scramble using MD5 function</td>
<td>12/08/09</td>
</tr>
<tr>
<td>8.</td>
<td>Check POST VALUE for password (HTTPS connection)</td>
<td>-128 bit scrambled value</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
</tbody>
</table>

Figure 7.17 : Test cases for Registration Module
<table>
<thead>
<tr>
<th>No</th>
<th>Test Scenario</th>
<th>Expected Result</th>
<th>Actual Result</th>
<th>Remarks</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Page displayed a content for administrator to be edited</td>
<td>- Page displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>2.</td>
<td>Create new list</td>
<td>- Error message</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>3.</td>
<td>Click on edit</td>
<td>- Edit page displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>4.</td>
<td>View Details</td>
<td>- Details of the selected content is displayed</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>5.</td>
<td>Edit the content</td>
<td>- Page Updated</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>6.</td>
<td>Rename the menu name</td>
<td>- Menu updated</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>7.</td>
<td>Read content by User</td>
<td>Page Displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
</tbody>
</table>

**Figure 7.18: Test cases for Content Module**
<table>
<thead>
<tr>
<th>No</th>
<th>Test Scenario</th>
<th>Expected Result</th>
<th>Actual Result</th>
<th>Remarks</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>User click on the Media Button</td>
<td>- Page for video and brochure displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>2.</td>
<td>User click on video link</td>
<td>- List of video is displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>3.</td>
<td>User click on brochure link</td>
<td>- List of brochure is displayed</td>
<td>Same as expected</td>
<td>-</td>
<td>12/08/09</td>
</tr>
<tr>
<td>4.</td>
<td>User play the video</td>
<td>- Video played</td>
<td>Same as expected</td>
<td>- User needs to install plugins to play the video</td>
<td>12/08/09</td>
</tr>
<tr>
<td>5.</td>
<td>Pause the video</td>
<td>- Video paused</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>6.</td>
<td>Stop the video</td>
<td>- Video stopped</td>
<td>Same as expected</td>
<td>Scramble using MD5 function</td>
<td>12/08/09</td>
</tr>
<tr>
<td>7.</td>
<td>Forward the video</td>
<td>- Video forwarded</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>8.</td>
<td>Rewind the video</td>
<td>- Video rewinded</td>
<td>Same as expected</td>
<td>Fixed and tested in cycle 2</td>
<td>12/08/09</td>
</tr>
<tr>
<td>9.</td>
<td>Click save to save the video</td>
<td>- Directory opened</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
<tr>
<td>10.</td>
<td>Right click to save the brochure</td>
<td>- Directory opened</td>
<td>Same as expected</td>
<td></td>
<td>12/08/09</td>
</tr>
</tbody>
</table>

Figure 7.19: Test cases for Media Module
<table>
<thead>
<tr>
<th>No</th>
<th>Test Scenario</th>
<th>Expected Result</th>
<th>Actual Result</th>
<th>Remarks</th>
<th>Completion Date</th>
</tr>
</thead>
</table>
| 1. | Click on Discussion Board link | - Session created  
          - Login Successfully                                | Same as expected       | 32-bit session ID seeded using username, password and microtime            | 12/08/09        |
| 2. | Click on Forum Link            | - Error message                                       | Same as expected       | -                                                                        | 12/08/09        |
| 3. | Click on Post Message          | - Error message                                       | Same as expected       | -                                                                        | 12/08/09        |
| 4. | Enter Post Message             | - Error message                                       | Same as expected       |                                                                           | 12/08/09        |
| 5. | Leave blank for subject        | - Confirmation Message appear                         | Same as expected       |                                                                           | 12/08/09        |
| 6. | Leave blank for Body           | - Confirmation Message appear                         | Same as expected       | Scramble using MD5 function                                              | 12/08/09        |
| 7. | Read the Inbox                 | - Message appeared                                    | Same as expected       |                                                                           | 12/08/09        |

**Figure 7.20: Test cases for Discussion Board Module**
7.4.1 (c) System Testing

System testing in WISS involves testing against integrated hardware and software system in order to verify that the system meets the specified requirements as described in the requirement specifications. Also, it involves a series of different test designed to fully exercise the system to uncover its limitation and measure its capabilities. The WISS system testing takes place at a higher level, whereby the testing focuses on behavior rather than functional structure.

7.4.1 (d) Security Testing

The security testing is to verify that the protection mechanism built into the system will protect it from improper access. During the security testing, access authentication module is tested aggressively for any possible access. Security testing ensures that WISS must always verify and authenticate all the accesses and requests made by the authorized user as stated in requirements WISS-Mod02-01. The security testing ensures that all the requirements in access authentication module are implemented correctly.
7.4.2 Testing Process

Each type of testing stage in the WISS uses the testing process as illustrated in

Figure 7.21

![Testing Process in WISS](image)

As shown in Figure 7.21, all the test cases are documented in Test Plans which are derived from WISS requirements and functional specifications. Based on the requirements specification on Chapter 4, each of the test cases is developed and the expected results are written first. Then, the WISS application is executed and tested with all of these sample data. The test outputs are compared with expected outputs. If there exists any differences between the test outputs and the expected outputs, the program code will be checked to discover bugs.
7.5  OVERALL SUMMARY OF THE CHAPTER

This chapter has provided a detailed report on the implementation of the PSP.NET automated PSP support tool. The tool was implemented as a web based application; a combination of PHP as a core programming language, MySQL as the relational database management system and Apache as the web server. It then presented the implementation level view of the tool's operations. The verification of each requirement and system design follows after each of the module interfaces are presented throughout this chapter.
8.0 INTRODUCTION

System evaluation is conducted to guarantee that the redesigned system fulfills its new design requirements and goals. System evaluation follows UCD methods and is discussed later in the next chapter. This chapter describes and presents WISS evaluation process and results.

8.1 EVALUATION TECHNIQUES

There is several evaluation techniques used to support the evaluation process. However, the decision to choose which techniques to be applied is depending on what sort of evaluation paradigms are adopted. User testing, cooperative evaluation and user acceptance testing is the THREE (3) techniques chosen for the evaluation process. Each of the techniques is described in the following section.
8.1.1 User testing

User testing is conducted to make sure that the design of the website is satisfy user’s needs. The advantages of having this is because it will be conducted with the high-fidelity prototype for the web design that will be improved based on feedback from initial evaluations. For the purpose of evaluating WISS prototype, a set of questions is prepared and is divided into four sections which are:

- Interface (color, image)
- Information structure (site navigation and word used to represent the menu & submenu)
- Usability (it is easy to read, to understand, to navigate to the menu that you desire to)
- System features

There are four evaluations that have been conducted which involved the same four respondents. Table 8.1 show the detail of the respondents and the result of this.

<table>
<thead>
<tr>
<th>No.</th>
<th>Evaluator</th>
<th>Location</th>
<th>Age</th>
<th>Sex</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evaluator1</td>
<td>NASAM</td>
<td>40</td>
<td>Male</td>
<td>Stroke Caregivers</td>
</tr>
<tr>
<td>2</td>
<td>Evaluator2</td>
<td>MIND</td>
<td>35</td>
<td>Male</td>
<td>Occupational Therapist</td>
</tr>
<tr>
<td>3</td>
<td>Evaluator3</td>
<td>UM</td>
<td>28</td>
<td>Female</td>
<td>Stroke Patient (Student)</td>
</tr>
<tr>
<td>4</td>
<td>Evaluator4</td>
<td>UM</td>
<td>28</td>
<td>Male</td>
<td>System Expert</td>
</tr>
</tbody>
</table>

**NASAM** = National Stroke Association of Malaysia, **MIND** = Malaysian Information Network on Disabilities, **UM** = University of Malaya
### Table 8.2: User Testing Results

<table>
<thead>
<tr>
<th>Interface</th>
<th>Information structure</th>
<th>Usability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q 1</td>
<td>2</td>
</tr>
<tr>
<td><strong>First Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Poor</td>
<td>Disagree</td>
</tr>
<tr>
<td>USER2</td>
<td>Poor</td>
<td>Disagree</td>
</tr>
<tr>
<td>EV3</td>
<td>Average</td>
<td>Disagree</td>
</tr>
<tr>
<td>USER4</td>
<td>Average</td>
<td>Disagree</td>
</tr>
<tr>
<td><strong>Second Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EV1</td>
<td>Average</td>
<td>Agree</td>
</tr>
<tr>
<td>USER2</td>
<td>Good</td>
<td>Agree</td>
</tr>
<tr>
<td>USER3</td>
<td>Good</td>
<td>Disagree</td>
</tr>
<tr>
<td>USER4</td>
<td>Average</td>
<td>Disagree</td>
</tr>
<tr>
<td><strong>Third Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Good</td>
<td>Agree</td>
</tr>
<tr>
<td>USER2</td>
<td>Good</td>
<td>Agree</td>
</tr>
<tr>
<td>USER3</td>
<td>Average</td>
<td>Agree</td>
</tr>
<tr>
<td>USER4</td>
<td>Average</td>
<td>Disagree</td>
</tr>
<tr>
<td><strong>Fourth Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Good</td>
<td>Agree</td>
</tr>
<tr>
<td>USER2</td>
<td>Good</td>
<td>Agree</td>
</tr>
<tr>
<td>USER3</td>
<td>Excellent</td>
<td>Agree</td>
</tr>
<tr>
<td>USER4</td>
<td>Excellent</td>
<td>Agree</td>
</tr>
<tr>
<td>Table 8.3 : User testing for Additional Comments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional Comments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td><strong>First Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Major changes, overall structure</td>
<td>I need to see revised version</td>
</tr>
<tr>
<td>USER2</td>
<td>The color and menu navigation</td>
<td>Major changes</td>
</tr>
<tr>
<td>USER3</td>
<td>Background color</td>
<td>Please improve on the usability</td>
</tr>
<tr>
<td>USER4</td>
<td>Background color</td>
<td>Please improve on the usability</td>
</tr>
<tr>
<td><strong>Second Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Main Page need to restructure again</td>
<td>Please improve on the navigation structure</td>
</tr>
<tr>
<td>USER2</td>
<td>Color varieties</td>
<td>No comment</td>
</tr>
<tr>
<td>USER3</td>
<td>Focus on main page to attract user</td>
<td>No comment</td>
</tr>
<tr>
<td>USER4</td>
<td>Background color</td>
<td>Please improve on the usability</td>
</tr>
<tr>
<td><strong>Third Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>Do not include the helpline number on the top of stroke site</td>
<td>No comment</td>
</tr>
<tr>
<td>USER2</td>
<td>The background color for submenu</td>
<td>Too many redundant information</td>
</tr>
<tr>
<td>USER3</td>
<td>Add logo to represent the website</td>
<td>No comment</td>
</tr>
<tr>
<td>USER4</td>
<td>Background color</td>
<td>Please improve on the usability</td>
</tr>
<tr>
<td><strong>Forth Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USER1</td>
<td>No comment</td>
<td>Too many information in main page</td>
</tr>
<tr>
<td>USER2</td>
<td>No comment</td>
<td>No comment</td>
</tr>
<tr>
<td>USER3</td>
<td>Background color</td>
<td>Please improve on the usability</td>
</tr>
<tr>
<td>USER4</td>
<td>No comment</td>
<td>No comment</td>
</tr>
</tbody>
</table>
8.1.1.1 User Testing Results

For user testing, the result gives different views and opinions from the first sketch of the design until fourth designs. In this section, it gives overall results on each of the user opinion. The interface is refined until it satisfies the users involved. Based on the user testing conducted which involved FOUR (4) users which comes from different background. This is a continuous design process where this research use similar user for each of the user testing.

For the first interface design, almost all the user have a similar opinion where they disagree with the design proposed. They found that almost all the elements is inconvenient to look and use. They found that the interface is very poor where they ask the user to change on most of the parts of the system. They emphasize that they need to see other background color compared to the current one which is used.

For the second interface, they happy to see some improvements on the interface where they rated most of the parts as good and they agree with the information structure and the usability elements for the WISS. However, they are not satisfied with the arrangement or styles presented for site navigation structure for the interface designed.

