CONTENT MANAGEMENT SYSTEM (T-CMS) FOR PRIMARY SCHOOL TEACHERS

by

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Final Dissertation submitted in partial fulfilment of
the requirements for the
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Business Information System Programme
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in partial fulfillment of the requirement for the

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…….
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May 2012

CERTIFICATION OF ORIGINALITY

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

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ATIKASERI MUHAMAD

ABSTRACT

The implementation of technology in education has emerged very rapidly due to its positive impacts on the improved teaching and learning. Teaching materials and academic resources need to be channeled wisely among the educators in order to enhance the academic performances. A medium of sharing and organizing contents is believed to be beneficial and useful in the context of knowledge sharing. This paper discussed the implementation of a Content Management System (CMS) in education that is focused for primary school teachers resided in rural areas. The aim of developing this system is mainly to provide a sharing medium that help teachers to organize, manage and store contents that indirectly promote the knowledge sharing culture among them. Apart from that, it acts as a mean of communication among teachers in order to provide better education to the students. Plus, this system will help teachers who are working in rural areas to improve their technological skills and be able to develop better interactions which indirectly motivating them to achieve a common set of goals that is improving academic performances of the students. Surveys and interviews are used as the data gathering tools to gather users' acceptance on the system. In addition, Scale Usability Score standard is used to measure the level of usability of T-CMS and how the user perceives the system's general look and feel. With 82.5% SUS score, it can be concluded that the system receives positive feedback from the users and they are satisfied using the proposed system as a sharing mechanism.

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ABBREVIATIONS AND NOMENCLATURES

CMS	Content Management System
KM	Knowledge Management
IT	Information and Technology
SMS	Short Messages System
LMS	Learning Management System
TC-CMS	Teachers College Content Management System
GUI	Graphical User Interface
LCMS	Learning Content Management System
RAD	Rapid Application Development
KMS	Knowledge Management System
RDBMS	Relational Database Management System
UAT	User Acceptance Test
UML	Unified Modelling Language
SUS	System Usability Score
API	Application Programming Interface

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF STUDY

Documentation, the recording of organizational structures, policies, actions, and goals, is vital to any business, and undoubtedly so for those of in development sectors. In today's business world, any organizations including industrial workplaces, educational institutions and even small organizations implement the use of technological advances in their daily business activities. The significance of handling any electronic documents has always been one of the important factors to ensure the business operations and processes are conducted in an effective and efficient manner.

Recently, the need of knowledge sharing within organizations is tremendously being pointed out. The significant of knowledge sharing culture is to ensure knowledge, skills, and experiences are being disseminated among the individuals inside an organization.

Content Management System (CMS) is one of the knowledge management (KM) initiatives in order to support the knowledge sharing culture in organizations. It serves the purpose of organizing electronic documents and files in a more systematic manner. Electronic documents or contents can be stored, accessed and distributed more effectively among the employees of an organization.

While most of this KM initiative is implemented in profit-based organizations, it leads to the development of this system which is customized to educational institutions or more specifically primary schools located in rural areas. CMS will help teachers from different knowledge area and expertise to manage, share, access and deliver their files easily, efficiently and reliably. In short, this system development will provide them a better communication and sharing medium.

1.2 PROBLEM STATEMENT

1.2.1 PROBLEM IDENTIFICATION

It is agreed that people who are staying in rural areas are not implementing the advancement of technology in their daily practices.

There might be some of them who are technically competent and applying the technological advances, however it is circulating in a minority group of people.

In this research study, a few problems have been addressed as follows;

There is no sharing medium for the teachers to have a more effective communication. Conventionally, it takes place in an informal circumstance whereby they will have conversations among them or perhaps via phone calls, short messages system (SMS) or emails. In contrast, a formal communication will normally be via meeting.

- Primary schools that are resided in rural areas infrequently apply the Information and Technology (IT) in order to better facilitate the daily business routines.
- The culture of knowledge sharing in primary schools is not initiated due to an absence of a medium to share any academic resources that includes teaching materials, exam or test papers, effective teaching methods and more.
- Teachers tend to keep their files in thumb or hard drives and personal laptops or computers which are not accessible by others. In other words, they do not feel the need of knowledge sharing among them and they are lacking of knowledge sharing awareness.

In order to motivate and encourage teachers to share their knowledge, the development of this system is vital. It acts as a sharing medium and it enables teaching materials to be sourced, managed, accessed and delivered in a digital environment.

1.2.2 SIGNIFICANCE OF THE PROJECT

This system development is significant to the users which are primary schools teachers. As technology is one of the Knowledge Management (KM) Pillars, this system enables and provides the infrastructures and tools to encourage knowledge sharing within the schools. Teachers can simply share any academic resources with other teachers for the betterment of the school performance.

Practically, this sharing medium is not only restricted to academic based documents. It may also include any knowledge such as pedagogic skills, experiences gained from courses on how to handle underperforming students, the latest syllabus or spotted questions in exams can also be shared.

Apart from sharing teaching materials and academic resources, this system also acts as a repository backup system. Normal cases such as crashed laptops or hard drives prevent us from retrieving the saved documents. With this system, the important documents are still retrievable if such cases occur. In fact, teachers can use the shared materials for future reference.

In a nutshell, this application will not only help teachers to organize and share the electronic documents in a more organized manner, but it also provides a better communication medium among them. Thus, with improved communication and knowledge sharing, indirectly it helps the teachers to provide better and more resourceful education for their students.

1.3 OBJECTIVES

Every new inventions and innovations are developed for a purpose. The main objective of this research is;

- To design and develop a documentation of the proposed system that would benefit primary school teachers that is capable of handling, managing and sharing of electronic documents or files

In addition, this study aims for following specific objectives:

- To create a user friendly and comprehensive prototype for Content Management System (CMS) in the field of education that caters the needs of primary school teachers.

- To test on the usability of the system application.

1.3.1 SCOPE OF STUDY

The scope of study of the system development covers the teachers who are teaching in rural areas or can also be applied in the sub-urban areas. Schools resided in these areas basically do not really implement the IT advancement in their teachings. It might be due to a low level of development, no technological skills and experiences or the expertise to implement an adequate use of technological aids in education.

For the project development purposes, the scopes covers common documents shared among teachers in order to facilitate their teaching to be more resourceful and proficient such as the latest trends of exams questions, spotted topics or chapters covered based on annual analysis and more. They can upload the documents into the system easily. It enables teachers to have unlimited access to any documents shared within this application seamlessly by retrieving or downloading the documents at any times.

Similarly, this system will also act as a portal for teachers to provide them with the necessary information and announcements with regards to the school activities and academic programs. Other than that, this system will also include the teachers' profiles, academic qualifications, and area of expertise in order to identify the suitable personnel for any programs organized by the schools.

1.4 RELEVANCY OF THE PROJECT

This system is relevant to the needs of the organization. In this case, primary schools are the organizations and teachers are as the main users. For a non-profit organization, the vision and mission will not be explicitly measured. Instead, it is determined by the academic performances of the students. The academic performance is somehow related to this system development whereby better communication and knowledge sharing among the educators will indirectly affect the performances of the schools academically.

In addition, with better communication, teachers are able to come out with enhanced academic programs for their students such as extra classes, workshops on effective learning methods and motivational programs. In line with the school missions to produce successful products, in this case the students, this system helps the programs

organizers to identify who are the most talented individuals to conduct those activities.

1.5 FEASIBILITY OF THE PROJECT WITHIN THE SCOPE AND TIME FRAME

1.5.1 TECHNICAL FEASIBILITY

In terms of technical feasibility, the software is feasible technically, although there are some risks taken into consideration. It concerns whether or not the system can be developed.

Low to Medium risk on Technology Area

Based on the general study in primary schools that are resided in rural areas, it can be said that only a minority group of teachers who are well versed in the technological advancement especially in the aspects of improving day to day routines and tasks. However, the trends of using emails and social networking sites are normally being practiced among them. Thus, the risk of developing the proposed system is medium.

As for the developer point of view, the developer has some experiences in some programming languages such as C++, Java and Visual Basic. This knowledge will be very helpful in creating the system to ensure the system can be built. A part from that, open source development tools and software are available over the internet which will be used to develop this system. Therefore, the risk is low to medium for the system developer to transform the ideas into a working solution.

Medium risk on Familiarity of the Functional Area

The system developer needs to explore on how to come up with the suggested and proposed system. Plus, the developer must have a comprehensive understanding of what it is has to be done, who else to be influenced by the project, what the project will achieve and defining in definitive terms the outcome of the project. At the same time, a better understanding on how current systems work in which the methods used among primary schools teachers in sharing knowledge is required. Hence, the risk is medium in this context area.

Medium risk on Project Size

Based on the suggested and proposed features that are made available in the system development, the project size of the proposed system is in a small to medium scale. Due to the development of this system is only done by a developer; it caters only a few areas and departments in the schools which relatively reduces the risk. Furthermore, the user involvement is required to be able to come up with this system.

In terms of time frame, a complete and thorough study of the subject matter especially in the algorithm approach requires a high time commitment. Since the research period is very short, it is limiting the extensive research outcomes and transforming ideas and solutions into a working system will be quite challenging. With all the constraints that may be encountered throughout the development phase, the risk on the project size is medium.

High compatibility of the proposed system with existing technology

The compatibility of the system with the technology is great. The existing or current system of storing information is manually stored. Conventional filing systems are still being implemented and at a higher level, a spreadsheet is used. With the development of this system, it helps to store information and knowledge in a more organized manner.

1.5.2 OPERATIONAL FEASIBILITY

Operational feasibility refers to the acceptance of users on the system development, how they feel about the solution provided, and it is a measurement whether a system can work and will work to solve the problem addressed (Castro & Mylopoulos, 2002).

The proposed system helps in introducing a method of documents sharing among the teachers, which indirectly affect the betterment of school performances especially on the academic aspects. The system also helps to initiate the knowledge sharing culture among teachers to share their teaching materials with one another as well as providing a mean of an improved communication.

In order to cater the adaptability challenges that the proposed system will issue, internal training and user guide manual will be provided to the teachers, on how to

use the system and how to share documents among each other to enhance their pedagogic skills and job efficiency.

1.6 COST-BENEFIT ANALYSIS

Cost benefit analysis covers the costs that include the development costs, operational cost, intangible costs and the benefits from the system implementation. Costs of the developments may include the hardware and software costs, user training costs, and licensing cost. Since educational institutions are non-profit organizations, the expected benefits are converted into forms of monetary in term of the reduction in cost of conducting knowledge sharing seminars and workshops and may also include the cost of printed materials and the teachers' productivity. Table 1 below is the expected costs and benefits for the system development.

Table 1: Cost Benefit Analysis

			Capital Costs (RM)	Yrs Depreciated over	Other Setup Costs (RM)	Per Annum Cost	
Costs						**Revenue**	**Capital**
	Office Infrastructure Setup						
	Server Costs		3,500	4			875
	Server maintenance					500	
	Flex worker Support & Management						
	Training				120		
	ICT Remote Support				200	400	
	Laptop x 3		1,680	3			560
	Training				400		
	Admin payments (2 x 104)					208	
	Total Setup Costs		**5,180**		**720**		
	Alternative Per Annum Costs					**1,108**	**1,435**
	Total per annum costs						**2,543**
Benefits							
	Training costs saved on	340					34
	Productivity increased	1000					1000
	Increased staff productivity 5%***						3,000
	Organizational Performance Increased						2,500
	Total Benefit Per annum						**6,534**

CHAPTER 2: LITERATURE REVIEW

2.1 COMMUNICATION AND CONTENT MANAGEMENT SYSTEM: DEFINITIONS AND CONCEPTS

The communication and interaction between teachers are crucial in order to generate information. Communication is an exchange of messages that happens between at least two people which at one end is the sender and the other end is the receiver. It is a process of expressing their feelings, opinions, and beliefs with each other in the hope for reciprocity. On the other hand, when two or more actors, in this case teachers, influence and have an effect on each other's actions and activities in order to accomplish their goals, performing some works in common or conducting a shared duty is considered as interaction. In order to teach students to become good learners, one of the ways is to find at least two or three, or it is better five to seven people to act as a team either close by or far off to have an exchange of information and knowledge (Semenow, 2005).

According to Blau and Hameiri (2010), with regards to the interactivity, through a research hypothesis of implementation time affected the number of messages sent by teachers to their colleagues proves that the number of messages sent by teachers to their colleagues has been increasing with the existence of a system. It supports that the implementation of technological change at schools impact the online communication among teachers to be more effective.

To exchange information with each, there is a need of technological tool to support this activity. One of the tools is the Content Management System (CMS). According to Baxter et al. (2002), CMS is described as information delivery systems that organize the content separately into documents and borders and it includes a web based system. In addition, content can be any item of any size in any forms such as textual, graphical, or audio which is delivered to users and viewers. These contents are delivered via a 'Web Server' in pages that can be read by 'browsers' using embedded tagging features.

Apart from that, CMS is defined as a tool used to create, edit, manage and publish contents, be it text, graphics, documents or video by applying a standardized set of rules, processes and workflows in a logical method. Furthermore, it enables people that include both technical and non-technical staff to manage a wide range of contents with variety of formats with reliable rules (Stewart et al, 2008).

2.2 KEY FEATURES AND BENEFIT OF CMS

CMS is referred as content delivery, be it data, information or knowledge. When these contents are managed properly, the organization functions will be more effective and it leads to a better decision making. Browning and Lowndes (2001) mentioned that the objective of CMS is to enhance integration and computerization of the practices that supports efficient and effective Internet deliverance and listed below are some of the business benefits of implementing CMS technology in educational context, which is the university;

- Creating the use of information by permitting the ready integration of data from various sources
- Allowing an proficient re-purposing of information in different formats for different purposes
- Permitting an entrusted maintenance of information and maintain the central control
- De-skilling of the task of putting information on the Web by reducing the conventional methods such as word-processor documents
- Allowing past information or to be re-created, re-constructed and stored
- Metadata are captured upon creation and amendment that provides a best information management practice.

2.3 IMPLEMENTATION OF CMS IN EDUCATION

2.3.1 LEARNING MANAGEMENT SYSTEM (LMS)

There are a few implementations of CMS in educational aspects. Learning Management System (LMS) is one application of CMS. Content management is one of the features of LMS that supports content management, assessment, and course delivery via Intranet or Internet. In fact, there is no LMS without CMS (Crocetti, 2002).

