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Take-A-Break Notification

by

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CERTIFICATION OF APPROVAL

Take-A-Break Notification

by

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A project dissertation submitted to the
Information Systems Programme
Universiti Teknologi PETRONAS
in partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
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Approved by,

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UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

January 2014

January 2014

CERTIFICATION OF ORIGINALITY

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

(NELLMONDEE JULIUS)

ABSTRACT

Take-A-Break Notification is a software which runs on Windows operating system. It is designed for office workers who have the highest tendency on prolonged computer screens use. Employees need to ensure that their performance is at the maximum level in order to increase their work productivity. However, they need to be concerned about the ergonomic practices which are mostly neglected by employees. Therefore, this software is one of the efforts to reduce the number of hours employees sit in front of the computer screens which can cause severe eyes fatigue and other related symptoms mainly Computer Vision Syndrome (CVS). Rapid Application Development (RAD) methodology has been selected to be used for the project development phase. The software will dim the computer screen, disable the mouse and keyboard, which force the employees to take a 5 minutes break after 2 hours working in front of the computer screens, which apparently require them to be away from the screens and practices a simple muscle stretching or exercises. Employers should encourage ergonomics practices and monitor the employees to take a break for a while and continue the works after that. This application will hopefully encourage the office workers to apply the ergonomic practices and be able to counter the inclining rate of Computer Vision Syndrome (CVS) among the office workers.

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CHAPTER 1

PROJECT BACKGROUND

1.1 Introduction

In today's age, human and computer are associated with one another. For the past decade, humans were able to complete any tasks or jobs without the existence of a computer. However, a study shows that nearly 150 million of computer users nowadays, sit in front of a computer screen for hours each day without even realizing how it may affect their vision (Bauers & Oppenheimer, 2008). According to internet world statistics, there are roughly around 2,405,518,376 of internet users worldwide up to June 2012 (<http://www.internetworldstats.com/stats.html>). The internet has become the most common and powerful tool used for business, entertainment, shopping and even education and learning.

Office workers are more exposed to computer screens in their daily working environment. Apparently, this situation may cause a higher risk with computer usage related health problems such as Computer Vision Syndrome (CVS), as well as muscular and skeletal problems too. CVS occurs when an individual overtaxes the human eye by forcing it to spend prolonged amounts of time staring at images that can overwork and affect its capabilities (Bauers & Oppenheimer, 2008). According to the online article, most employees who are working in the office do not even realize that they have sat in front of the computer screen for 8 hours straight at a time (Bauers & Oppenheimer, 2008). Without a proper ergonomic guideline and awareness, this unhealthy practice will eventually lead to many health problems and may affect the company's productivity in the future.

Most of the multinational companies throughout the world have implemented ergonomics practices in order to protect their employees' healthcare such as ExxonMobil (<http://emgs.na.xom.com/sfsafety/newsletters/may2001.html#ergolaptop>).

Apart from that, there are some multinational companies which have even developed their own system and application to help and guide their office workers in practicing the ergonomic practices. It is crucial to understand the importance of human factors in order to increase productivity in any organization and on how to improve the problems.

1.2 Problem Statement

1.2.1 Problem Identification

The prolonged interaction of vision with computer images will increase the possibility of having a Computer Vision Syndrome (CVS) and severe eye strain (Myers, 2012).

The heavy workloads in the office have highly influence the workers to sit and work in front of the computer screens for a long duration. Most of office workers are dealing with computer every day. Online journal shows that they have spent 8 hours sitting in front of the computer to do their office works without a proper break (Bauers & Oppenheimer, 2008). According to a new study conducted, by spending more than four hours each day in front of a computer or television may lead on getting the risk of dying from heart disease or being hospitalized (Chan, 2011). Also, sitting for a long duration will eventually causes back pain, neck and shoulder pain as well as muscle cramps which will result in severe muscular and skeleton injuries.

1.2.2 Significance of Study

The significance of this study is that office workers are more expose on using computer screens for a long duration. Therefore, this situation may cause higher risk with Computer Vision Syndrome (CVS). Based on experts, Computer Vision Syndrome (CVS) occurs when an individual overtaxes the human eye by forcing it to spend

prolonged amounts of time staring at images that can overwork and affect its capabilities (Bauers & Oppenheimer, 2008).

A proper ergonomic practices guideline in a workplace is very crucial for employees. However, they have the tendency to keep on doing their jobs continuously without a break if they are not being reminded by the superiors, subordinates or any other software or hardware tools. Most of organizations are lacking on the application development tools that can alert and remind the employees to take a break from sitting in front of the computer screen.

1.3 Objectives

- To develop software for the office workers that allows them to take a 5 minutes break for every 2 hours.
- To prevent a computer user from sitting in front of a computer screen for a long duration.
- To produce an alternative way to enforce ergonomic practices in a workplace.

1.4 Scope of Study

OFFICE WORKERS: UTP Lecturer and Staff

The scope of this project will be on office workers (focusing on academic staff) who work using computer that runs on windows operating system. This is because they are more likely to work in front of computer screen for longer duration. Eventually, this may help to remind them to take a break. Other users which are interested on the benefit of this project may consider it for a personal uses, but the scope will ultimately be limited to the office workers only.

1.5 Project Feasibility

Feasibility literally means whether some idea will work or not (Saxena & Sodhi, n.d). It knows beforehand whether there exists a sizeable market for the proposed products or services, what would be the investment requirements and where to get the funding from, whether and where from the necessary technical capabilities to convert the idea of the Take-A-Break Notification project into a working prototype, commercialization and so on. However, in this context, the project feasibility will cover in terms of its scope, time frame, cost-effectiveness, technical capability and ergonomically concerns.

The project feasibility has the following conclusions:

Scope

- The project is feasible in terms of its scope as the first target user will be tested among UTP staff who eventually working on computer screens roughly from 8am – 5pm (working hour).
- It is convenient to conduct surveys among the target users as the location of project development will be held in Universiti Teknologi PETRONAS (UTP) itself as the reliability during the system testing.

Time Frame

- The project duration is around 6 months.
- Project research for the first 3 months.
- Project development requires 2-3 months on the working prototype.

Cost-Effectiveness

- Apparently, this project will incur less cost as not many features will be included.
- This project will be using free development software which is Microsoft Visual Studio 2012.
- Using online tools to acquire information such as research papers, books and so on.

Technical Capability

- The programming language that will be used to develop this project is visual basic VB6.
- No technical concerns to go forward with the project development in terms of the technicality because most of the coding is available from various sources in the internet and publications.

Ergonomically Concern

- This project is relevant to the ergonomic practices as its basic purpose is to reduce the prolonged amount time spend on computer screens by allowing users to take 5 minutes break.
- This project is beneficial for the users to reduce the risk on getting Computer Vision Syndrome (CVS) and at the same time allowing them to practice several workplace exercises.

CHAPTER 2

LITERATURE REVIEW

2.1 General Problems Related to Sitting In Front Computer Screens

There are many researchers that linked sitting for a long period of time on computer screens with a number of health related problems including computer vision syndrome (CVS), repetitive strain injury (RSI) and as well as eye strain or fatigue. Without a proper care and concern, eye strain may increase on getting myopia (nearsightedness), lead to general fatigue and also a decrease in overall performance efficiency. Mostly, everyone is having the risk of getting eye strain, especially individuals who are working with computer for more than four hours each day. Normally, eye strain results in a combination of various symptoms such as dry eyes, eye fatigue, headache, blurred vision and also change in the perception of color. Moreover, while they are attempting to view the computer screen precisely or clearly, most of them are tend to hold their heads off in bad positions. This situation may then leads to neck, back and shoulder pain (as retrieved from <http://www.princeton.edu/uhs/healthy-living/hot-topics/ergonomics/>).

Apart from that, prolonged sitting in front of computer screens contribute to work related musculoskeletal disorders (WMSDs). Based on the *Journal of The Spinal Research Foundation* published in 2011, musculoskeletal disorders (WMSDs) is define as a collective term that describes disorders related to muscles, tendons and nerves which typically caused by bad postures. This situation may cause the individual to experience pain during work or rest time (as retrieved from <http://www.ccohs.ca/oshanswers/diseases/rmirsi.html>). According to the same journal, a person may reduce the risk on getting musculoskeletal disorder by repetitive bending, straightening, gripping, holding, twisting, clenching and reaching exercises (Porter, 2008). Individuals will not injure themselves just by performing these motions once or twice a day, or during they take a break.

Recent study made by OSHA and other researchers has found the fine-tune guidelines as well as improving standards for workers in all industries, especially computer workers. They believed that computer workers increasingly suffer from eyestrain, musculoskeletal disorders including mental and physical fatigue, poor physical fitness levels, static work and home offices, and longer working hours (Porter, 2008). According to the Ministry of Labor guideline published in 2004, appropriate work station design may reduce the risk of computer related health problems. For example by allocating suitable desks and adjustable chairs, appropriate lighting, training as well as the use of proper office equipment such as suitable monitor sizes for task and workstation (<http://www.labour.gov.on.ca/>).