For the third interface, most of them are satisfied with the designed. However the black color used for the drop down menu is not appropriate for the user to see. They asked to change to more soft color. They also emphasized that icon or logo must be used as a presenter for the WISS.

For the last interface, most of them are happy with the design developed. They were happy to see that most of the interface design has been improved from the previous one. They rated excellent as one criteria for the interface design. They would like the design
remains as presented and they need to see the contents for next testing. Next part will be
discussed on details based on the changes that the user needs.

8.1.1.1 (a) First Interface

![Figure 8.1: First design](image)

The figure shows the first result of prototype and navigation structure which is
developed based on the card sorting activity conducted by previous stroke caregivers and
stroke patients. The feedback from users for the first prototype is very bad because of its
poor design. Furthermore, the card sorting activity excluded the information on what the
interface of the prototype should be developed but focused more on structuring the site
navigation structure.

Evaluation results that we gathered from user showed that user wanted to improve most on:

- Interface
- Information structure
It can be concluded that the initial design for the prototype need to be changed totally.

8.1.1.1 (b) Second Interface

The second evaluation illustrates that the prototype changed completely referring to the first evaluation results. The illustration image on the prototype is now appropriate with the information delivered. The navigation menus have already changed from the top level one to the left side menu. The text on the submenu is being organized based on the comment from the first evaluation. The information given on the main page is based on the first evaluator who wants to prioritize what they need to see on the first page. The navigation
indicator is included on this design to be able for user to know where they really are on the page. The features of the prototype that have been added here is ‘Search’ function.

8.1.1.1 (c) Third interface

The third prototype designed shows that it changed dramatically from previous evaluation. On the interface view, we can see that color has change from one color to varieties of color. The illustration image provided is change based on what the evaluator has requested. The discussion board section is no longer at the bottom of the page but on the right site of the page. The navigation indicator is now on the left side of the page which is previously on the right side.
8.1.1.1 (d) Fourth Interface

Based on Figure 8.4, there are slight changes that we can see from this structure compare to the previous one. The text written to describe the definition of stroke has been modify from white to read as well as the position of it which is previously at the top of the page together with the image. As you can see, the background of site navigation menu color has change from black to light blue which is more acceptable for
user. The navigation indicator has been adjusted where user can see on where they are. As for additional comment from the third evaluator which requested the logo to represent the website, the prototype has already included the logo that represents the prototype instead of sentences as mentioned by third evaluator. Redundant menu such as ‘emergency’, ‘education’ and ‘life after stroke’ have been removed from the previous prototype design base on the 2nd evaluator comment. The emergency helpline have been removed based on first evaluator comment.

### 8.1.2 Cooperative Evaluation Session

The evaluation session is conducted as a collaborative work involving four users (who perform given tasks using the system) and a facilitator (who runs the test, analyzes the data and reports the results). The evaluation is conducted in two stages. First stage is the observation, where the facilitator observed users interacting with WISS user interface. Users at this stage were asked to think aloud (users are continuously speaking out their minds); to verbalize whatever they are doing and planning to do (Gahanam, Y & Maurer, F, 2007). At the same time, the facilitator observed and recorded unexpected behaviours and comments from users on the interface.

#### 8.1.2.1 Cooperative Evaluation Participants

The participants were four participants which two of them are from the Faculty of Computer Science and Information Technology of University Malaya. The second and third participants is stroke caregivers from NASAM. The number of participants was chosen by referring to Nielsen’s Alertbox (2000), where he declared that “The best results come from testing no more than 5 users and running as many small tests as you can afford, and as you
add more and more users, you learn less and less because you will keep seeing the same things again and again”. Moreover, by testing the first user, the evaluator learns nearly 30% of all the design’s usability problems. And when testing the second user, it will be noticed that the second user does some similar things as the first user did. So, some observations overlap will be existed. But, because of the fact that people are different, the second user does some new things that have not been observed with the first user. So, the second user adds some new things to be observed, but not as much as the first one did. When it comes to the third user, many same things were already observed with the two users before are done. But of course some amount of new data is added, but not as much as the first and the second users did. Based on that, it was concluded to test with five users. However, additional users need to be tested if the software has several highly distinct groups of users.

8.1.2.2 Cooperative Evaluation Followed Procedures

The evaluation was conducted individually, each subject at a time following the cooperative evaluation procedures.

Before start performing the tasks, the facilitator:

- Made a short introduction and gave the evaluation’s script to the subjects. The script provides the needed information about WISS functionalities and the evaluation session (see appendix).
- Asked the subjects to explore WISS design and functionalities.

Start performing the tasks:
• The subjects were given clear tasks’ instructions. Two main tasks were given; first, is to view the content on the page for stroke care. Secondly is to view on discussion board.

• The subjects were asked to think aloud and verbalize what they are doing while performing the tasks.

• The subjects were encouraged to criticize the system.

• The subjects were encouraged to explain what they were doing and their responses to the system.

• The subjects were encouraged to ask for a clarification if any problem arises.

• The subjects were asked to take notes of unexpected events and user comments.

• When users encountered unexpected behavior from the system caused them to be stuck and they were not able to deal with sufficiently, the facilitator asked the subjects some questions like “what do you think you need to do next? Did you expect that to happen, what are you thinking about now?” Asking these questions aimed to collect information regarding users’ immediate expectations, preferences and feedbacks.

8.1.2.3 Cooperative Evaluation Results

As mentioned, the evaluation was conducted using observation stage. This section describes the stage in details.
8.1.2.3.1 Observation Stage

This technique is used to identify the needs leading to new types of products and help to evaluate the prototypes (Preece, Rogers, and Sharp 2007). Users’ activities are observed and their interactions with the system are documented. This information is used to see how users interact with the system. At this stage, the subjects were observed independently. The average time for each individual observation session was 20 minutes. Each subject performed the given tasks individually. They were all able to successfully accomplish the given tasks. The facilitator reported that subjects performed better when a task was repeated.

While working on the tasks, each subject faced some difficulties, needed to ask the facilitator some questions and orally made comments on the interface. At the same time, the facilitator recorded every problem they encountered, and when they got stuck, he got the chance to informally ask them some questions to collect certain qualitative data about their perceptions and preferences.

8.1.2.3.1(a) Observation Stage (User 1)

The first user who is students from Faculty of Computer Science and Information Technology in University Malaya found it easy to see the website. Most of the questions that have been asked are responded in a positive way. The questions that he asked the facilitator seems reasonable seems he quite new to the systems where he asked few questions related to design of the web itself. He makes a suggestion for improvements which are:

- Too much text in the web. Hope to see simple one.
• It is better to come out with table line to present the information in history result page font color on the menu is not clear to see
• The images is too big sometimes
• The font color on the menu is not clear to see

8.1.2.3.1(b) Observation Stage (User 2)

A second participant who is stroke caregiver gives a medium responds on the system developed. She paused for an average of 20 seconds when she needs to answer most of the questions asked by the facilitator. Seems she is new to the WISS, she just asked two questions where she found important for her as stroke caregivers. She gives feedback on:

• I don’t see why discussion board is having different interface from the main interface.
• The video should be viewed in more bigger window
• The text for downloadable is not easy to find.

8.1.2.3.1(c) Observation Stage (User 3)

The third participant is stroke caregivers where he gives a good respond on the website. However, she needs to be reminded 2 times for 20 minutes duration of time to speak aloud while she was opening the website. She seems interested with the interface design where she mentioned that it is simple design. However, some comments that she made are:

• I don’t see the drop down bar is good since I could not see the information below that if I not click on that
• The terms use is not reflecting what I want to see inside.
• Should have interesting color so that I would love to open the website and stroke people will be happier more to open it

8.1.2.3.1(d) Observation Stage (User 4)

Fourth participant who is master student from University Malaya gives a good feedback. She seems understand with the system design and becomes a bit advance seems she also in computer science background. She gives good suggestions such as:

• The interface needs to be changed to be more interactive one.

• It is important to enlarge the fonts.

• The text does not really appropriate for user to read.

8.1.3 User Acceptance Testing

This is one of the common techniques used for evaluating a software product. Users will be asked on their opinion about the product. It is the way how designers getting feedback from users. Users will be interviewed and need to answer set of questionnaires about their experience of using the system. Sample of questionnaires used for this research as attached in Appendix.

8.1.3.1 Evaluation Result

This section summarizes the results of the evaluation activities. The data is gathered based on the feedbacks from users that participate during the evaluation process. It is divided into two main sections; participant background and the system evaluation.
8.1.3.1 (a) Respondent’s Background

Participant’s background refers to the personal details to get the picture of the respondents who are involved in user acceptance testing. Total of respondents who is taking part in the evaluation is 80 respondents. The first section shows the demographic information about the respondents. The results for each of these factors are summarized.

The result shows the calculation of respondents who involved in evaluating WISS who are not related to any stroke background. There is a 49-percent of respondents who are not affected by stroke nor have a relationship with the stroke patient. Only two doctors involved in the evaluation process and 20 stroke caregivers from different background has taken part too. The reason why almost half of the respondents found comes from stroke background is because most of them is refused to join and it’s quite hard to find the stroke patient who are healthy to involve in this activity. Following graph depicts the percentage of participants that involved in the evaluation process.

![Figure 8.5: Percentage of Participants Involved](image)

Figure 8.5: Percentage of Participants Involved
Figure shows total of the respondents aware on stroke. Results show 28 respondents have low knowledge on stroke and 4 of them have a high knowledge. Doctors who are involved in this activity demonstrate that they have a very high knowledge about stroke since they are expert on this area.

Figure 8.6: Total of level of respondents on stroke awareness

Figure shows the percentage reflects how respondents gather information about stroke. Results shows majority of the respondents choose Internet as a method for them to acquire information about stroke. Only 2 from the total of respondents get advice from doctors meanwhile 8 of them do not care about stroke disease and did not aware that stroke can attack anyone that does not count age level.
8.1.3.1 (b) Information Structure

Since the structure of the web-designed is based on arrangement by user, it is important to measure on how the structures satisfy and meets the other user needs also. Information structure refers on how user rates the overall structure on web site designed. This includes on background color of the web design, site navigation, vocabulary use and others.
Figure shows user ratings from 1 to 5 which 5 is considered the highest and 1 is the lowest rates. Figure shows the result on the system usability as a histogram. The x-axis shows total of respondents while the y-axis shows the question on information structure. Results shows that majority of respondents choose value 3 which is the average rating for the web designed. Furthermore, 35 respondents agree that they are satisfied with overall structure on WISS.

**8.1.3.1 (c) System Usability**

Figure below shows the result on the system usability as a histogram. The x-axis shows total of respondents while the y-axis shows the question on usability. In terms of the accuracy of information given, 40 respondents agree while 30 of them could not decide that the information is accurate. The question asked on the satisfaction that are referring to; easy to find information, system can be used as the software development assistance, the speed of the system is satisfying and I am satisfied with the system, accumulates that they agree with the statement. This shows that in terms of user interface, the system needs to be improved in its user-friendliness and instruction or guidance on how to use the system.
8.2 OVERALL SUMMARY OF THE CHAPTER

The evaluation process is used to gain feedback from users about the product and their satisfaction in using the system. It is an essential activity to identify whether the application meets users’ expectation and it is able to convince users. There are three evaluation paradigms used during the evaluation stage which are the user testing, cooperative evaluation and user acceptance testing. The information gathered from the feedback given by users will be used by designers to improve the quality of the system. Designers will analyze the data gathered to identify the system capabilities, weaknesses of the system as well as the recommended improvements.
CHAPTER 9

CONCLUSIONS AND RECOMMENDATION

9.0 BACKGROUND

Web based information system for stroke chose as the main research area is to give users the chance to arrange the web information system based on their needs. This research is conducted by evaluating the current process and tools that are used to support data management tasks. By considering issues on stroke and the limitation of the existing system, this research is expected to be one of the solutions in improving the information designed for stroke. Hence, detail study is conducted to ensure that users are involved in each development process. User-Centered Design techniques implemented in the design process to ensure that each requirement identified that involving users is implemented efficiently. The results of each activity conducted such as interviews, focus group, card sorting activities are documented throughout the whole process. The major objective is this project is to ensure that UCD techniques are applied throughout the process of web based development.