According to Sharma et al. (n.d.), LMS is defined as a software application that is used for various tacks that include management, documentation, tracking and reporting of training programs, classrooms, training contents, e-learning programs and online activities. It provides means of uploading contents for timely delivery for teaching and learning resources. CMS learning environment such as e-learning facilitate and improves the self-regulation skills of both educators and students particularly their metacognitive skills that is the automatic awareness of their knowledge and the ability to understand the cognitive process such as planning and goal setting.

Ismail (2002) stated that Learning Content Management System (LCMS) provides the functionality and tools to come up and manage effective learning content. Moreover, LCMS allows the organization to capture knowledge and it helps to achieve rapid updates, distribution, management and application of knowledge throughout the organization. The benefits offered by LCMS supports the Knowledge Management (KM) processes of discovering, capturing, sharing and application (Becerra-Fernandez, et al., 2004).

Then utilization of CMS has been increasing in higher education that includes medicine, universities to provide a better center of education and distribution of learning materials. A closer example, the e-learning of Universiti Teknologi Petronas (UTP) has contributed towards a better learning experience for both the educators and students.

2.3.2 TEACHERS COLLEGE CONTENT MANAGEMENT SYSTEM (TC-CMS)

Columbia University has come up with a CMS specifically for teachers. This system allows teacher to locate their profile and include their basic information, affiliation and documents. For the documents section, teachers are allowed to share documents on their site and for the update profile section allows teachers to upload the latest information about their academic work ("*Teacher Content Management System (TC-CMS) Faculty Module Guide*", 2007). Figure 2 below shows one of the Graphical User Interfaces (GUI) of TC-CMS.

Figure 1: 'Locating Your Profile Online' in TC-CMS

2.4 KNOWLEDGE SHARING

In a research article of 'Motivating Knowledge Sharing through a KMS' by King & Marks (2006), Knowledge Management System (KMS) has been regarded as a mean of knowledge sharing in organizations where knowledge it is designed to capture individual's knowledge and to distribute the knowledge instead of keeping it to themselves or sharing it via conventional conversations among colleagues. This study addresses two primary factors in KM which are, how to best motivate people to share their knowledge and the incentives for knowledge contribution and sharing. Supervisory control and social exchange are the two different methods been discussed in this paper. Supervisory control means the efforts exerted by management to increase the probability of an individual will act in such a way to the achievement of company goals.

In fact, the analysis resulted in a positive relationship between supervisory control and the frequency of contributions. On the other hand, social exchange among individuals is a theory where people contribute to others is seen as elements of reciprocal arrangements, or simply the rewards and incentives of their contribution. From the research conducted, the hypotheses of the level of perceived organizational support is positively associated with the effort exerted to provide efficacious knowledge to a KMS is supported.

Haas and Hansen (2007), conducted study of a differentiated productivity model of knowledge sharing in organizations proposing that different type of knowledge has different benefits for task units. The purpose of the study is to analyze how different types of knowledge affect the task level outcomes which have been conducted in 182 sales team of a management consulting company. There are two mechanisms being used in this study which is the explicit and tacit knowledge. Additionally, the study addressed three task performance outcomes which are time savings, work quality and signal competence. The results of the study indicated that sharing codified knowledge saved time during the task but did not improved work quality and signaled competence or strength of the company. In contrast, sharing tacit knowledge would improve the work quality and signals the competence, but it uses a lot of time. To conclude, the three dimensions of task performance are inter-related in which if time savings from using explicit or tacit knowledge being implemented in the organizational tasks, it would bring positive effects to the work quality. Nevertheless, if signals competence or strength of the company is related to the quality, it would also have affected the signaling ability which results in a competitive advantage of an organization.

2.5 KNOWLEDGE MANAGEMENT IN EDUCATION

Petrides & Nodine (2003) in their study of implementation of KM in education has stated that a few educational institutions implemented KM to improve information flow, to enhance evaluation of outcomes and to improve information sharing.

Based on the research, an increase in internal and external pressures for improvements has drive KM in educational institutions where teachers, administration staffs, and college faculty has to keep abreast of the changing

standard, curriculum, and pedagogical methods. In addition, the research discussed some barriers of effective information use that include lack of staff, data and information is not uniform, lack of leadership, lack of integration of technology and more. The primary benefit of KM in education is that it helps to address both the technology culture and information culture where they both unique to educational institutions. Accurately, KM brings three core organizational resources that are people, processes and technology that enable organization to use and share information more effectively. Furthermore, the KM management continum that comprises of data, information and knowledge are being aligned to the needs of colleges, universities and schools such as integrating the technology into the curriculum, student learning and more. To conclude, practicing KM allows people to build the energy, organize efforts, share resources, information and knowledge that later results in further improvement.

2.6 IMPROVEMENT AND IDEAS FROM EXISTING SYSTEMS THAT CAN BE IMPLEMENTED IN THE PROJECT.

Based on the research studies conducted by experts, it can be said that the development of CMS for primary school teachers will result in positive impacts on the education. As for the TC-CMS, it mainly covers the teachers profile and it does not provide means of effective communication among them. For the system development, a chat or forum discussion feature will be included to enhance and improve the interaction and communication among teachers.

On the other hand, e-learning or LCMS is quite complex for the primary school teachers especially in rural areas due to basic implementation and knowledge of technology. In fact, LCMS deals with both students and teachers whereby it is not suitable to be implemented in primary schools resided in ‘kampung’ as the students are not exposed heavily to the advancement of Information Technology (IT). Therefore, the development of CMS for primary school teachers will cater the limitations of the end users by providing a user-friendly interface and complete user guide to help them operate the system.

CHAPTER 3: METHODOLOGY

3.1 SYSTEM METHODOLOGY

Research is conducted to gather more information about a specific topic. It is a process of hunting for facts or truth about a subject in order to solve problems, test hypotheses, develop or invent new things. The research is done for this project is to explore and have a better understanding on the nature of problem to be studied and identifying the related area of knowledge.

Methodology used in developing this system is Rapid Application Development (RAD). According to Fitzgerald (1998), RAD focuses on the 'frequent tangible result' philosophy where the functioning system is delivered within a shorter period of time. On top of that, RAD is an iterative process where the system development will undergo the same process for more than a time and it involves prototyping (Berger, Baynon-Davies, & Cleary, 2004). This is due to the added functionalities that evolve during the system development phase based on the user requirements. Therefore, this methodology is parallel and suitable for the system development where the final output will be a working prototype and will be delivered within a shorter time scale. Figure 2 below shows the RAD model;

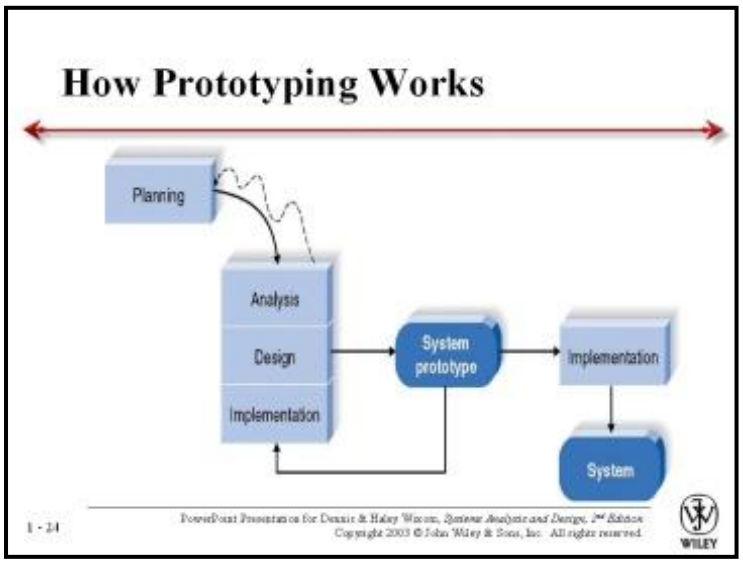

Figure 2: Rapid Application Development Model

3.2 PROJECT ACTIVITIES

Listed below are the project activities taken throughout the system development period;

1. ***Define research problem***

For this project, the problem has been identified where there is a need of a communication and sharing medium for primary schools teachers to organize, store and arrange important electronic documents in a more systematic manner. Other than that, the system development is aimed to help teachers in rural areas to enhance and improve their technological skills in order to be aligned with the implementation of technological advancements in the field of education.

2. ***Review concepts and theories/ Review previous research findings***

Critical analysis on the literature is conducted to have a better understanding on the research area and to review for any existing system in the market. It includes the CMS features, benefits and also the CMS implementation in education in which the project development falls under KM initiatives in cultivating the knowledge sharing culture.

3. ***Gather project requirements/Data Gathering***

This phase is to gather data and information on the user requirements using different methods of data collections such as interviews, acceptance surveys, observations and more. This phase is the most crucial part of this project. "*A requirement is a description of what a system should do*" (Leszek, 2001). The requirements specification is then produced from the detailed definitions that clearly define the system functions.

4. ***System Design***

System design is a phase that emphasizes on how the system should perform in order to fulfil the requirements. This involves the architecture design, objects and classes design, database design and user interface design. Unified Modelling Language (UML) modelling, such as Use Case Diagrams, Class Diagrams and Sequence

Diagrams also been used in this project in order to specify, model and document the system

5. ***Development/Implementation***

The implementation stage of software development is the process of converting a system specification into an executable system. The implementation phase involves the actual development of the system. With the documentations from the analysis and design phase, the system should be built upon what has been documented. The implementation phase deals with issues of quality, components and debugging. The development involves the implementation of User Interface, Data Access Tier and the integration of all these components.

6. ***Testing***

The next stage in this process model is testing. The system needs to be tested for conformance with the system requirements and specifications. There are two types of testing that will be carried out. The first one is the alpha testing in which the system developer will test the system functionality and fix any errors encountered. Secondly, the beta testing where it includes the end users who are the teachers to test on the system usability and functionality.

7. ***System Deployment***

The deployment of system involves testing the full version of system on real time in order to combine the modules of the system and test whether or not the system is functioning correctly and according to the specified requirements.

Figure 3 below shows the flow of the project activities in order to complete the development of T-CMS.

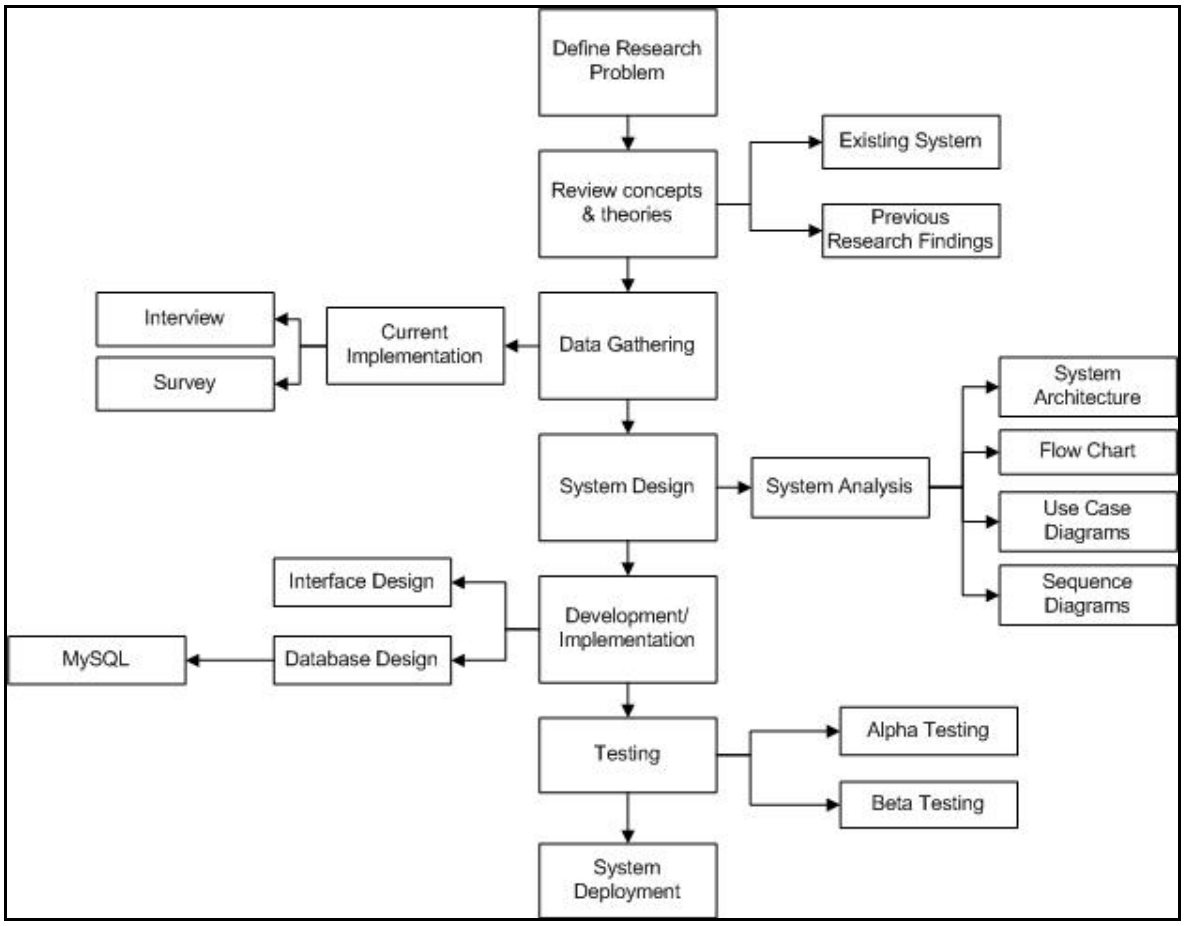

Figure 3: Project Activities

3.3 METHODS OF DATA COLLECTION

Data gathering will be conducted by using both primary and secondary sources as listed below;

- Interview with primary school teachers to have a more comprehensive understanding on the current system implementation and what are their requirements (*See Appendix*)
- Acceptance survey or questionnaires will be forwarded to the related populations which are mainly primary school teachers. This will include both open-ended and close ended type of questions.
- Theoretical information will be gathered through review of related literature of content management system specifically aiming for teachers

- T-CMS Web Application Usability Test will be conducted on selected population, which consist of the system's related users, the educators (lecturers, teachers, tutors)

3.4 SAMPLE DESIGN

3.4.1 DEFINING THE POPULATION

An acceptance survey or questionnaires will be distributed among primary school teachers who are working in rural areas. They are the targeted population and the main users of the proposed system. It will include teachers from different departments such as Mathematics & Science, Linguistic Department and Religious or Moral.