2.2 Maximum Hours to Sit In Front Computer

The Occupational Health and Safety Administration (OSHA) have set minimal standards that all employers should follow to decrease the risk of injury to workers (Erin, 2011). According to the study that has been conducted by Academy of Family Physicians of Malaysia in 2008, working nonstop with computer for more than 4 hours has been associated with eye strain which leads them on getting the Computer Vision Syndrome (CVS) (Loh, 2013). Majority of the people around the world are spending the whole day in front of computer without even stopping for a break. This is due to many factors including office workloads, writing, reading, social networking, gaming, doing an online business and etc.

Based on past researches and online journals, there are various suggested maximum hours for the computer users sitting in front of the computer screens. New study conducted in 2011 suggested that spending more than 4 hours each day in front of a television or computer screens may doubles the risk of dying from heart disease or being hospitalized (Chan, 2011). Many people have a job which require them a consistent performance. This group of people have spends more than six to eight hours sitting at the computer to complete their job at a time. Emmanuel Stamatakis, a researcher from the Department of Epidemiology and Public Health at the University

College London believed that people who exercise cannot even overcome the detrimental effects of too much screen time (Chan, 2011).

Apparently, there are many studies that suggested the maximum hours of computer users sitting in front of the screens. According to Australian and American guidelines, they have suggested that children and adults should spend in front of computer or television screens no more than 2 hours (Beckford, 2011). Scientists also suggested that people should limit their time spending in front of a computer screen for 2 hours in order for to live longer. American Academy of Pediatrics supports that the maximum screen time or “critical cutoff” for children and adults is 2 hours (Seaman, 2013).

An ergonomic expert, Deborah Quilter says that computer users have to blink and stretch their eyes for every 15 minutes and must follow the rule of 20s; stand up for every 20 minutes, walk and look 20 feet away from the screen for at least 20 seconds (Quilter, 2012). Another Optometric experts and authors of three best-selling books in United States, Dr Kondrot who is also the founder of Healing The Eye & Wellness Center Florida, stated that even while on the job, it is crucial for the employees to give their eyes a break from using the computer (Murphy, 2013). Another expert believed that taking 5 minutes break from intensive computer operation in each hour is encouraged as a good practice and a reasonable precaution to protect the health and safety of workers (http://www.labour.gov.on.ca/english/hs/pdf/gl_comp_erg.pdf).

2.3 Computer Vision Syndrome (CVS)

According to the American Optometric Association (AOA), it is believed that a complex of eye vision problems related to the activities that stress the near vision and which are experienced in relation or during the use of the computer clearly define a Computer Vision Syndrome (CVS) (Loh, 2013). CVS can be also causes by a number of different factors including computer screen glare, improper positioning of the monitor, spending more than three hours a day on computer and wrong prescription for corrective lenses (Quilter, 2012). Based on the study conducted in Academy of Family

Physicians of Malaysia, the main symptoms of CVS reported are blurred vision, eye strain, double vision, irritation, redness and burning sensation (Loh, 2013). It is believed that the symptoms are temporary which will be disappeared at the end of their working day. However, without a proper intervention being taken, most of these symptoms will be recurred and worsen (Loh, 2013).

The symptoms of CVS are headaches and eyestrain which can force the employees to shut down. Computer-related works are yet proven to cause permanent damage to eyes, but temporary discomfort that may occur can reduce performance and productivity (Charpe & Kaushik, 2009). Latest online journal published in February 2013 stated that adults are not the only people who vulnerable to the symptoms of CVS (Heiting & Wan, 2013). The prolonged use of computer may stress child's eyes and affect their development of normal vision too (Heiting & Wan, 2013). There are millions of children at home or even at school who uses computer every day.

Social networks such as Facebook, Twitter, Blogs and many other social networks nor websites have influence people to just sit in front of the computer all day long. An expert believes that CVS caused by the different reaction between eyes and brain towards characters on the computer screen. It is difficult for the human eyes to focus on the printed material that contained dense black characters. American Optometric Association (AOA) stated that words and images on the screen are produced through the combinations of small points of pixels which vary in contrast (Bauers & Oppenheimer, 2008). Human eyes are having the difficulties in focusing and refocusing on these combined pixels. As the eye lens work harder to focus and support the function of the sight, the eyes become tired and lazy and result in vision blurs (Bauers & Oppenheimer, 2008).

James E. Sheedy, a clinical professor at University of Berkeley School of Optometry says there are about 40% of computer users having dry eyes problems which lead to CVS (Bauers & Oppenheimer, 2008). He also believed that it is caused by the lack of blink rate during the human interaction with the computer (Bauers & Oppenheimer, 2008). Based on the online journal, CVS refers to visual and ophthalmic symptoms which are normally occur among the computer users (Kokkinakis, 2012).

Human needs to understand clearly that computer is not the main cause which affect and damage their eyes. However, the significant problem here is whether they have managed their time sitting in front of the computer screens properly or otherwise. Nobody goes blind from the CVS problem but if no serious action and prevention taken on this matter, it may cause a serious health problem.

2.4 Existing Software to Help Remind Computer Users to Take a Break

Nowadays, people cannot live without computers. They became an important part for offices, universities, and homes. They are aware and understand of the negative effects of computers on their health. However, there are not many to follow the rules and action to prevent from getting computer-related illnesses.

Meanwhile, there are also group of people specifically IT professions, who are concern on how to prevent CVS. As a result, some software programmers have developed few software and application to remind the computer users to take a break. Informer Technologies Incorporation official website has come out with various type of software to combat the eyes related health problem (Bjerke, 2012 & Vozrak, 2013). Below are the comparisons between the top five rated software from their website:-

Software Name	Description
EyeDefender (Vozrak, 2013)	<ul style="list-style-type: none"> • EyeDefender is free software to prevent Computer Vision Syndrome (CVS) which results from working on computer for long hours. • Eyedefender software allows the user to set periods of time between breaks and duration of the breaks. After the software triggers the time set by the user, the program will activate a default screen saver, display some pictures from its own library or from the folder that the user choose. Apparently, this will gives them a reminder by a visual display showing to stop working and take a break.

<p>Off4Fit (Bjerke, 2012)</p>	<ul style="list-style-type: none"> • The program will remind the user to take a rest and do some exercises in front of the computer. The computer will then generate an image of a girl that demonstrate a set of various exercises for eyes, hands and body, each one repeated several times. • It allows the user to choose intervals between training from 10 to 180 minutes, but the program advised the interval between exercises is set to 60 minutes.
<p>Scirocco Take A Break (Vozrak, 2013)</p>	<ul style="list-style-type: none"> • It is free software that reminds users on when to take a break, which visualize in style. • The features including complete customization of work, break times and snooze, audio or visual notifications, type of timer display, screen saver, locking mechanism of workstation on break, tray icons, and time spent statistics, average of break time per hour and also motivational pie chart.
<p>Smart Break (Bjerke, 2012)</p>	<ul style="list-style-type: none"> • SmartBreak is a ergonomics program which reminds the users to take a break while working on computer screen for long duration. • SmartBreak actually monitors the time spent on a computer and prompts that the user need to rest at the specific duration. This means that user can spend more time in front of a computer in more efficient way by utilizing the break time.
<p>TakeABreak (Bjerke, 2012)</p>	<ul style="list-style-type: none"> • The TakeABreak is developed to manage users on the working hours and breaks in front computer. • The program will pop up a message after a specific duration (default: 20 minutes). "Take a break" message will be appeared and it will repeatedly to appear until the break time is over. Once break time is over, sound will be played and turn the screen on to allow the users notify that the break time is ends and the computer can be used again.

	<ul style="list-style-type: none"> • Its main purpose is to allow users to let their eyes rest. It also includes the "Nudge me if I continue working" feature which it allows users to continue working on computer although on break period. Meanwhile, the computer screen will off every 10 seconds up until the break time is over or when the user stop using the computer.
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Table 1: Comparisons of Top 5 Rated Ergonomics Software

Based on the table above, there are various solutions to prevent CVS and other workplace injuries existed. However, most of the software requires the user to set all of the functionalities before they start working on the computer. This will encourage the computer users to aware on their own health, but somehow they have the tendency to forget and postpone the break duration.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

The project deals with ergonomic issues in a workplace. In order to understand more on the topic, it is crucial to be able to access to reading materials such as online articles, research papers, books, journal and other related publications. Apart from that, there will be some interviews and observations on UTP lecturers to enquire about the real working environment and problems that they have encountered related to the ergonomic practices. Other communication mediums for doing the research are through online tools such as emails, WhatsApp and also telephone calls.

Figure 1 below summarizes the research methodology:

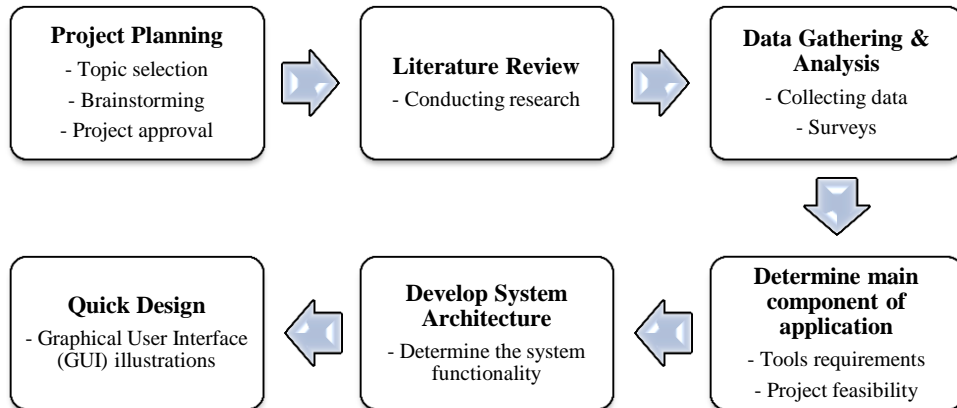


Figure 1: Research Methodology

3.2 Development Methodology

The development methodology used in this project is Rapid Application Development (RAD) method. RAD methodology is implemented due to the time constrain of the project, which approximately less than 10 months.