However, there are certain constraints found that could lead to certain issues in completing the final product. All of these points are discussed in the project strengths and project constraints respectively. A part from that, there are sections discussing on the
contribution of the research to the software project team in the life-cycle development, and the recommendation for future study is also described this chapter.

9.1 PROJECT CONTRIBUTIONS

WISS gives a lot of contributions in social community, especially those who seek for the information on stroke. As the problem statement is identified, the research conducted has met the objectives defined previously. The objectives of the research project have been achieved as described as below;

9.1.1 To identify and investigate issues and problems related to stroke care
All issues and problems related to stroke care are identified through research methodology which applies UCD approaches. Such approaches reveal all issues and problems from users and later use to guide the web navigation structure.

9.1.2 To develop web based information system that provides relevant information on stroke care using UCD approaches
UCD approaches and techniques such as interviews, focus group discussion, card sorting activities, questionnaires and low fidelity prototyping are implemented to gives an overview on UCD.

9.1.3 To evaluate the developed system using UCD approaches
WISS is evaluated through UCD approaches such as users’ evaluation and cooperative evaluation which resulted on users’ satisfaction on the system functionality.
9.2 PROJECT STRENGTHS

WISS is developed by the implementation of User-Centered Design (UCD) that helps developers throughout the development process. The major advantage is that the system developed will be based on users’ experience and users’ expectation. This technique emphasizes what users’ needs and users’ desire for the system. The application is developed based on PHP programming languages that also have several advantages. Codes written in this language are reusable. Meaning that, classes compiled in Windows platform can be reused for other platform without having to write the program or to compile codes specifically for the particular platform. Furthermore, WISS is an online website which allows users to access the application anywhere and anytime when there is an Internet connection.

9.3 PROJECT CONSTRAINTS

There are some constraints that have been identified in this project. Due to the limitation of time, budget and resources, there are functions that are not possible to be completed and delivered to target users. Although some of the functions have been listed in the main functions, those features are proposed to be part of future research. Thus, these research constraints are:

- Will emphasize on stroke in Malaysia
- Lack of doctors and consultants involved
- Should hire consultant to validate the content of the website designed
Card sorting activity should involve more users from different backgrounds.

Language used for the website is limited for users who know English language only.

### 9.4 RECOMMENDATION FOR FUTURE WORK

There are few areas that need further enhancement in order to make the WISS more beneficial and usable for the project team. Some of the functions that are mentioned in the previous section will be added as functions to be implemented in future research. However, some additional features that are recommended to be incorporated in WISS are:

- **Evolve from website to portal development**
  Instead of giving out the long page of information, WISS should also act like a portal that provides a lot of outside resources.

- **Links with other stroke sites**
  This stroke site should be able to get extra information provided by other stroke agencies. To make sure that stroke people get the best information, WISS should link with other sites also.

- **Cooperation with government hospitals**
  Government hospitals play an important role since most of stroke patients will directly go to the hospital for treatment. However, after stroke patients being discharged from hospital, government agencies should provide continuous treatment for them to make sure they are fully healthy. From the online site, government hospitals will be able to cooperate with rehabilitation centres to give more support for those stroke patients.

- Involved more user throughout the process
For the future development of WISS, the evaluation process should involve more users. As for card sorting activity, more than 30 respondents should involve to ensure that the validation of site’s structure. This is to guarantee that different background of respondents give feedback to the activity.

- Focuses wide area in Malaysia
  For next WISS, stroke rehabilitation centre from different states that provide therapy session should be relook to get a closer view on stroke therapy.

- Language for the site should be in English, Malay and Mandarin
  Since Malaysia is a mix-culture country, WISS should be able to deliver the information in Malay and Mandarin language too.

- Involve consultant to validate the information provided on the website designed
  The accuracy of the information given on the website is important because stroke people will follow the information on the website. By hiring consultant who is expert in this area is one of the best solution where he or she is able to validate the information and provide latest information on stroke.

- Apply UCD evaluation techniques for redesign purposes
  Although WISS used UCD techniques to design the website, for the redesign purpose in future, it must also include other UCD evaluation techniques such as heuristic evaluation and other evaluation techniques to detect usability problem accurately.
Table 9.1: WISS comparison with existing system