In addition, the web application usability test took place in a school and also in the campus on selected personnel such as the teachers, both primary and secondary teachers, lecturers and also the tutors. Even though the system is meant for the primary school teachers, the usability testing is conducted in different users' perspectives to improve the usability if T-CMS.

3.4.2 SAMPLE SIZE

The estimated total numbers of teachers in a primary school is around 60. Due to time constraint, from the overall population, about 30 respondents will involve in the acceptance survey and questionnaires.

As for the usability test, it was conducted on 4 users in which all of them are from an educator's background. They tested the usability of each module available in T-CMS and understood the flow of the system. Only a small number of users involved in the usability testing due to the limitation of time and costs in order to perform the full application usability test to the intended users.

3.4.2 SAMPLING METHOD

In order to conduct the survey, a probability sampling method is chosen. For this type of sampling method, it is required to decide on the sample population. In this research area, the sample population has been highlighted and every element of the population has an equal chance to be selected that leads to the calculation of the selected sample. On top of that, there will be no bias if the sampling is properly conducted (Doherty, 1994). Precisely, the random sampling method will be applied

for this research study seeing that conducting survey is used as one of methods for data collection.

3.5 DATA REPRESENTATION

Once data collection is completed, interpretation and analysis of data will be carried out to gather the information in both qualitative and quantitative methods.

- Qualitative Method: It concerns with the views and opinions from the sample population derived from the interviews with regards to how current system works. At the same time, it answers the 'why' questions which leads to a clearer view on how the to-be system will be implemented in this system development.
- Quantitative Method: This method is concerned with the initial hypothesis made at the beginning (McBride & Schostak, n.d.). For this research study, the hypotheses will be;

  Implementation Hypothesis:-

  - **H0**: Primary school teachers who are working in rural areas do not use a proper technological-based medium to share their teaching materials.
  - **H1**: Primary school teachers who are working in rural areas use a proper technological-based medium to share their teaching materials.

  Usability Hypothesis:-

  - **H0**: T-CMS web application is difficult to be used in terms of the look and feel of the application and users are less likely to use the system once it is implemented.
  - **H1**: T-CMS web application is easy and convenient to use in terms of the whole look and feel of the application and users are most likely to use the system once it is implemented.

At the same time, this method use numerical evidences to support the data gathered from the questionnaires or acceptance survey that will be carried out to the specific

respondents. The data will be depicted into graphs and charts with percentages to be able to draw an informed conclusion.

Once both the qualitative and the quantitative data have been gathered, it will be represented in graphical forms such as bar graphs and pie charts with axis descriptions and title in order to depict clearer and distinctive patterns with one another. From the semi-structured interviews with a few teachers and extensive reviews of the literature, an analysis is conducted to have an improved understanding of the system requirements. SWOT analysis has been prepared in order to have a more comprehensible approach towards the system development.

3.6 GANTT CHART AND KEY MILESTONES

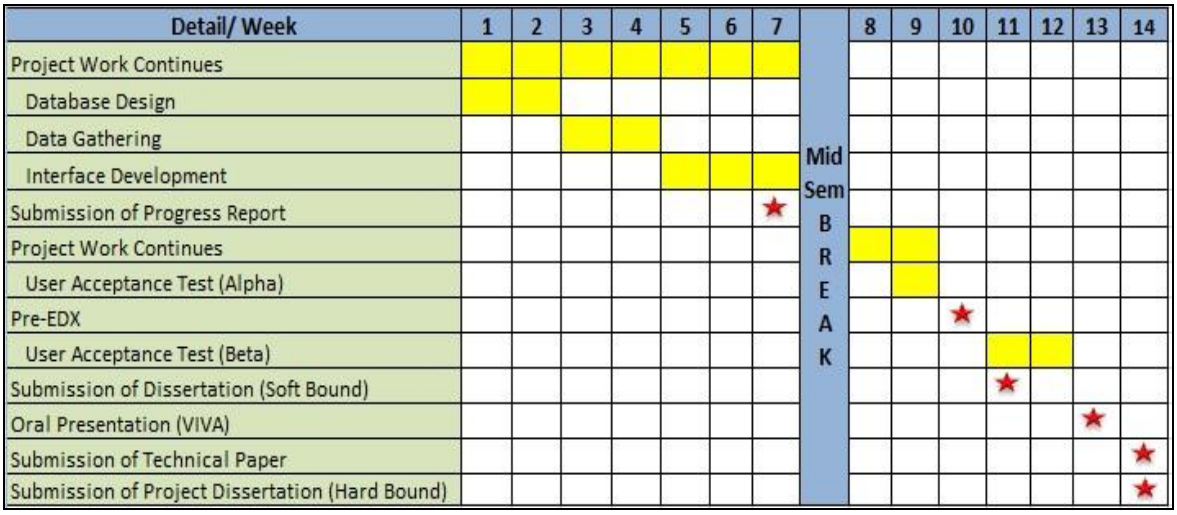

Figure 4: FYP 2 Gantt Chart and Key Milestones

Based on Figure 4 above, 12 weeks are the estimated time for the development of T-CMS. For the first half of the semester, from Week 1 to 7, this period is exclusively for data gathering for the development purposes, drafting and designing the web interfaces. It includes what kind of materials and information need to be included inside the system development and the arrangement of the Graphical User Interfaces (GUI) of the system in terms of the suitable position of each module and functions. Basically, it deals with the general outlook and appearance of the web application of T-CMS.

A user acceptance test (UAT) alpha level will be conducted in Week 9 in which the system is operating in 90% completion stage with the combination of dummy data

and also the real data gathered from the educational websites and portals. This phase of testing is an in-house testing where the system needs not to have the full functionality; however core functionality and features are made ready to generate the expected output. Fundamentally, alpha testing helps the developer to detect bugs or errors and perform quick bugs fixing.

After the pre-EDX which is week 11 onwards, T-CMS will be given a test run using UAT beta for the real end user(s) in a real environment to ensure the system is functioning according to the users' requirements and specifications. UAT Beta Testing is expected to be completed by Week 12.

3.7 TOOLS

Table 2: Tools used to develop the system

Elements	**Software/ Platform**
Development Tool	Joomla – Content Management System
Programming language	PHP
Database	MySQL
Web Server	Apache HTTP Server - Xampp

- *Joomla*

Joomla is a CMS that helps to publish contents over the internet and the world wide world (WWW).

- *Database Server*

There are various types of database server that can be used to create the database application. In this project, a database of the system will be created using MySQL to manage the information about the users, files and documents. MySQL is a free open source Relational Database Management System (RDBMS).

- *Programming Language*

The system will used PHP as its programming language for web development. PHP is a language that well suited to interact with database.

- *Web Server*

The system will use XAMPP as the web server. It can run on variety of operating systems and it is reliable. Once the web server is running that includes the Apache and MySQL, the personal computer in use is ready to be made a local server or it is normally called the local host.

3.7.1 HARDWARE REQUIREMENTS

To develop T-CMS, the developer recommends the following hardware specifications and requirements to support the system. As shown in Table 3, the following are the minimum requirements for this project;

Table 3: Minimum Hardware Requirements to develop T-CMS

Hardware	**Descriptions**
CPU	Intel Centrino 1.6 Ghz Processor or higher or others
Memory	At least 512 MB Recommended: 1 GB or higher
Hard Disk Space	At least 1.5 GB
Others	Other required standard computer peripherals (Mouse, Keyboard, etc)

CHAPTER 4: RESULTS AND DISCUSSIONS

This chapter will discuss the results and findings from the research methodology discussed in the previous chapter. Basically, it covers both the qualitative findings from the interviews and observations. Also, this chapter will discuss comprehensively in terms of the quantitative findings gathered from the acceptance surveys and web application testing of the system.

4.1 DATA GATHERING/DATA ANALYSIS

Based on the results gathered from the surveys, it can be said that the overall acceptance of the proposed system is favorable and it helps in promoting the culture of knowledge sharing among teachers. Indirectly, it helps create the awareness of the importance and benefits of knowledge sharing in achieving the goal of an organization. Hence, it is a positive approach of developing a CMS for the primary school teachers in order to improve the quality of education provided to the students. The flow of the proposed system would be as follow;

4.1.1 UNIFIED MODELLING LANGUANGE (UML)

In a system development, there are three different models that are significant which are the use case diagrams, the activity diagrams and the sequence diagrams. Each diagram serves different purposes and enhances the understanding of a system development process.

4.1.1.1 USE-CASE DIAGRAM OF T-CMS

The functional model, represented in the UML with use case diagrams, describes the functionality of the system from the user's point of view. Figure 5 below shows the use-case diagram of the proposed system. The system is developed for two different users which are the front-end user, i.e. the teachers and the back-end user, i.e. the administrator. Both administrator and the teachers have different types of tasks, activities and permission access into the system. Basically, system administrator is more powerful as he or she will have both the front and back end access of the CMS. Unlike the users, they are only entitled to have access at the front end of the system.

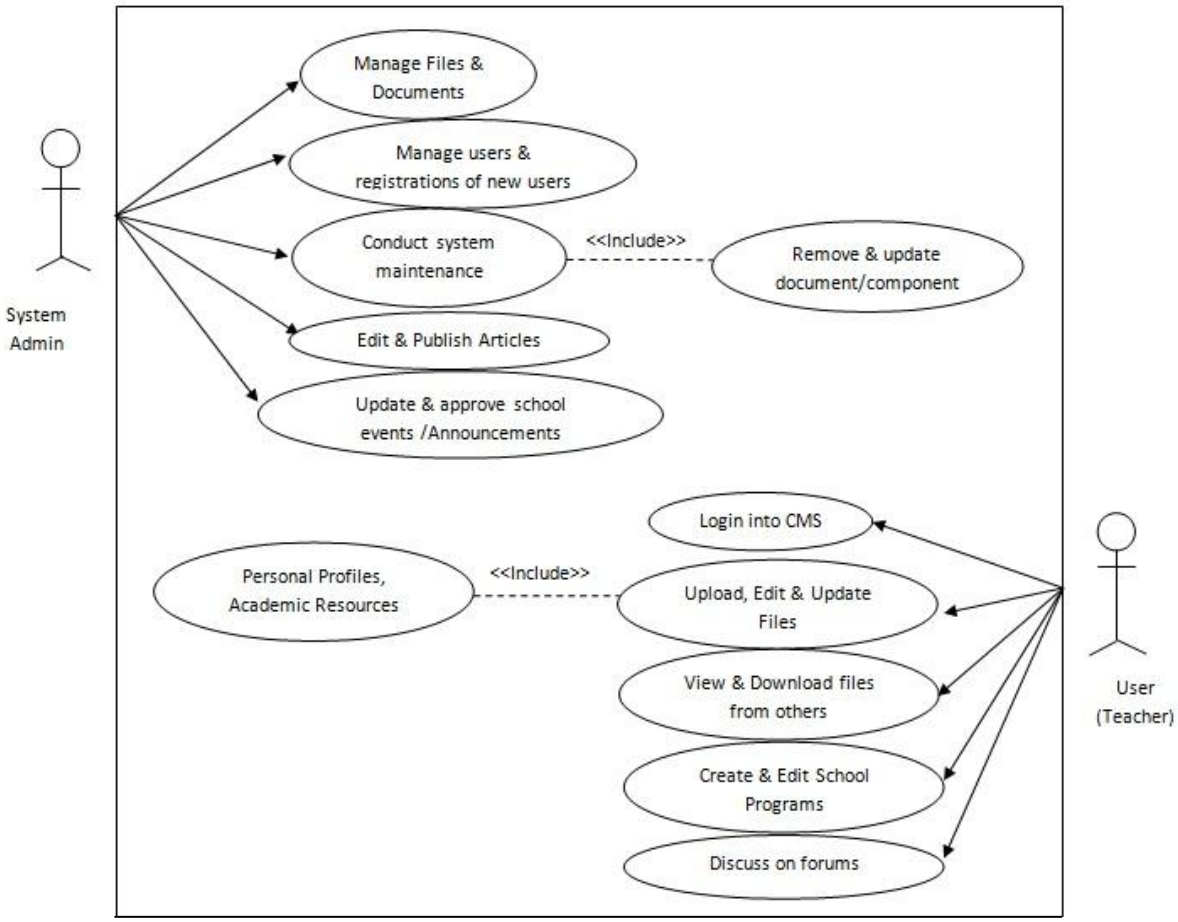

Figure 5: Use Case Diagram of T-CMS

As depicted in Figure 5 above, the teacher is now being able to create and edit events on the system. Previously, the permission to create and update school events is only given to the system administrator as to avoid users to simply create events on their own. However, after the web usability testing with a few teachers, they suggested that a user should be able to create and update events on the system as some of the teachers are held responsible for a certain program. Therefore, there are some changes on the system whereby normal users are given the permission to create and edit their own events as they are the ones who are well informed of the specific events. However, in order to avoid users from simply creating any events, each event created must be approved by the administrator before it is formally published.

Table 4 and 5 below explain in further details of the tasks and activities of both the administrator and the users of T-CMS;

Table 4: Use Case Template for System Administrator

Elements	**Descriptions**
1. Primary Actor	System Administrator
2. Goal in context	- To check any pending user and approve users' registration (approve images, assign users to specific groups, etc) - To manage users and set users' permission access - To perform maintenance of the system (e.g. remove outdated documents or school events, check for software upgrades, install any relevant new components, etc) - To update on school events and announcements, to approve events created by users.
3. Trigger	The System Administrator is responsible to approve and handle user's registration, set users' permission access and perform maintenance activities.
4. Scenarios	1. Admin logs into the system – Administration Access 2. Admin enter his/her username & password 3. The system displays all major function buttons 5.Admin does the tasks that have been chosen from the system and save the changes 6. Admin tests the application from the front end and closed the application. 7. Admin monitors the recentness of any school events and programs, remove any outdated documents and approve events created by users, entertains users' requests or any issues encountered when using the system
5. Secondary Actor	System Users (Teachers)

Table 5: Use Case Template for System User

Elements	**Descriptions**
1. Primary Actors	System Users (Teachers)
2. Goal in context	- Log into the system - To Upload, Edit, & Update Files Submissions - To update and edit own profile (educational background, experiences, basic info, etc) - To post or update any documents on school programs or event - To view and download related documents for future use
3. Trigger	- The user is responsible to manage their own profile by updating and uploading the latest files and documents, including the academic materials to be shared with other teachers, any events reports or details handled by them and more.
4. Scenarios	1. User logs into the system – Front End Access 2. User updates and uploads any related documents into the system especially academic-related 3. User update own profile and may browse into others' profiles for more information and download any related materials for future use 4. User can discuss and post comments among each other especially with regards to school events and programs 5. User can create and edit school events for which they are held responsible for.
5. Secondary Actor	System Administrator

4.1.1.2 ACTIVITY DIAGRAM OF T-CMS

Activity diagrams represent the functionalities of the system, the logic of an operation and the flow of the system. Figure 6 below shows the activity diagram of the system administrator.