The benefits of using RAD methodology is that it allows any modifications to be made during the development phase if there is a need to review and recheck at any other phases throughout the project development. It is important to have flexibility throughout completing the project such as debugging process. The whole project will be divided into four main phases as illustrated below:

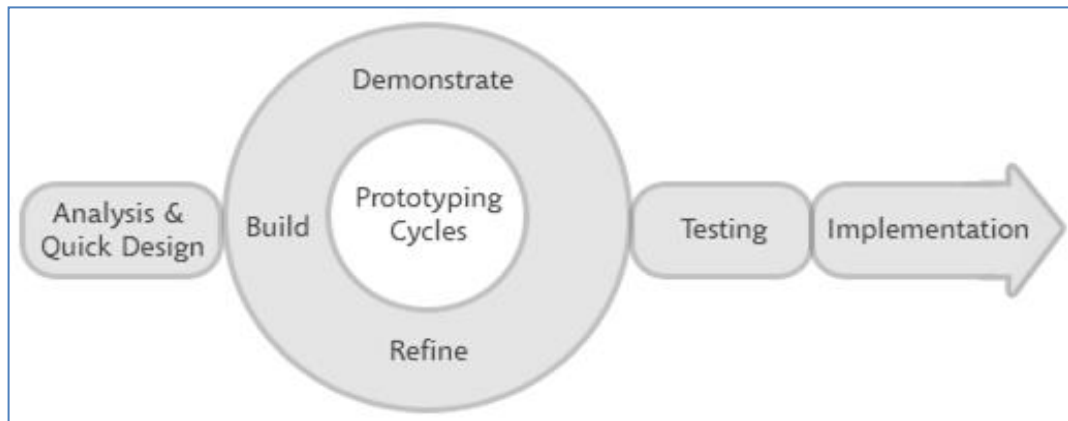


Figure 2: Rapid Application Development (RAD)

- Analysis and Quick Design Phase
- Prototyping Cycles (Building, Refining, and Demonstrating process)
- Testing Phase
- Implementation Phase

ANALYSIS AND QUICK DESIGN PHASE

- Developing system architecture
- Sketching Graphical User Interface (GUI)

PROTOTYPING CYCLES

- Building system, Refining & Demonstrating
- Back-end coding
- Monitoring & Controlling

TESTING PHASE

- System testing
- Monitoring & Controlling
- Tabulating result

IMPLEMENTATION PHASE

- Final product
- Implementing to system users
- Monitoring & Controlling

3.3 Basic System Architecture

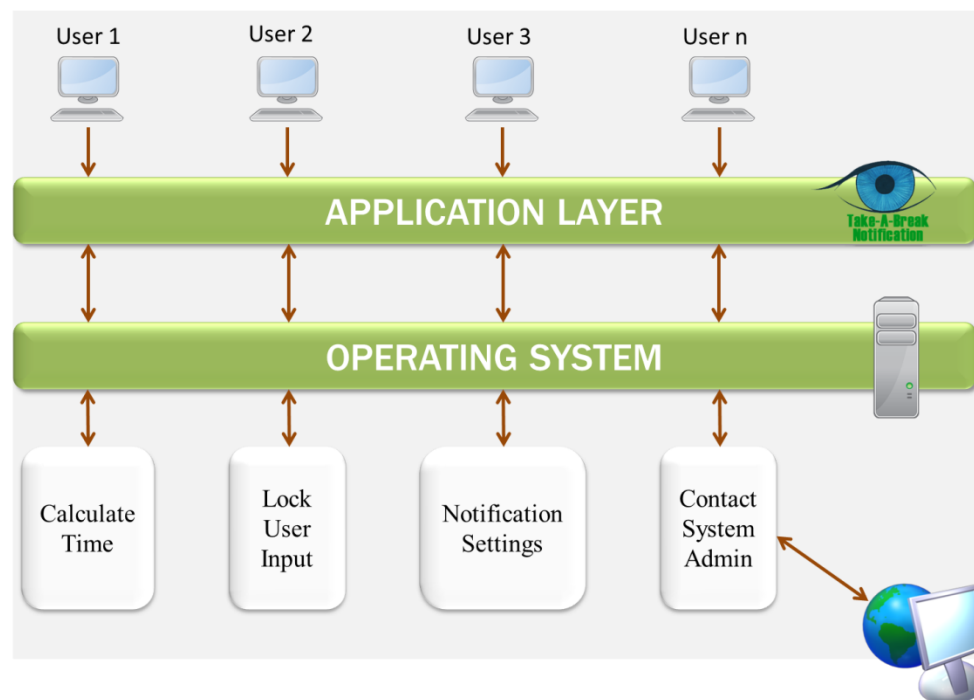


Figure 3: Basic System Architecture

3.4 Development Tools

Basic development tools used in completing the project are:

Hardware

- Personal Computer for Coding
- Computer runs in Windows Operating Systems (for testing purposes)

Software

- Microsoft Visual Studio 2012
 - For main coding and system development
 - Debugging process and building solutions
- Adobe Photoshop CS5
 - Graphical User Interface (GUI) illustrations and quick design

3.5 Gantt chart

Figure 4: Final Year Project 1 Gantt Chart

No.	Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Planning	■	■												
2	Literature Review/Theory			■	■	■	■								
3	Data Gathering & Analysis			■	■	■	■	■	■						
4	Determine components of application									■					
5	Develop system architecture										■				
6	Designing interface of the system											■			
7	Proposal Defense & Submission of Interim Report												■	■	■

Figure 5: Proposed Final Year Project 2 Gantt Chart

No.	Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Development & Prototyping	■	■	■	■	■									
2	System Testing & Monitoring					■	■								
3	Tabulate result and discussion							■							
4	Submission of Progress Report								■						
5	Implementation									■	■				
6	Documentation							■	■	■	■	■			
7	Pre-SEDEX & Viva												■	■	
8	Final Dissertation														■

3.6 Project Milestones

In this context, project milestone shows the project deliverable duration and specific date of it. The project milestone for FYP1 and FYP2 are depicted as shown below:

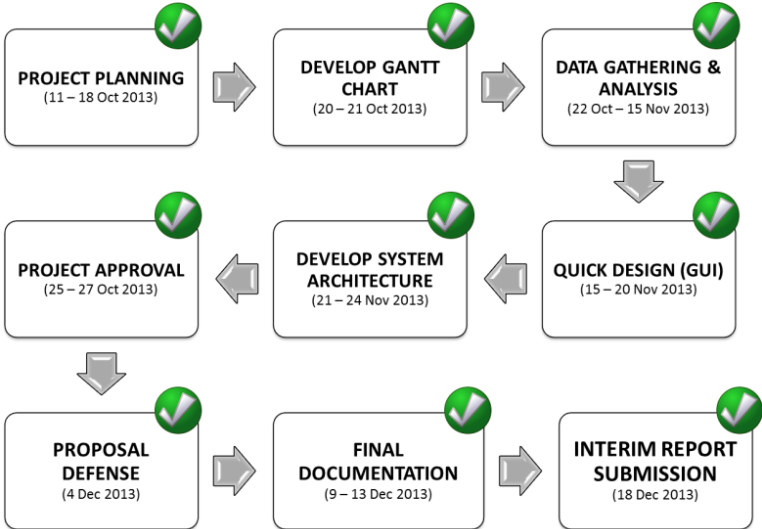


Figure 6: FYP1 Project Milestone

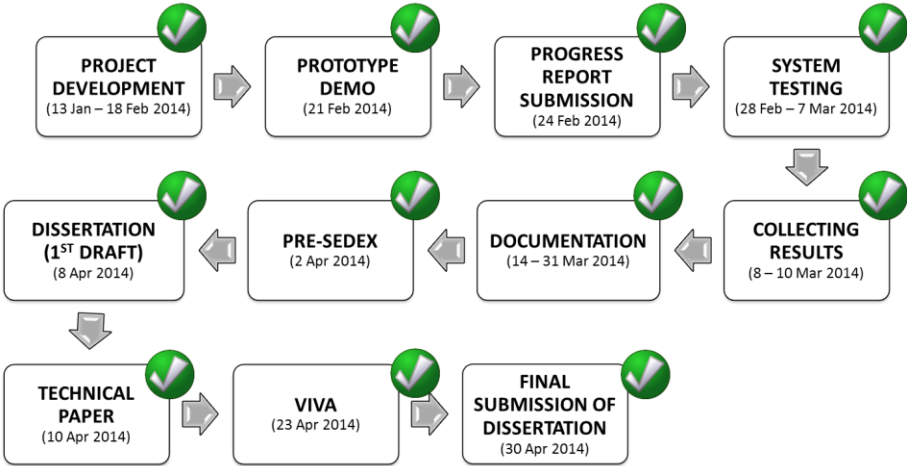


Figure 7: FYP2 Project Milestone

CHAPTER 4

RESULT AND DISCUSSION

The final prototype, unit testing and usability testing results are shown in this section. During the early stage of quick design, there are various graphical user interface (GUI) sketches to be used in developing the real software interfaces. Apart from that, few APIs which could be implemented in the program codes have been found. There are three main components in the software; Dim Screen (locking mouse and keyboard functions), System Timer and System Tray Notification. The sketching of mock graphical user interface (GUI) and program flow chart are displayed in this section.