<table>
<thead>
<tr>
<th>Menu Association</th>
<th>Overview</th>
<th>User</th>
<th>Screen Layout</th>
<th>Page Length</th>
<th>Internalization</th>
<th>Usability</th>
<th>Visualization</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Stroke Association</td>
<td>Aims to provide knowledge and information related to stroke and main target for American</td>
<td>SC,SS</td>
<td>Dynamic with appropriate alphabetical order</td>
<td>1-2 Screens</td>
<td>English</td>
<td>Easy to access by navigating only in one webpage only</td>
<td>Consistent between pages. Words and phrases are displayed in small fonts which makes reading difficult</td>
<td>The content is relevant for user to use.</td>
</tr>
<tr>
<td>National Association Stroke of</td>
<td>Aims to promote the rehabilitation centre and</td>
<td>SC,SS</td>
<td>Static</td>
<td>3-5 screens</td>
<td>English, Malay</td>
<td>Easy to access and understand</td>
<td>Consistent between pages. User can change</td>
<td>The content is relevant for Malaysian user</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
<td>provide some information about stroke who main targets at Malaysia</td>
<td>Malaysia</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Stroke Foundation - Australia</td>
<td>Aims to provide information about stroke in multilingual. It focuses for Australian People</td>
<td>National Stroke Foundation - Australia</td>
<td>SC,SS</td>
<td>Static</td>
<td>5-7 screens</td>
<td>English, Vietnamese, Arabic, Italian, Greek, Chinese</td>
<td>Medium accessibility functions where the functionality is hard to access where user needs to play around with the menu</td>
<td>Inconsistency between pages. Poor design where the images is not consistent with the information provide. The font used is to use but still have some limited information in that.</td>
</tr>
</tbody>
</table>
| Peninsula Stroke Association | It acts as sources to provide stroke from Nonprofit organization serving | SC,SS | Static | 3-5 screens | English | Easy to access which user will redirect to the page where they | The web pages is not consistent with each page. The color used is not appropriate. | The content is conflict with other page where it gives multiple | before arrive to the specific functions. very small and user cannot change the font according to user needs. The arrangement of the menu is considered as “mess”.

```
<table>
<thead>
<tr>
<th>National Stroke Association</th>
<th>Californians in San Mateo and Santa Clara counties</th>
<th>desire.</th>
<th>The font they are using is synchronizing between the pages.</th>
<th>information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on stroke, stroke prevention, stroke recovery and stroke care for Spanish people</td>
<td>SC, SS Dynamic 5-7 screens</td>
<td>English, Spanish</td>
<td>Medium accessibility to navigate to the redirect menu.</td>
<td>Has consistent user interface, easy to understand and use. The interface is attractive, and is not cluttered with too much information.</td>
</tr>
<tr>
<td>Stroke Association of Southern California</td>
<td>A nonprofit organization committed to reducing the incidence and impact of stroke in communities throughout Southern California</td>
<td>SC,SS</td>
<td>Static</td>
<td>5-7 screens</td>
</tr>
<tr>
<td>Chest, Heart &amp; Stroke Scotland</td>
<td>California.</td>
<td>SC, SS</td>
<td>Dynamic</td>
<td>1-3 screens</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
<td>-------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Chest Heart and Stroke Scotland</td>
<td>aims to improve the quality of life for people living in Scotland affected by chest, heart and stroke conditions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISS (Web Information System for Stroke Care)</td>
<td>Aims to provide information for stroke care for Malaysian using UCD approaches</td>
<td>SC, SS, Doctors, Therapist, Rehabilitation Centre</td>
<td>Dynamic</td>
<td>1 – 2 screens</td>
</tr>
</tbody>
</table>
9.5 OVERALL SUMMARY OF THE CHAPTER

Chapter 9 wraps up area of research conducted. It summarizes the overall view of the research which consists of the reason for choosing this topic; in what process the research is conducted; the objectives that have been achieved for the research conducted; the outcome of and so forth. This section also describes the contributions of WISS on health care for stroke patients. The research conducted applies UCD approaches to deliver the information for stroke care in Malaysia. The reason for conducting this research is because there are no specific web applications that are dedicated for stroke patients in Malaysia. Even though there are a lot of existing systems providing information on stroke care and there are also some issues raised when the analysis is conducted throughout the existing system. From the issues and problem raised, UCD approaches are applied to resolve all the problems.

The strength of web information development on stroke is discussed to encourage users to make use of the application developed. Users’ evaluation and heuristic evaluation are applied to evaluate the system designed whether it meets the system requirements or not. It is revealed that some users are satisfied with it but still, it needs a lot of improvements. From the constraints highlighted in this chapter, there are still a lot of issues that needed to overcome with. On the other hand, the future enhancement talks about enhancement for the future system that is going to be developed as overcome the issues that have been identified. From the research conducted, the approach that applied WISS is helpful for those who really need to seek the information on stroke instead of using a normal online website.
APPENDIX FOR WEB INFORMATION SYSTEM FOR STROKE CARE (WISS)
APPENDIX A : INTERVIEW SESSION
**1.0 Initial Interview**

**1.1 1st Interview session**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Time</td>
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<tr>
<td>Duration</td>
<td>1 and ½ hour</td>
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<tr>
<td>Place</td>
<td>MIND</td>
</tr>
<tr>
<td></td>
<td>(Bangunan Bakti Siti Hasmah, Petaling Jaya)</td>
</tr>
<tr>
<td>Job</td>
<td>Occupational Therapist</td>
</tr>
<tr>
<td>Age</td>
<td>32</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
</tbody>
</table>

**Q1. Please introduce yourself and please state your job description?**

I work as therapist in here. My job function is to help people who have disabilities to make a schedule on daily programme. MIND prepare the conference and gather all people in Malaysia who have disability problems and helping them to deliver the information about daily important information.

**Q2. What is the information that stroke patient should have?**

It depends on the stroke patient it self on what level that they had stroke in. Such as diet, because normally people who had stroke have diabetes and high blood pressure need to be control. Information such as, what they need to do everyday is also important. Hypertension is one of the problems that the stroke patients have and we also provide some information on how to handle this stroke patient.

**Q3. Have you ever handle cases which related to stroke?**

Yes, but now our main concentration is more to people who has disability problem.

**Q4. Who is responsible to take care on stroke patient?**

Therapist, the doctors, caregiver. The hospital prepares a place and gives some equipment to help them/ stroke patient to handle the stroke patient.

**Q5. Does the stroke patient need to stay at hospital?**

For the acute phase, yes because the hospital need to analyze the stroke level for each stroke patient.

**Q6. Do you have ever operated any supporting system in order for you to conduct therapy session?**

No, when we knew that the patient who had stroke and asked to help them we analyze the stroke level first, the diet that they need to have and all the necessary requirements that the
stroke patient really need. Or some stroke patient, we also prepare a supportive equipment to help them moving

Q7. How do you connect to stroke patient?

Through online communication such as email.

Q8. Have you ever been to the stroke patient house to conduct the therapy?

Yes, that is one of the necessary things that we need to do or MIND patient because we need to check the stroke patient condition from time to time.

Q9. How do stroke patient and stroke caregivers knew about getting the right information about stroke.

Normally, the stroke patient that we met they get the information from the internet and they also get the information about MIND from them. We organize a programme where we visit a place where we gather the entire stroke patient and prepare them a useful programme to give an exposure on the stroke patient.

Q10. What type of information delivery that you give to the stroke patient?

The type of delivery that we give to the stroke patient is form mouth to mouth. For stroke caregiver who came with the stroke patient, they have the advantages where they can see by themselves how the therapy is conduct and beside I will asked them to do it together. It’s easier and applicable.

Q11. Is it easy to practice the information that you deliver to them?

Normally, they can easily get the information from anywhere, it just the problem for the stroke patient whether they can accept the information or not. This is depending on the stroke patient level on how they can handle the stroke themselves. Some of the stroke patient who have the hypertension problem did not want to do the activity and one of our task is to advice them to tell them on how importance to do all the activity. We have a case where stroke caregivers @stroke patient did not do what and forgot exactly we taught them on how to do it. For example: there is a case where the stroke patient’s shoulder relocate because they did not follow the steps correctly.

Q12. What is the necessary thing that stroke caregivers need to know in order to help the stroke patient?

They have to know what the stroke patient knows or more than that. They must have the information from us (therapist) to help the stroke patient practice the activity at home.

Q13. How long it takes for you to handle the stroke patient for one session?

Normally it takes one hour. It depends on where the therapist conduct the session, normally if it conducted at home, so it takes more than 3times a day, while in the government
hospital then it takes only one hour. This is because; there are a lot of people at government hospital. It depends on the requirements itself.

**Q14.** *What are the functional requirements in the mobile phone for stroke caregivers?*

The information such as daily care, daily activities such as (changing clothes), diet is the common necessary thing that the stroke patient need to have. For example, if the stroke patient cannot move his hand properly, they are some way to explain on how they move their hand to assist them to recover. Diet is also important because normally stroke patient also have hypertension, diabetes where the diet itself need to be taken care by caregivers and this information is rely important to them.

**Q15.** *What is the ideal type of delivery in the mobile phone?*

Video with sound

**Q16.** *Is the information available for stroke is updated for stroke caregivers and patient?*

Yes, the information is updated base on the research that people did. Some treatment maybe updated to help the stroke patient. That is why, for my opinion, in order to develop the information system; we need to have system that updated the information base on the new information, tips and etc.

**Q17.** *Can you please describe the step and method from the beginning until the end phase of the stroke patient when they had to do some treatment?*

There is a lot of step involved. For one session, we analyze the level of the stroke itself. When we knew the level (ex: they show the improvement, initial level etc), we have to start the therapy with them at first. It depends on their stroke level. Then we direct the stroke caregivers to join and guide them on how they can learn of these.

**Q18.** *How many stages the stroke patients normally have? How do you normally handle it?*

The stroke have a lot of stage which normally it has 3 attacks of stroke. For the 1st attack, the stroke patient will need to be hospitalized for the investigation. Or the 1st attack, normally the stroke patient can be fully recover but depend on the stroke level. Sometime, the stroke patient can be recover by doing the therapy but some of them cannot. Normally, the stroke patient will have maximum of 3 stroke attacks and for the third stage , they will completely paralyzed

**Q19.** *Is the stroke patient able to use the mobile phone in order for them to help themselves?*

Yes, but depends on the accessibility of them. There are a lot of things that we need to consider such as stroke level, the handphone size, the disability type and so on.
20. Is the information that stroke patient and stroke caregivers received are the same?

They received very similar information but how they accepted the information is totally different.

21. Is there any existing system with the research that we conducted?

No

22. Do you think they really need the system?

Yes, but from my opinion for the stroke patients, there are a lot of criteria that you need to consider. Maybe you can just focus on the stroke caregivers only.

23. Is there any other information which we need to focus on stroke patient and the caregivers?

If the stroke patient have problem in getting the information about stroke, maybe they can directly call us to know the updated information. Maybe the information that they are looking for that is not available in the existing system.

************************************session end************************************

2nd Interview session

<table>
<thead>
<tr>
<th>Date</th>
<th>13 November 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:30am- 10:00pm</td>
</tr>
<tr>
<td>Duration</td>
<td>½ hour</td>
</tr>
<tr>
<td>Place</td>
<td>NASAM, Petaling Jaya</td>
</tr>
<tr>
<td>Job</td>
<td>Occupational Therapist</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
</tr>
</tbody>
</table>

1. What is your job scope here?

I am Occupational therapist and work as admin executive at NASAM.

2. What is your task?

I handle all activities regarding to the schedule of stroke patient activity and handle the administrative staff here.
Q3 : How long have you been working here?

Almost 10 years since NASAM opened at Petaling Jaya.

Q4 : We are going to develop an information system for stroke patient using mobile phone, do you agree with it?

First of all, I did not agree with your suggestion on developing an information system using mobile phone. Furthermore, if I need an information system for stroke, I can use google to search for the information. It is faster than I need to search it and strained my eyes to read the text on mobile phone.

Q5 : We are intended to develop a mobile application to help the stroke patient on helping them to assist them on physiotherapy, what is your opinion?

Stroke patient did not use mobile phone; most of them do not even have the mobile phone. The reason is because their disability restricts them on using the mobile phone where they do not know how to use it. If you want to develop it, you need to develop it on the PDA, since the normal phone have a very small size of screen, it is impossible for them to look on the screen and see on it. Most of the stroke patients have an eyes problem where they cannot clearly see what in front of them.

Q6 : What is your suggestion?

From my opinion, if you want to develop a physiotherapy module, you make a cd which have the video on physiotherapy module together with a voice that can instruct and help the stroke patient on doing the physiotherapy. But, if you want to make an information system on the internet (pc), you cannot focuses on the stroke patient as a user for your system. Most of them cannot see and hear properly plus they did not know how to use the computer, so you can focus on other use such as speech therapist, stroke rehab centre like us or stroke caregivers. Stroke caregiver is the most important person for the stroke patient for guiding them on doing everything. Maybe you can focus more on stroke caregivers because they are the one who needs more attention compared to the stroke patient itself.

**********************************************************************session end**********************************************************************
2.0 Interview with Therapist

2.1 1st Interview session

<table>
<thead>
<tr>
<th>Date</th>