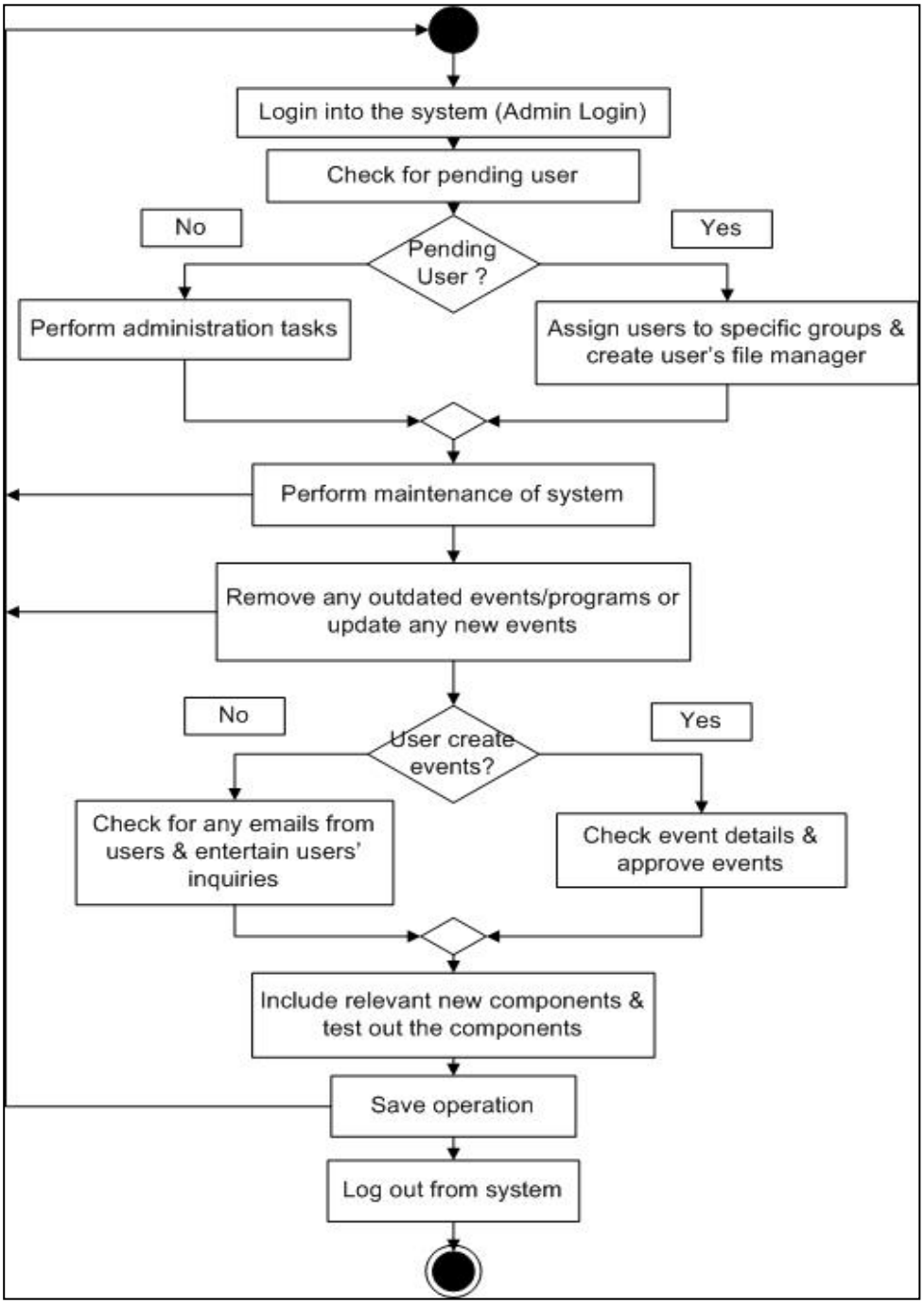

Figure 6: Activity Diagram of T-CMS (Administrator)

Figure 7 below shows the activity diagram of a user of T-CMS. The user is divided into two, which are the registered users and the unregistered users. Both users have different permission access towards the system.

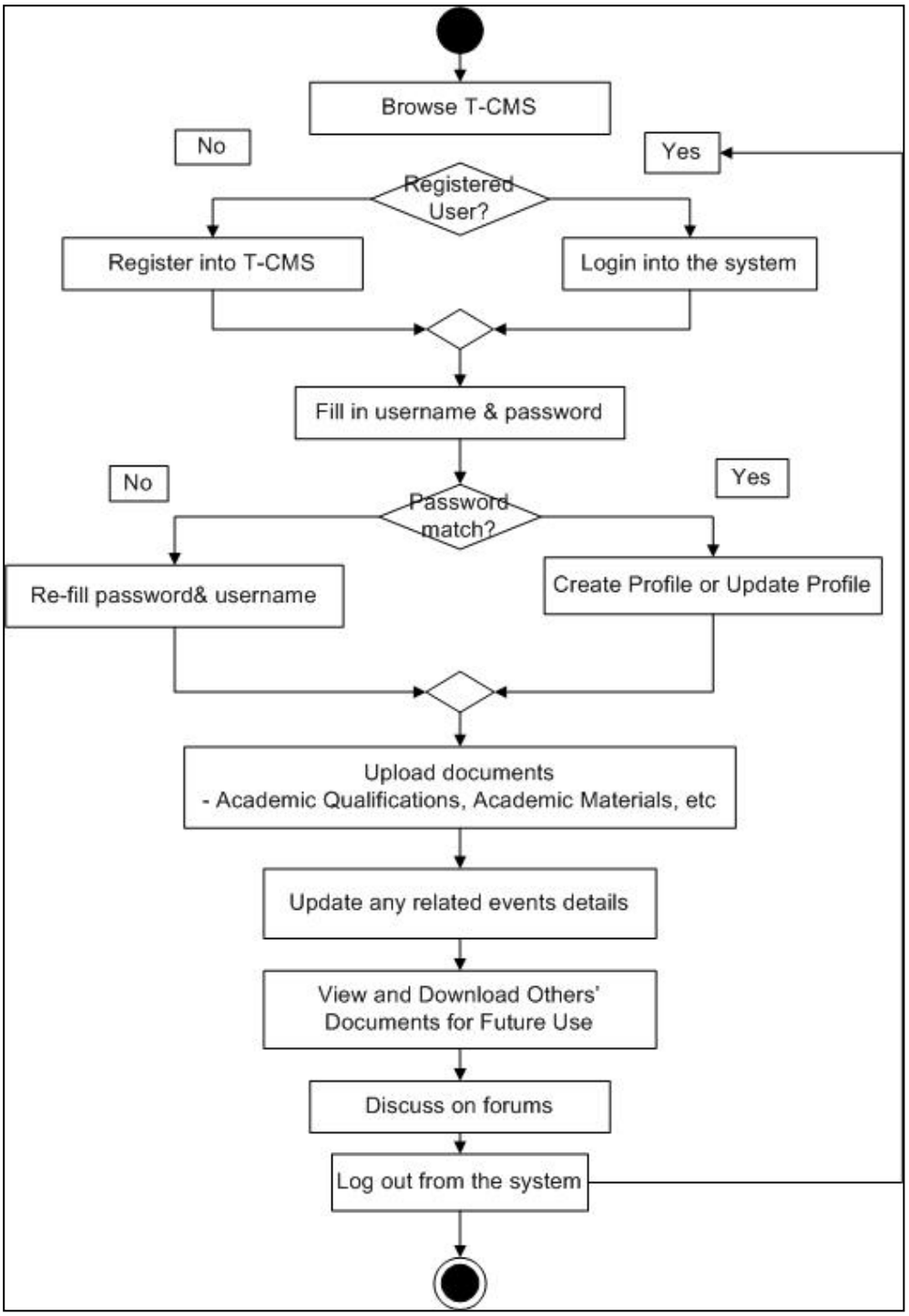

Figure 7: Activity Diagram of T-CMS (User)

4.1.1.3 SEQUENCE DIAGRAM OF T-CMS

A sequence diagram depicts the sequence of actions that occur in a system. The invocation of methods in each object and the orders in which the invocation occur is captured in a sequence diagram. Hence, it makes the sequence diagram as a very useful tool to represent the dynamic behaviour of a system (Mandar & Pravin, 2002). Figure 8 and Figure 9 below show the sequence diagram of T-CMS for both the administrator and the user.

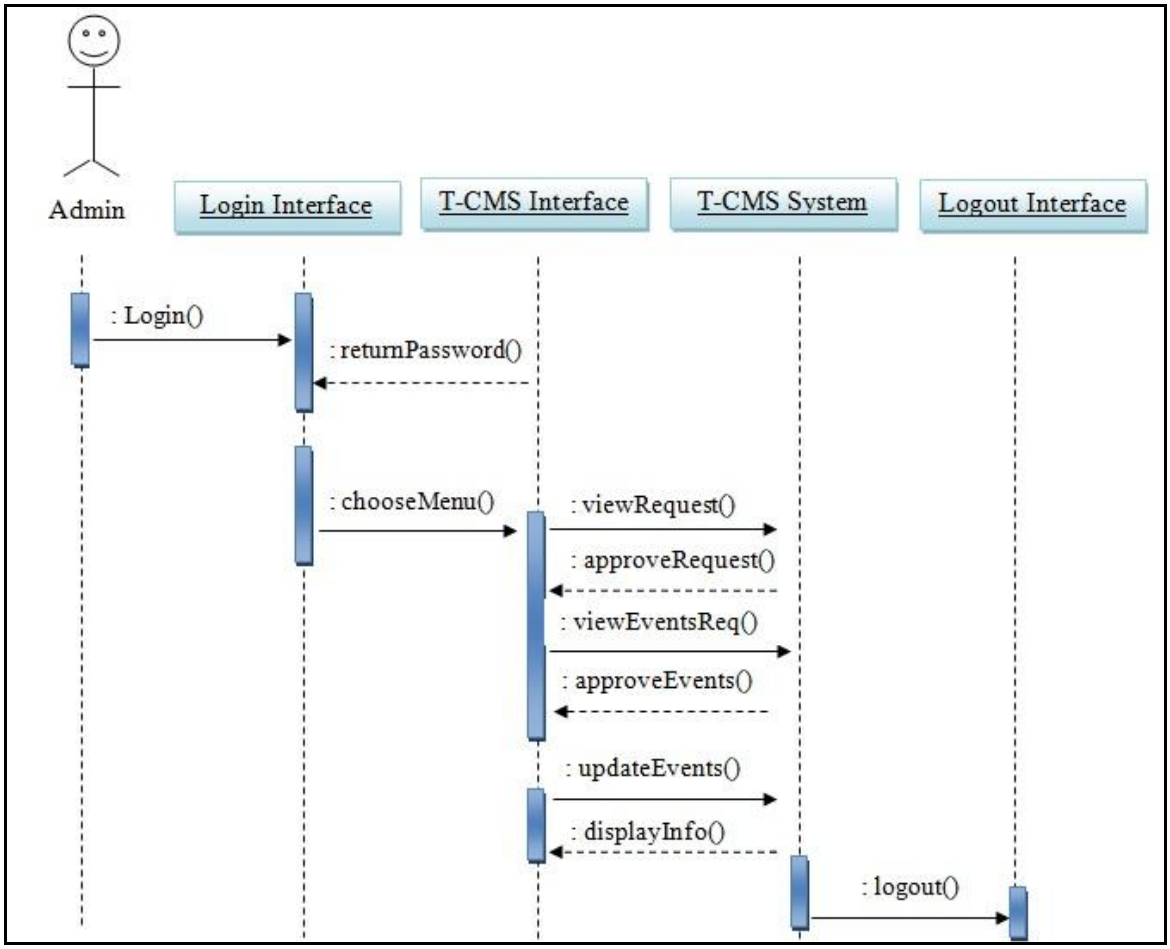

Figure 8: Sequence Diagram for an Administrator of T-CMS

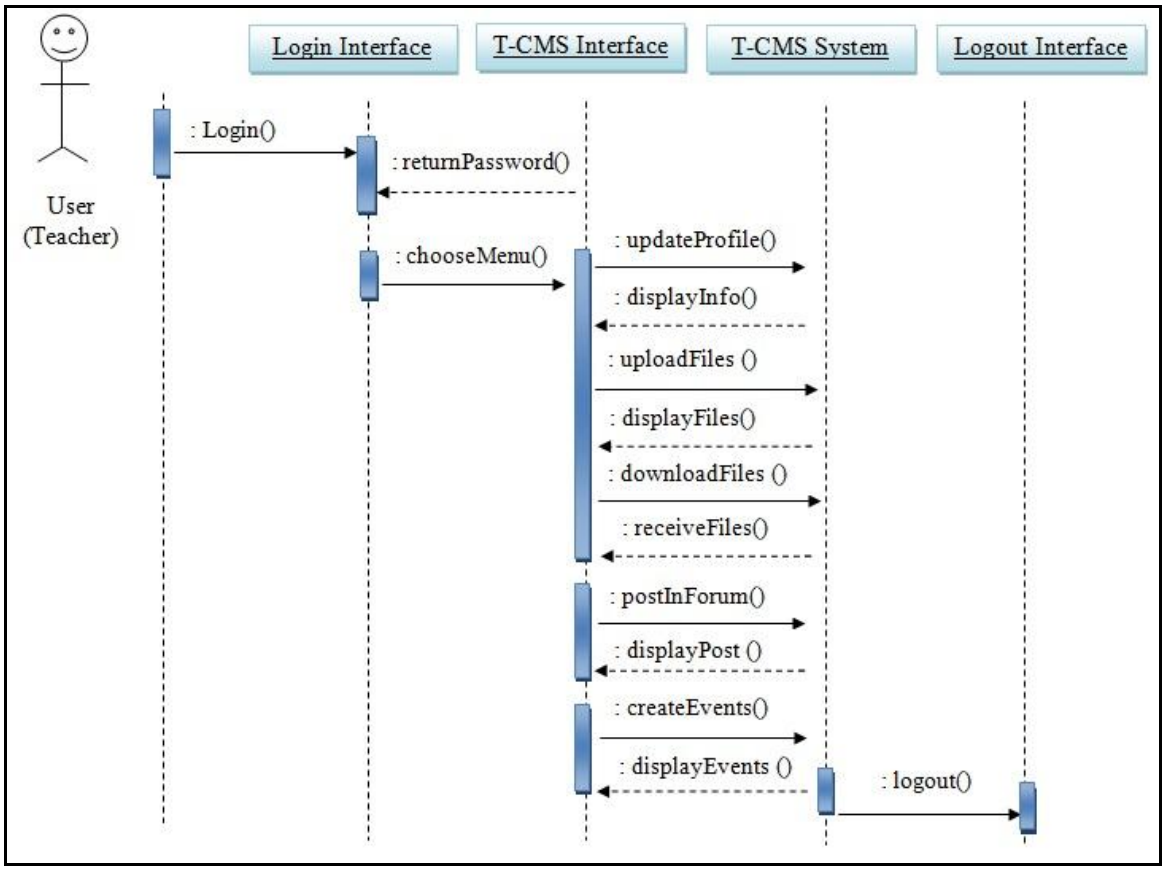

Figure 9: Sequence Diagram for a User of T-CMS

Sequence Diagrams above show how the system reacts with the users' invocation of any activities conducted. From the diagrams, both users and the administrator will receive different output when the user input or invoke different tasks to the system. By having these diagrams, the system developer will have a better understanding on how the system works and what the output should be when a user invokes a specific task to the system. Also, this has made clear which interfaces involve in each task invocation.