4.1 Mock Graphical User Interface (GUI)

4.1.1 Preliminary Prototype

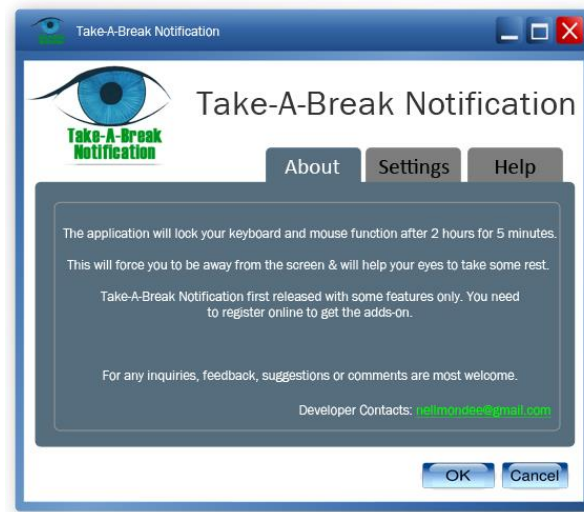


Figure 8: GUI About tab

About tab is the landing page for Take-A-Break Notification. It provides the system user with a short description and overview about the software. User may contact the system developer through the contact details provided.

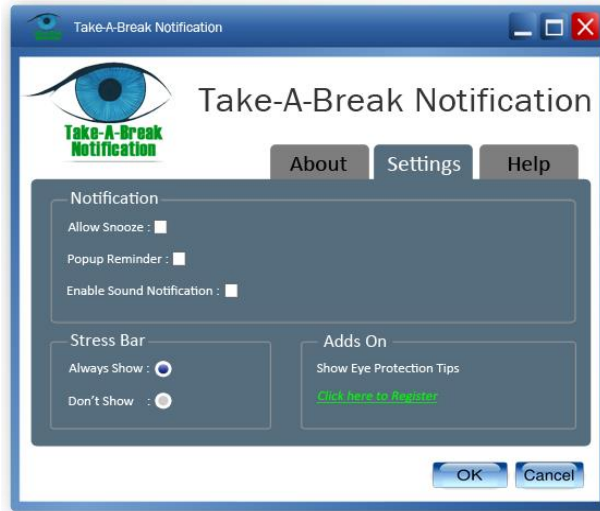


Figure 9: GUI Setting tab

Setting tab is to allow system user to set the reminder notification before the locking function is activated. All features are not available for the first release.

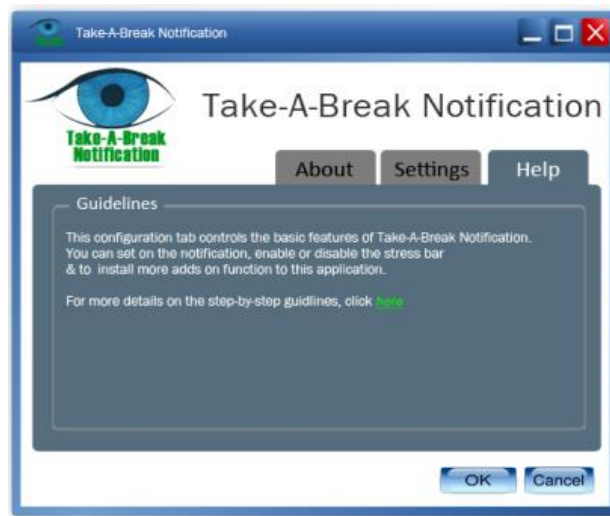


Figure 10: GUI Help tab

Figure 10 above shows Help Tab to provide the system users with step-by-step guideline on how to use and configure the application. System user may click on the 'here' link as shown above and User Manual will be popped up in pdf form.

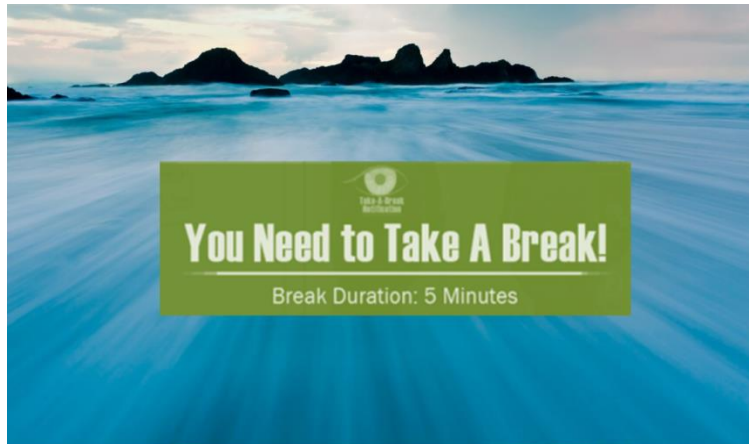


Figure 11: GUI Dim Screen

Once the locking function timer hit 120th minutes, Dim Screen is activated user inputs will be locked (keyboard and mouse function). The above screen is generated showing break duration for the system users.

4.2 System Flow Chart

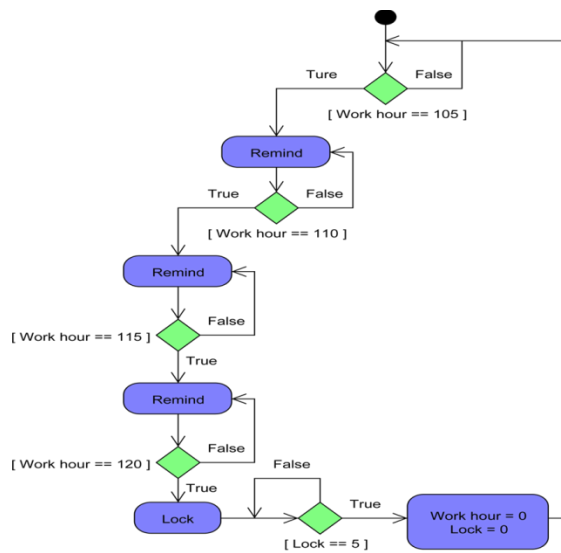


Figure 12: System Flow Chart

The above flow chart summarized the main components of Take-A-Break Notification. As shown in Figure 12, the system timer will firstly check during the 105th minutes on time spent by the user. If the calculated current time equivalent to 105th

minutes, the system will pop up a first reminder. The system timer will continuously checking and pop up a second and final reminder at 110th minutes and 115th minutes consecutively. During the 120th minutes, the Dim Screen function will be activated in 5 minutes duration.

Once the break duration reach the end, the system timer will loop and return to zero values (*System Timer = 0 min, SystemLock = 0 min*) and the program will be restarted from the beginning.

4.3 Final Prototype

Typically the software works and runs on Windows operating system. It means the software functionalities are not supported by other operating systems. The beta release of the software contains the main components as per mentioned in earlier section. Additional features such as snooze, pop up sound, music background and stress bar will be added in the future as soon as the beta testing phase is successfully done.

User needs to copy Take-A-Break Notification folder into C:\ directory. Once the launcher icon from the program folder is clicked, the program will starts with “About” screen. This is where user will click the “OK” button and program will then starts. The prototype screenshots are shown below:-

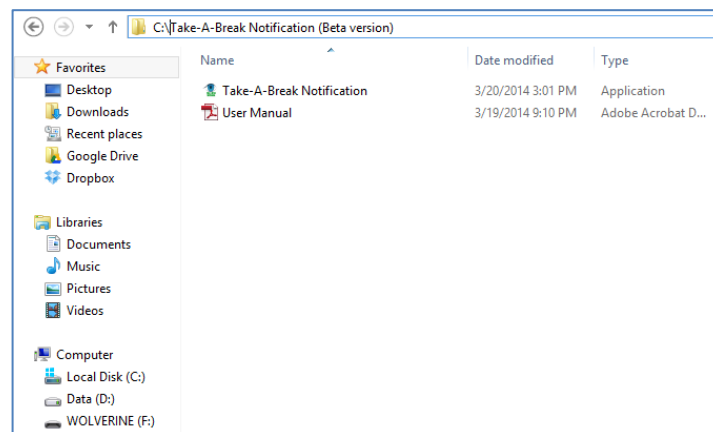


Figure 13: Copy Folder to C:\ directory

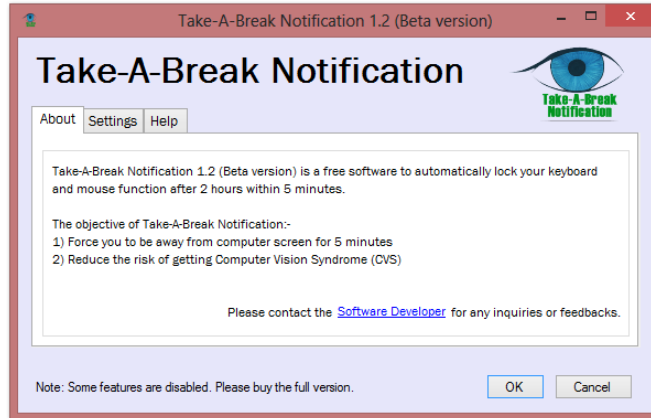


Figure 14: Screenshot “About” tab

About tab contains the overview of Take-A-Break Notification as well as the objectives of the software. This is to allow user to read the importance and purpose of the software implementation especially among office workers. The first release of Take-A-Break Notification (Beta version) is to test the user acceptance on the functionality of this software.

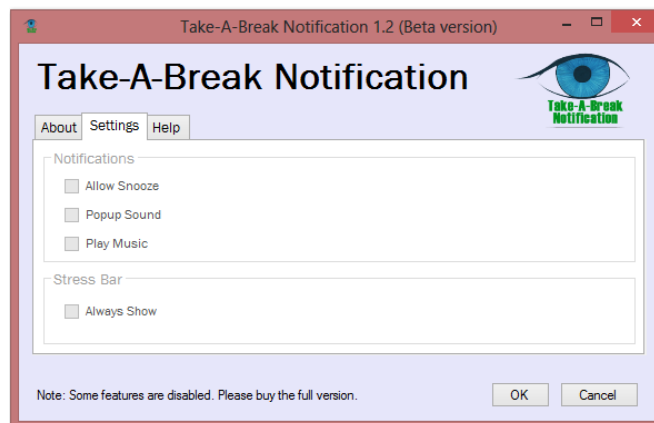


Figure 15: Screenshot “Settings” tab

Future users will be provided with the complete version of the software. The complete version will be included with few interactive features such as Popup Sound, Music Background during the 5 minutes break and also Stress Bar to indicate the period concentration before the PC is locked. Apparently, Take-A-Break Notification (Beta

version) is free software. Users that want to use the complete version of the software need to register or purchase from the software developer.

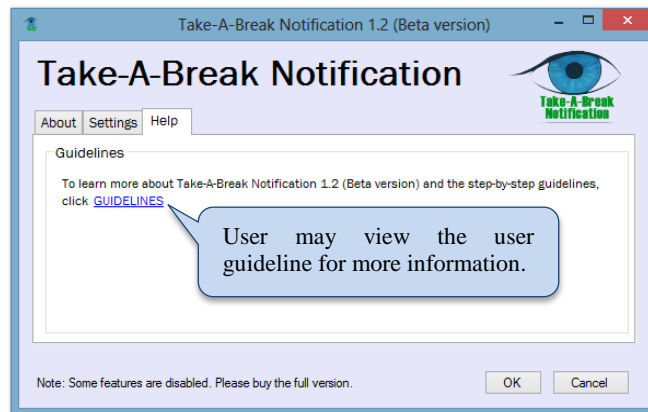


Figure 16: Screenshot “Help” tab

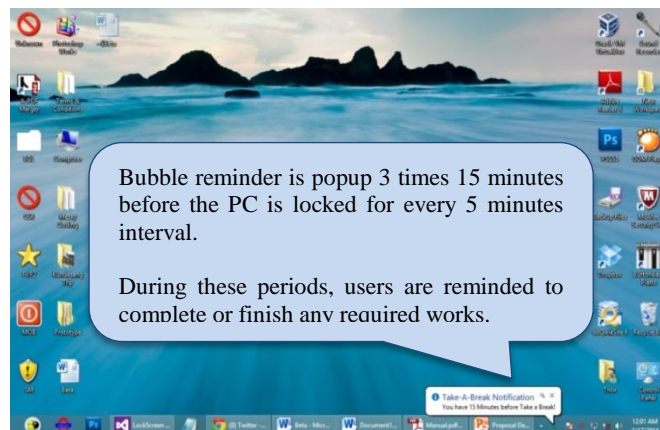


Figure 17: Screenshot Notification popup from system tray

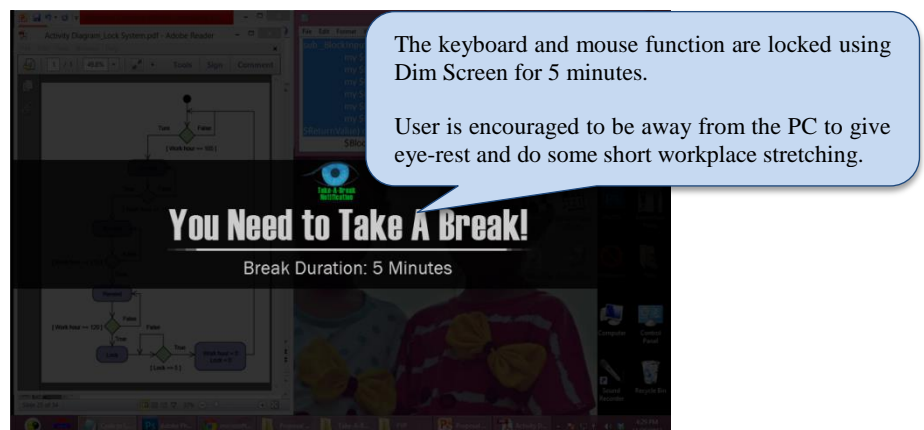


Figure 18: Screenshot of Dim Screen

4.4 Survey Data Collection & Findings

During the final development phase of the project, there were two type of tests conducted; (1) unit testing and (2) early usability testing. Unit testing or also known as component testing was conducted based on white-box technique. The white-box technique is being used in order to obtain and/or select test cases based on the analysis of the internal structure on the system component. It was conducted by the software developer without involving the target users. The outcome of unit testing will be further explained and represented in the next section. Meanwhile, the early usability testing was conducted on 10 UTP lecturers and staff. Results of the outcome are illustrated in the next section.

4.4.1 Unit Testing

Unit testing or also known as component testing searches for defects and verifies the functioning of the software. Each modules or classes in the software were tested separately in order to verify the functionality of each module or classes are working and few defects were typically fixed as soon as they were found during the testing phase, without formally managing these defects.

There are nine (9) units or components used in the software:

1. Timer
2. Dim Screen
3. Notify Icon
4. Minimize to icon tray
5. Double click on icon to open
6. “OK” button
7. “Cancel” button
8. “Contact Developer”
9. View “User Manual”

The main functions of Take-A-Break Notification are its timer and Dim Screen. The user keyboard and mouse will be disabled and Dim Screen will be activated after 2 hours of PC uses within 5 minutes.

Several test cases being simulated for the purpose of beta testing phase:-

Test case:

Typically, Timer will be counted 7200 seconds. Therefore, for the purpose of beta testing, the Timer duration is set to 35 seconds before Dim Screen is activated to show whether the timer looping and calling the dim screen functions are working properly.

Main Components	Actual Duration	Test cases (duration as in Beta testing phase)
Timer	120 minutes : (7200 seconds)	35 seconds
Dim Screen	5 minutes : (300 seconds)	10 seconds

Table 2: Test Case of Main Components

There are three (3) popup reminders at specific duration (th) as per shown below;

Popup Reminder	Actual Duration	Test cases (duration as in Beta testing phase)
1st	105 th minutes : (6300 seconds)	10 seconds
2nd	110 th minutes : (6600 seconds)	20 seconds
3rd	115 th minutes : (6900 seconds)	30 seconds

Table 3: Test Case 2 of Popup Reminder

Technique used:

Simulate the real duration of system timer and dim screen functions. Duration of each component/function has been reduced to increase the efficiency of unit testing by ensuring the effectiveness of each component in the software as shown below:-

```

Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) _
    Handles Button1.Click

    Me.WindowState = FormWindowState.Minimized
    Me.Visible = False
    NotifyIcon1.Visible = True

    Me.Timer1.Interval = 1000 '1 Second interval
    Me.Timer1.Enabled = True 'Start Timer

End Sub

```

Test Case 1: “OK” button to start system timer

```

Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
    Dim myObj As abcLockScreen = New abcLockScreen
    SecondCount += 1 'Add another second to the Count of Second

    'Check whether Counted 10 seconds or not
    If SecondCount = 10 Then '105th minutes : 6300 seconds / 15 minutes before locked
        NotifyIcon1.Visible = True
        NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
            "You have 15 Minutes before Take a Break!", ToolTipIcon.TTI_INFO) 'Popup 1st Reminder

    ElseIf SecondCount = 20 Then '110th minutes : 6600 seconds / 10 minutes before locked
        NotifyIcon1.Visible = True
        NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
            "You have 10 Minutes before Take a Break!", ToolTipIcon.TTI_INFO) 'Popup 2nd reminder

    ElseIf SecondCount = 30 Then '115th minutes : 6900 seconds / 5 minutes before locked
        NotifyIcon1.Visible = True
        NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
            "Final Reminder! 5 Minutes left!", ToolTipIcon.TTI_INFO) 'Final popup then only break
        Me.Timer1.Enabled = False
        myObj.LockSystemAndShow(Form2)
        SecondCount = 0
        Timer1.Enabled = True
    End If
End Sub

```

Test Case 2: Check the conditions of system timer

As shown in the unit tests above, instead of the timer starts counting 6300 seconds, 6600 seconds and 6900 seconds, the Timer1_Tick() will starts counting the timer and check whether it satisfies 10 seconds, 20 seconds and 30 seconds. If the timer hits the 30th seconds, it will stop counting, calling the LockingSystem() and initialize the current value of timer to zero (0 second). The program then will starts looping until the user click exit button.

```
Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
    SecondCount += 1 'Add another second to the Count of Second

    'Check whether Counted 10 seconds or not
    If SecondCount = 10 Then 'Dim Screen for 5 minutes : 300 seconds
        Me.Timer1.Enabled = False
        SecondCount = 0
        bolExit = True
        Me.Close()
    End If
End Sub
```

Test Case 3: To set the Dim Screen duration

```
NotifyIcon1.Visible = True
NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
    "You have 15 Minutes before Take a Break!", ToolTipIcon.TTI_INFO) 'Popup 1st Reminder
```

```
NotifyIcon1.Visible = True
NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
    "You have 10 Minutes before Take a Break!", ToolTipIcon.TTI_INFO) 'Popup 2nd reminder
```

```
NotifyIcon1.Visible = True
NotifyIcon1.ShowBalloonTip(3000, "Take-A-Break Notification", _
    "Final Reminder! 5 Minutes left!", ToolTipIcon.TTI_INFO) 'Final popup then only break
```

Test Case 4: Popup notification from system

4.4.2 Usability Testing

The usability aspects of the software were measured by using System Usability Scale (SUS) standard. Users are required to fill up a questionnaire after using the system (software) and to answer each question by selecting based on point scale 5 ranging from “Strongly Agree” to point scale 1 which is “Strongly Disagree” (Sauro, 2011). All results and analysis of the usability testing are illustrated as shown below:-

Question 1: I think I would like to use this software frequently.

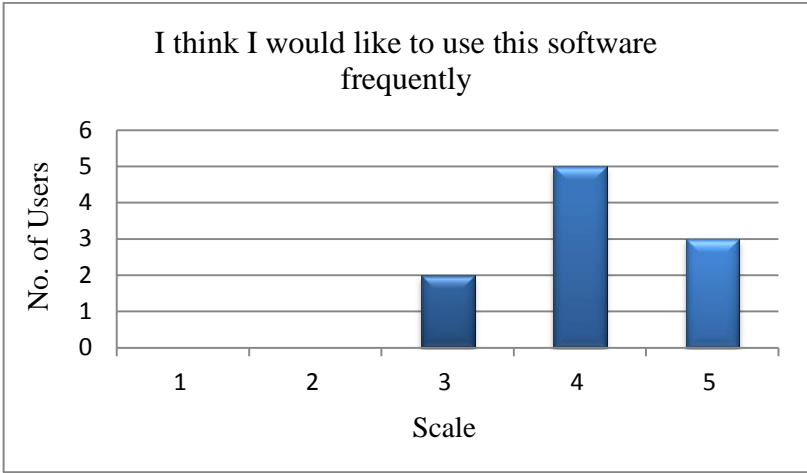
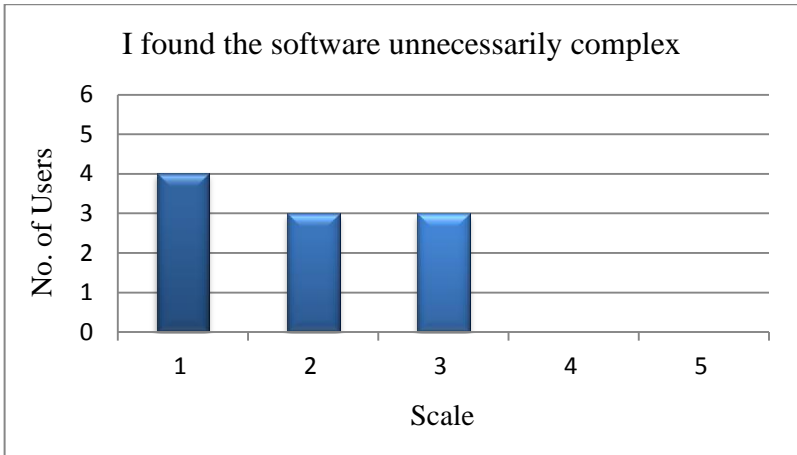


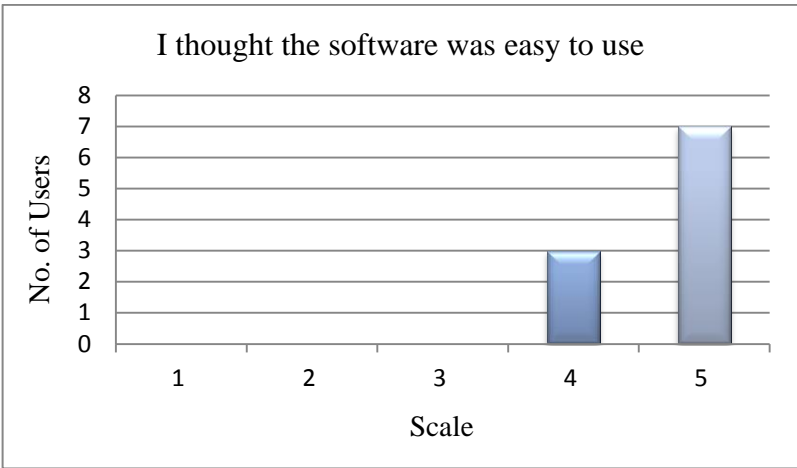
Figure above shows the outcome for the first question. The question asked whether user would like to use the system (software). The result shows that two (2) users rated scale 3; five (5) users rated scale 4, and three (3) users rated scale 5. This has shown that 80% of the users agreed they would like to use the software.

Question 2: I found the software unnecessarily complex.



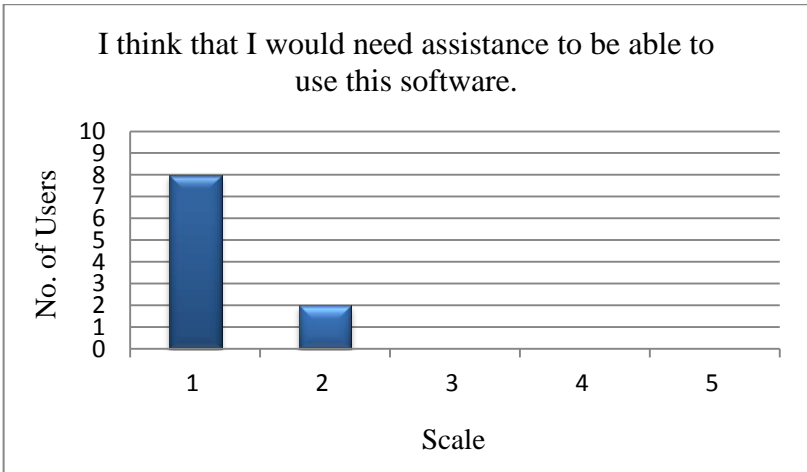
The second question asked the user if they find the software to be unnecessarily complex. The result shows that four (4) users chose scale 1, three (3) users chose scale 2 and three (3) users chose scale 3. None of the users chose scale 4 or scale 5. This shows that most of the users do not think that the application is unnecessarily complex. While, there is still a room for improvement on the software (system) complexity in the future.

Question 3: I thought the software was easy to use.



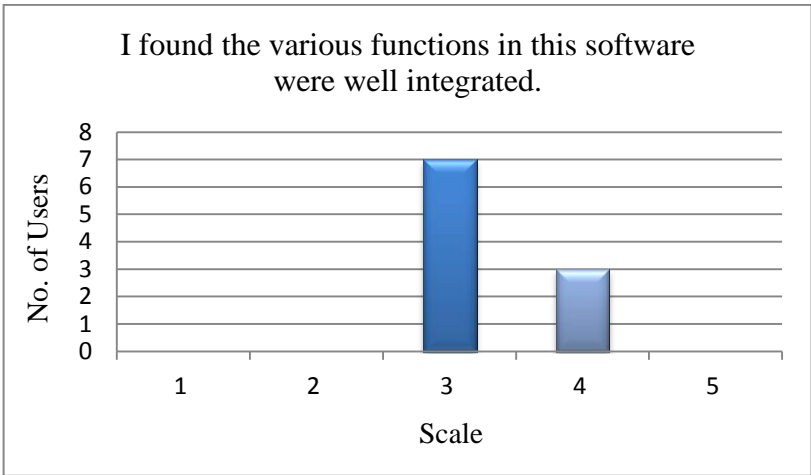
The third question in the SUS testing asked the user if they thought that the software (system) was easy to use. Seven (7) of the users rated 5 on the scale, and the remaining three (3) users rated scale 4. This shows that the users think that the application was very easy to use.

Question 4: I think that I would need assistance to be able to use this software.