<th>27 November 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:30am- 10:30pm</td>
</tr>
<tr>
<td>Duration</td>
<td>1 hour</td>
</tr>
<tr>
<td>Place</td>
<td>NASAM, Petaling Jaya</td>
</tr>
<tr>
<td>Job</td>
<td>Therapist cum Admin Executive</td>
</tr>
<tr>
<td>Age</td>
<td>38 &amp; 42</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
</tr>
</tbody>
</table>

Q1. Please introduce yourself.

1st interviewee: I am Tracy works as admin and therapist at NASAM
2nd interviewee: I am Regina, works as admin and therapist at NASAM.

Q2. How do you usually get the information about stroke patient in the hospital?

Normally, we did not go directly to the hospital to see the stroke patient. But, as far we know, lack of coordination on how to handle stroke patient at the hospital. Some of our physiotherapist will go to the medical ward and ask the stroke guy what he really concerns on. Primary care clinics doctor is not enough at the hospital. Patients that are not very bad stroke and consider stable, 2-3 days discharge, and the physiotherapist doesn’t have time to say hello, physiotherapist work so hard.

Q3. What is the relationship between hospital and rehabilitation centre?

Now, it is a problem. We do not have an official equipment to communicate directly with the hospital who handles stroke patient. Normally they (stroke patient) know about rehabilitation centre form media, from friend, articles and flyers. We wish that we can have a communication with the hospital for any stroke patient that discharge from the hospital.

Q4. What is the proportion in NASAM?

Physical, occupational and speech therapists (that comes 2, 3 times a week), some of them that make speech. We include these entire three processes in our rehabilitation centre.

Q5. What is the most of the cases that patient discharges to the hospital the physiotherapist that need to go to speech therapist compare to physiotherapist?

Everybody addresses physical problem and movements which we addressed the most. When it comes to activities in daily living, speech, swallowing and there is no tips for them. There are still lacks of tips that provided to the stroke patient that need to be concentrate on. For me, the action should be taken, where stroke patient immediately go to the rehabilitation centre, so that can we interfere so that we can take any action on them. We need to get to know and examine which one are the most priorities for the stroke patient. While in a group where one stroke patient do the therapy, the rest of the stroke patient can
wait for the others to navigate them in doing some rehabilitation activities. That is couple of 
condition that they need to see where some of them still need to see doctors and we are 
working very hard and it have many issue that we handle here.

Q6. The therapy, is it also available on website?

From our website there is no such thing available but others they did provide some general 
exercise for maintaining stroke on some basic therapy exercise. The most specific stroke for 
stroke patient that the most stroke patient is need to be tailored to their disability to their 
level, they do not have it online.

People (stroke patient) is not being savvy as well , they need caregivers to guide them 
where to do, what to do, where to go, They have to go research everything they need for.

There is no one single portal for everything.

There is one website (American website), they link to stroke site, they link to professional 
boarding list ,issue , they also link to related to caress to other area (caregivers section ) 
that link to other .For stroke survivor as well. They have area where they have everything. 
You also can download online the stroke brochure and many things. But, if there is 
someone that can developed all of this information here in Malaysia , it is very good and 
that is the should be the way.

Some of stroke caregivers, they need and have to search for the website information, 
instead of doing that, why don’t they come to us with some details that they can search on.

On my suggestion, it also very thoughtful for caregivers to teach them on how to do things. 
It is rather or we can distribute to them gave an information out in one pamphlet in order 
for them to refer to everything. Hospital cannot occupy with many of them, stroke patient 
comes vary from ages, youngest strokes, and we should give a comprehensive recovery.

Q7. Talk about young stroke, how youngest stroke patient can be?

We handle stroke patient is age at 7, 19, 21 40++, 25, 23 years old.

Q8. What do you think that is lack on stroke education?

This people in the hospital need to know on how to handle to stroke patient, what they can 
go through, what they do have to do, where, why they must do it, those are the things that 
we need to generate and concentrate on. In my experience as therapist, I will be counseling 
them, show them the care, how to proceed your life. In private hospital that I use to work, I 
am in charge of them for 48hours. They will look after me if I provide lack of information 
for them such as the shoulder care, the step for this. This all the first thing that we need to 
gave them for the first most recovery for the stroke. Every stroke exercise is related to each 
other.

Q9. Is there anything that can be automated developed system?

There is skeleton positioning but we do not have the material. We having to develop that. 
That’s why we need material which we can give away to stroke patient.

Q10. Which sort of information that applicable to everybody and for individual?
A lot of physical therapy is everybody’s stroke, for speech, things like swallowing should be more specific. There is step to step guidance on how to swallow on how to spell each correct word properly. There is still a lot of thing to be consider on such as on how to transfer stroke patients, what to prepare in the house, activity involve for them in daily life, welfare site, where to get inverse exception events, this is what we need to know. There is also information on where they can communicate, where they can find source of information, equipment and nursing home available plus the information should vary form in different languages as well.

Q11. The structure for NASAM to do everything, what is your preference in doing?

Our concern is which hospital, which doctors to go, which cares nurse they should be, we assign them on what daily activities that they need to do.

Q12. We are from the faculty information technology, what we should be doing in order to help the stroke patient in any chance?

You can work on to could expand the website and materials. If it is is necessary, you also can make a cd and now we have a plan to planning to start with on educational on how to handle to stroke. How can stroke patient can be, where can ongoing recovery on the rest of the day. Normally stroke patient just go home and they do nothing. It should be a cd that helps them in general, depending on the level, this strokes need to do this, basic what can they really depend on the caregivers that, on the early stage positioning, such as handling. This is what the caregivers should look into at the specific time for the recovery that they can monitor that thing(on the cd), they can always see on what they need to do first. So, you can do it into that, we intend to do it, but that we seems do not have time, If somebody can do that first, we can have the guidance on how can we plan everything.

This cd one is very good rather than doing mobile application which it is also small that is not good medium of the delivery. As we doing public website, we are not gave any CD, material, any education on one specific thing that they want. From that source of cd which have several of modules, we can get something, Depend what program that they have, stretching and etc.

Q13. Is there any timetable for them?

That involve programme, planning and to have an interactive activities for them. Volunteers as well assist the stroke patient in doing some exercise. Some strokes that cannot be able to do they exercise, they need to have and follow sequence of step before they can really do the physical exercise. Actually there is still one cd or video that available on the internet. But, this website offers a video that it is really general, but it is not on stroke recovery, but they are very generic one. This is the thing that you need to buy it to open the thing.

Q14. Which one is more useful as a portal for everything instead of having a vcd on the internet?
What the rehabilitation centre really need is a pamphlet. As this information that we need to distribute for the stroke patient. Stroke caregivers and stroke patient, they wont open the website ,instead of that, they need to copy on pamphlet on the VCD then we can just print that out .the information with inside the vcd that should that what the importance thing to do. The information should also include the links that they can open it. The flow of the exercise, the things that they can do and etc Lastly, physical disabilities that management slightly change, handling, it is got high little request, so we can gives them to practice it at home.

***************************************************************************

2.2 2\textsuperscript{nd} Interview session

<table>
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</tr>
</thead>
<tbody>
<tr>
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<td>Duration</td>
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<td>Place</td>
<td>NASAM, Petaling Jaya</td>
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<tr>
<td>Job</td>
<td>Speech Therapist</td>
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<tr>
<td>Age</td>
<td>33</td>
</tr>
<tr>
<td>Sex</td>
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</tr>
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</table>

\textit{Q1. Please describe about yourself.}

Therapist,32 years old and train as University College of London, England Speech therapist, Private Health Care in London, National Health Care in Community Clinic, Work independently at NASAM, persatuan kanak2 Istimewa, Damansara specialist hospital.

\textit{Q2. If a portal that is Information system for stroke centre, stroke therapist, stroke rehab centre, in terms of speech therapy what should be necessary?}

Speech and language is a broad aspect and which have many things you can look at. You need to describe, language disorder, dysphasia, you can have both, one, you might not be able to get work out even though you know that what it is and it is very disabling frustrating . As human being we need to interact with each other, it is a difficulty since it is the most important part. Some patient might not be able to understand language, so it need to use something as environment. We need to figure out how severe it is, we need to know using object communication, drawing diagrams, photographs using newspaper articles .Even though, he cannot write in right hand and he maybe can write in the left hand.

\textit{3. What is the major problem of stroke patient and speech therapist facing?}

We have a right mixture in here .Most of them have language disorder and speech disorder. They have disaphia language disorder and diarrhea. Some of the cases the understanding is good but they cannot say the right word. And the family need use to object. But is very hard again, because you need to take a photograph for everything. The patient cannot say what they want. They need to work and lips and tongue exercises.
Q3. How many sessions for speech therapy?

A lot, we have one to one session, when we make facial massage, they can do it everyday.

Q4. Do you use any medium for you speech exercise?

We have picture which is not really high technology thing which we scan picture and we intend to have it on computer which the stroke patient can repeat and can type and writing in the computers. It is a little bit useful but not applicable for stroke patient because looking on their disability. By the way, we do not use VCD as our materials but we use mirrors. Its better to use it on mirrors because stroke patient cannot follow on what VCD shown, even though its for caregivers you need to take patient hand to do a—e---eoo—in. so we need to see how they are doing it.

Q5. Is there any assessment to see the patient improvements?

I do all the assessment by myself in sense of counting, reading, learning object, function object, short sentences, eating and many more. We need to see the tongue, the jaw to see whether they said in correct words. For some patient, we need to have swallowing assessment.

Q6. Is it possible to get the assessment list?

No, it just in my head.

Q7. Is there any system that can be automated in speech therapist?

It needs to be more specific. For example, if we have difficulties naming, then we can have on the internet naming, when you press button on the keyboard it said apple on it. We also need to treat stroke patient base on their age, level of thinking not as youngest child. They are different for each age and level. We must come out with functional vocabulary.

Q8. What is the step in speech therapy, from initial until to the final step?

It depend on the type of problem that are facing, there are a little hierarchy and understanding that we have to follow which is a long list if I want to explain it here.

Q9. Is there any resource for stroke patient for speech therapist?

No, we have no formal resources. All you need to know is the strength and difficulties for stroke patient. I use NDB measuring skills. The questions such as, are they communicating with family members? people? Are they communicating with others? Need to look level of their impairment of disability. We measure everything with numbers and write it down on it and see the improvements.

Q10. How long it takes to recover?

It varies depend on the impairment level.
Q11. For speech therapist, what do you need is information

A lot of speech therapist work individually, what would be good for them that aware NASAM exist and facilities, myself (for example, if stroke patient refer to me by the hospital, I ask them don’t see me privately, just come to NASAM, then I will treat you here, because you can have other stroke patient). It is more functional because you can communicate with others instead of doing individually, you can talk with each other which is more effective and natural. They can have a very natural environment.

Most of speech therapist, do not know that this place exist for them to work. Most of them do not know the existence of rehabilitation centre where they find it hard to search it.

**************************************************************************session end**************************************************************************

3.0 Interview with Stroke Caregivers

3.1 1st Interview session

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<td>Age</td>
<td>36</td>
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<tr>
<td>Sex</td>
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</table>

Q1. As general, mobile phone in your opinion for generate the portal?

They don’t seem the relevant; you got all kind of funny sms. You have a choice to delete. It is not relevant to applicable. MMS can get limited sms. Handphone is an equivalent method to be use instead of digital media.

Q2. What type of application that you think suitable in order to develop the system (portal)?

Internet is the most applicable application. It is one to many media, is the .Net. getting to people to know that this is not the issue.

Q3. As caregivers for your mum, what is the main issue?

Being educated, the caregivers not enough clear information
- My education
- The management of the stroke

As you know, there is four type of generic stroke, each of the four generic types require specific management from medical perspective. The problem is not of us are aware of these. In the hospital, the doctor’s only tell that he has stroke. And that’s it.