4.1.1.4 SYSTEM ARCHITECTURE

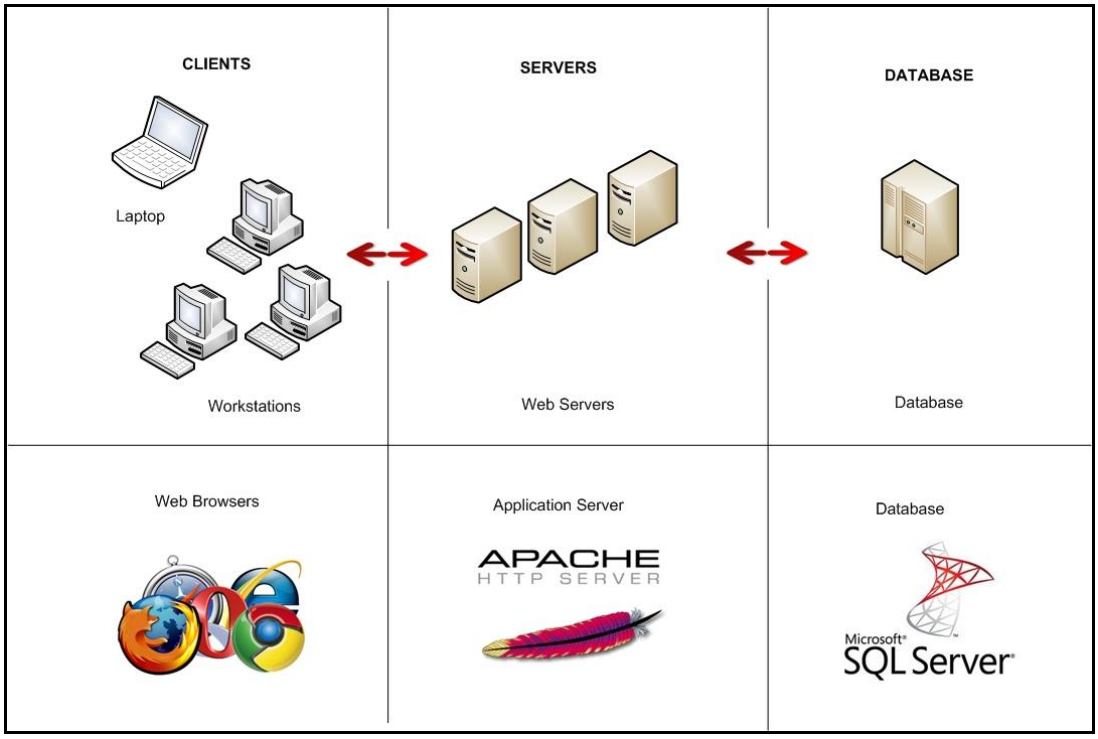

Figure 10: System Architecture

Figure 10 above shows the system architecture of T-CMS. There are three important components of developing the project which are the client, the servers and the database. For the system developments, the client will be the user's personal laptop and web browsers where T-CMS works on a few web browsers such as Google Chrome, Mozilla and Internet Explorer. For the web application server, the apache HTTP Server or Xampp is used. The developer's personal computer will be made as the server to run the web application.

However, for testing purposes, in order to have two simultaneous users using the system, a free web hosting is used to publish the system into a public domain. This is done in order to prove that how T-CMS helps teachers to have a better communication and how it acts as a sharing medium. Besides that, the database used for the project development is MySQL where the data is kept inside the database.

4.2 FINDINGS

4.2.1 QUALITATIVE DATA

Interview and Observation

Interview is the most common and direct method to gather information. The type of interview conducted is the semi-structured interview in which it combines pre-determined sets of open questions. Basically, there are rooms for more questions, discussions and detailed explanations during interview session. It helps the interviewer to explore further responses and discussions from the interviewee.

The interview is conducted via face-to-face conversation with one of the developer's previous primary school teacher. Below is the interview summary with the respondent;

Person Interviewed:

- Mr. Azizan Md Yasin, a 'Bahasa Melayu' teacher in Sekolah Kebangsaan Ceneh Baru, Kemaman, Terengganu.

Interviewer: Atikaseri Muhamad

Purpose: To obtain better understanding on the current flow of knowledge sharing and the requirements for new system to be developed.

Summary of Interview:

- The interview is conducted with Mr. Azizan in order to have a closer approach on the existing methods of sharing academic resources. The interviewee exposed on how the teachers share their teaching materials in school. It is found that the teachers normally share their teaching aids or previous exam papers via the conventional methods by using emails or most commonly used method, they print out the documents.
- Based on the information provided, it can be concluded that there is no sharing medium or shared drives used to share any academic-related materials.

- In fact, the teachers will only disseminate their teaching materials to those who asked for it. It means, the knowledge sharing culture is not cultivated in an effective manner since they do not aware of how does sharing of knowledge will help them to provide an improved education to the students.
- Other than that, in the event of having a school program, the teachers will have meetings to discuss and to suggest for ideas or recommendations. Also, they are not aware of which individuals have experienced organizing a particular event until they sit in the meeting room.
- Also, there are no exposed teachers' profiles in the school. They happened to know each other more closely in terms of their abilities and experiences once they work together for a particular event or program.
- In short, based on the interview and some observations done during the visit to the school, it is found that there is no proper sharing medium for teachers to share their knowledge with each other.

4.2.2 QUANTITATIVE DATA

Acceptance Survey

Acceptance Surveys or questionnaires have been given out to the intended recipients which are the teachers teaching in primary schools. The questionnaires are given out to more than 30 teachers in a few schools resided in the sub-urban and rural areas via emails and social network media (Facebook) in a form of Google docs. Based on their responses, majority of them agreed that by implementing CMS would help to increase the efficiency of their daily tasks. In fact, most of them also agreed that knowledge sharing would be very beneficial in helping them to achieve better outcomes especially in enhancing academic performances of the students.

Below are the detailed findings from the surveys;

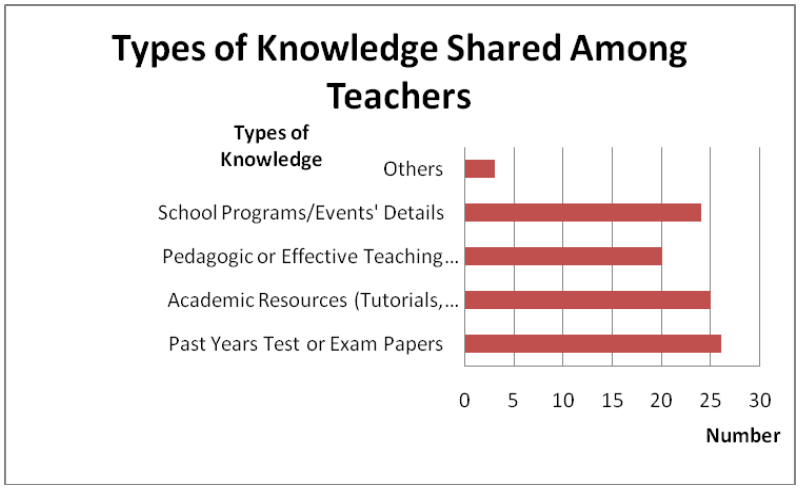

Figure 11: Types of Knowledge Shared Among Teachers

Based on Figure 11 above, it is found that majority of teachers shared their academic resources that covers the tutorials, exercises, past years test and exam papers. These materials are shared especially during the intensive classes conducted for Year 6 students for the preparation of 'Ujian Penilaian Sekolah Rendah' (UPSR). At the same time, they also share their effective teaching method with each other to enhance their teaching. Besides that, they are also sharing the details of school programs or events among themselves in order to ensure each teacher is aware of the school activities especially for the betterment of the school academic performances.

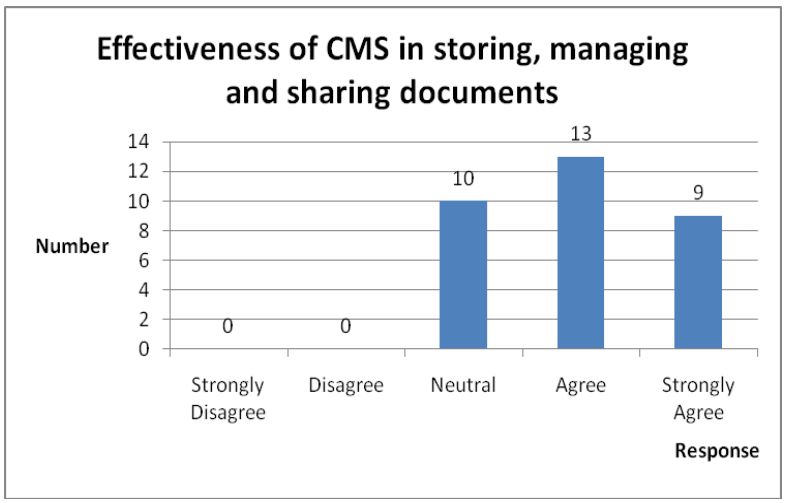

Figure 12: Effectiveness of CMS in storing, managing and sharing documents

Figure 12 above shows the effectiveness of CMS in storing, managing and sharing documents. About 22 respondents or about 68.75 percent agreed that CMS would be effective in helping them to store, access, organize and share electronic documents. Based from the survey, about half of the respondents have experienced using CMS previously. Therefore, they can already perceive the positive impacts of using CMS in organizing files and documents more systematically.

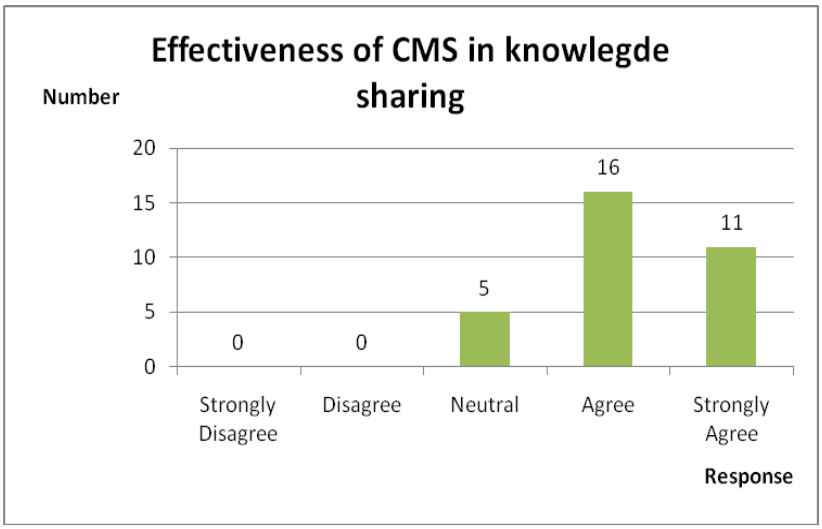

Figure 13: Effectiveness of CMS in knowledge sharing

Figure 13 shows the effectiveness of CMS in knowledge sharing. Absolutely, they do share knowledge with each other regardless in tacit or explicit forms. However, despite knowing that knowledge sharing is important, they also encounter few barriers that majority of them would opined that time constraints is one of the major barriers apart from absence of sharing medium and their own attitudes. Based on the survey, about 27 respondents or around 84.38 percent agreed that CMS would be helpful in knowledge sharing.

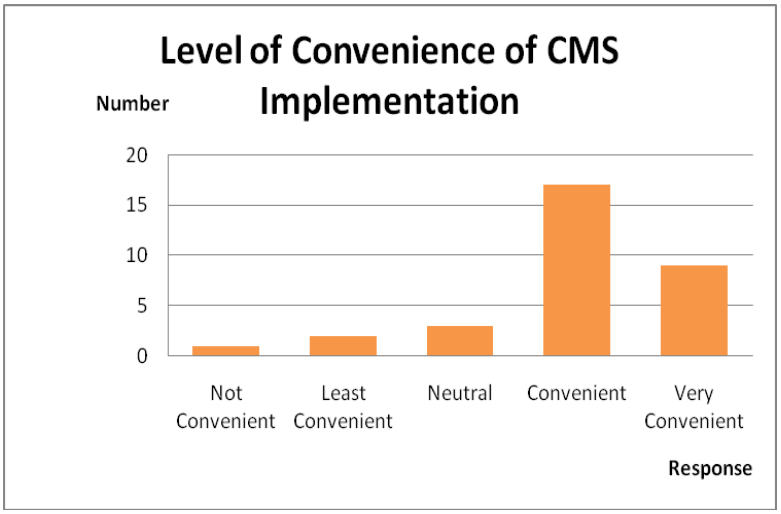

Figure 14: Level of Convenience of CMS Implementation

Figure 14 above shows the results of the level of convenience upon CMS implementation. Even though there are some respondents who felt inconvenient or awkward using CMS to manage and share their electronic documents, however, majority of the respondents or about 81.25 percent felt convenient to share their knowledge through a CMS. It means they are comfortable using a CMS as a systematic way of organizing, managing and publishing documents. Furthermore, by having a CMS as a medium of knowledge sharing, time constraints issue would be reduced and it helps and promotes them to share the knowledge more often.

To summarize, based on the interview, observation and acceptance survey, it can be concluded that primary school teachers reside in rural areas does not use a proper technological-based medium to share their teaching materials. Therefore, Implementation Hypothesis H0 is proven.