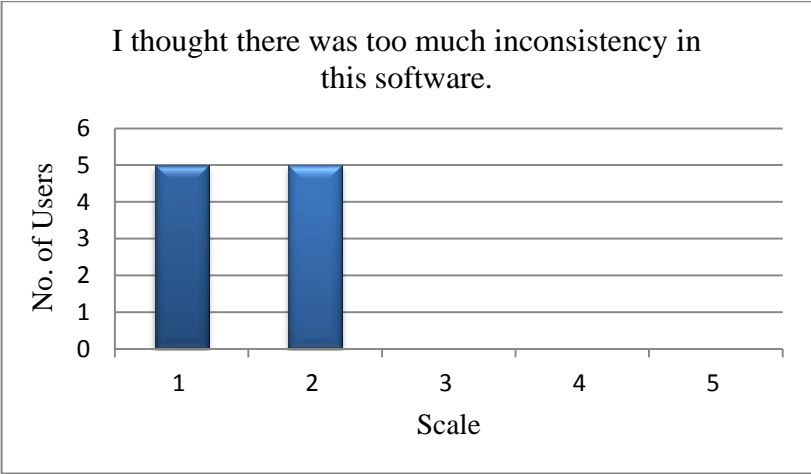
The fourth question asked if the users think that they would require support and assistance from a technical person. The result shows that eight (8) of the users chose scale 1, while the remaining two (2) users chose scale 2. This shows that the users did not quite need any assistance from any technical person to use the application.

Question 5: I found the various functions in this software were well integrated.



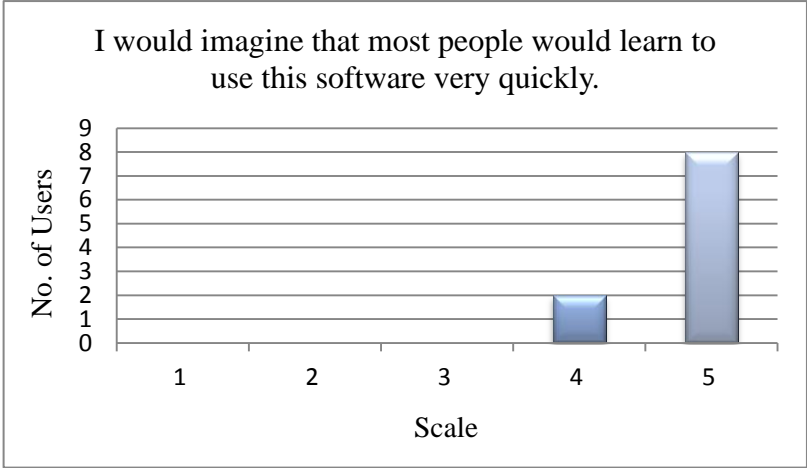
The fifth question asked if the users find that the various functionalities in the system (application) are well-integrated. The result shows the seven (7) of the users chose scale 3 as their answer, while the remaining three (3) users chose scale 4. It shows the functionalities inside the application can be integrated better.

Question 6: I thought there was too much inconsistency in this software.



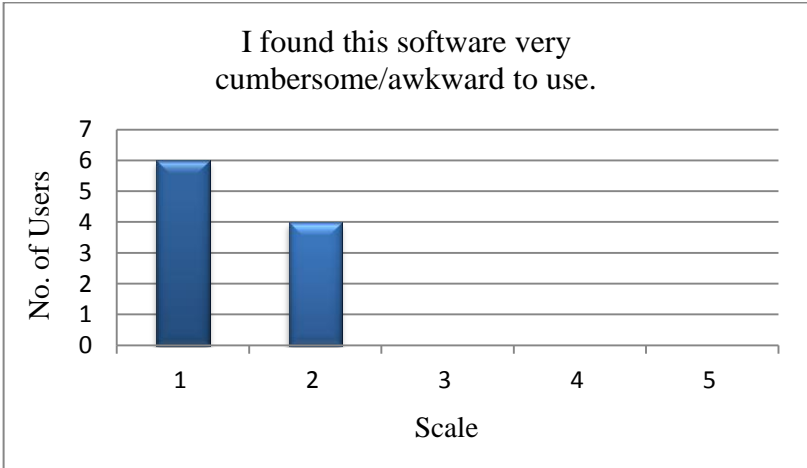
The sixth question in the SUS testing asked if the user thought that there was too much inconsistency in the system (application). 50% of the users, which comprises five (5) people, chose scale 1 while the remaining 50% chose scale 2. This shows that not half of the users think that the consistency in the application is good, while the rest thinks there is some inconsistency.

Question 7: I would imagine that most people would learn to use this software very quickly.



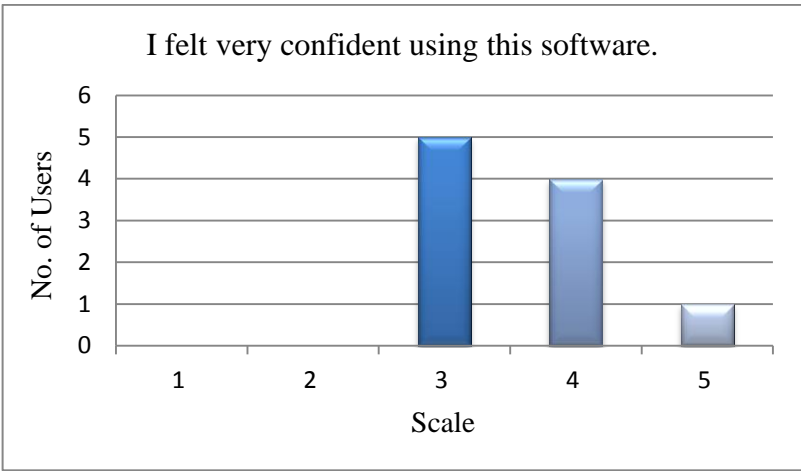
The seventh question asked the users if they would imagine if other users would learn to use the system (application) very quickly. The result shows that eight (8) users chose scale 5, and the remaining two (2) users chose scale 4. This indicates that almost all of the users think that other people will learn to use the application quickly.

Question 8: I found this software very cumbersome/awkward to use.



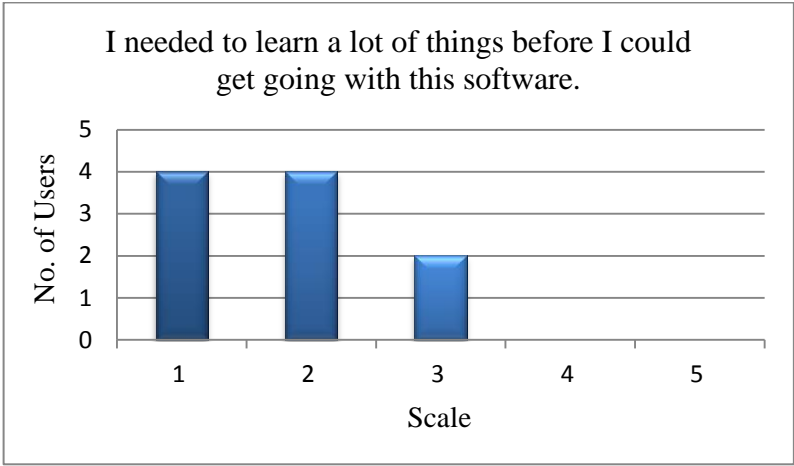
The eighth question asked if the users find the application to be very cumbersome to use. The result shows that six (6) of the user rated scale 1 and another four (4) users rated scale 2 as their answer. This shows that over half of the users think that the application is not cumbersome to use at all.

Question 9: I felt very confident using this software.



The ninth question asked the user if they were confident when they were using the system (application). The result shows that five (5) users scored scale 3 as their answer, four (4) users scored scale 4, and one (1) user chose scale 5. This shows that not all the users felt confident in navigating through the system.

Question 10: I needed to learn a lot of things before I could get going with this software.



The last question asked if the user think that they need to learn a lot of things before they could use the system (application). The results show that four (4) of the users selected scale 1, another four (4) selected scale 2, and the remaining two (2) users

selected scale 3. This indicates that some of the users still think that they have to learn a lot of things before they could get going with the system (application).

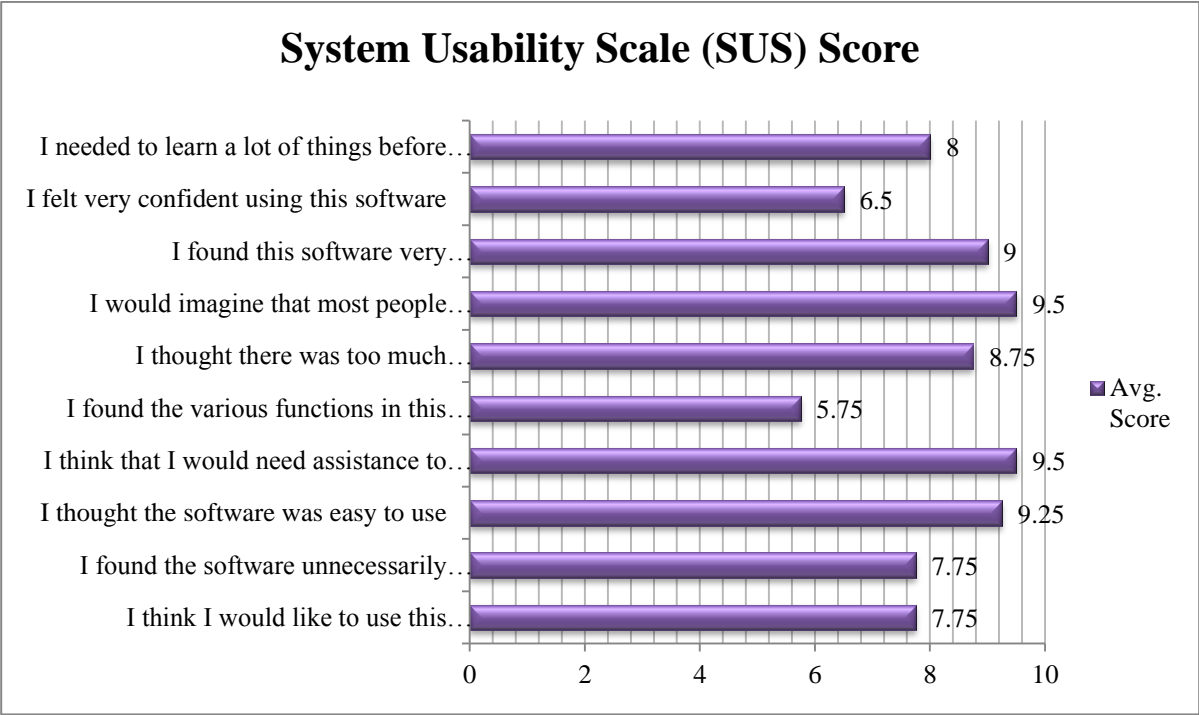


Figure 19: Average Score of Each Item based on SUS Survey

The figure above shows the average score for each of the question, from a total of ten users. The calculation to obtain average scores for odd-numbered (1, 3, 5, 7, and 9) questions differ from the average scores for the even-numbered (2, 4, 6, 8, and 10) questions. This is because question 1, 3, 5, 7 and 9 expect users to rate more towards the higher side of the scale (3 – 5) to achieve better usability rating, while question 2, 4, 6, 8 and 10 expect the opposites (Sauro, 2011).

Below are the formulas to obtain average scores based on the questionnaire outcome:-

Odd-numbered questions
 Average score = [No. of Users * (Scale Position - 1)] * 2.5 / Total No. of Users

Even-numbered questions
 Average score = [No. of Users * (5 - scale position)] * 2.5 / Total No. of Users

Figure 20: Average SUS Score Formula

Therefore, the total score for System Usability Scale (SUS) of Take-A-Break Notification obtained from the ten (10) users is shown below:

SUS = Sum of Average Score for all 10 questions;

$$\begin{aligned} \text{Sum of Average Score} &= 7.75 + 7.75 + 9.25 + 9.50 + 5.75 + 8.75 + 9.50 + 9.00 + 6.50 + 8.00 \\ &= 81.75, \text{ SUS Score obtained} > 80 \text{ (Attaining Grade A)} \end{aligned}$$

Based on the SUS score, Take-A-Break Notification obtained score above 80 which is considered as attaining grade A in the usability standard. This has shown that development process have been done according to the usability aspects. The high usability quality of this software has proven that it is applicable for non-technical users which may find difficulties in using and configuring new implemented software or system.

CHAPTER 5

CONCLUSION

5.1 Recommendations

More thorough research and findings materials are needed such as coding efficiency or reduction, more APIs required in order to obtain the best interactive user interfaces. The recognition and awareness on Computer Vision Syndrome (CVS) related software among computer users are very low. Hence, future researchers should look into doing a comprehensive research and ways to implement this kind of software especially among office workers as an alternative way to enforce ergonomics practices in the workplace.

This project only covers the scope of Windows OS users. In the future, it is possible to create a similar application for other operating system such as Apple and Linux. The additional features will be included after the beta release is successfully accepted within 6 months.

5.2 Conclusion

In this final dissertation, all the details of the project and its significant are well explained. Based on the final prototype of Take-A-Break Notification had undergone two tests; (1) unit testing and (2) usability testing. The software has been proven to be accepted by users which had shown in the SUS result obtaining grade A software. Beta testing among 10 UTP lecturers have also shown their interest towards the software and supported that it is applicable to implement in their office. The additional features of the software will be included in order to increase its commercial value. Based on all these criteria considered, I hope that the project will achieve its main objectives and help to reduce the possibility on getting Computer Vision Syndrome (CVS).

CHAPTER 6

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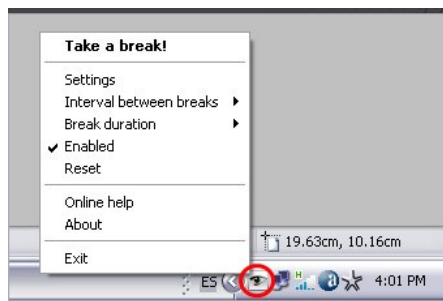
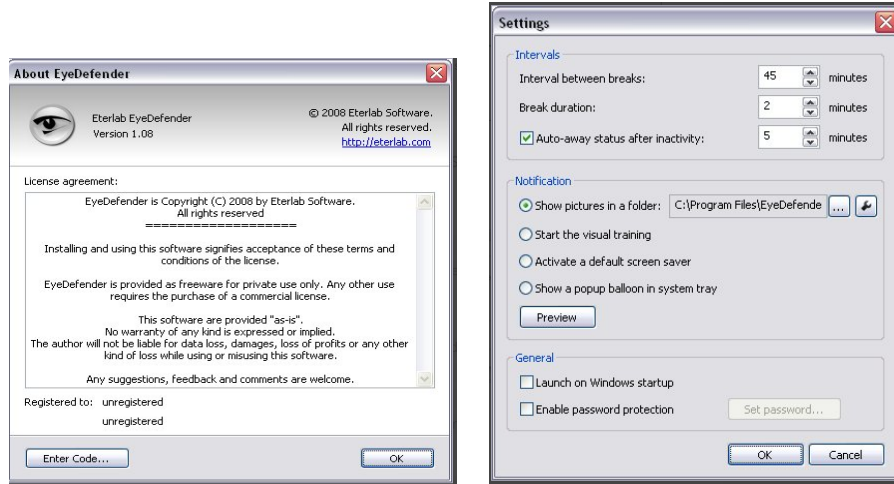
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APPENDIX 1

Existing Software

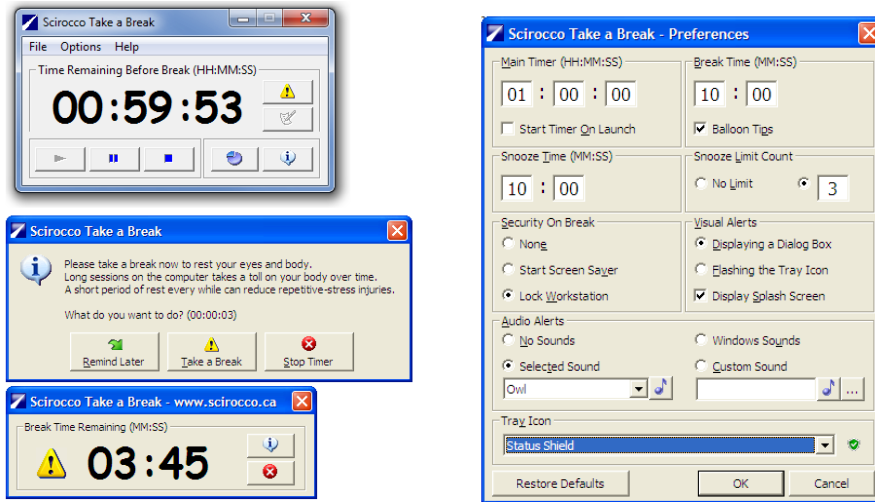
1. Eye Defender



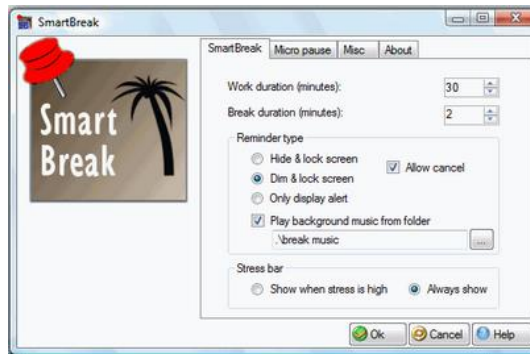
2. Off4Fit



3. Scirocco Take A Break



4. Smart Break



5. TakeABreak



APPENDIX 2

Participant ID: _____

Date: ___/___/___

System Usability Scale

Instructions: For each of the following statements, mark one box that best describes your reactions to the Take-A-Break Notification software.

		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this software frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	I found this software unnecessarily complex.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	I thought this software was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	I think that I would need assistance to be able to use this software.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	I found the various functions in this software were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	I thought there was too much inconsistency in this software.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	I would imagine that most people would learn to use this software very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	I found this software very cumbersome/awkward to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I felt very confident using this software.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I needed to learn a lot of things before I could get going with this software.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please provide any comments about this software:

This questionnaire is based on the System Usability Scale (SUS), which was developed by John Brooke while working at Digital Equipment Corporation. © Digital Equipment Corporation, 1986.