One of the biggest challenges that we face was challenging the doctors. We need to know what type of stroke, what I should do. The management is the same, it is very sad, because each stroke the recurrent possibility for the risk factors is different for each type of stroke is different. It being created somewhere (stroke), education of the caregiver, medical management of the patient, information is lacking in terms of various type of stroke. We must be aware of each type (prospect, risk). The type of stroke, management for short term, medium term and long term. We must understand at least as for primary care. Otherwise option is very limited. It very frustrating because I could not find the resources. And it was by chance that I come across NASAM (through word of mouth) which he also heard it from somewhere which it mentioned on awareness issue and educational issue, caregivers point of view. This stroke requires a lot of education for people to know about stroke. A lot of people that cannot understand that you and me can have stroke, predisposed to stroke. You can watch tv and have stroke. Your muscle contracts, there is no more control. There is no policy with regards on how stroke is manage. As I experience, when you go to hospital, they were giving lack of resources. Considering number do stroke that they have, they do not have number of policies that have a management on how to handle stroke.

**Q4. We know that we want to use computer-base technology which is means, computer or mobile application. What is your opinion?**

Social issue, culture issue on using mobile phone. Stroke can apply to anybody, you receive sms for a stroke then you won’t read it anyway

**Q5. How did you find more information after you know you mother had stroke**

A website which is national stroke association of America.

**Q6. How did people know about stroke?**

They don’t, they just ignorance 50% of caregivers do not have an issue. They just know that it happens, on why it happens nobody cares. Once you have a stroke, the likely you can have secondary is very high. Nobody understands about it. The doctors only advice you but you have to change everything. There is huge level of different of stroke. I was very shocked; they just said “wait for your mum to be discharge”

For me, I still have my option; there are a lot of people that are not aware.

**Q7. Do you connect to other caregivers?**

They should be an improvement area; they should be a support group of caregivers. It is huge emotional burden for caregivers. The moment we suffer first, they go for personality change. They can become impulsive, rude, a little aggressive sometime that is because they are not able to control their own feeling. If you want to do something, they blocks ability control. They are huge emotional load of caregivers. You need to work through that. Apart of that you lose someone. The person that you want does not exist anymore, physically they do, but they are not the same person. So you need to adjust to them. Chemically, their brain altered. They become a different human being in different human person so we need to accommodate with it.

**Q8. What do you think on having support group?**
Support group will be wonderful because it sends a nice in network of people that will generate awareness and they will become ambassadors for the course itself. A word spread from them. Become good ambassadors.

Q9. How’s your life after your mother’s stroke?

No such thing of balance. Time balance of work and on care of my mother. You have gone through for 24-hours. Now she is ok, but initially she couldn’t that is the reason why I leave her in the nursing room. You have to make a decision that you have to sacrifice guilt because you are abandoning your mother. Then you have tailored to know what kind of care that you want to give her. There is no such thing as balance. It just priorities thing on what you should do first.

Q10. How long it takes for you mum to send here?

2 months.

Q11. The doctors said the stroke cause by what?

It suspects that it could be embolism, but they never knew what it was. It is quite frightening. This is why we just schedule we have test that I it that can be some prevented. But we need to find out what is the root cause.

Q12. Does she need to change her diet?

No. Because nothing wrong with her, no hypertension, no diabetes, thoroughly functional, she can drive and live independently. She is very healthy. All of sudden, then it is stroke.

Q13. How old is she?

67.

Q14. IS there any stroke history from your family?

8 years ago, she suffered from aneurism which is the type stroke which is cause one of vessel eruption It erupts because there is something wrong with the blood vessel at the point. It is congenital issue. You will be born the factor and it took 67 years for that weakness to show. She is 16, 32, 27 year old, aneurism. Maybe we have but we do not know. She suffered from aneurism 8 years ago and she fully recovered and she fully recovered after 6 months and now she fine (normal).

Q15. Does she use technologies, DVD, mobile phone?

No, she is the technophobia thing.

Q16. Does she use normal television and phone?

Yes.
At the moment is she has unable to control her emotion?

The thing about stroke here is on physical point of view. The nerves neither are nor damage, is she quite ok. It just the connection to the brain that is broke.

**********************************session end**********************************

3.2 2nd Interview session

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<td>Age</td>
<td>65</td>
</tr>
<tr>
<td>Sex</td>
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</tr>
</tbody>
</table>

Condition: Stroke Survivor (She is considered fully recovered)

The reason she recover is because she did more than the doctor asked him to do. For example, if the doctor asked her to do twice the activity, she will do more than that. She has a very high spirit.

Q1. Please describe yourself.

2005. I am very active person, I am do volunteer work, go to MIND. Before this, I go to the hospital and visit the stroke patient. I now open a private school. I work as HR MINDF. I involve a lot of staff training. I have to deal with a lot of people; I am very active question. involve with Red Crescent where I need to visit to rural area school. I start doing voluntary work when I am form 2.

Q2. Do you still work as voluntary work at MIND

MIACC. This is subdirectory for MIND which helps for the stroke patient for speech therapist.

Q3. Any sign of you to know that you stroke?

Anyone needs to be cautious, 1st if your blood pressure, if it is high, diabetes high then you can get stroke, fever and smoking. Firstly, I am very hyperactive person, stress, I was born not to sit and just do nothing. I do a lot of activity since I was child. Since I was 5years old, I always help people who sick and go to hospital. Secondly, I love to teach student in English, recite al-Quran. I also learn about mandarin and expert in it but after I had stroke, I cannot remember anything about mandarin. I did not give enough rest to my body. Everything I do , I do by myself.

There is a situation where i cannot write but I can hold my pen and I saw doctors but she said that’s normal. I still drive and I love driving. I drive porches and bmw7series. Then I kept complaining about my fingers, and then my friends ask me to put some medication on
my skin. There is another situation, where I felt that my hands was very weak than I ask doctors. Then I check to doctors that my blood pressure is 210/110. As a dar as I know, when the pressure is high, they should send me to see the specialist. But they asked me to go back and sleep. Then I drive but, I hit something, and this time I cannot press the brake, but I keep on driving. When I go home I just take some medication and sleep. Then, the next day, somebody told me that I am slurring, and then he asked me to go hospital. Then I go to hospital to see my niece and ask her my opinion. The she called hospital to asked or prepare for wheelchair and everything. Then doctor examine, then I’ve being warded and the neurosurgeon came and he said that I will get stroke. I know that what is stroke is but I just asked "what is stroke" to the doctor. And he mentioned that the stroke is when your right brain, there is a plague (thrombosis) in other word you will be paralyzed during 24hours on right body. I ask him how long I can have this, and I did not realize that it is very serious. All my body is very weak, and then I go back home, when I pray I cannot even raise my hand and cannot read anything even any words. Than, i scream again and again than I cannot stop it and cannot control the scream. It means that my nerves are not ok. Then I frightened then I realize the seriousness of the stroke.

Q4. Before you get the stroke, what type of information that you need to know before you had stroke?

Yes, for example, symptom that I need to know. Just go to the hospital if your blood pressure is high.

I already recovered from stroke for 5 years but I still do a lot of activity then one day I fall then my hand broke. I was in plaster for 6 months. Doctor asked me to take a rest but I am not that type of person.

Q5. When you had stroke, what is problem that you facing?

Communication. My daughter cannot understand what I am talking about. I was very stressful when they did not understand. My children are not around they are all in oversea. And they come back and start buying equipment that must fit with my situation. Then I start change everything in my house. I found that my house full with stairs. Then I start to move my room from upstairs to downstairs. Then I go to the rehabilitation centre at PPUM that involve therapist which is quite expensive. Then I had reflexology on my first day that i had stroke. Second day I start to do occupational therapy than after two weeks I start to do acupuncture. Everyday I go to hospital; I had treatment everyday which are the reason I feeling better.

Q6. How long it takes for you to recover?

For the 1st three month, I could not walk. I adjust everything on my bathroom, and have grabber in my bathroom for my treatment. UH(University hospital) is very good where they teach everything which they provide everything on rehabilitation requirements. After 8 months I do not need to use wheelchair anymore.

Q7. Where is the equipment that you normally bought it?

The cheapest is IKEA.
Q8. Who told you about the equipment that you need?

Nurses. I need to have equipment on my right hand.

Q9. What they normally teach you?

Many thing. How to wear bra, grooming and everything. Cannot wear any clothe. You have to change many things. They teach step by step.

Q10. Do you need to follow any diet plan?

Yes, I have to follow many things. My son (caregivers) take care of my diet and timetable for 2months.

Q11. Do you have any problem on contact for therapist?

No problem. They are my friend now.

Q12. Have you ever heard about NASAM?

Yes, but I never ever been there. Because the equipments is not really good. The place is small and full with people.

Q13. Any information that we can provide on the step by step or stroke?

First, when you had stroke, you have to know that this can be recover. Do not pity yourself. Forget about sympathy, just think on the solution. Do all the exercise that doctor asked you to do. Then when you ok a bit, then you have to plan. First, what you should have in your houses.

First, stair, make an adjustment to your home. The doctor came to your house and evaluate what equipment that you should have in the house. Bathroom is very important. You have to find the equipment that suitable with your bathroom. Then you bedroom adjustment then your dining room also should be adjust. A lot of adjustment to do. Of course it must followed by medication. You have to take medication as doctor said.

Q14. Where do you have the information to buy the equipment?

Occupational therapist informed me.

Q15. What information for stroke caregivers?

Being with the stroke patient all the time and being encourage for the stroke patient. The caregivers have to be very strong. As caregivers, you cannot hire maid. You have to encourage stroke patient to be more independent and must be able to everything. Just be yourself like before. Go over like before. Caregivers need more attention, give counseling to make them realize how importance to handle stroke patient. Stroke disturb nerves, sadness everything, you cannot control feeling, laugh, sad and any type of emotion. Until now, it is not easy to control our emotion.

**********************************session end**********************************
APPENDIX B : FOCUS GROUP SESSION
5.0 Focus Group

Date  
30 November 2007

Time  
10:30am - 11:30am

Duration  
1 hour

Place  
NASAM, Petaling Jaya

Three questions that we have asked which are:

4. When you had your first stroke attack?
5. What type of rehabilitation that you did here (NASAM)?
6. What type of information that you need at home?

5.1 GROUP 1 (Cantonese Group)

This group consists of 10 persons and the average age for stroke patient is between 50-70 years old and they are unable to speak in English. On this focus group, one translator is assigned in order to help us translating the Cantonese language spoken to English. This translator is one of the stroke survivors who has partially recovered from stroke.

<table>
<thead>
<tr>
<th>Stroke Patient Characteristics</th>
<th>Stroke Condition</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
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<tbody>
<tr>
<td>Age : 55 Gender : M Job : U</td>
<td>Early</td>
<td>2005</td>
<td>Physiotherapy</td>
<td>Schedule from NASAM</td>
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<td>Age : 63 Gender : F Job : U</td>
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<td>Physiotherapy</td>
<td>I don’t know, normally people assisting me in doing it</td>
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<tr>
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<td>2004</td>
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<td>A caregiver</td>
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Gender: F  
Job : U  
Age : 63  
Gender: F  
Job : U  
Age : 58  
Gender: F  
Job : U  
Early 2003  
Physiotherapy  
No answer  
Early 2001  
Physiotherapy  
No answer

**Table 1:** Details of focus group 1 output

### 5.2 GROUP 2 (English Group)

This group carries on 3 patients where accompanied by stroke caregivers with them because of their impairments. Most of the answer is given by stroke caregivers.

<table>
<thead>
<tr>
<th>Stroke Patient Characteristics</th>
<th>Stroke Condition</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
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</thead>
<tbody>
<tr>
<td>Margaret Age : Early 50</td>
<td>Early 2005</td>
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<td>Physiotherapy</td>
<td>Give more support group to share each other feelings.</td>
</tr>
<tr>
<td>Shirley Age : Early 60</td>
<td>Middle 2004</td>
<td></td>
<td>Physiotherapy</td>
<td>Counseling session or us where we need to know on how to handle everything related to the stroke patient</td>
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<tr>
<td>Age : Early 70</td>
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</table>

**Table 2:** Details of focus group 2 output

**Remarks**
*U: Unknown

***************session end***************
APPENDIX C:
CARD SORTING ACTIVITY
6.0 Card Sorting Activities

On this step, 87 cards representing the menu for WISSC have been giving out to the 4 respondents which are the stroke caregivers. In this section, list of the cards is presented and the result from each of the four respondents from the card sorting activity. Finally, we conclude from overall output of card sorting activity.

6.1 The Cards

1. Caregiver’s health management
2. Caregivers’ personal stories
3. Chart from initial step to final step in rehabilitation
4. Common thread Pen-Pals
5. Connecting others
6. Contact
7. Diet plan
8. Directory if doctors
9. Directory if volunteers
10. Directory of care centre
11. Directory of nursing home
12. Discussion board for speech therapy
13. Discussion forum for caregivers
14. Downloadable information on daily activities at home
15. Downloadable information on rehab centre (NASAM,MIND)
16. Downloadable information on schedule of diet plan
17. Downloadable information that they need at home
18. Education
19. Educational information or caregivers
20. Effect
21. Emergency
22. Emergency and education for patient
23. Example picture of bathroom modification
24. Example picture of kitchen modification
25. Example picture of stairs modification
26. Exercise and fitness
27. Financial resources
28. Finding supplies (bed)
29. General Information about stroke
30. Getting support for post-stroke
31. Handling emotion for caregivers
32. Helpline for emergency and questions regarding stroke
33. Highlighted activities (do and don’t do for stroke patient)
34. How to avoid another stroke
35. Improving patient care
36. Information from professional
37. Information on advice centre by professionals
38. Information on communication & swallowing
39. Information on national organization for empowering caregivers
40. Information on national organization for empowering caregivers
41. Information on the caregiver’s marketplace
42. Information on the fact that family history is a predictor of stroke
43. Life after stroke
44. Links to government hospitals and rehab centers
45. List of Donor
46. Marketplace for modification tools (budgets, where to get)
47. Media statistics
48. Media stroke news
49. Mobility aid application (e.g., people living in 4th floor of an apartment with no elevator)
50. motivational talk by doctors
51. motivational talk by professional
52. Motivational talk (by volunteer)
53. New and alternative therapies
54. Occupational therapy
55. Patients feedback to therapists
56. Pediatric Stroke Resources (Links for family who experienced strokes)
57. Preparation of home for patient
58. Program organized for stroke patient & caregivers
59. Program provided
60. psychiatry/psychology information to handle stroke
61. Rehab and regaining independence
62. Research findings
63. Social welfare support
64. Speech Therapy
65. Step by step guidelines for bathroom modification
66. Step by step guidelines for kitchen modification
67. Step by step guidelines for stairs modification
68. Step in speech therapy
69. Stroke connection magazine
70. Stroke patient personal stories
71. Support group for caregivers
72. Therapies
73. Therapy that the patient need
74. Therapy that the patient need (different types)
75. Video on how to carry stroke patient
76. Video on how to help patient swallow food
77. Video on how to move patients from bed
78. Video on how to take care of patient’s shoulder
79. Video on how to turn patient around
80. Video on how to walk in a correct way
81. Videos
82. Warning signs of stroke
83. What MUST do daily
84. What programs of rehabilitation are available
85. What to expect in rehabilitation
86. What to prepare in the house
87. When to begin rehabilitation

6.2 Results

6.2.1. 1st Result

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<tr>
<td>Age</td>
<td>42</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
</tbody>
</table>

1. Caregiver’s health management
2. Caregivers’ personal stories
3. Chart from initial step to final step in rehabilitation
   - Contact
     - Common thread Pen-Pals
     - Connecting others
     - Directory if doctors
     - Directory if volunteers
     - Directory of care centre
     - Directory of nursing home
     - Links to government hospitals and rehab centers
     - List of Donor
   - Discussion board for speech therapy
   - Discussion forum for caregivers
4. Education
   - Downloadable information on daily activities at home
   - Downloadable information on rehab centre (NASAM, MIND)
   - Downloadable information on schedule of diet plan
   - Downloadable information that they need at home
   - Improving patient care
   - Finding supplies (bed)
   - General Information about stroke
   - Getting support for post-stroke
   - Exercise and fitness
   - Financial resources
   - Handling emotion for caregivers
   - Life after stroke
   - Marketplace for modification tools (budgets, where to get)
   - Social welfare support
   - Stroke connection magazine
   - Stroke patient personal stories
   - Support group for caregivers
- Psychiatry/psychology information to handle stroke
- Rehab and regaining independence
- Mobility aid application (e.g., people living in 4th floor of an apartment with no elevator
- Pediatric Stroke Resources (Links for family who experienced strokes)
- Preparation of home for patient

5. Educational information for caregivers
   - Example picture of bathroom modification
   - Example picture of kitchen modification
   - Example picture of stairs modification
   - Step by step guidelines for bathroom modification
   - Step by step guidelines for kitchen modification
   - Step by step guidelines for stairs modification

6. Emergency
   - Emergency and education for patient
   - Effect
   - Highlighted activities (do and don’t do for stroke patient)
   - How to avoid another stroke
   - Warning signs of stroke
   - What MUST do daily

7. Helpline for emergency and questions regarding stroke

8. Information from professional
   - Information on advice centre by professionals
   - Information on communication & swallowing
   - Information on national organization for empowering caregivers
   - Information on national organization for empowering caregivers
   - Information on the caregiver’s marketplace
   - Information on the fact that family history is a predictor of stroke
   - Motivational talk by doctors
   - Motivational talk by professional
   - Motivational talk by volunteer

9. Media statistics

10. Media stroke news

11. Program provided
   - Program organized for stroke patient & caregivers

12. Research findings

13. Therapies
   - Therapy that the patient need
   - Therapy that the patient need (different types)
   - Speech Therapy
   - Step in speech therapy
   - New and alternative therapies
   - Occupational therapy
   - Patients feedback to therapists
   - What programs of rehabilitation are available
   - What to expect in rehabilitation
   - What to prepare in the house
   - When to begin rehabilitation

14. Videos
- Video on how to carry stroke patient
- Video on how to help patient swallow food
- Video on how to move patients from bed
- Video on how to take care of patient’s shoulder
- Video on how to turn patient around
- Video on how to walk in a correct way

*******************************************************************************session end******************************************************************************

//the cards given out only is in half amount from the total of the card

6.2.2 2nd Result

<table>
<thead>
<tr>
<th>Date</th>
<th>4December 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>11:00am - 11:30pm</td>
</tr>
<tr>
<td>Duration</td>
<td>½ hour</td>
</tr>
<tr>
<td>Place</td>
<td>NASAM, Petaling Jaya</td>
</tr>
<tr>
<td>Job</td>
<td>Unknown</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
</tbody>
</table>

1. Diet plan
   - Common thread Pen-Pals

2. Connecting others
   - Downloadable information on daily activities at home
   - Downloadable information on rehab centre (NASAM, MIND)
   - Downloadable information on schedule of diet plan
   - Downloadable information that they need at home

3. Contact
   - Directory if doctors
   - Directory if volunteers
   - Directory of care centre
   - Directory of nursing home
   - Discussion board for speech therapy
   - Discussion forum for caregivers

4. Education
   - General Caregiver’s health management
   - Caregivers’ personal stories
   - Chart from initial step to final step in rehabilitation
   - Educational information or caregivers
   - Helpline for emergency and questions regarding stroke
     - Highlighted activities (do and don’t do for stroke patient)
     - How to avoid another stroke
     - Improving patient care

5. Effect

235
6. Emergency
   - Emergency and education for patient
   - Exercise and fitness
   - Financial resources
   - Finding supplies (bed)
   - General Information about stroke
   - Getting support for post-stroke

7. Handling emotion for caregivers
   - Information on national organization for empowering caregivers
   - Information on national organization for empowering caregivers
   - Information on the caregiver’s marketplace
   - Information on the fact that family history is a predictor of stroke

8. Information from professional
   - Information on advice centre by professionals
   - Information on communication & swallowing

6.2.3 3rd Result

<table>
<thead>
<tr>
<th>Date</th>
<th>5 Disember 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>12:00pm - 12:30pm</td>
</tr>
<tr>
<td>Duration</td>
<td>½ hour</td>
</tr>
<tr>
<td>Place</td>
<td>NASAM, Petaling Jaya</td>
</tr>
<tr>
<td>Job</td>
<td>Unknown</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
</tr>
</tbody>
</table>

1. Life after stroke
2. Marketplace for modification tools (budgets, where to get)
   - Media statistics
   - Media stroke news
   - Mobility aid application (e.g., people living in 4th floor of an apartment with no elevator)
3. motivational talk by professional
   - Motivational talk by doctors
   - Motivational talk (by volunteer)
4. Pediatric Stroke Resources (Links for family who experienced strokes)
5. Preparation of home for patient
   - Links to government hospitals and rehab centers
   - List of Donor

//the cards given out only is in half amount from the total of the card

**************************session end**************************
6. Program provided
   o Step by step guidelines for bathroom modification
   o Step by step guidelines for kitchen modification
   o Step by step guidelines for stairs modification
   o Program organized for stroke patient & caregivers
   o Psychiatry/psychology information to handle stroke

7. Rehab and regaining independence
   o What programs of rehabilitation are available
   o What to expect in rehabilitation
   o What to prepare in the house
   o When to begin rehabilitation

8. Support group for caregivers
   o Research findings
   o Social welfare support
   o Stroke connection magazine
   o Stroke patient personal stories
   o Warning signs of stroke
   o What MUST do daily

9. Therapies
   o Therapy that the patient need
   o Therapy that the patient need(different types)
   o New and alternative therapies
   o Occupational therapy
   o Speech Therapy
   o Step in speech therapy
   o Patients feedback to therapists

10. Videos
    o Video on how to carry stroke patient
    o Video on how to help patient swallow food
    o Video on how to move patients from bed
    o Video on how to take care of patient’s shoulder
    o Video on how to turn patient around
    o Video on how to walk in a correct way

****************************************************session end****************************************************

6.2.4 4th Result

<table>
<thead>
<tr>
<th>Date</th>
<th>8 Disember 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>10:30am- 12:00pm</td>
</tr>
<tr>
<td>Duration</td>
<td>1 and ½ hour</td>
</tr>
<tr>
<td>Place</td>
<td>University Malaya</td>
</tr>
<tr>
<td>Job</td>
<td>Unknown</td>
</tr>
<tr>
<td>Age</td>
<td>24</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
</tr>
</tbody>
</table>

1. General Information about stroke
2. Emergency and education for patient
   i. Emergency
      o Helpline for emergency and questions regarding stroke
      o What MUST do daily
      o Therapy that the patient need
   ii. Education
      o Getting support for post-stroke
      o Information on communication & swallowing
      o Marketplace for modification tools (budgets, where to get)
      o Finding supplies (bed)
      o Financial resources
      o Social welfare support
      o Stroke patient personal stories
   iii. Videos
      o Video on how to carry stroke patient
      o Video on how to help patient swallow food
      o Video on how to move patients from bed
      o Video on how to take care of patient’s shoulder
      o Video on how to turn patient around
      o Video on how to walk in a correct way

3. Life after stroke
   o Rehab and regaining independence
     ▪ Therapies
       ➢ New and alternative therapies
       ➢ What to expect in rehabilitation
       ➢ When to begin rehabilitation
       ➢ Chart from initial step to final step in rehabilitation
       ➢ Occupational therapy
       ➢ What programs of rehabilitation are available
       ➢ Highlighted activities (do and don’t do for stroke patient)
       ➢ Speech Therapy
       ➢ Step in speech therapy
       ➢ Therapy that the patient need(different types)
     ▪ Effect
       ➢ Warning signs of stroke
       ➢ Information on the fact that family history is a predictor of stroke
       ➢ Media statistics
       ➢ Media stroke news
       ➢ Stroke connection magazine
   o Preparation of home for patient
     ▪ What to prepare in the house
     ▪ Mobility aid application (e.g., people living in 4th floor of an apartment
      with no elevator
     ▪ Example picture of bathroom modification
     ▪ Step by step guidelines for bathroom modification
     ▪ Step by step guidelines for stairs modification
     ▪ Example picture of stairs modification
     ▪ Step by step guidelines for kitchen modification
     ▪ Example picture of kitchen modification
How to avoid another stroke
- Exercise and fitness
- Diet plan
- Improving patient care

4. Information from professional
   - Information on advice centre by professionals
   - Psychiatry/psychology information to handle stroke
   - Motivational talk by professional
   - Motivational talk by doctors
   - Motivational talk (by volunteer)

5. Connecting others
   - Common thread Pen-Pals
   - Patients feedback to therapists
   - Pediatric Stroke Resources (Links for family who experienced strokes)
   - Discussion board for speech therapy

6. Caregivers
   - Information on national organization for empowering caregivers
   - Educational information or caregivers
   - Discussion forum for caregivers
   - Caregivers’ personal stories
   - Handling emotion for caregivers
   - Support group for caregivers
   - Information on the caregiver’s marketplace
   - Caregiver’s health management
   - Information on national organization for empowering caregivers

7. Research findings

8. Program provided
   - Program organized for stroke patient & caregivers

9. Downloadable
   - Downloadable information on rehab centre (NASAM, MIND)
   - Downloadable information on daily activities at home
   - Downloadable information that they need at home
   - Downloadable information on schedule of diet plan

10. Contact
    - Links to government hospitals and rehab centers
    - List of Donor
    - Directory of nursing home
    - Directory if volunteers
    - Directory if doctors
    - Directory of care centre

********************session end************************

6.3 Result of final card sorting activity

11. General Information about stroke
12. Emergency and education for patient
    i. Emergency
o Helpline for emergency and questions regarding stroke
o What MUST do daily
o Therapy that the patient need
  ii. Education
o Getting support for post-stroke
o Information on communication & swallowing
o Marketplace for modification tools (budgets, where to get)
o Finding supplies (bed)
o Financial resources
o Social welfare support
o Stroke patient personal stories
  iii. Videos
o Video on how to carry stroke patient
o Video on how to help patient swallow food
o Video on how to move patients from bed
o Video on how to take care of patient’s shoulder
o Video on how to turn patient around
o Video on how to walk in a correct way
13. Life after stroke
   o Rehab and regaining independence
     ▪ Therapies
       ➢ New and alternative therapies
       ➢ What to expect in rehabilitation
       ➢ When to begin rehabilitation
       ➢ Chart from initial step to final step in rehabilitation
       ➢ Occupational therapy
       ➢ What programs of rehabilitation are available
       ➢ Highlighted activities (do and don’t do for stroke patient)
       ➢ Speech Therapy
       ➢ Step in speech therapy
       ➢ Therapy that the patient need(different types)
     ▪ Effect
       ➢ Warning signs of stroke
       ➢ Information on the fact that family history is a predictor of stroke
       ➢ Media statistics
       ➢ Media stroke news
       ➢ Stroke connection magazine
   o Preparation of home for patient
     ▪ What to prepare in the house
     ▪ Mobility aid application (e.g., people living in 4th floor of an apartment with no elevator
     ▪ Example picture of bathroom modification
     ▪ Step by step guidelines for bathroom modification
     ▪ Step by step guidelines for stairs modification
     ▪ Example picture of stairs modification
     ▪ Step by step guidelines for kitchen modification
     ▪ Example picture of kitchen modification
   o How to avoid another stroke
     ▪ Exercise and fitness
14. Information from professional
   o information on advice centre by professionals
   o psychiatry/psychology information to handle stroke
   o motivational talk by professional
   o motivational talk by doctors
   o Motivational talk( by volunteer)

15. Connecting others
   o Common thread Pen-Pals
   o Patients feedback to therapists
   o Pediatric Stroke Resources (Links for family who experienced strokes)
   o Discussion board for speech therapy

16. Caregivers
   o Information on national organization for empowering caregivers
   o Educational information or caregivers
   o Discussion forum for caregivers
   o Caregivers’ personal stories
   o Handling emotion for caregivers
   o Support group for caregivers
   o Information on the caregiver’s marketplace
   o Caregiver’s health management
   o Information on national organization for empowering caregivers

17. Research findings

18. Program provided
   o Program organized for stroke patient & caregivers

19. Downloadable
   o Downloadable information on rehab centre (NASAM,MIND)
   o Downloadable information on daily activities at home
   o Downloadable information that they need at home
   o Downloadable information on schedule of diet plan

20. Contact
   o Links to government hospitals and rehab centers
   o List of Donor
   o Directory of nursing home
   o Directory if volunteers
   o Directory if doctors
   o Directory of care centre

********************************************************************session end********************************************************************
APPENDIX D: QUESTIONNAIRE
Interface Evaluation Questionnaire

Name: _________________________________________________
Gender: _________________________________________________
Job: ___________________________________________________
Age: ___________________________________________________

Interface

1) Please grade our website on overall look.
   - Excellent
   - Good
   - Average
   - Poor
   - Very Poor
   - Undecided

2) The illustrations/images are in appropriate location.
   - Disagree
   - Agree

   If disagree, please state if any
   ______________________________________________________

3) The background colors are pleasing.
   - Disagree
   - Agree

   If disagree, please state suggestion color:
   ______________________________________________________

Information Structure

4) Please grade our website information structure on overall look.
   - Excellent
   - Good
   - Average
   - Poor
5) The position of the sub-menu is on the correct side.
   - Disagree
   - Agree

   If you did not agree, which side you want the submenu to be?

6) The drop down menu use to represent the sub-menu is appropriate for the site.
   - Disagree
   - Agree

   If disagree, please state your suggestion.

7) The information is sufficient for the intended audience.
   - Disagree
   - Agree

   If disagree, please state if any insufficient information.

8) The vocabulary use on the menu is appropriate for the intended audience.
   - Disagree
   - Agree

   If you disagree, please state which information that should be excluded in the main page.

9) The background color for sub-menu is pleasing.
   - Disagree
   - Agree

   If disagree, please state suggestion color.
Usability

10) The information given on the main page is appropriate
   ☐ Disagree
   ☐ Agree

11) The user can clearly see where s/he is on the site (site navigation)
   ☐ Disagree
   ☐ Agree

12) It is easy to find the information I needed
   ☐ Disagree
   ☐ Agree

If disagree, please state what information that you search for
_____________________________________________________________________
_____________________________________________________________________

13) What changes or additional features would you suggest for this website?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

14) Other Comments?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

---Thank you on behalf of department of Software Engineering, Faculty of Computer Science and Information Technology, University Malaya---
APPENDIX D: WISS Usability Testing

(Cooperative Evaluation Scripts)

Cooperative Evaluation of Web Information System for Stroke (WISS)

WELCOMING MESSAGE

Assalamualaikum and a very good morning everybody. My name is Noor Hafizah from Faculty of Computer Science and Information Technology (FSKTM), University Malaya, Kuala Lumpur. I would like to do some testing today on Web Information System for Stroke (WISS) that I have already developed. This web actually caters for stroke care. I really appreciate your participating and helping in the evaluation process. All your ideas and opinion regarding to the stroke care are welcomed and I will take any of your critics as a guidance to enhance WISS. We have a name for our evaluation which are “cooperative evaluation” where it needs your cooperation to enhance the system that I already developed. The purpose of this evaluation is to acquire a list of usability problems that can be found in the WISS user interface, in order to redesign its user interface to make it usable for us in the future development. Hopefully, all of us can fully cooperate since the web that
I developed is very useful to most of us or maybe us ourselves. I will give you a set of question and you can please to write any comment on this.

Thank you.

**How we will conduct this evaluation (Procedures)? What I want from you?**

1. I will introduce you the system we are going to evaluate, and then I want you to explore it.

2. I want you to do some tasks using the system (WISS). Task instruction will be given for you.

3. I want you to think aloud while working on the tasks. Think aloud?! Yes, say what you are doing, of what you are thinking e.g. say what you think will happen if you press a certain button.

4. I will ask you some questions while you are working on the tasks.

5. I want you to criticize the system, please don’t be shy, and say whatever you want.

6. I want you to ask me for any needed clarifications, if any problem arises please ask me.

7. I want you to write any comments, notes and opinions you want.

8. After we finish the tasks, we will set together and discuss the problems we found, and try to propose any applicable solutions.

**Tasks’ Instructions**

1. Click on button for General Information for Stroke Care.

2. Back to Home

3. Click Button Emergency and Education

4. Click Downloadable

5. Click Video

6. Play the Video

7. Click on Back button
8. Click on Discussion Board

9. Back to Home

Here you can write any comments, ideas and opinions you want

Thank you very much.
Cooperative Evaluation’s Results per Individual

User-1

<table>
<thead>
<tr>
<th>Cooperative Evaluation</th>
<th>User 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evaluation Duration (min)</strong></td>
<td>20</td>
</tr>
</tbody>
</table>
| **Facilitator Questions To User** | After open the web (Take page):
  - Can you easily see the General Information on Stroke Care button?
  - Do you found it easy to be found?

After clicking “General Information About Stroke”:
  - How do you see the page viewing?
  - Is the text is easy to be read on.

After clicking the “Back” button:
  - What do you think on Back button?
  - Is it necessary?

After clicking the “Button Emergency and Education” button:
  - Do you see the link or button below that?
  - How do you think the pop-up menu appears?
• Is it interesting?

**After clicking the “Downloadable” button:**

• Can you easily see the list of video available?

**After clicking the “Video” link:**

• Do you see the list of video available?
• What do you think the list of video displayed? Is it interesting to see?

**After play the “Video”:**

• Can you clearly see the video?
• What is your opinion on the size of video displayed?

**After click on “Discussion Board”:**

• Do you think this page is necessary?
• What do you think on its design?
<table>
<thead>
<tr>
<th>User Questions To Facilitator</th>
<th>When clicking the “Back” button:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Where is the back button?</td>
</tr>
<tr>
<td>After clicking the “Downloadable” button:</td>
<td>• Why do you put this link up here?</td>
</tr>
<tr>
<td></td>
<td>• Is it same if I click on the side here?</td>
</tr>
<tr>
<td>When click the video link:</td>
<td>• Why too many details?</td>
</tr>
<tr>
<td>When Play video:</td>
<td>• Can I save the video?</td>
</tr>
<tr>
<td></td>
<td>• How do I go back to see another video?</td>
</tr>
<tr>
<td>When click on Discussion Board:</td>
<td>• I need to click here?</td>
</tr>
<tr>
<td></td>
<td>• Why the things is different?</td>
</tr>
</tbody>
</table>

<p>| Reminded To Talk Aloud        | 3 Time.                          |
| User’s Comments               | • It is a good interface         |
|                               | • The font color on the menu is not clear to see |
|                               | • The images is too big sometimes |
|                               | • It is better to come out with table line to present the information in history result page. |</p>
<table>
<thead>
<tr>
<th>Cooperative Evaluation</th>
<th>User 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation Duration (min)</td>
<td>20</td>
</tr>
<tr>
<td>Facilitator Questions To User</td>
<td>After open the web (Take page):</td>
</tr>
<tr>
<td></td>
<td>• Can you easily see the General Information on Stroke Care button?</td>
</tr>
<tr>
<td></td>
<td>• Do you found it easy to be found?</td>
</tr>
<tr>
<td></td>
<td>After clicking “General Information About Stroke”:</td>
</tr>
<tr>
<td></td>
<td>• How do you see the page viewing?</td>
</tr>
<tr>
<td></td>
<td>• Is the text is easy to be read on.</td>
</tr>
<tr>
<td></td>
<td>After clicking the “Back” button:</td>
</tr>
<tr>
<td></td>
<td>• What do you think on Back button?</td>
</tr>
<tr>
<td>Other</td>
<td>Too much text in the web. Hope to see simple one.</td>
</tr>
<tr>
<td></td>
<td>To click on discussion board, user stuck a while too search the button.</td>
</tr>
<tr>
<td></td>
<td>To save the video, the user wondered where should he clicked to save the video.</td>
</tr>
</tbody>
</table>

User-2
- Is it necessary?

After clicking the “Emergency and Education” button:
  - Do you see the link or button below that?
  - How do you think the pop-up menu appears?
  - Is it interesting?

After clicking the “Downloadable” button:
  - Can you easily see the list of video available?

After clicking the “Video” link:
  - Do you see the list of video available?
  - What do you think the list of video displayed? Is it interesting to see?

After play the “Video”:
  - Can you clearly see the video?
  - What is your opinion on the size of video displayed?

After click on “Discussion Board”:
  - Do you think this page is necessary?
  - What do you think on its design?
<table>
<thead>
<tr>
<th>User Questions To Facilitator</th>
<th>After clicking “General Information About Stroke”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Why the information is too long?</td>
</tr>
<tr>
<td></td>
<td>When click on Emergency and Education.</td>
</tr>
<tr>
<td></td>
<td>• What I should do?</td>
</tr>
<tr>
<td></td>
<td>After click on Downloadable:</td>
</tr>
<tr>
<td></td>
<td>• Do I have to go back?</td>
</tr>
<tr>
<td></td>
<td>• Why the image is too small?</td>
</tr>
</tbody>
</table>

| Reminded To Talk Aloud       | 1 Time. |

| User’s Written Comments       | • Easy going interface |
|                               | • I can see where I am when I click on the certain pages |
|                               | • I don’t see why discussion board is having different interface from the main interface. |
|                               | • The video should be viewed in more bigger window |
|                               | • The text for downloadable is not easy to find. |

<p>| Other                        | • He clicked on the wrong button when asked to open downloadable |
|                               | • He seems hard to find the button to be played on. |
|                               | • He did not satisfy with the sound of the |</p>
<table>
<thead>
<tr>
<th>Cooperative Evaluation</th>
<th>User 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation Duration (min)</td>
<td>15</td>
</tr>
<tr>
<td>Facilitator Questions To User</td>
<td>After open the web (Take page):</td>
</tr>
<tr>
<td></td>
<td>• Can you easily see the General Information on Stroke Care button?</td>
</tr>
<tr>
<td></td>
<td>• Do you found it easy to be found?</td>
</tr>
<tr>
<td></td>
<td>After clicking “General Information About Stroke” :</td>
</tr>
<tr>
<td></td>
<td>• How do you see the page viewing?</td>
</tr>
<tr>
<td></td>
<td>• Is the text is easy to be read on.</td>
</tr>
<tr>
<td></td>
<td>After clicking the “Back” button:</td>
</tr>
<tr>
<td></td>
<td>• What do you think on Back button?</td>
</tr>
<tr>
<td></td>
<td>• Is it necessary?</td>
</tr>
<tr>
<td></td>
<td>After clicking the “Emergency and Education” button:</td>
</tr>
<tr>
<td></td>
<td>• Do you see the link or button below that?</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>How do you think the pop-up menu appears?</td>
<td></td>
</tr>
<tr>
<td>Is it interesting?</td>
<td></td>
</tr>
<tr>
<td><strong>After clicking the “Downloadable” button:</strong></td>
<td></td>
</tr>
<tr>
<td>Can you easily see the list of video available?</td>
<td></td>
</tr>
<tr>
<td><strong>After clicking the “Video” link:</strong></td>
<td></td>
</tr>
<tr>
<td>Do you see the list of video available?</td>
<td></td>
</tr>
<tr>
<td>What do you think the list of video displayed? Is it interesting to see?</td>
<td></td>
</tr>
<tr>
<td><strong>After play the “Video”:</strong></td>
<td></td>
</tr>
<tr>
<td>Can you clearly see the video?</td>
<td></td>
</tr>
<tr>
<td>What is your opinion on the size of video displayed?</td>
<td></td>
</tr>
<tr>
<td><strong>After click on “Discussion Board”:</strong></td>
<td></td>
</tr>
<tr>
<td>Do you think this page is necessary?</td>
<td></td>
</tr>
<tr>
<td>What do you think on its design?</td>
<td></td>
</tr>
<tr>
<td><strong>User Questions To Facilitator</strong></td>
<td></td>
</tr>
<tr>
<td>After clicking General Stroke Care Button?</td>
<td></td>
</tr>
<tr>
<td>Why the menu is too long to read?</td>
<td></td>
</tr>
<tr>
<td><strong>After clicking the “Emergency and Education”</strong></td>
<td></td>
</tr>
<tr>
<td>Reminded To Talk Aloud</td>
<td>2 Times.</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>User’s Written Comments</strong></td>
<td></td>
</tr>
<tr>
<td>- I don’t see the drop down bar is good since I could not see the information below that if I not click on that</td>
<td></td>
</tr>
<tr>
<td>- The terms use is not reflecting what I want to see inside.</td>
<td></td>
</tr>
<tr>
<td>- Should have interesting color so that I would love to open the website and stroke people will be happier more to open it</td>
<td></td>
</tr>
<tr>
<td>- Simple design</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>- He does not know the usage of discussion board.</td>
<td></td>
</tr>
<tr>
<td>- He confused where he should clicked.</td>
<td></td>
</tr>
<tr>
<td><strong>Cooperative Evaluation</strong></td>
<td><strong>User 4</strong></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Evaluation Duration (min)</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Facilitator Questions To User</strong></td>
<td><strong>After open the web (Take page):</strong></td>
</tr>
<tr>
<td></td>
<td>• Can you easily see the General Information on Stroke Care button?</td>
</tr>
<tr>
<td></td>
<td>• Do you found it easy to be found?</td>
</tr>
<tr>
<td></td>
<td><strong>After clicking “General Information About Stroke”:</strong></td>
</tr>
<tr>
<td></td>
<td>• How do you see the page viewing?</td>
</tr>
<tr>
<td></td>
<td>• Is the text is easy to be read on.</td>
</tr>
<tr>
<td></td>
<td><strong>After clicking the “Back” button:</strong></td>
</tr>
<tr>
<td></td>
<td>• What do you think on Back button?</td>
</tr>
<tr>
<td></td>
<td>• Is it necessary?</td>
</tr>
<tr>
<td></td>
<td><strong>After clicking the “Emergency and Education” button:</strong></td>
</tr>
<tr>
<td></td>
<td>• Do you see the link or button below that?</td>
</tr>
<tr>
<td>User Questions To Facilitator</td>
<td>After click on the webpage.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>After view the page for General Information for Stroke Care</td>
<td>• Why do you choose this text be read by</td>
</tr>
</tbody>
</table>

• How do you think the pop-up menu appears?

• Is it interesting?

**After clicking the “Downloadable” button:**

• Can you easily see the list of video available?

**After clicking the “Video” link:**

• Do you see the list of video available?

• What do you think the list of video displayed? Is it interesting to see?

**After play the “Video”:**

• Can you clearly see the video?

• What is your opinion on the size of video displayed?

**After click on “Discussion Board”:**

• Do you think this page is necessary?

• What do you think on its design?

• Click on Discussion Board
<table>
<thead>
<tr>
<th>Reminded To Talk Aloud</th>
<th>1 Time.</th>
</tr>
</thead>
</table>
| **User’s Written Comments** | • The interface needs to be changed to be more interactive one.  
• It is important to enlarge the fonts.  
• The text does not really appropriate for user to read.  
• I could not find the list of available video |
| **Other** | • He stuck after click on downloadable  
• He noted that the passage is too crowded with the text  
• He expected that once he clicks on the “Video” links, the video will directly appear. |
References