T-CMS Web Application Usability Testing

The survey has been conducted to 4 respondents with time constraint of 3 minutes per person in order to have a general browsing experience and to evaluate the general look and feel of the web application. Another 5 to 7 minutes was given to the respondents to go through T-CMS modules and test out the features available in the system.

The survey is divided into two sections in which Section (1) caters the General Observation and Section (2) is for the System Usability Scale (SUS). The findings are as below:

General Observation

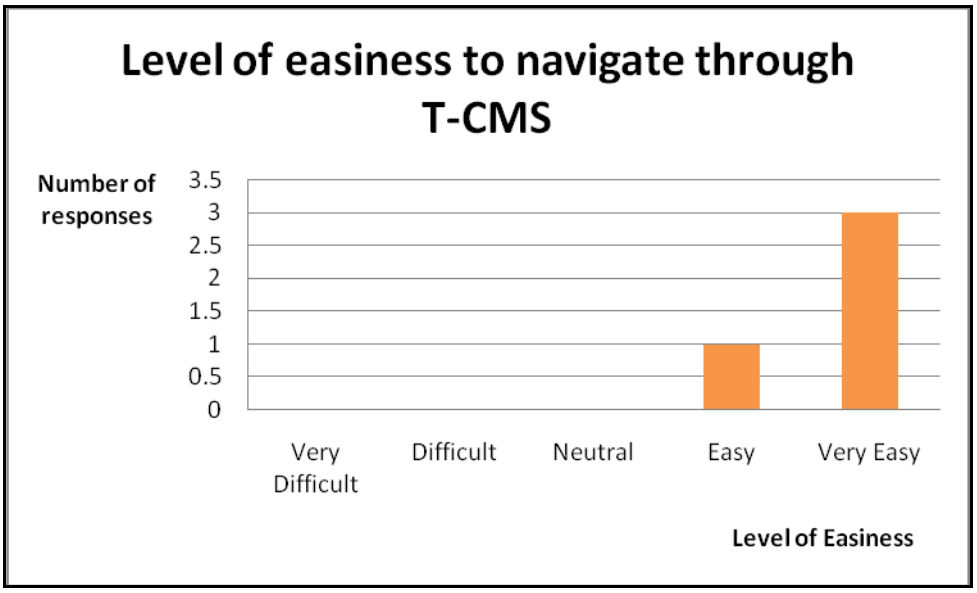

Figure 15: Level of Easiness to navigate through T-CMS website

Based on Figure 15, from the question "How easy it is to navigate through the website?" it is found that the mode of responses is under the *Very Easy* group while *Easy* hold the second most answered responses and for the *Neutral*, *Difficult* and *Very Difficult* received no responses at all. Based on this information, it can be concluded that the web application is generally very easy to navigate form each page to the next pages. Therefore, there will be no changes or enhancements in terms of the web navigation as the responses from the users are very positive.

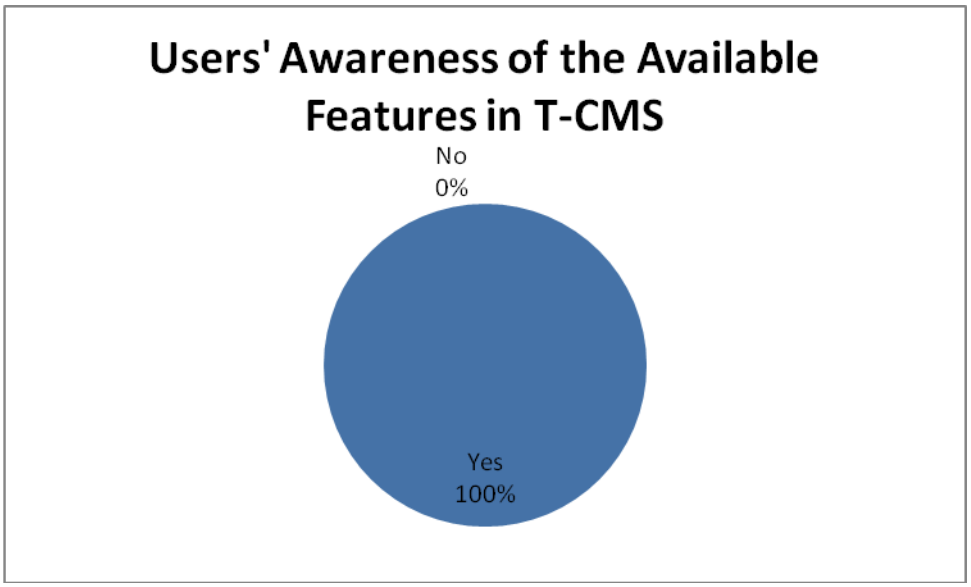

Figure 16: Users' Awareness of the Available Features in T-CMS

Based on the 100% responses from the users as shown in Figure 16 above on their awareness of the features available, it can be said that T-CMS has successfully managed to provide a user-friendly Graphical User Interface (GUI). It can be concluded that the GUI and the layout of T-CMS are made clear for the users.

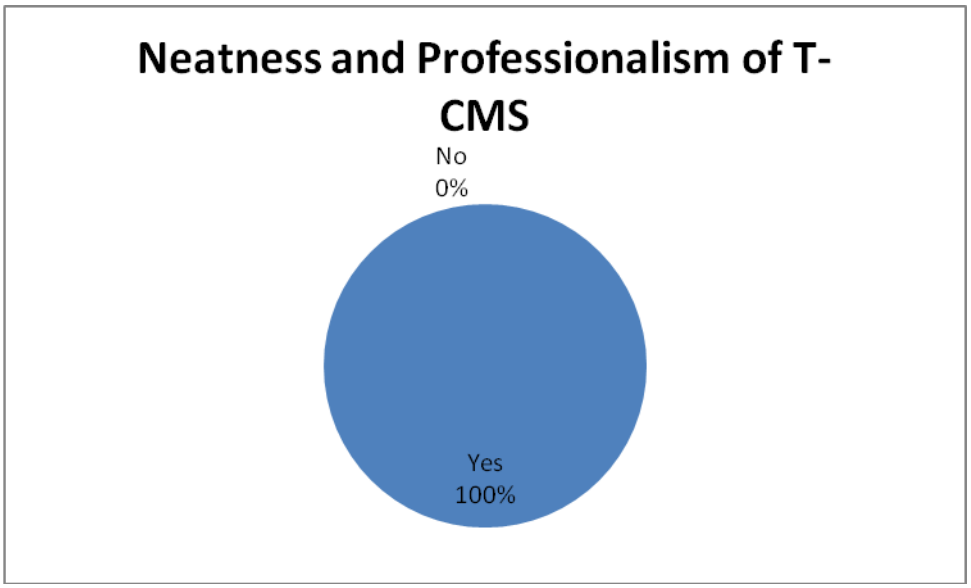

Figure 17: Neatness and Professionalism of T-CMS

Based on figure 17, 100% of the users agreed that T-CMS looks neat and professional. It means that the web application is suitable to be implemented in the field of education for the teachers and to ensure the users are contented using the system.

System Usability Score (SUS)

SUS is fundamental to assess the level of usability of a system. Importantly, SUS should cover the effectiveness of the system that is meant by the ability of users to complete tasks using the system and the quality of output of those tasks, efficiency which means the level of resources consumed in performing a task and the satisfaction of the users when using the system (Brooke, n.d.).

Table 6: Scale Usability Score (SUS) Result

Questions	Rating Average (minus 1 or 5 minus the rating average)
1. I think that I would like to use this system frequently	4.0 – 1 = 3.0
2. I found the system to be unnecessarily complex	5 – 4.5 = 0.5
3. I thought the system was easy to use	4.75 -1 = 3.75
4. I think that I would need the support of a technical person to be able to use this system	5 – 2.0 = 3.0
5. I found the various functions in this system were well integrated	5 – 1 = 4.0
6. I thought there was too much inconsistency in this system	5 - 1.0 = 4.0
7. I would imagine that most people would learn to use this module very quickly	4.75 – 1 = 3.75
8. I found the module is very cumbersome to use	5 - 1.0 = 4.0
9. I felt very confident in using this module	4.5 – 1 = 3.5
10. I needed to learn a lot of things before I could get going using the module	5 - 1.5 = 3.5
Total	**33.0**

Table 6 shows the SUS of the overall usability of the system with the summary of the whole questionnaire and each question has its own rating. There is a specific method to calculate the SUS score. According to Brooke (n.d.), the first step would be to sum up the score contributions for each question. Each score contribution will range from 0 to 4.

For the odd numbered questions which are questions 1, 3, 5, 7 and 9, the score contributions is the scale position minus 1. As for the even-numbered questions which are questions 2, 4, 6, 8 and 10, the score contribution is 5 minus the scale position. Once the total score is obtained, the value is multiplied by 2.5 to obtain the overall value of SUS. As shown in Table 6, the sum score is 33. Therefore, the overall value of SUS will be;

33 x 2.5 = 82.5

Based on the SUS overall value, it is clear that the score is more than 50 percent which makes the level of usability of T-CMS high and yielded an attractive result. Hence, Usability Hypothesis of H1 is proven. Figure 18 shows a more understandable and a more comprehensible SUS results.

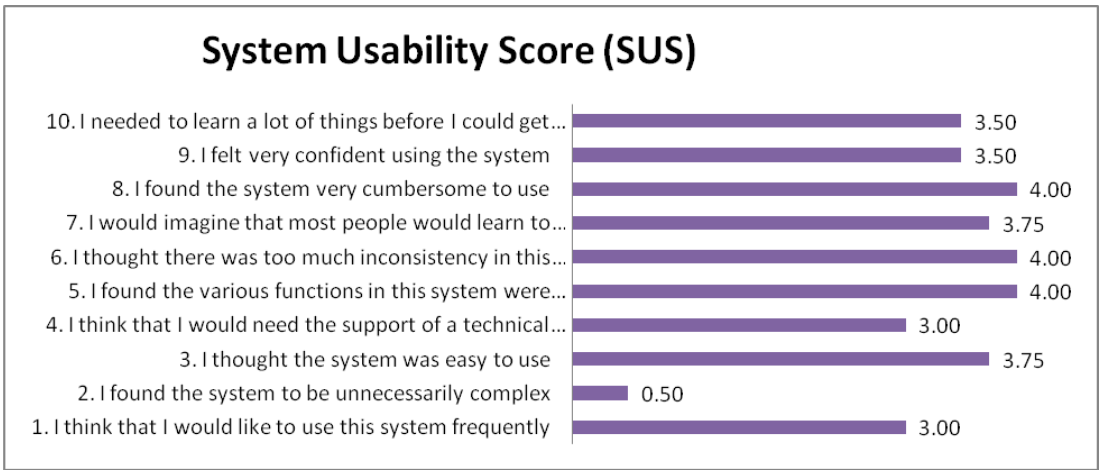

Figure 18: A Comprehensible SUS Result

Based on Figure 18 above, the SUS result can be seen more clearly after the score calculation shown in Table 6 previously.

4.2.3 SWOT ANALYSIS

Based on the qualitative findings from the interviews, observations and online forum and journal reading, Table 7 below depicts the proposed system's SWOT analysis:

Table 7: SWOT Analysis

Strength (S)	**Weaknesses (W)**
▪ Offers teachers a new and interactive method of knowledge sharing and communication ▪ Low in cost	▪ No expertise in setting up the servers to host the web application and to publish the application as an intranet instead of an internet
Opportunity (O)	**Threat (T)**
▪ Have space for enhancement to include both students and teachers to interact more effectively	▪ System Security where confidential information might leak to outsiders due to high cyber crime cases

4.3 EXPERIMENTATION/MODELLING/PROTOTYPE/PROJECT DELIVERABLES

The design model represents a blueprint of the system to fulfill the requirements. It also has to consider all the non-functional requirements posed on the system. Rumbaugh (1997) describes design, as "How the system will be constructed without actually building it". The design is about producing a solution that meets the requirement that have been analyzed. The design activity is concerned with specifying how the prototype will meet the requirements.

Below figures show the prototype of the web application of T-CMS;

Figure 19: Home Page

Figure 20: Department Details Page

Figure 21: Registration Page

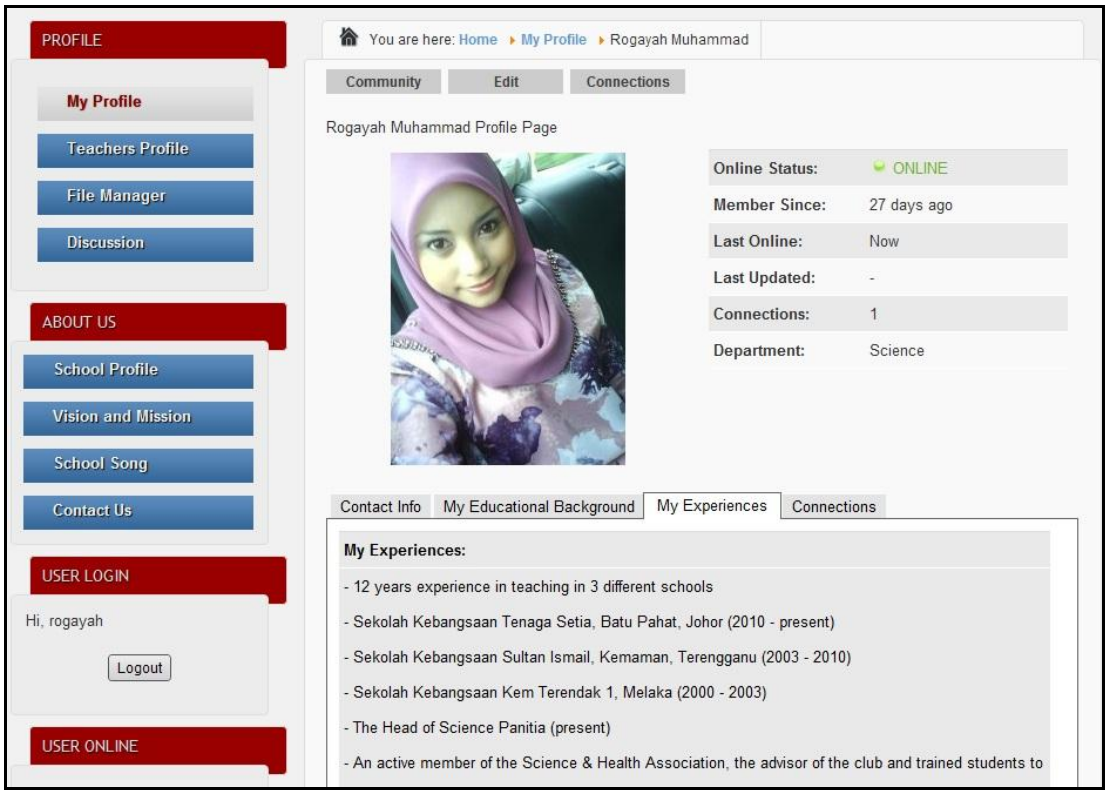

Figure 22: Teacher's Profiles

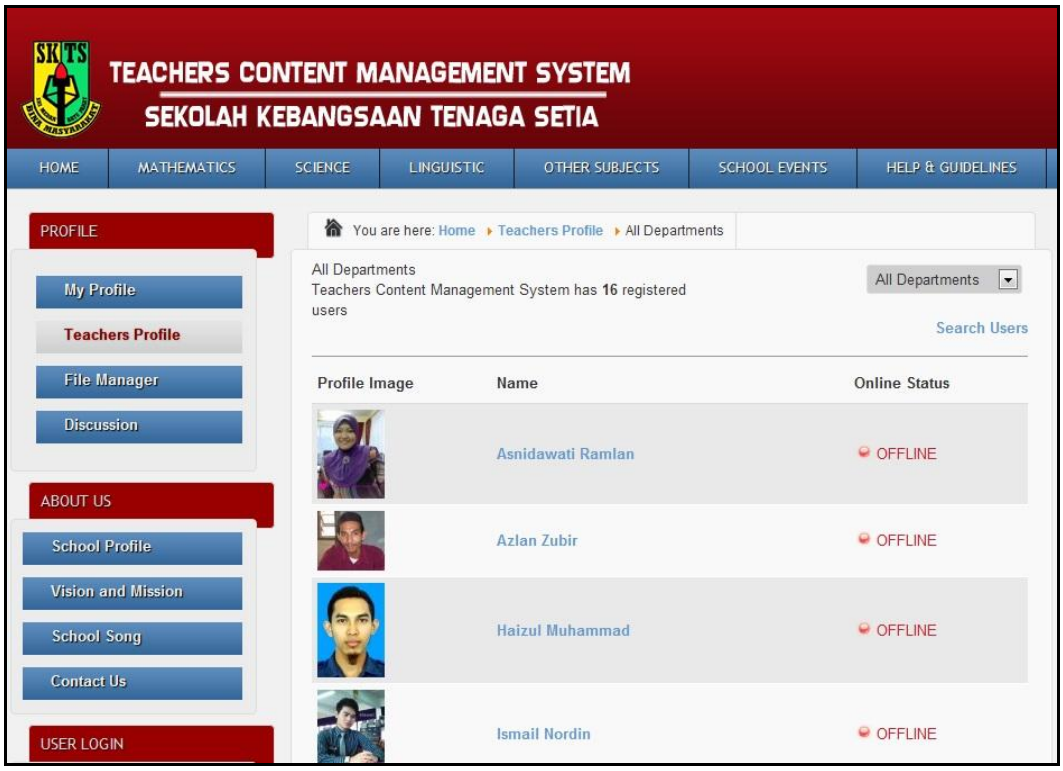

Figure 23: List of Teachers' Profiles

Figure 24: Edit Profile Page

Figure 25: File Manager – File Sharing

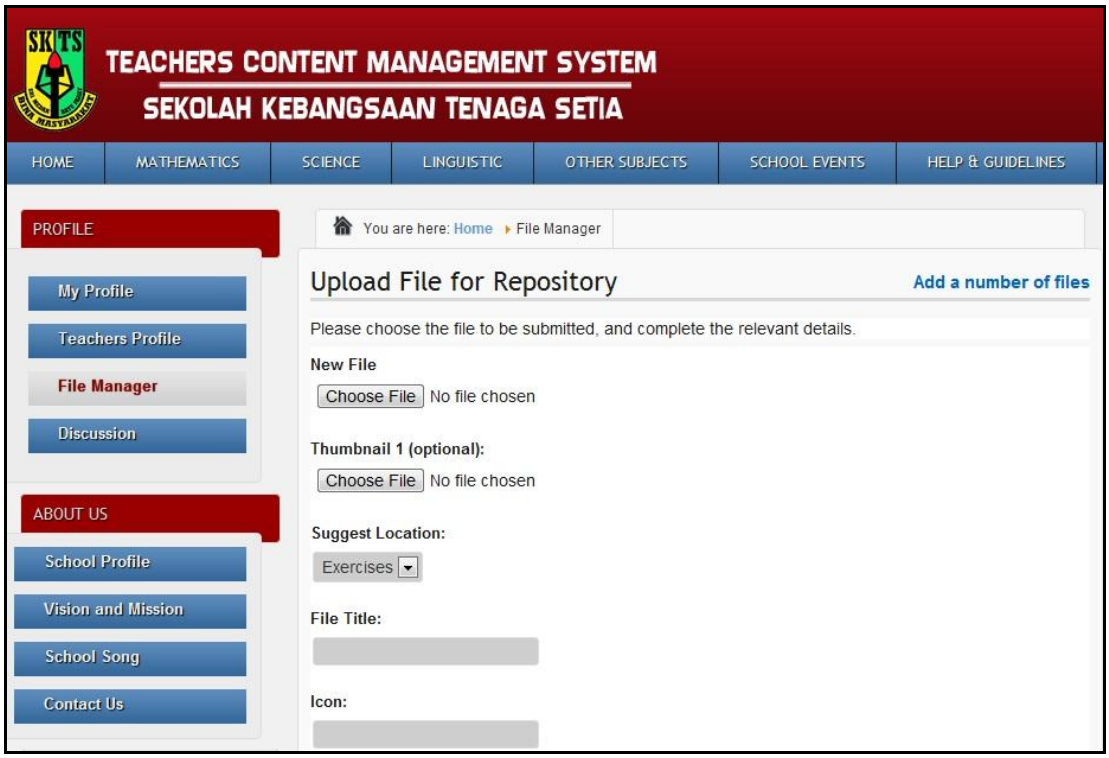

Figure 26: Upload Files

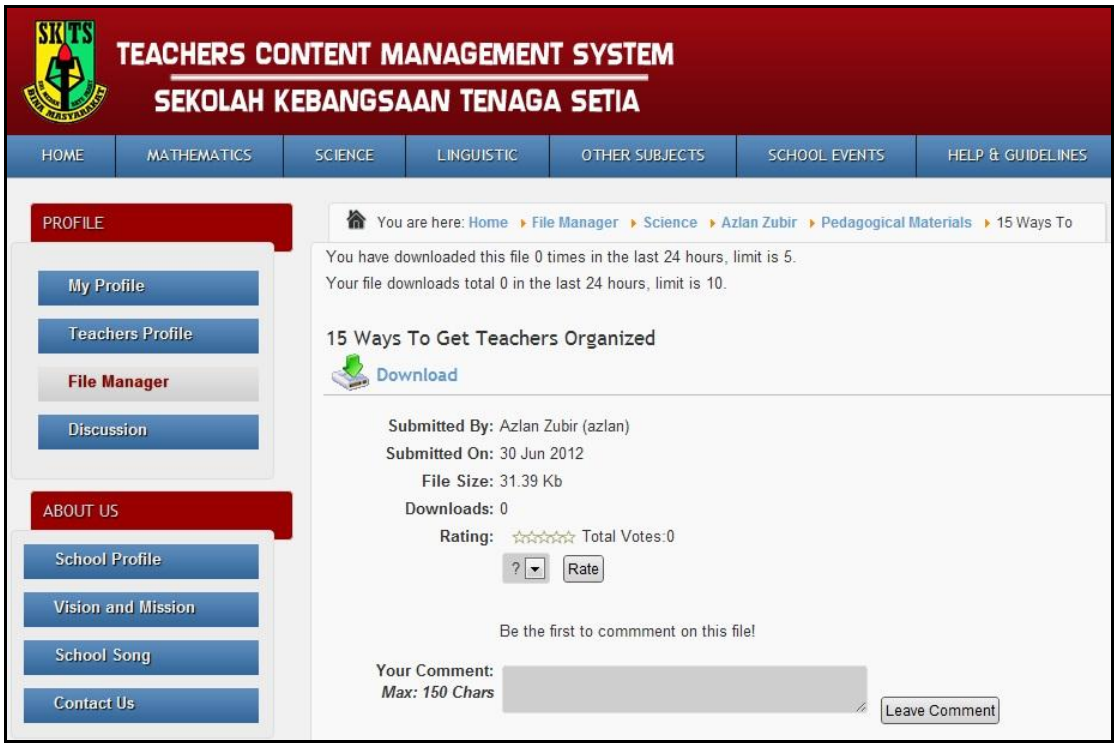

Figure 27: Download Files

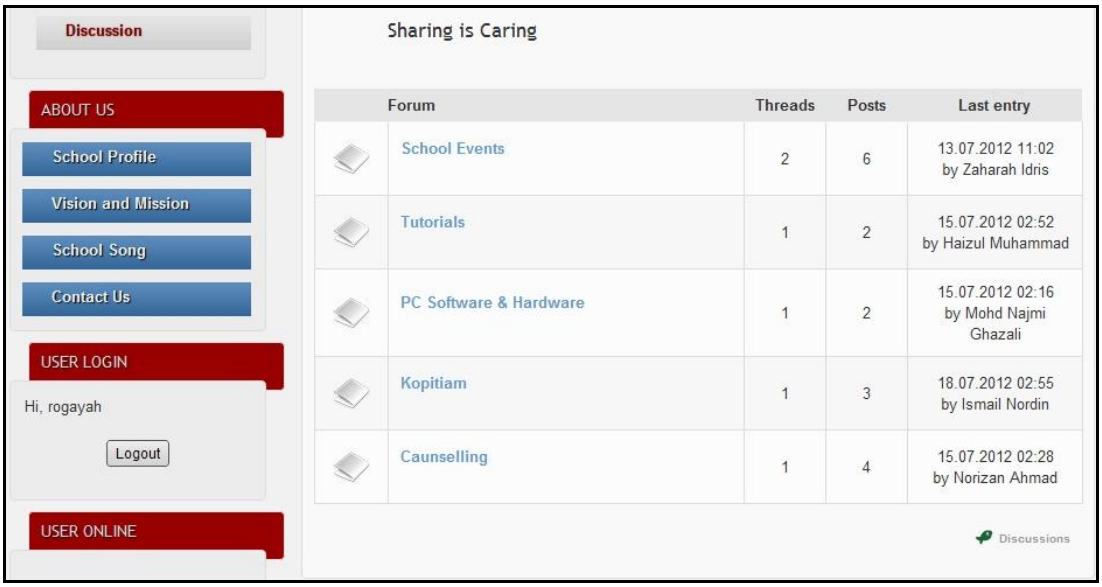

Figure 28: Discussion Forum

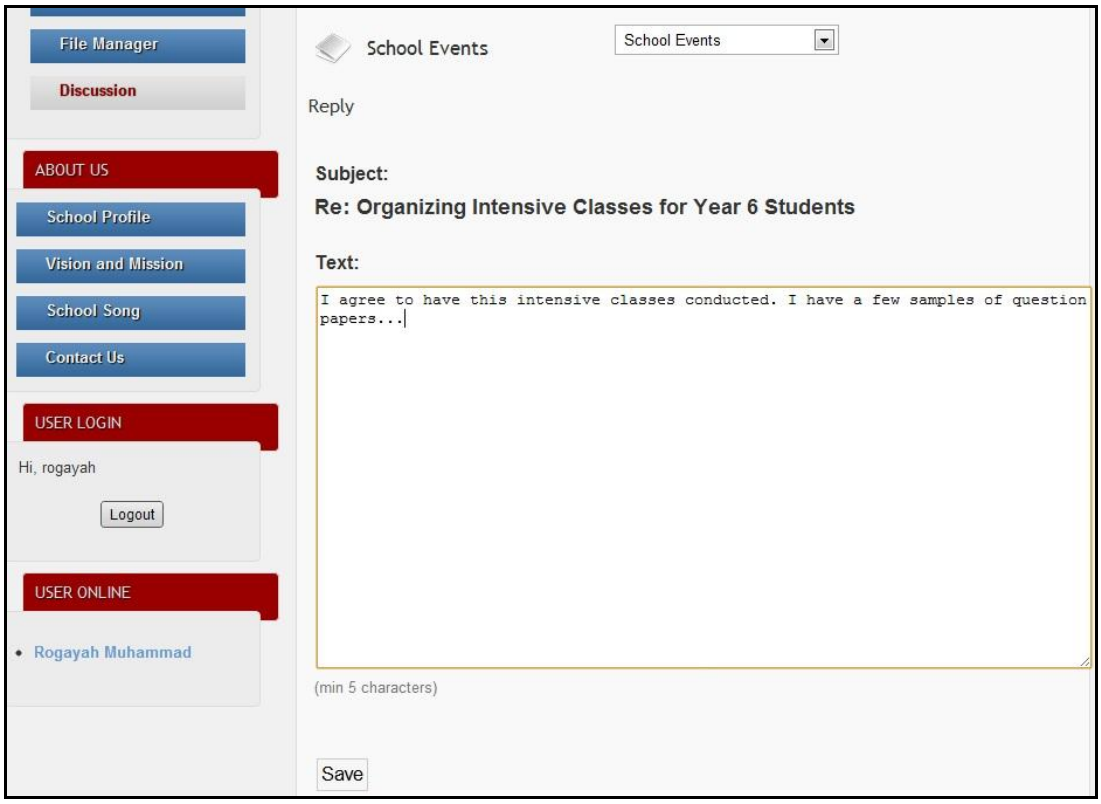

Figure 29: Reply a Post

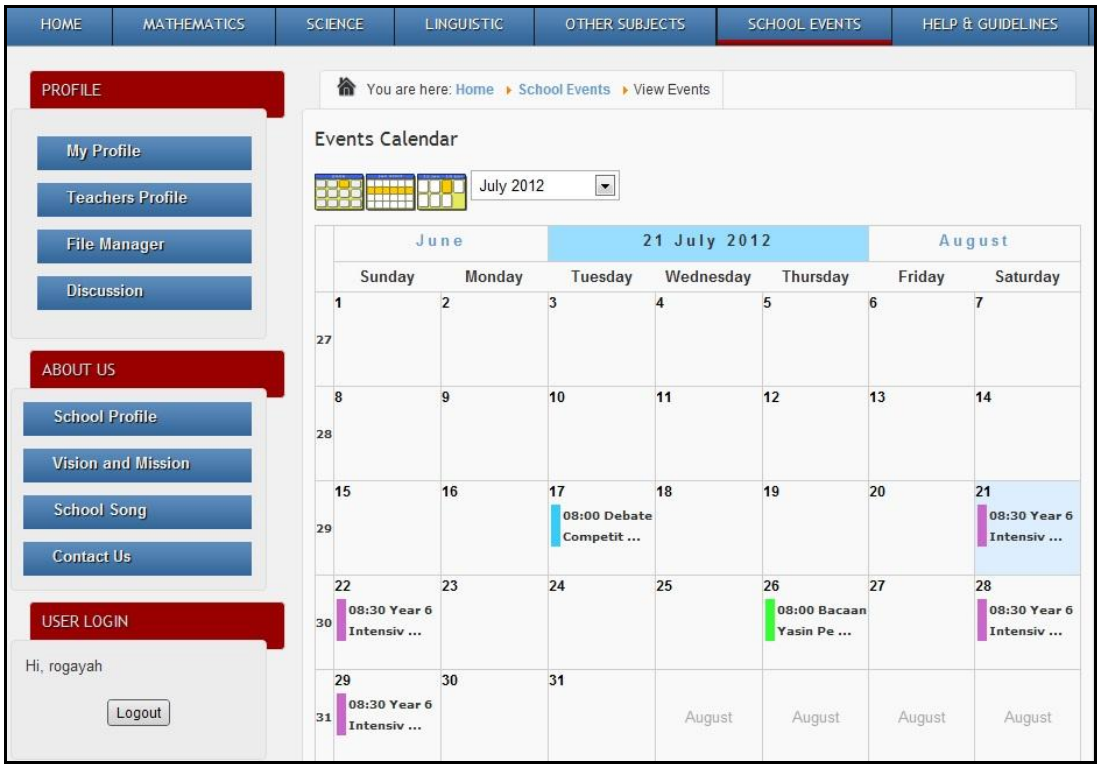

Figure 30: School Events

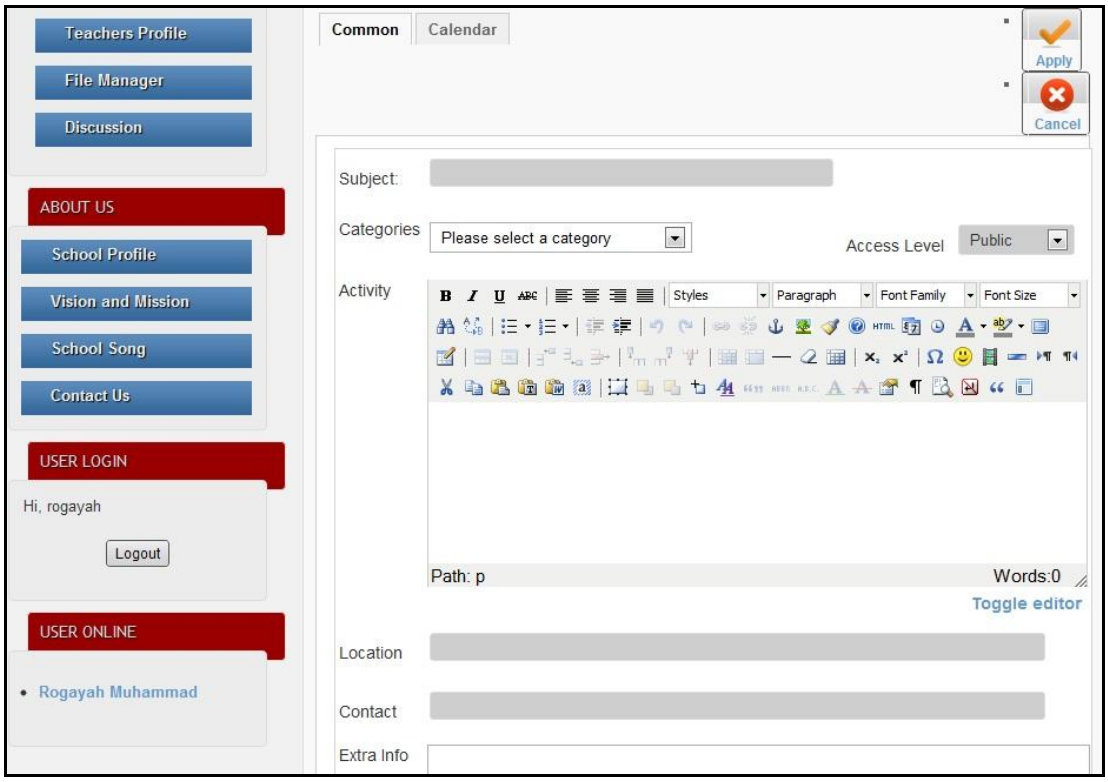

Figure 31: Create Event Page

Figure 32: Help & Guidelines Page

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 RELEVANCY TO THE OBJECTIVES

As stated previously, the objective of this research is to design and to develop a documentation of the proposed system and to come up with a comprehensive CMS that caters the need of primary school teachers. In this case, this system is primarily intended for primary school teachers who are teaching in rural and sub-urban areas to help them handling, managing and sharing of electronic documents via a CMS. In terms of relevancy, it can be concluded that it is relevant to the objectives proposed earlier where the system documentation and development is completed successfully.

With regards to the goals of developing this system in such a way that it helps to provide a more effective sharing and communication medium for the teachers, it is significant with the development of the CMS prototype. With CMS, teachers will have a better communication and sharing medium between each other as they can easily upload the related documents to be shared. In fact, with the implementation of the proposed system, it helps to indirectly promote the culture of knowledge sharing which has been pointed out earlier to be one of the problems identified. Since knowledge sharing is being extensively highlighted and practiced in various organizations, hence, practicing knowledge management in educational institutions would also be beneficial that leads to positive results.

In short, the proposed system does follow the objectives and scopes defined. The activities that have been conducted that include research and mostly application of theories into practices are relevant to the objectives specified.

5.2 SUGGESTED FUTURE WORK FOR EXPANSION AND CONTINUATION

In developing a system, there are always rooms for expansion as nothing is perfect at the first time of development. For the proposed system, it only caters the communications and interactions between primary schools teachers. Hence, the system can be expanded to a three-point communication where it includes teachers to teachers' communication, teachers to students' communication and teachers to parents' communication.

In line with the expected benefits of this system development to enhance and improve the school academic performances, by having a three-point communication, it would be more effective and the realization of improving the students' results would be more realistic.

In addition, this system can be further developed to cater the needs of both primary and secondary schools regardless of areas. It is undeniable that, some schools already have their own websites that include the students' performances, the schools' activities and programs and the students' details. In fact, parents have the access to view their children's exam results via the website. However, school websites are more towards informing others about the schools or in other words, websites are used in a way to promote the schools to others. Hence, CMS can be further implemented in both primary and secondary schools towards promoting the sharing or knowledge apart from being an information gateway to the users.

Apart from that, integrating T-CMS via Application Programming Interface (API) will make the web application more sophisticated. To reap the benefits of CMS that it allows ready integration from various sources, API is an effective method that allows content integration applications through a single set of object oriented interfaces.

Last but not least, improvements can be implemented in the system features itself such as having a chat feature or a more sophisticated online discussion that may include a video conference for the user. Absolutely, live conference and communication will be more effective to provide a two-way interaction between the users.

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APPENDICES

SAMPLE QUESTIONNAIRES

The objective of this questionnaire is to find out the acceptance of implementing a new communication and sharing medium for primary school teachers, which is through a Content Management System (CMS) that helps in sharing of academic resources. The response will be kept private and confidential and will be solely used for the purpose of the final year project.

The proposed system will help teachers to store, organize, manage and share contents or documents (i.e. academic resources) and the system will also act as a repository to help back up important documents, as well as promoting knowledge sharing culture among the users.

It is hope that each question will be answered. Thank you in advance for your cooperation.

1. Please select your gender.

   ☐ Male ☐ Female

2. Please select your age group.

   ☐ 25 years old and below ☐ 46 to 55 years old
   ☐ 26 to 35 years old ☐ 55 years old and above
   ☐ 36 to 45 years old

3. Please select your years of experience in teaching.

   ☐ 1 year or fewer ☐ 11 to 15 years
   ☐ 2 to 5 years ☐ 16 to 25 years
   ☐ 6 to 10 years ☐ 16 years or more

4. Do you think knowledge sharing is important among teachers?

   ☐ Yes ☐ No

5. Do you share knowledge or information among your colleagues?

   ☐ Yes ☐ No

6. What kind of knowledge or documents normally be shared among each other?

   You may tick more than one option

   ☐ Past Years Test or Exam Papers
   ☐ Academic Resources (e.g. exercises or tutorials, timetables)
   ☐ Pedagogic of Effective Teaching Skills
   ☐ School Programs /Events' Details
   Others: _____

7. What methods or channels do you used to share your knowledge?

   You may tick more than one option

   ☐ Face-to-face conversations
   ☐ Formal meetings or Sharing sessions
   ☐ Notice Boards
   ☐ Emails
   ☐ Phone calls or SMS
   Others: _____

8. What is/are the factor(s) that hinder you from sharing knowledge among your colleagues?

   You may tick more than one option

   ☐ Time constraints
   ☐ Lack of awareness on knowledge sharing and its benefits
   ☐ Absence of sharing channels
   ☐ Attitudes (e.g. poor communication skills, low confidence level, etc)
   ☐ Lack of management supports
   Others:_____

9. Do you have any experience using Content Management System (CMS)?

   Content Management System (CMS) is a tool used to create, publish, store, manage and organize contents (i.e. files or documents) in a systematic way.

   ☐ Yes ☐ No

10. Please rate your level of familiarity with computers and technological applications.

    It may include the familiarity in using Emails, Social Network Medium (e.g. Facebook, You Tub), 4shared, etc).

    Least Familiar ☐ ☐ ☐ ☐ ☐ Very Familiar
    1 2 3 4 5

11. Do you agree that by having a Content Management System (CMS) is useful in assisting you to manage, organize and share documents with each other?

    Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree
    1 2 3 4 5

12. Do you agree that the proposed system will help you to communicate with each other more easily especially in sharing of knowledge?

    Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree
    1 2 3 4 5

13. Do you agree that sharing of knowledge among teachers will help to provide better academic resources and education to students?

    Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree
    1 2 3 4 5

14. How would you rate the level of convenience towards your tasks of storing, managing and organizing documents of the proposed system is implemented?

    Least Convenient ☐ ☐ ☐ ☐ ☐ Very Convenient
    1 2 3 4 5

15. How would you rate the level of convenience if the proposed system is equipped with discussion/chat forums?

    Least Convenient ☐ ☐ ☐ ☐ ☐ Very Convenient
    1 2 3 4 5

INTERVIEW OUTLINE

<table>
<tr><th colspan="3">Interview Outline</th></tr>
<tr><td colspan="2">Interviewer:
Atikaseri Muhamad</td><td>Interviewee:</td></tr>
<tr><td colspan="3">Appointment Details</td></tr>
<tr><td colspan="3">Date:
Start time: End time:
Venue:
Department:</td></tr>
<tr><td colspan="3">Objectives & Reminders</td></tr>
<tr><td colspan="3">• To gather user's background information (job scope, daily tasks, system relevancy)
• To gather information on the flow of sharing activities
• To do observation on the flow of the existing system</td></tr>
<tr><td colspan="3">Agenda & Estimated Time</td></tr>
<tr><td colspan="2">Introduction
Background on the project research objectives
Background on the proposed new method
• Topic 1: Questions on user
• Topic 2: Questions on existing system and challenges faced
General question</td><td>1 min
5 min
2 min
7 min
7 min
5 min</td></tr>
<tr><td colspan="3">General Observations:</td></tr>
<tr><td colspan="3">Questions:
1) Can you briefly explain on how do you share materials with your colleagues?
2) Is there any automated system or a shared drive used in order to share any academic resources?
3) If you would like to view the teaching materials used by other teachers of the same department, how would you do that?
4) Is there any sessions conducted to share your way of teaching with other teachers?
5) Regarding to Question 4, if there is such session, can you please comment on the attendance level?
6) If the school is organizing a program, can you tell me the frequency of having meetings to discuss about the event? Is there any medium in which the teachers can discuss without having to organize frequent meetings?
7) I'm aware that for each meeting, there will be a minute-of-meeting (MOM) that documented the meeting outcomes. So, how do you retrieve the MOM after the meeting?
8) If one teacher has a new idea or suggestion to improvise a school event which is not raised up during the meeting, how does the individual be able to channel his/her ideas?
9) Regarding to Question 8, will the school committees conduct a new meeting or discussion session?
10) Do you have any experience in using a content management system in sharing your teaching materials and as a mean of communication?
11) What are the challenges you faced using the existing system?
12) If the purposed system is going to be developed, what do you hope it would do to reduce the challenges you faced and assist you better in sharing any academic resources?</td></tr>
<tr><td colspan="3">Relevant questions/Unresolved issues:</td></tr>
</table>

T-CMS WEB USABILITY TEST

This survey is conducted to find out the level of usability of the web application of Teachers-Content Management System (T-CMS). User is given 5 to 10 minutes to browse through the CMS while being guided by the developer. The system developer will guide the user and explain the available features of T-CMS and to try it out. Your answers will be much appreciated and will be used to improve the usability of the web application. Thank you. Please tick or circle your answer.

General Observation

1. How easy it is to navigate through the website?

1	2	3	4	5
Very Difficult	Difficult	Neutral	Easy	Very Easy

2. Is it obvious and clear to you which features are made available for you to use?

☐ Yes ☐ No

3. Look and Feel

   a. Is the website consistent from pages to pages?

   ☐ Yes ☐ No

   b. Do you find the font size used suitable?

   ☐ Yes ☐ No. Please specify why.

   _____

   c. Are the colours chosen suitable for the web application?

   ☐ Yes ☐ No. Please specify why.

   _____

   d. Do you think the website look neat and professional?

   ☐ Yes ☐ No. Please specify why.

   _____

T-CMS System Usability Scale (SUS)

Please tick whichever applicable and rate the level of usability.

1. I think that I would like to use this system frequently

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. I found the system to be unnecessarily complex

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. I thought the system was easy to use

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. I think that I would need the support of a technical person to be able to use this system

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. I found the various functions in this system were well integrated

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. I thought there was too much inconsistency in this system

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. I would imagine that most people would learn to use this system very quickly

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. I found the system very cumbersome to use

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. I felt very confident using the system

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

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

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree