HONOURS PROJECT

SHAWCO K2 Center
Learning Management System

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Abstract

Learning Management Systems (LMS) are a software tool designed to manage user learning interventions. Currently on the market there are numerous LMS available to the public. Some of these packages are open source while others remain proprietary. This report describes the customization of Moodle for the users at the SHAWCO K2 Center. The report covers problems faced at the K2 Center and the aims of the project. Background into LMS and the technology used in developing LMS is covered such as Moodle which use the following technologies PHP, MySQL and Apache. The design of the customized modules for Moodle is covered in detail in this report and software engineering methodologies are covered as well. Details of how the modules were implemented are also covered and the evaluation of the custom modules is provided. From the evaluation conclusions were drawn were it was discovered that Moodle is highly customizable and it can be customized for inexperienced users such as those from the SHAWCO K2 Center. The report ends off by touching on the future work that could be done after this project.

Keywords: Learning Management Systems, Moodle, Learning Objects, Web based Learning, educational strategies.

Acknowledgment

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1　Introduction

1.1　Project Introduction

Khayelitsha which means "new home" was established between 1984 and 1985 during the apartheid era as a dormitory area for the working class and as a way for the then apartheid regime to solve the problem of where to house the growing black population in the Western Cape. Khayelitsha like most informal settlements is best known for shacks which are a legacy which persists to date. Today Khayelitsha is home to between 500 000 and 1 million people with an ethnic make up of 90% Black African and 10% coloured and Xhosa being the prominent language spoken by the residents [1, 2].

Khayelitsha is the largest township in the Cape Flats and the third largest in South Africa. Since 1994 with the change of government in South Africa there have been noticeable changes in Khayelitsha, such as brick houses, running water and electricity in some of the areas. Since Khayelitsha is largely under-developed and the largest township in the Cape Flats it attracts funding and partnerships from international companies, Non Government Organisations (NGOs) and Government. All these entities have one goal and that is to help better the inhabitants of Khayelitsha [1, 2].

SHAWCO is a student run UCT organisation which looks at helping the young inhabitants of Khayelitsha better prepare themselves for finding work and gaining access in Tertiary institutions in the future. Through a number of programs SHAWCO tutors students and in the IT Center the students of the surrounding area are tutored by UCT student volunteers at the K2 Center [4].

The SHAWCO IT Project was established at the K2 Center in 2002 with a large expansion in 2004 as the computer center was built. With roughly 80 volunteers the center tutors 90 grades 8 – grade 10 basic computer literacy in Khayelitsha. The participants have between 2 – 4 hours of volunteer interaction a week during 1 or 2 sessions. The IT Project teaches participants how to use Microsoft Word, Excel, Power point, Outlook and the Internet for a variety of tasks [4, 5].

1.2　Problem Definition

The IT Center currently has 30 computers for 30 participants for each session a week and volunteers choose which day of the week they want to attend, mostly only attending 1 session a week. The computers in the center are networked and they have recently been provisioned with an Internet connection.

The participants on average will have 2 volunteer tutors depending on whether they attend once or twice a week. Each week they are given notes on basic computer literacy which they go through with the tutors who are available to them that week. The notes are followed by computer exercises which test out the theory which they read about in the notes.

At the beginning of each session the volunteer day co-ordinator for that day will start by handing out printed notes on a piece of paper of what is to be done that day. The participants and the volunteers will go through the notes and do the exercise that follows with the volunteers assisting the participants if they require any help. At the end of the day as the students leave the day co-ordinator will take attendance register for that day, for the participants and the volunteers. The register is taken with the use of a piece of paper with the names of the interested parties printed.

The following problem areas where discovered during an ethnographic study conducted at the IT K2 Center:

- Since the participants share computers they have no area of securely saving the work they have done
- Too much time is spent by the students explaining to the tutor for that day what the last section they did is and what they understood
- Too much time is spent with taking the attendance register of the participants and if the day co-ordinator does not show up, no one takes register for that day
- The volunteers attendance register is also not taken on a regular basis

1.3 Project Aims

The problems identified above from the ethnographic study at the center, a decision was reached to provide the IT center with a Learning Management System (LMS). The following list of requirements was reached after meetings with Jonathan Hoffenberg who is the education supervisor for SHAWCO:

- The use of the core functions of a LMS to store the resource material and the user data
- A Custom built attendance register module to plug into the LMS for tutors and participants
- A custom built bookmark feature for the students to keep track of work done and who helped them
- A custom built module for the LMS where all the students can save the work they are working on.
- All the modules had to be user friendly and easy to use

1.3.1 Research Questions

The primary research question of this project is whether:

- LMS are easy to use and intuitive for inexperienced computer users
- The other question is can LMS be customized for inexperienced computer users.

The questions will be tackled through the customization of a LMS for the SHAWCO K2 Center, which teaches basic computer skills to inexperienced users.

The project was designed to be a combination of software engineering and the adding of functionality to a LMS. The main aim of the project was to provide the IT Center a usable solution to be used by the participants and the volunteers. Since the participants are still relatively new to computers a friendly and easy to use system was required. The system also had to be easy to use on the administrative side. Our main goal was to provide custom module plug-ins to a LMS for the IT Center.

The IT Project was separated into 2 distinct sub-systems which would later on be integrated into the LMS. The one part of the project involved implementing the modules for allowing the user to save their work, the attendance registers and the student bookmark feature. The other part of the project involved facilitating communication between the participants and the tutors through a cell phone based system. This allowed both group members to proceed with the sub-system work concurrently, and also ensuring that both members were allocated enough challenging problems to resolve. The figure below shows how the work was divided for the project.
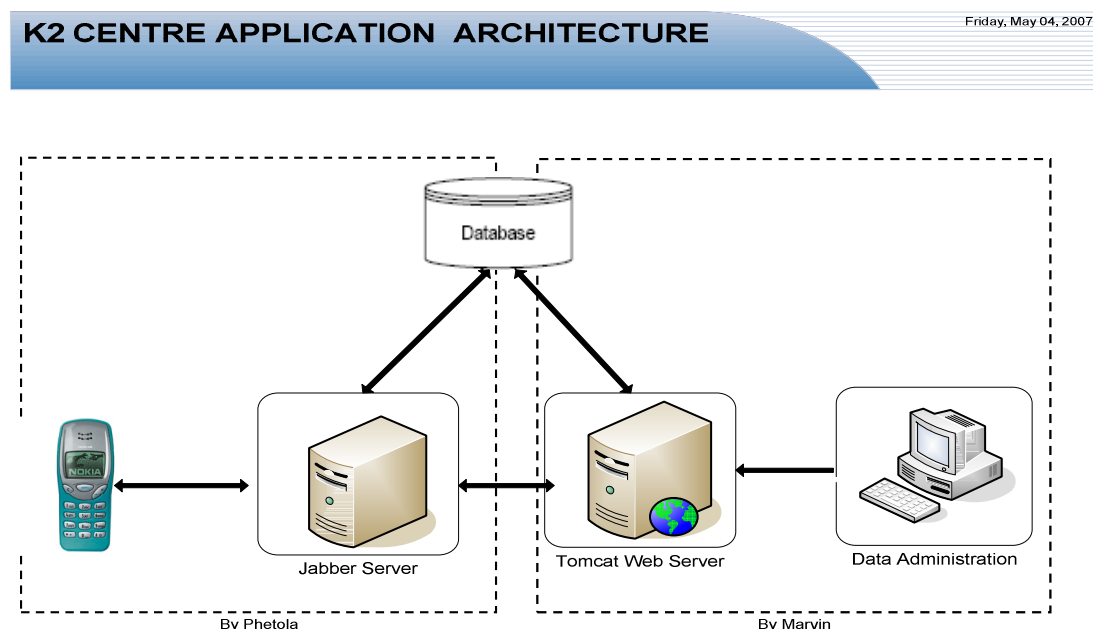
Figure 1: K2 Centre Application Architecture

While the attendance register, bookmark and module to save users work involved the interaction with a LMS and the core functionality of the LMS in terms of designing the back-end, modules and the blocks that the users would interact with. The other sub-system involved implementation of the modules, back-end, blocks and interaction with a cell phone API.

The following report aims to present the analysis, design, testing, results and conclusion of the custom participant and tutor attendance register, participant bookmark feature and the feature for participants to save their work

1.4 Project Outcomes

The success of the project will alter the way the SHAWCO IT Project currently operates. It will reduce the amount of paper that is currently being used for printing out the attendance register sheets for the participants and tutors every week. There would be no need to print out the work for the students on paper every day, since it can be stored in the system.

More time will be spent by participants and tutors going through the actual work than the participants trying to explain to the tutor what they covered in the last week. The tutors will also have access to the notes to go through them before hand while in the past this could not be done.

Through the use of the cell phone communication feature the participants will have a place where they can reach the tutors outside of class. The use of LMS will introduce the participants to a new web interface that they will come across in the future.

1.5 Report Outline

The remainder of the report is separated into the following section:

- Chapter 2: Related Technology and Research
- Chapter 3: Analysis and Design
- Chapter 4: Implementation and Integration
- Chapter 5: Experiments and Testing
- Chapter 6: Results and Conclusions
- Chapter 7: Future Work

The related technology and research covers the background into the project technology, through the investigation of LMS and techniques used to develop LMS. Numerous LMS were considered in the design and development phase of the project. This section is included in order to understand the underlying technology used in developing the system.

The analysis and design chapter focuses on the software engineering techniques used to draw up the different system diagrams used to explain the system. Detailed descriptions are given in support of each design choice and the diagrams that define the structure of the different components are provided. A discussion of the overall system design is also included.

The implementation and integration chapter discusses the hardware that was used to develop the modules and how the back-end was structured. The integration discusses how the modules were integrated into Moodle and how the 2 sub-systems were also integrated with each other at the end.

The experiments and testing chapter has details of how testing was conducted with the participants and the tutors at the K2 Center and the reasoning behind the tests are also

provided. The results gathered from the testing are provided in chapter six with the conclusions regarding the questions raised from software engineering.

The last chapter proposes possible extensions to the project and possible approaches are discussed as well.

2   Related Research and Technology

2.1   Research

For the system to be developed a decision was made to use one of the pre-existing LMS and add custom functionality as gathered from the requirements. But before the LMS was chosen as there are lots in the market, an investigation was conducted into some of the available LMS and chose one that would meet the requirements of the K2 center.

2.1.1   Learning Management Systems

2.1.1.1   Drupal

Drupal was developed in 2000 by Dries Buytaert and some of his friends who wanted to build a small news site with built in web board. The board would allow Dries and his friends to leave each other notes and announcements. It was only in 2001 that the software was released. Drupal is said to be modular and extensible, demands low resources and is easy to use [3].

Simpson [7] wanted to move from a paper based "to-do" list to a neatly printed list on a computer. The solution for this was a Content Management System (CMS). The author wanted to experiment with different techniques in developing a CMS, they looked at varies options, from building the CMS form scratch to comparing Open Source package Drupal and Mambo. The final result was that the author leant how to use the different tools in developing a CMS such as the database and server. From the comparison of Drupal and Mambo, the author states that working with a pre built package was better since it can be extended from what others have already done. Between Drupal and Mambo the author found using Drupal was better than using Mambo even though they could both facilitate the tasks the author had in mind [7].

Sawhney and Mund [13] had previous experience with using Drupal to build successful websites and they share what they have learnt when they migrated the Planetizen website to drupal. This allowed them to cut down on development time, add features which they needed and benefit from the advantages that came with open source software. Drupal was selected because of its user management, access control, work flow, separation of content, web based editing and administration features. In the paper the authors explain how they customized Drupal to fit what they needed from selecting the module they wanted to use, configuring drupal, user roles and permissions, taxonomy and finally choosing the themes.

2.1.1.2   Vula (Sakai Project)

Vula is a Sakaiproject initiative at UCT of an online LMS. Sakai is the consortium of universities from around the world started to discuss and share teaching and learning methodologies with the common goal to improve higher learning. The Sakai LMS

was selected at UCT because of the strength of the consortium, the solid architecture, proven scalability and sustainability [11].

The core features that come with Sakai are announcements, drop box, resources, chat room, forums, and message of the day and message center and many more. The sakai community continue to develop new tools for the project, to keep up with advancements in IT technology some of the future tools that will be included in the coming Sakai installations are shared display, multi-point audio, pod-casting and more [11].

2.1.1.3 Blackboard (WebCT)

Blackboards mission is to enable educational innovations everywhere by connecting people with technology. Their role is to improve the educational experience with Internet-enabled technology that connects students, faculty, researchers and the community in a growing network of education environments dedicated to better communication and content [12].

The products from Blackboard are proprietary. The LMS offers most of the features most people have come to expect. It offers chat rooms and forums for the users, central repository of resources, online submissions and online quizzes. WebCT which is a product from Blackboard is mainly used in the Statistics department at UCT.

2.1.1.4 Moodle

Moodle is an Open Source LMS that was developed by Martin Dougaimas, then a PhD candidate in Education with a background in computer science in 1999. The first version of Moodle was released in August 2002 [9].

A single Moodle web site can host a large number of courses and students. Each course has support for teachers, tutors and students. One or more teachers can manage a course in Moodle and have control over what content is displayed on the course site and the number of registered students and tutors.

The tutors in the course can view the work submitted by the students and grade the work and post the results for the students to view. The tutors can also have access to the forums. The students in the course site have access to login accounts and can submit their work on Moodle and view their grades. They can also view their submitted work as well as the content that the teachers make available to them.

Graf and List [8] compare a group of Open Source LMS in an attempt to find out which was the most adaptive, Moodle and Sakai were amongst the list of LMS that were compared. At the end of the study it was found that Moodle dominated the evaluation by achieving the best results in five categories and the best rating in the adaptation category. The strength of Moodle from the paper was the realization of communication tools, and the creation and administration of learning objects [8].

Chavran and Pavri [10] conducted a study on Moodle. They looked at the installation and configuration, administration and the customization of the product. The results that were established from this study indicate that Moodle runs on the widest variety of platforms, its easy to install and modify, it is modular to allow growth and it can be used in conjunction with other systems and it is well documented.

Table 1: The following table shows the features that Blackboard, Sakai and Moodle support for more detail visit [13].

©2007 EduTools / WCET			
Product Name	**The Blackboard Academic Suite**	**Sakai 2.3**	**Moodle 1.8**
Developer Name	**BlackBoard**	**Sakai 2.3**	**Moodlerooms**
Communication Tools			
Discussion Forums	Supported	Supported	Supported
File Exchange Online	Supported	Supported	Supported
Journal/Notes	Supported	Supported	Not supported
Real time Chat	Supported	Supported	Supported
Productivity Tools			
Bookmarks Calender/Progress	Supported	Supported	Not supported
Reviews Searching within	Supported	Supported	Supported
course Work offline/	Supported	Supported	Supported
Synchronisation	Supported	Supported	
Orientation helper	Supported	Supported	Supported
Student Involvement Tools			
Group work Community	Supported	Supported	Supported
Networking	Supported	Supported	Supported
Student Portfolios	Supported	Supported	Supported
Administration Tools			
Authentication Course	Supported	Supported	Supported
Authorization Registration	Supported	Supported	Supported
Integration	Supported	Supported	Supported
Course Delivery Tools			
Different Test types Automated testing	Supported	Supported	Supported
Management Automated testing	Supported	Supported	Supported
Support Online Marking	Supported	Supported	Supported
Tools	Supported	Supported	Supported
Online Gradebook	Supported	Supported	Supported
Student Tracking	Supported	Supported	Supported

Content Development Tools			
Content Sharing/Reuse	Supported	Supported	Supported
Course Templates	Supported	Supported	Supported
Customised Look n Feel	Supported	Supported	Supported
Instructional Design tools	Supported	Supported	Supported
Hardware/Software			
Client Browser Required	Some	Some	All
Database Requirements	Oracle, MySQL and MS SQL server	Oracle and MySQL	Oracle, MySQL, MS SQL server and PostGreSQL
Unix Server	Supported	Supported	Supported
Windows Server	Supported	Supported	Supported

2.2   Technology

2.2.1   Apache Web Server

After deciding on the LMS to be used for the system which was Moodle this left use a few technology options which could use for a web server. Moodle comes with a built in Apache web server. Apache is a web server notable for its key role in the advancement of the World Wide Web (WWW). Currently Apache serves roughly 47.73% of all websites. Apache supports a variety of features which are implemented as compiled modules which extend the core functionality. The core functionality ranges from server side programming language support to authentication schemes [15, 16].

Apache provides common language interface support for PHP, PERL and Python. Some of the security features include SSL and TSL. Apache is free over the Internet and there is a lot of support on the Internet to assist users if they come to any technical problems [15, 17].

2.2.2   MySQL Database

Moodle also comes with a built in MySQL database which is also free over the Internet and there is lots of support for developers for MySQL over the Internet. MySQL is a multithreaded, multi user SQL database management system, which runs on a server providing multi user access. MySQL is popular for web applications, which is tied to the popularity of PHP which is usually combined with MySQL [18, 19]

2.2.3 PHP

PHP is a reflective programming language designed for producing dynamic web pages. PHP is mainly used on the server side as a scripting language. It is used mainly in the web industry as a method of developing and deploying inexpensive, reliable, scalable and secure web applications. PHP can also be used in a wide variety of rational database management systems and runs on the most popular web servers and is available for different operating systems. There is a lot of support on the web for PHP developers [20, 21].

3   Design and Analysis

3.1   Analysis

3.1.1   Finding a solution

Before implementing any of the designs conceived, a prototype was implemented which was presented to Jonathan Hoffenberg. Various software engineering practices were considered at this phase ranging from a paper prototype to a system designed with different tools to what will be used in the final design. Below is a discussion on some of the software engineering practices used.

3.1.1.1   User Centered Design

On of the main key success feature of the project is that the system is user friendly and easy to use and one of the design philosophies considered was User Centered Design (UCD). Katz-Haas [15] stated that "User Centered Design is a philosophy and process which places the user at the center; it is a process that focuses on cognitive factors as they come into play during people's interaction with things." This philosophy seeks to answer questions about the user including their goals as they perform everyday tasks. The gathered information from this philosophy is used to fuel user friendly development and design.

3.1.1.2   Ethnographic Study

Jones and Marsden in their Mobile Interaction Design book [22] state that "Ethnographic studies focus on producing an account of what is going on in real situations by observing the moment by moment behaviour of people interacting with others and their environment over an extended period of time." This results in the ethnographer being able to collect first hand, eye witness accounts of how people go about doing their work. An observation at the K2 center was set up, were the participants and the tutors were observed as they went about their business. This method of requirements gathering was helpful in that problem areas were noticed and areas where improvements could be made at the K2 Center were highlighted.

3.1.2   Analysis of SHAWCO K2 Center work flow

Through the ethnographic study the K2 Center was visited and a properly observation of the processes that take place at the center were noted. The K2 Center essentially exists to provide the students at the K2 center with computer literacy. From the observations the following main operations at the center where noticed:

- Taking of register for the participants and the tutors
- Students explaining to the tutors what they did with other tutors in the last session

- The tutors helping the participants with the work.

These processes were partitioned into the following operations:

- The taking of the attendance register for the participants and tutors
- The bookmarking of work
- The ability for the participants to store their work

3.1.2.1 Participants Attendance Register

As the participants are about to leave they are asked to line up and the day co-ordinator for that day will ask for each students name as they leave and tick it of the register to note that the particular student was present on that day. This process is repeated for each session.

3.1.2.2 Participants and Tutor Interaction

Before any work commences the participants wait to receive the printed piece of paper with instruction for that session, while the tutors wait for the session to begin as well. Once the notes for that day arrive; the participants and tutors start to discuss where they left off with the other tutor and the participants explains if they were able to understand before they can continue with this weeks work load.

3.1.2.3 Participants Work

Once the participants and the tutors have gone through the notes, if the participants have an exercise which they were working on in the past session they will search for it on the desktop or any of the other folders on the computer, so they can continue with that exercise. Some of the participants will find the exercise others are not as fortunate and have to start from the beginning.

3.1.2.4 Tutor Attendance Register

After the long session and the students have left; the day co-ordinator will proceed by taking attendance register of the tutors who showed up that day. This process varies according to the day co-ordinator as some will take register during the session and others will wait until they are in the bus headed back to UCT, before they take the attendance register. As with the participant attendance register this is also done on a piece of paper which will need to be filed. The use of paper for attendance register posses a problem since paper can get lost or the person given the task of filing and updating the records could make a mistake or forget their responsibilities.

3.2   Design

3.2.1   System architecture Design

Due to the inherent design of Moodle it meant that three-tired web architecture would be used. The separate components of the system are as follows:
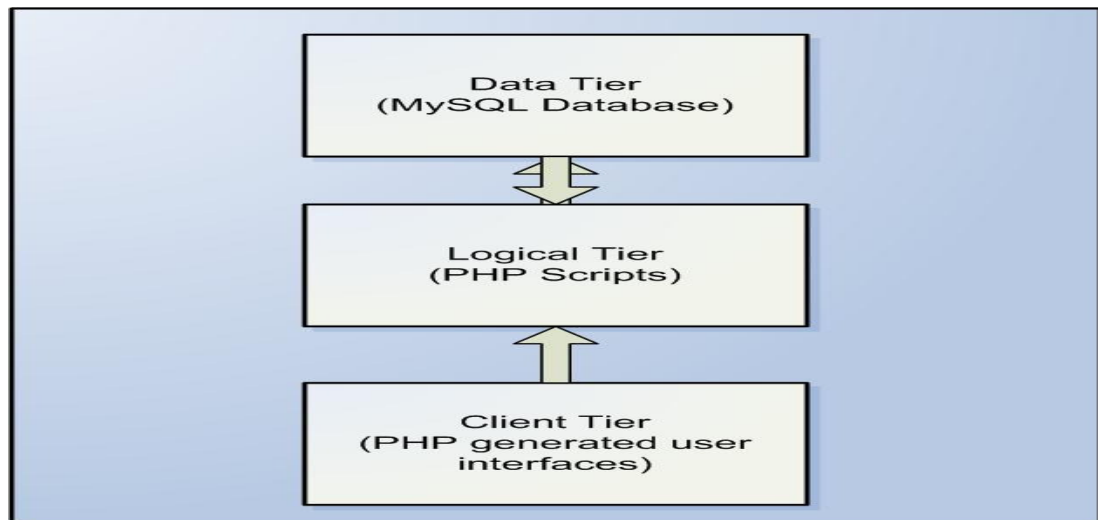
Figure 2: Overview of the web architecture

- The client tier is responsible for translating the PHP scripts to the web browser and displaying the information that the user interacts with
- The Logical tier (Middle tier) is responsible for the way transactions take place between the user interface and the back end
- The data tier is responsible for the storing and retrieving of the data

The advantages of a three-tier architecture are well documented and understood; they allow developers the freedom to make changes in one part of the system without the need to change the other tiers of the system. This was an important factor as this allowed the system to be developed in different phases. The interface could develop without having to worry about the back end or the logical tier and when designing the back end all that had to be done was to alter a couple of the middle tier classes to make sure that they integrated well together.

Various software engineering techniques were addressed during this phase, the most important methods are described in the following section and the resultant diagrams are also provided.

3.2.2 Proposed Solution

3.2.2.1 Development Tool

As described earlier Moodle was chosen as the LMS that would be customized for this project. Moodle comes with a MySQL database and an Apache web server and for the scripting language PHP is used. This was due to the fact that most of the core classes in Moodle are written in PHP and the Apache server can process PHP and.

3.2.2.2 User Interface

The other reason why Moodle was selected was because of its user friendly interface which meant that even beginners can learn to navigate through Moodle with relative ease.
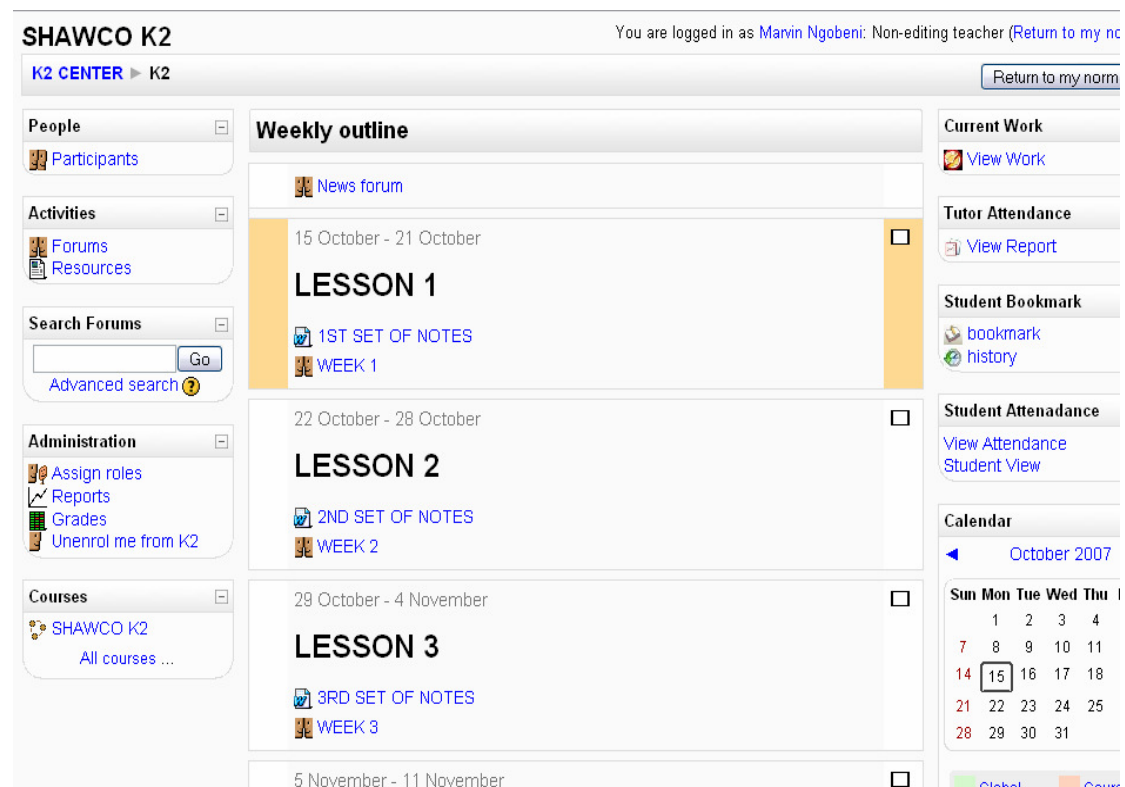
Figure 3: Screen shot of the Moodle Home page

The above screen shot illustrates the home page to Moodle with the custom blocks added on the right hand side; the modules are Current work, Tutor attendance, and Student bookmark and student attendance respectively.

3.2.2.3 Upload/Download module

The screen shot below shows the Upload/download module where the users can browse to the file they want by clicking on the browse button and upload it. The participants can also click on the item uploaded to download it again and on delete to remove the file from the database.
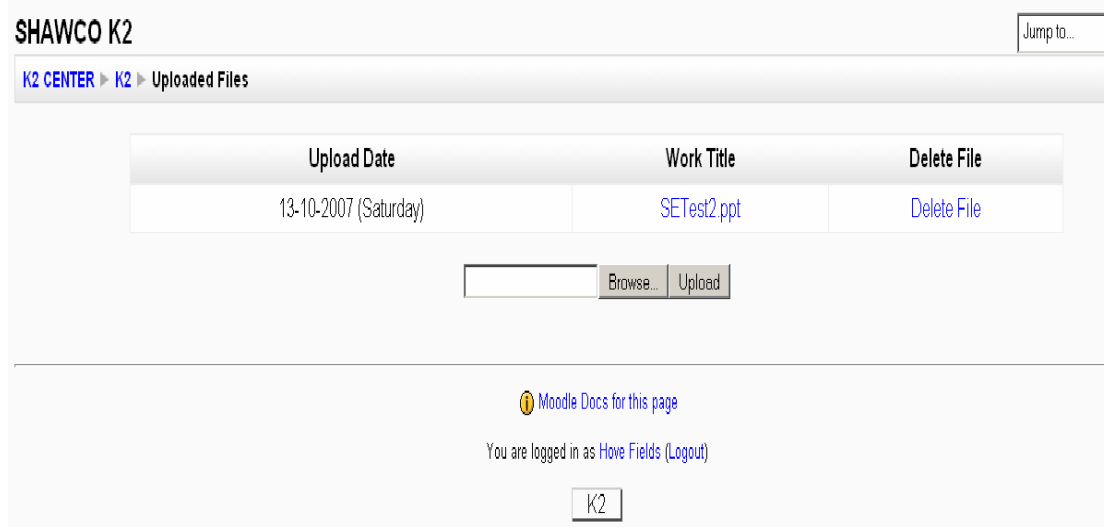
Figure 4: Screen shot of Upload/Download module

The above design was selected after comparing different file upload methods, since the users are new to LMS a simple design was selected. This design allows the participants to view the work they have just uploaded and they use the same module to download and delete the file. The choice for performing all the actions on one User Interface was to reduce the number of clicks to perform simple tasks.

3.2.2.4 Student bookmark module

The screen shot below illustrates the bookmark feature were the user can enter the fields required and after they submit the form the bookmark history is displayed.
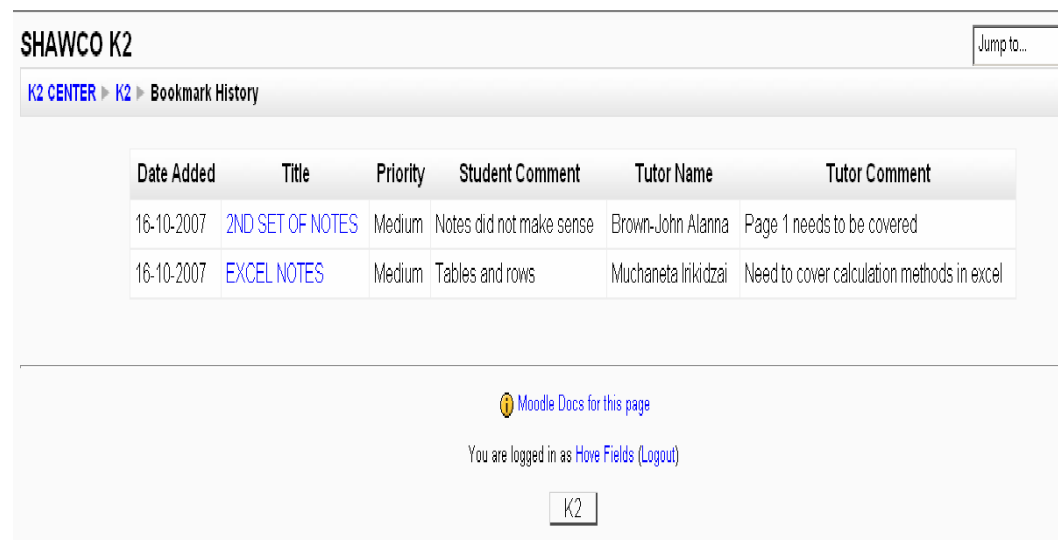
Figure 5: Screen shot of bookmark module

The above design for bookmarking was selected after consultation with some of the tutors from the K2 center. The section title was selected to help the participants know

which section they want to refer to and it is used for downloading purposes. The comments field were selected so that the student can have a reminder why they bookmarked that section, they can enter a sentence which would have meaning to them when reviewing the bookmark. The tutor comment section was included as a guide to others tutors so they can know where the previous tutor left off and the name of the tutor was also included. The priority field was included as a guide for the participants so that they can easily choose the most important section when reviewing all they have gone through at the end of the year.

3.2.2.5 Bookmark history module

The screen shot below shows the bookmark history section of the module where the participants can download the notes from this section as well as view the information they entered about the bookmark. The participants also have the option to delete any of the bookmarks they have.

Figure 6: Bookmark history section

The design for the bookmark history module was intuitive since it is retrieving the information entered by the user from the previous field. The only information which is retrieved from the system is the date which lets the user know when they made the bookmark. The rest of the information is retrieved from the bookmark database table for that particular user.

3.2.2.6 Student Attendance View module

The below screen shot is of the participant's view of the attendance register, the participant can only view their own attendance record.

Figure 7: Participant view of attendance

The view above is of the attendance record for a particular user, this design was chosen since it allowed the participants to view the records for all the available sessions. This view can only be seen by the participants and the tutors. The day co-ordinators get to view the records for all the people in the course.

3.2.2.7   Tutor Attendance View module

The screen shot below is of the tutor attendance record which can be viewed by the day co-ordinator. The tutors themselves just like the students can only see their own status record. The day co-ordinator on the other hand can view the attendance records of all the tutors and participants.

Figure 8: Day co-ordinators view of attendance records.

The above interface shows the view that the day co-ordinator sees when they view the attendance records. This view shows all the records for all the tutors and participants on different days. The headers of the table shows the actual days that a participant was suppose to be there and the status of whether they attended or not.

3.2.2.8 Tutor Attendance Settings Module

The below screen shot is of the tutor settings where the administrator can select which day each tutor is supposed to attend.

Figure 9: screen shot of attendance settings

The above screen shot is of the tutor attendance settings were the administrator can select the day and the tutors to assign for that day. This design was selected since Moodle emphasises simplicity for User interfaces. With this design the administrator selects the day and clicks the tutors for that day and submits the form. The tutors will be assigned to the selected day.

3.2.2.9 Take Tutor Attendance Module

The below screen shot is where the day co-ordinator takes attendance for the tutors on that particular day.

Figure 10: screen shot to take register

The above take attendance design was designed to be similar to the settings module to maintain a sense of consistency within the system. In this module the day co-ordinator selects the day and checks the check boxes next to the names of the tutors who are present to take register.

3.2.3 Use Case Diagrams

The following section will cover the use cases for the students, tutors and the administrators in the K2 center project.
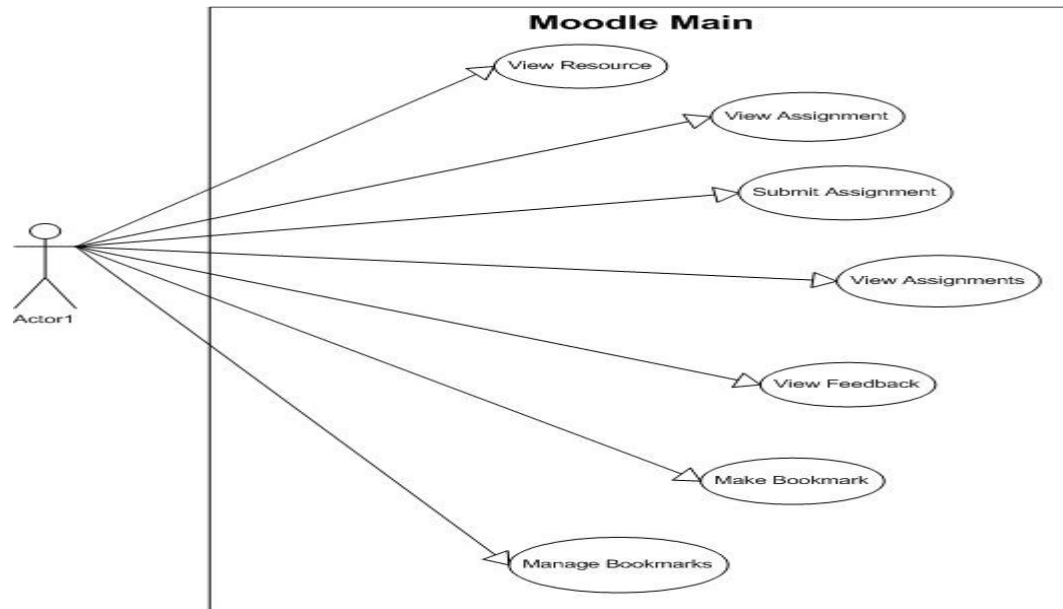
Figure 11: Student Use Case Diagram

The above figure illustrates the actions that can be performed by the student on the system. Most of the functions such as viewing the resources, assignments and viewing feedback are already present in Moodle. Functions such as the ability for the student to bookmark the current notes they are viewing is not available in Moodle. With this bookmark function the students can make a note on why that section was bookmarked. The students will be presented with an interface to manage their bookmarks and arrange them in any order they may want to for revision purposes.
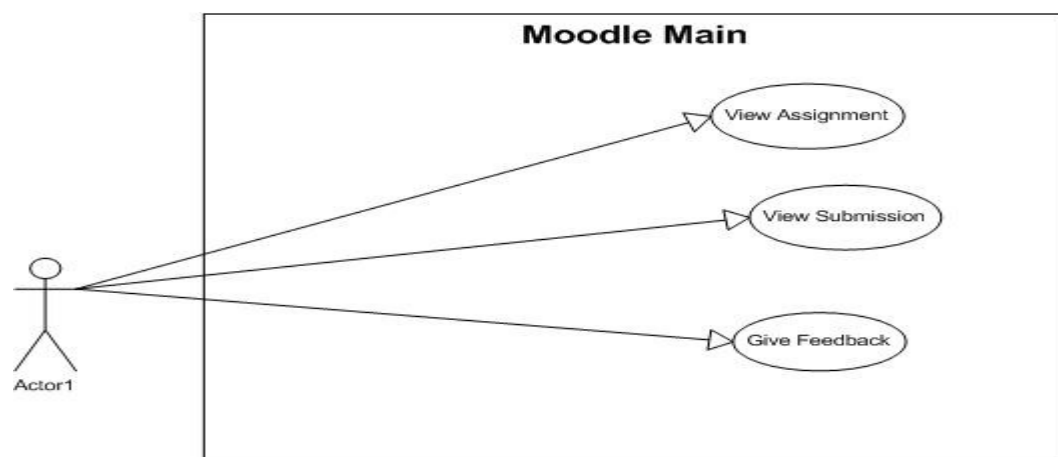
Figure 12: Tutor Use Case Diagram

The above figure shows the tutor use case diagrams. The tutor will be able to view all the assignments and as well as the submissions from the user. The tutors will be able to give feedback to the assignment submitted by the students.
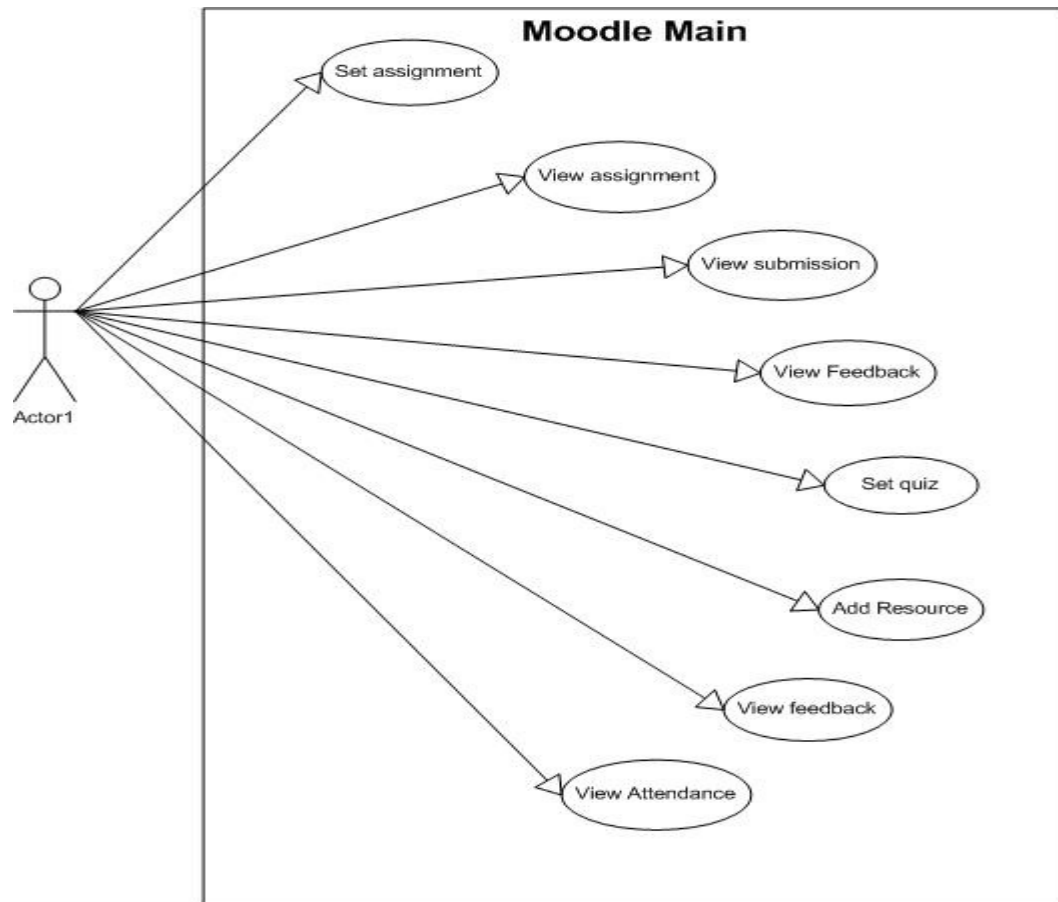
Figure 13: Administrator/Teacher Use Case Diagram

The above Use case is that of the administrator. The administrator will have complete control over the course. The administrator will be able to load new resources into the system, set the assignments and quizzes for the students. The administrator will also be able to view the feedback given to the students. The administrator will have the additional feature of being able to view the attendance register for the students and the tutors and they will be able to print out the form.

3.2.4 Use Case Narratives

3.2.4.1 Bookmark Narrative

1. **Brief Description:**	User can select work they want to bookmark
	User can view pass bookmarks and comments
	User can delete past bookmarks
2. **Preconditions:**	User must registered and logged on
3. **Business Trigger:**	User clicks on the bookmark or bookmark history
4. **Basic Flow: Bookmark**	
5. User clicks on the bookmark link on the bookmark block	
6. User is presented with a form to enter required bookmark data	
7. User submits the form	

8. User is re-directed to the bookmark history section

9. **Post Condition:**   The bookmark should be displayed on the bookmark history section which user is re-directed too.

10. **Alternate Flow: Delete bookmark**

11. When in 8

12. The user can delete required bookmark

13. By clicking on the delete link next to the bookmark

14. User will be asked to confirm the deletion of the document

15. **Post Conditions:** Item would have been deleted

16. **Alternate Flow: Download document**

17. When in 8

18. User can click on the name of the document to download it

19. **Business Rules:**

20. When the user clicks on the submit button all the information they have entered into the form will be saved into the database

21. In the bookmark history section the resource table must be searched in order to open the correct document

22. **Prototype Screen:**
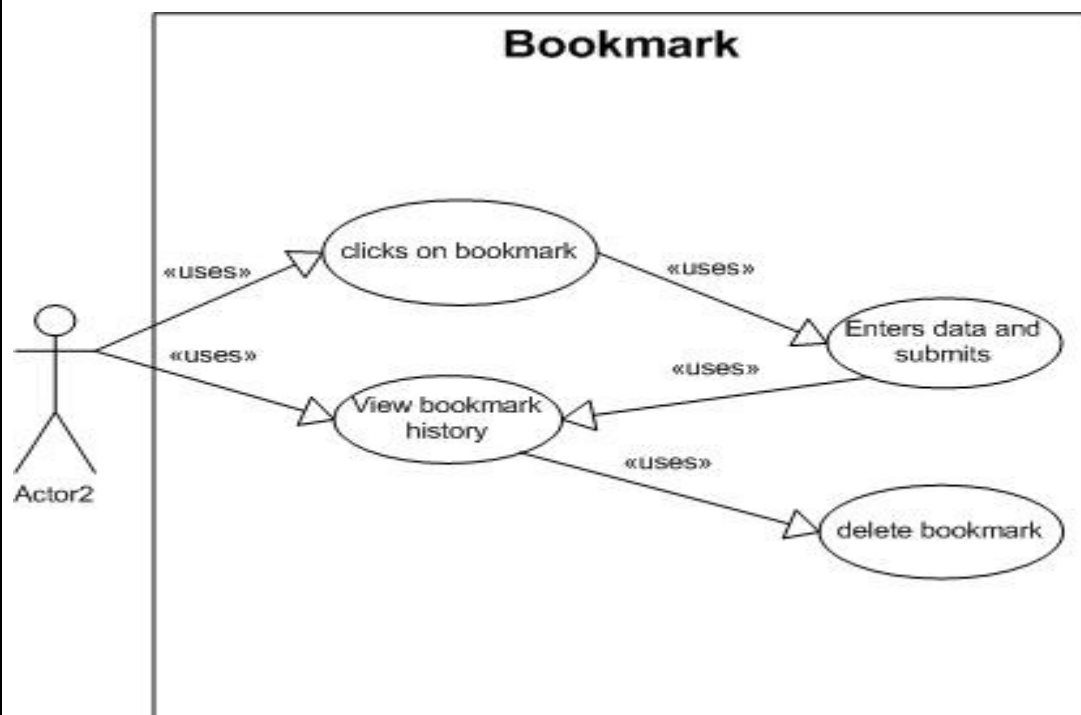
3.2.4.2 Upload/Download Narrative

1. **Brief Description:**	User can view all the work current uploaded
	User can upload new documents
	User can download the work in module
	User can delete old work

21

2. **Preconditions:**	User must registered and logged on
3. **Business Trigger:**	User clicks on the View work block

4. **Basic Flow: Upload work**

5. User clicks on the View work link on the current work block

6. User can view all the work they have uploaded in the past

7. User can upload new work by clicking on the browse buttons

8. Selecting the document they want to upload then clicking the upload button

9. **Post Condition:**	The new document should be displayed on the list of available documents

10. **Alternate Flow: Download work**

11. When in 6

12. The user can also download the work listed

13. Clicking on the name of the document

14. The user will be presented with the option to save or open or cancel the document

15. **Post Conditions:** The list will still have the number of items

16. **Alternate Flow: Delete work**

17. User can click on the delete link in same row as document

18. A confirmation of the delete will be required

19. **Business Rules:**

20. When the user uploads a document, the date, time, type of document, path of the document and the name of the document are all save in the database

21. The size of the document is checked to assure it does not exceed maximum

22. **Prototype Screen:**
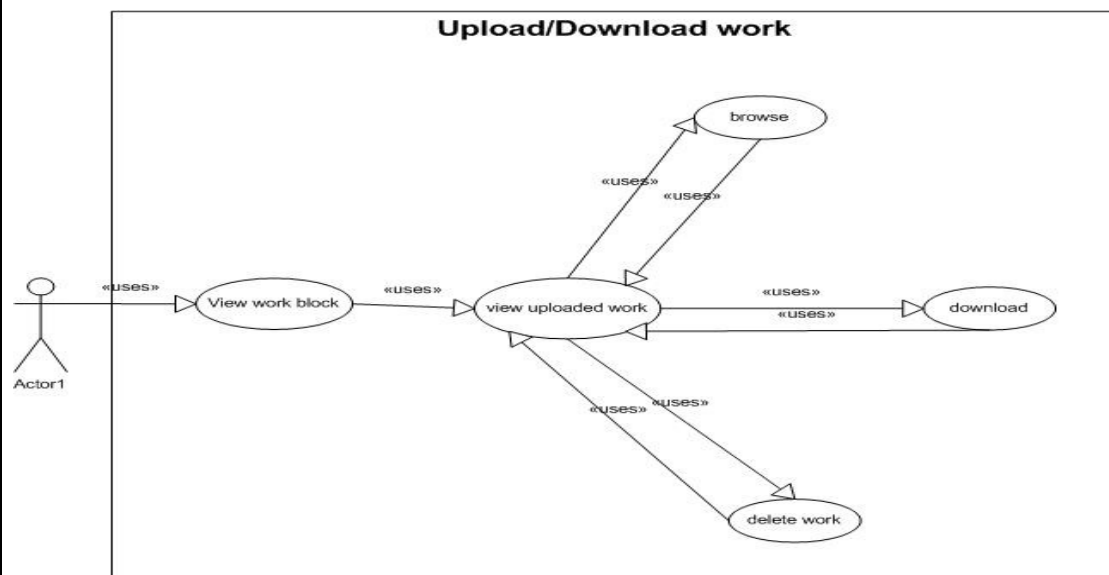
3.2.4.3 Attendance Record Narrative

1. **Brief Description:**	User can select the tutors to allocate to a particular day
	User can take attendance of the tutors
	User can view the attendance record of all the tutors or

students

2. **Preconditions:**　　　User must registered and logged on

3. **Business Trigger:** | User clicks on the attendance blocks

4. **Basic Flow: Bookmark**

5. User clicks on the settings link on the attendance block

6. The user can select the day to assign tutors

7. User can select the tutors they want to allocate to that day

8. User can submit the selected users

9. **Post Condition:**　　　User can select different day to assign tutors

10. **Alternate Flow: Take attendance**

11. When in 5

12. User can click on take attendance

13. Select the day for attendance

14. Select the present users

15. Submit the form to register the user for that day

16. **Alternate Flow: View records**

17. When in 5

18. User can click on view record

19. user will be presented with all the days and the list of user names suppose to attend each week

20. **Business Rules:**

21. When user selects the names of tutors to register their status is saved in the database

21. The day co-ordinator can only take attendance of the tutors for that particular day

23. For past days the tutor can only view the record

24. For coming days attendance can not be taken till that day arrives

25. **Prototype Screen:**
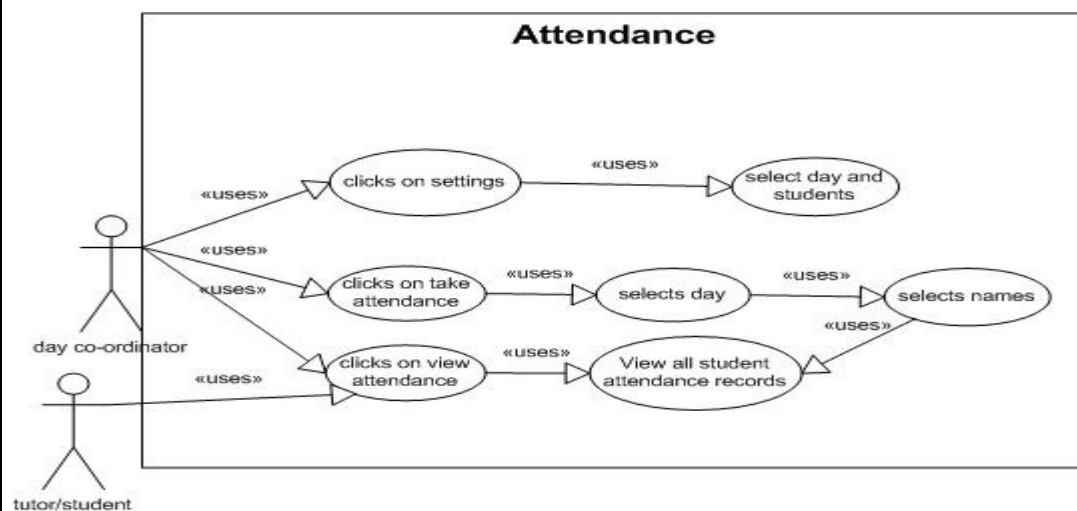
3.2.5 Class Diagrams

Based on the use cases above and their narratives the following class diagrams were identified and will be elaborated:

3.2.5.1 System Overview
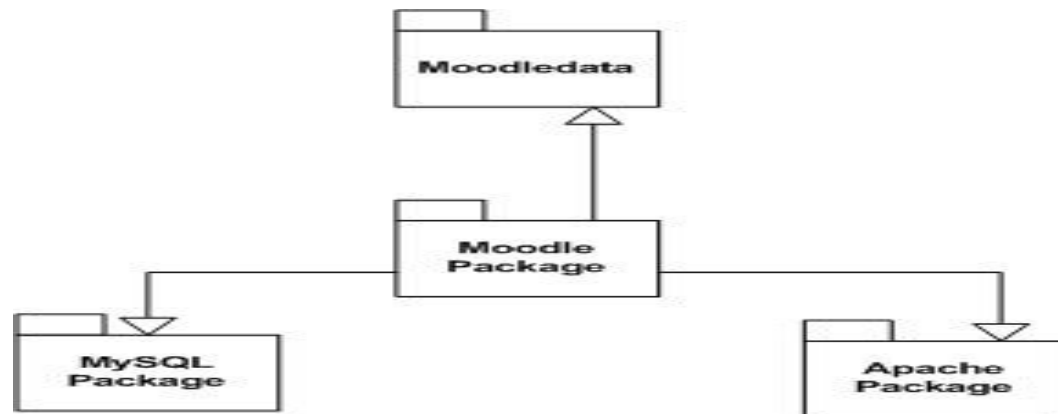
Figure 14: System packages

Figure 15 illustrates the main packages contained within Moodle. The MySQL and Apache packages hold the compiled classes and modules for running MySQL database and the Apache server. The Moodle package interacts with both these packages in order to run as a web service. When data is stored in Moodle such as word documents or any other file that's uploaded it is stored in the Moodledata package.

3.2.5.2 Attendance Class Diagram
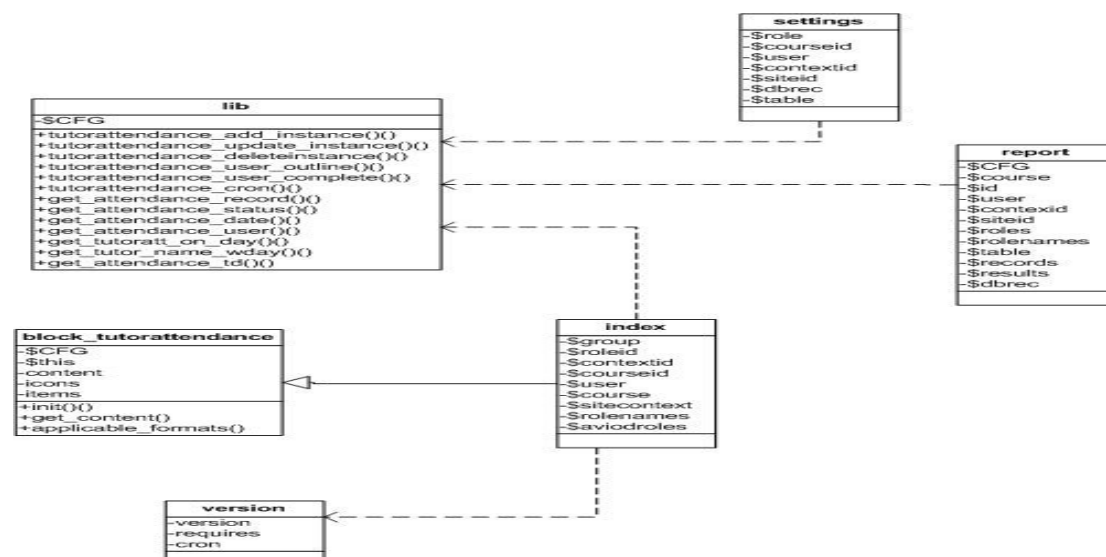
Figure 16: Attendance class diagram

Figure 15 shows the PHP classes that are used for the tutor attendance module. The classes that operate the User Interfaces are the index.php, report.php and the settings.php. The block_attendance.php class is used to place the block instances into the main page of Moodle. The lib.php has all the functions that are used to access the database and retrieve the data to be used in the other classes.

3.2.5.3   Upload/Download Work Class Diagram
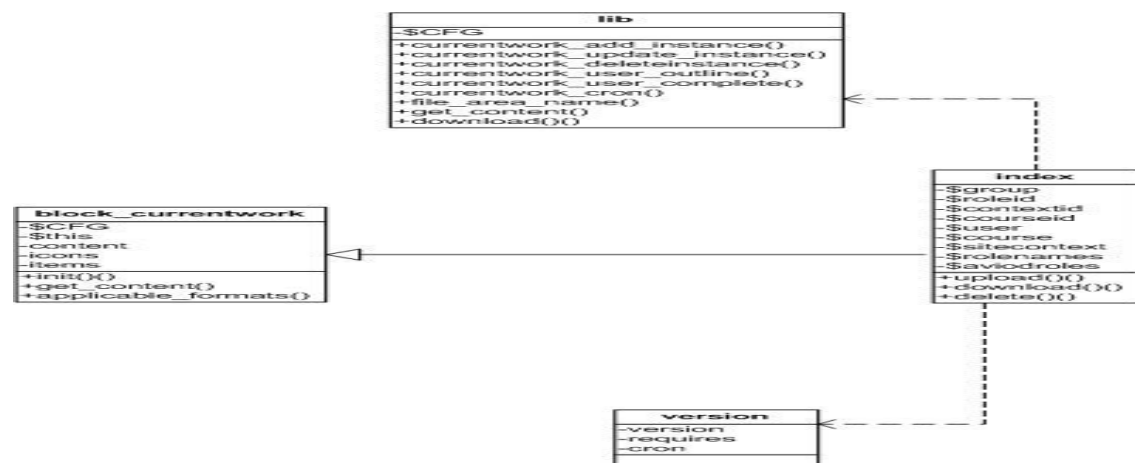
Figure 17: Upload/Download class diagram

Figure 16 shows the classes that are used the upload/download module. The block_currentwork.php is used to add the block instance in the main page. The lib.php holds the database methods for retrieving the data and the index.php is used for the interface.

3.2.5.4   Bookmark Class Diagram
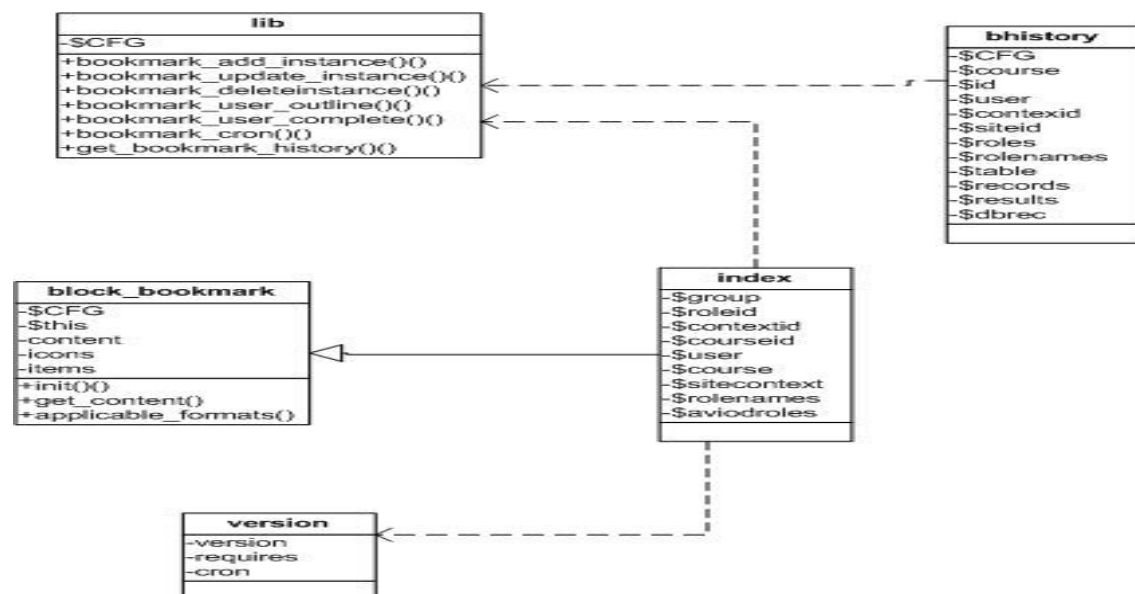
Figure 18: Bookmark class diagram

Figure 17 shows the classes that are used the bookmark module. The block_bookmark.php is used to add the block instance in the main page. The lib.php holds the database methods for retrieving the data and the index.php is used for the interface and the bhistory.php is for the interface of the bookmark history page.

3.2.6 Sequence Diagrams

3.2.6.1 Bookmark Sequence Diagram
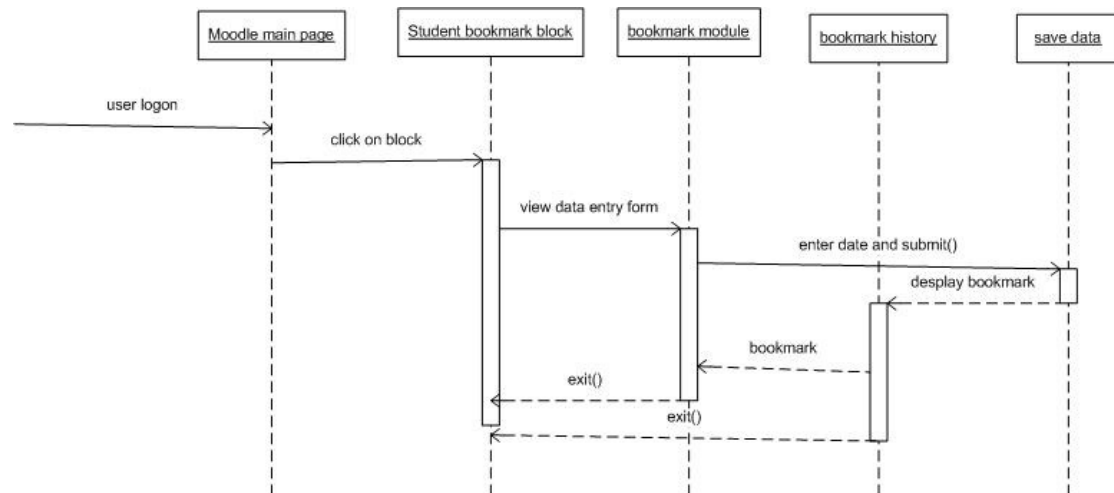
Figure 19: Sequence diagram for bookmark feature

Figure 18 shows the sequence that the user follows for using the bookmark feature from logging in. This sequence diagram follows the user actions from clicking on the block to open the module to when the participant submits the form and they are re-directed to the bookmark history. The sequence also shows when the data is store in the background.

3.2.6.2 Upload/Download Sequence Diagram
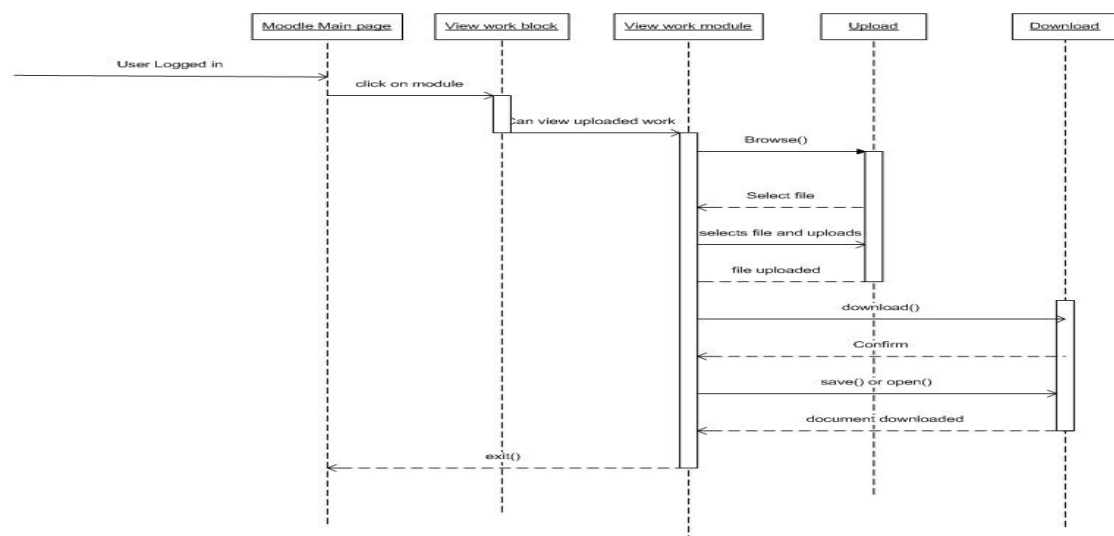
Figure 20: Upload/Download sequence diagram

Figure 19 shows the sequence diagram for the module where the students can save the work they are working on. The sequence shows the steps the participant should follow to upload and to download a document onto the system.

3.2.6.3 Attendance Register Sequence Diagram
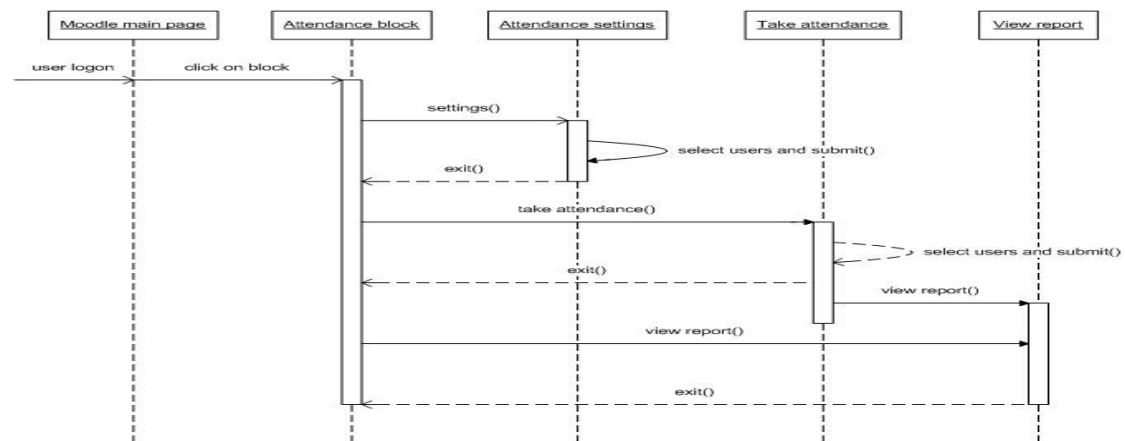
Figure 21: Attendance Register sequence diagram

Figure 20 shows the steps that must be followed when using the attendance register. The sequence diagram shows all the actions that can be performed from the attendance module such as the settings, take attendance and view report feature.

3.2.7 System Overview
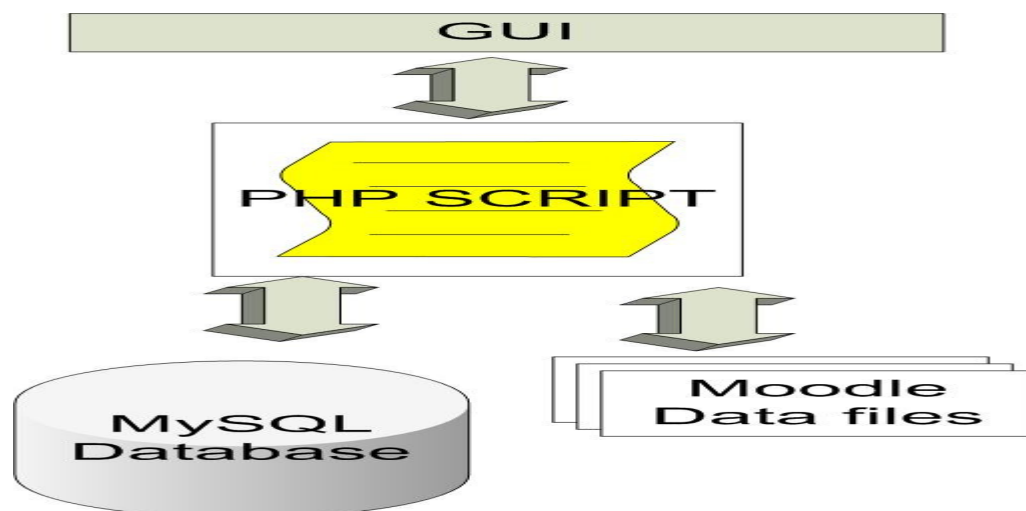
Figure 22: System Overview Diagram

Figure 21 gives a system overview of the entire system. The Graphical User Interface (GUI) will obtain information from the user and the PHP Script will control what goes on in the GUI. The GUI and the PHP Script make up the client side of the system. The PHP Script also queries the Moodle data files and the database depending on the type of information requested by the user. The PHP Script, Moodle data files and the database make up the server side of the system.

3.2.8 Database Design

Moodle comes with the MySQL database pre installed with tables to store information on users and the resources that they require for the course. To facilitate the modules that will be implemented new tables will need to be created to store the information for the new modules.

The new Moodle tables that will be created are:

- Mdl_currentwork_path
- Mdl_studentattendance
- Mdl_studentbookmark
- Mdl_tutorattday
- Mdl_tutorattendance_records

Table 2: Mdl_currentwork_path(id, course, userid, name, fname, type, size, path, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
userid	Integer	User id
name	Char	User name
fname	Char	File name
type	Char	File type (extension)
size	Integer	File size
path	Char	File path (location)
timemodified	Integer	Date table entry was made

Table 2 is the database table structure for the upload/download work module. This is where the data about the uploaded document is stored and it's retrieved by the module to display on the web page. The path is stores the location where the file is stored in the moodledata file.

Table 3: Mdl_studentattendance(id, course, userid, name, wday, wkid, date_act, status, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
userid	Integer	User id
name	Char	User name
wday	Char	Day of week (mon … fri)
wkid	Integer	Week id (1 … 7)
date_act	Char	Actual date
status	Integer	Represents present or absent
timemodified	Integer	Date table entry was made

Table 3 is the database table to store the records for the student attendance, this table interacts with the other attendance tables as illustrated by the ER diagrams below.

Table 4: Mdl_studentbookmark(id, course, name, userid, timeadded, title, priority, scomment, tname, tcomment, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
name	Char	User name
userid	Integer	User id
timeadded	Char	Time bookmark was added
title	Char	Selected title
priority	Char	Priority of bookmark
scomment	Char	Student comment
tname	Char	Tutor name
tcomment	Char	Tutor comment
timemodified	Integer	Date table entry was made

Table 4 describes the student bookmark database table. The user enters the information on the web interface and the data is stored in the fields provided. The timemodified field is retrieve from the system and not entered by the user.

Table 5: Mdl_tutorattday(id, course, username, wday, wkid, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
username	Char	User name
wday	Char	Day of week (mon … fri)
wkid	Integer	Week id (1 … 7)
timemodified	Integer	Date table entry was made

Table 5 shows the tutorattday database table where information for when each user should attend is stored. This table makes it easier when constructing the attendance tables.

Table 6: Mdl_tutorattendance(id, course, userid, name, wday, wkid, date_act, status, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
userid	Integer	User id
name	Char	User name
wday	Char	Day of week (mon … fri)
wkid	Integer	Week id (1 … 7)
date_act	Char	Actual date
status	Integer	Represents present or absent
timemodified	Integer	Date table entry was made

Table 6 shows the attendance tables for tutor attendance records and works the same way as the student attendance table.

Table 7: Mdl_tutorattendance_records(id, course, wday, wkid, date_act, timemodified)

Field	Type	Description
id	Integer	Table id
course	Integer	Course id
wday	Char	Day of week (mon … fri)
wkid	Integer	Week id (1 … 7)
date_act	Char	Actual date
timemodified	Integer	Date table entry was made

Table 7 show the attendance records for both tutors and students, this database table stores the day and the week id is an integer representation.

3.2.9   Entity Relationship Diagrams for Attendance Module

The following diagram shows the relationships between the attendance tables.
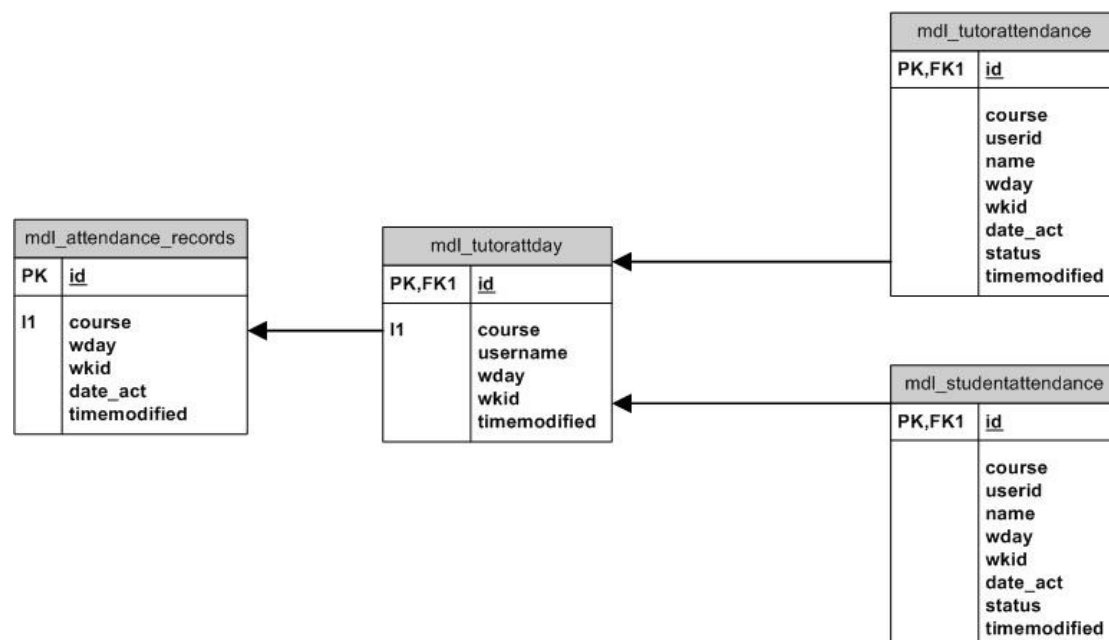
Figure 23: ER diagram for tutor attendance

Figure 22 above it can be seen that the mdl_attendance_records store the days and dates that attendance should be taken for a particular course. The mdl_attendance_records table is used by the mdl_tutorattday which gets the days for the course and associates those days with a particular user from the same course. Then the mdl_tutorattday table is used by both the mdl_tutorattendance and the mdl_studentattendance tables to capture the attendance status for all the users in the course.

The other tables' mdl_bookmark and mdl_currentwork do not have associations with any other customised tables and only store data which they receive from the participants.

mdl_studentbookmark	
PK	<u>id</u>
I1	course
	userid
	timeadded
	title
	priority
	scomment
	tname
	tcomment
	timemodified

Figure 24**:** Student bookmark tables

mdl_currentwork_path	
PK	<u>id</u>
	course
	userid
	name
	fname
	type
	size
	path
	timemodified

Figure 25: Upload/Download tables

3.2.10 Web Server Design
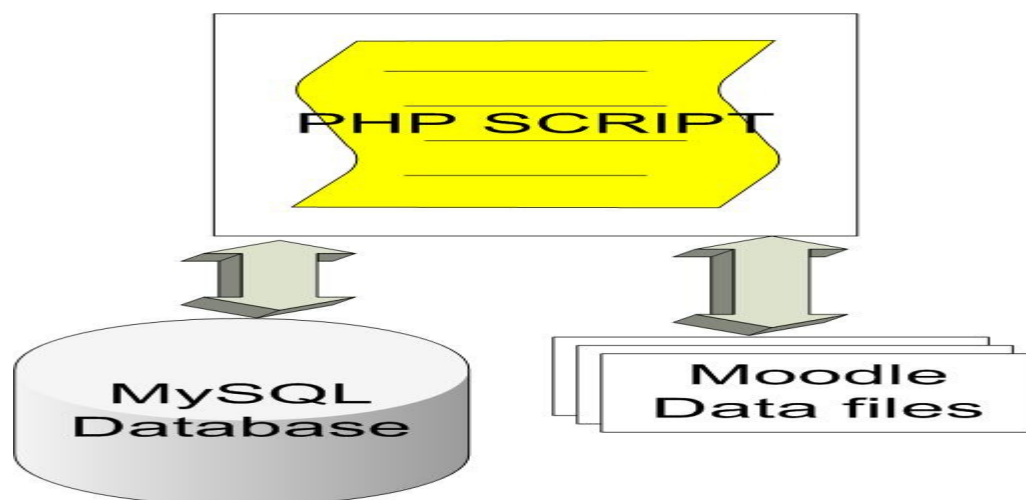
Figure 26: Web server Diagram

The server will consist of server-side scripts which will make up the engine for the whole module. The scripts will be used to capture the information from the interface and the information will be processed according to the functions being run. The web server provides an interface which is the GUI to pass information which is then processed by the server scripts. The scripts are stored in files in the server.

4   Implementation and Integration

4.1   Hardware

4.1.1   Development Systems

The entire system web interface and the backend were developed concurrently on entry-level hardware as this would assure an acceptable level of performance on the machines which are used at the K2 Center. The specification for the development machines are as follows:

Table 8: Development Machine

Components	Specification
CPU	Pentium ® 4
SPEED	3.04Ghz
RAM	256Mn DDR333
HDD	80GB Western Digital (7200rpm)
OS	Windows XP SP2

4.1.2   Test Systems

The development machines doubled up as test machines. The demonstrations for the prototype and a walkthrough of the system where also performed on these machines. The user evaluation of the system was performed on the machines at the K2 Center; this was to assure that the performance of the system on the end machines was acceptable.

4.2   Integration of Modules

The back end and the modules for Moodle were built concurrently; this reduced the amount of integration required. The blocks were the first to be built and they were loaded into Moodle to assure that there were no errors when loaded into Moodle. Blocks are the module instances loaded into the main page of Moodle and usually have a link to the main page of the module.

The next phase of the implementation involved the implementation of the modules which could be accessed through the blocks. After implementing all the modules and making sure that they operated properly with the blocks, the back end could be built.

The back end that comes with Moodle was used to retrieve the required information that was needed by the blocks. This included information about the users such as their names and which course they are registered for. Information about the course was also used such as which resources were loaded into the course. The final step for the back

end was to load the custom tables to store the information used and entered into the modules.

4.3   Key System Features

The system workflow attempts to make the running of operations at the K2 Center smoother by streamlining some of the operations that wasted time at the K2 Center and resolving the problems identified. The list below contains the key features implemented:

- Participants attendance register is performed automatically as the student logs on to Moodle
- The participants can bookmark a document they are working with comments from them and the tutor
- The participant can upload/download the work they are working on in Moodle
- Day co-ordinators can set the day that certain tutors are suppose to be available
- Day co-ordinators can take attendance register of the tutors for a particular day

4.3.1   Participants Attendance Register

The K2 center teaches grade 8 – 10 which means that some of the groups attend at least twice a week. This meant that the attendance register had to accommodate that Monday through to Friday different participants were attending. This meant that the interface for the administrator to set which users were supposed to attend for that weeks needed to be easy to use and understand.

The feature also took register of the students automatically depending on whether they are logged in on the day they are supposed to be there. The reporting for this feature also needed to be easy to understand without too many labels or buttons to confuse the users.

The other feature to the participants attendance register is that the administrator can view all the participants status of whether they attended that day or not but the participants could only view their own status for the days they are supposed to attend.

4.3.2   Participants Bookmark

The participants bookmark feature was designed to save time for the tutors and the participants, by lessening the amount time it takes the participants to explain what they did last. With this feature the participant can just open up the bookmark history, view what they were doing in the last session and which tutor helped them.

This feature allows the student to select the document they are working on currently from a drop down box; they can enter a comment about what they did not understand about that topic. The tutor can then select their name from a drop down box and enter a comment for the next tutor about what they think the participant did not understand and submit the form.

Everything that the participant bookmarks is stored in the bookmark history section according to date. The next time the participants attend they simply need to open the bookmark history section and check the previous date and click on the document they want to go over. The tutor can read the comments left by the other tutor and know where they need to proceed from to help the student more effectively.

4.3.3   Upload/Download Work

This feature was designed to help the participants have a place where they can store their work securely. Considering that the computers they work on are shared with other users who might delete others work by accident. The participants needed a place where they know that their work is stored privately.

This feature was designed to be user friendly and easy to use requiring the least amount of effort from the user. The feature uses two buttons one to browse to the work that they want to store and the other to actually upload the work into Moodle. After uploading the participants can see the document they have just uploaded as a link.

The link to the document that the participant just uploaded doubles as a download feature as well meaning that the user can still upload more documents if they so pleased or can download other documents they saved previously.

The uploaded work can only be viewed by the participants themselves and no one else this allows the participants the security that their work can not be viewed by anyone else until they are ready to submit it.

4.3.4   Tutor Attendance

The tutor attendance feature was designed to be similar to the students attendance feature, given that the tutors also attend on certain days of the week. The differences in the two modules is that the tutors only attend for one day of the week while some of the students can attend twice. The tutors do not necessarily need to logon to the system since the day co-ordinator can take attendance of the tutors.

This feature was design so that the administrator could set which tutors are supposed to attend on which particular day and the tutors commit to one day to go tutor the participants at the K2 center.

With this feature the day co-ordinator can select the current day and a list of the tutors for that day are presented and the tutor can proceed by checking the boxes to confirm

that the following tutors are there that day. When the form is submitted the register for those tutors selected is updated and they can not be selected again.

If it is Tuesday and the day co-ordinator selects Thursday by mistake they will not be able to check the boxes since the system will not allow the day co-ordinator to take attendance for that day.
The way that the attendance record is presented is similar to the participant's attendance record. For each day of the week a table is presented with the names of the tutors and the dates that are available for that day. If the tutor was there a counter is incremented. The total numbers of days that the tutor is supposed to attend is provided as well.

5 Experiments and Testing

5.1 System Testing

5.1.1 Black Box Testing

The presence of user is required for testing of the system but while the system is going through the implementation and design phase, testing is also required to ensure that the logic of the system is correct and that the methods function correctly. Black box testing was employed during the design and implementation phase with more emphasis on testing during the implementation phase.

5.1.2 Functional Testing

In-line with the user requirements functional testing was performed as each new function was added to the Moodle functionality. As Moodle promotes the modularity way of building systems this made functional testing easy. The first was to add blocks into Moodle and test that they were functioning properly. The next phase was to include the actual module including the database tables that were to be used by the module. Each blocks function was tested separately from the others since their functionality is also separate.

5.1.3 Interface Testing

Another important factor that required close attention during implementation was the interface. The interface developed during the implementation phase stayed close as possible to the one proposed during the design phase. The most important factor during his phase was to make sure that the hyperlinks worked correctly and the buttons in the system worked correctly. The other factor was to make sure that the look of the custom modules being developed remained as close to the look that Moodle user are used too.

5.1.4 White Box Testing

White (Glass) Box Testing is the close examination of the internal procedural detail of the system components. The main part of this form of testing is to ensure that all the logical paths of the system function correctly and have at least been executed once during the testing phase. In the later phase of the implementation flow graphs were employed to test all the "if" and "loop" statements in the implemented system to ensure that they functioned properly. Basis Path Testing was also used to test the "if "statements as well.

5.2 Experiments

For the final test a field test was conducted with the users at the K2 Center, using the one of the Pentium 4 machines available at the K2 Center. The test cases for the field test were derived from the use case diagrams to assure that the system performed as it was supposed to.

Five tests were drawn up to test the following functionality:

- Tutor Attendance settings
- Taking the tutor attendance
- Participants bookmark feature
- Participants uploading work
- Participants downloading work

(The actual tests can be found in Appendix A)

As stated above one computer was selected at the K2 Center to perform the test. The initial plan for the testing was to have 10 participant users from the K2 Center to test out the system and to have 5 tutors test out the system as well. Due to the time constraint it took to explain to the participants how the system worked the final number of participants evaluated was 10, with 5 students participants and 5 tutors.

Before the start of the test the selected participants were taken through a walkthrough of how to use the system and an explanation was provided to them why each of the functionality was present in the system. The walkthrough took about 15 minutes and 5 minutes were assigned for questions that any of the test participants might have had.

The evaluation began with the student participants one at a time and it was soon discovered that most of what they had observed during the walkthrough they had forgotten. Before each student participants went through the test cases they were asked to sign a consent form, then they would receive a quick 2 minute walkthrough again, after they completed each test case they were given a questionnaire before they continued with the next test case.

The tutor participants went after all the five student participants had gone through all their test cases. There was essentially no need to explain to the tutor participants what they had to do again, as all of them had; had past experience with LMS and web interfaces.

The student participants went through the bookmark, upload and download features as these would be the features they use on a daily basis. The tutor participants went through the tutor attendance settings and the take tutor attendance feature.

During the test a method of "Think out Loud" was employed during the test procedure. This was to gain insight into the cognitive process of the user. This method was used while the user was about to perform a task they were asked to state out loud why they were doing that action. All comments from the users were noted as they used the system

6 Results and Conclusions

The user evaluation went well with the tutors and the student participants being able to complete their tasks. The responses from the participants were then grouped into these three main headings; Usability, functionality and general comments. Using these heading as a guide conclusions are drawn about the ease of use, software engineering and customizability questions asked earlier in the report.

6.1 Usability

6.1.1 Attendance Module

From the user evaluation and the comments that were received after the participants used the system, these conclusions were reached. Most of the participants gave an average score of 4 on a scale of 5 with 5 indicating the best score on the questions given. The co-ordinator for that day even stated that in terms of taking register he prefers the system over the paper way since it required less effort.

Table 9 shows all results the results received from the user evaluation for the tutor attendance module. The users were given 4 questions each question was rated on a scale of 1 to 5 with 5 indicating very useful or very easy to use.

From the results it can be concluded that the module was very easy to use and understand since the overall average score received from the results is 4.55. This indicates that the users understood how to use the module and found it easy as well. The day co-ordinator gave a commenting saying "Ya, I like this, its good".

The users were also asked which method they preferred when it came to taking register, the system or the paper method and all the participants favoured the system over the paper method.

Table 9: Results for tutor attendance module

Condition	Mean	Std dev	N
Usefulness of attendance register	4.5	0.57735	5
Usefulness of select day option	4.75	0.5	5
Ease of use of feature	4.5	1	5
Understand ability of feature	4.75	0.5	5

Table 5 is a summary of the results received from the attendance settings module where the participants where asked the same questions as for the module above. From the results the users found the module easy to use and understandable with average scores of 5 and 4.7 respectively. This shows that the tutors found this module easy to use.

Table 10: Results for tutor attendance settings

Condition	Mean	Std dev	N
Usefulness of attendance settings	4.5	0.57735	5
Usefulness of select day option	4	0.816497	5
Ease of use of feature	4.75	0.5	5
Understand ability of feature	5	0	5

6.1.2 Upload/Download Module

With the upload and download feature for the work the participants found it particularly easy to use and download the work scoring 4.6 on ease of use and 3.6 on understand ability. The participants were given a question on the way the resultant data was presented after uploading a document and this received a low score at 3.8. This leads use to conclude that the way the data is presented can be improved for the users.

The users commented that the fact that it was all done in the same window uploading and downloading was good since they did not have to go to another window to view or download their work. The users were able to use the module and on average understood how it was used. The users found the module useful. This leads us to believe that the users will use the module.

Table 11: Table of results for Upload/Download module

Condition	Mean	Std dev	N
Usefulness of upload module	4.2	1.095445	5
Presentation Understandable	3.8	1.30384	5
Ease of use of feature	4.6	0.894427	5
Understand ability of feature	3.6	0.894427	5

6.1.3 Bookmark Module

For the bookmark feature the same scale was used as in the attendance module. From the module it can be seen that the users found the module easy to use and they understood how to use the module each section received an average score of 4.4 and 3.8 respectively.

The section which got the lowest score was the priority module with a score of 3.6 this could mean that the users did not like this feature because they did not see the need for selecting a priority on a bookmark. On average the user found the module useful with an average score of 3.4 and deviation of 0.89.

Table 12: Table of results for Bookmark module

Condition	Mean	Std dev	N
Usefulness of bookmark module	3.4	0.894427	5
Usefulness of tutor comments	3.4	1.140175	5
Usefulness of student comments	3.8	1.095445	5
Usefulness of priority	3.6	1.341641	5
Ease of use of feature	4.4	0.894427	5
Understand ability of feature	3.8	0.83666	5

Overall the participants were able to use the features provided and found the usability of the system fine and they understood how to use the features.

6.2 Functionality

The day co-ordinator was pleased with most of the functionality from the system. He stated that he found the tutor attendance settings feature easy to use since he could see all the tutor names and select the ones that he wants to allocate to that day.

The day co-ordinator was also pleased that with the students they would not have to take register anymore since the system would handle that and they could just check from the report section who has been missing sessions.

One of the tutors suggested that the date or time should be added for when the register was actually taken. Another tutor commented on adding more colour to the attendance register report so that it is not just black and white.

6.3 General Comments

Most of the participants commented that most of the modules did not have headings, until an explanation to them was given on how Moodle displays its heading.

"I did not see a heading so I was not sure what I was supposed to do".

They actually wanted to see the title in bold above which ever feature they were using. The tutor participants also commented that they prefer the system attendance register since they are assured of the fact that their attendance status will be stored in the system and not carried by the co-ordinator to someone else who they can not be assured will store the information that day.

Some of the participants stated the following about the taking of register:

"When the day co-ordinator takes the attendance we never know where it goes because we never see it".
"Since joining I have never seen the attendance register."

These comments show that the users especially the tutors want to see their attendance records which is something the SHAWCO administrators could never provide to them. This leads us to the conclusion that with this system where the participants can view their status will lead to better communication between SHAWCO and its' volunteers.

6.4 Conclusions

The following section will discuss the research questions raised in the project proposal and in the report.

6.4.1 Software Engineering

Due to the time constraints of the project and the few users for the testing this is not enough to make solid claims about the system. But the 5 tutors who tested the system can be considered expert users since they have experience with LMS and their comments should weigh more towards the conclusions made.

From the user testing a conclusion was reached that all the tutors were able to read the tasks and perform the operations that they were supposed to perform. This leads use to the conclusion that the system is easy to use and the participants were able to understand what they were supposed to do. With user participants there was a bit of a learning curve as they are new to web interfaces but after they were left to perform the tasks a couple of times they did not require any assistance.

We can also conclude that the learning curve for the students to learn how to use the system is short because the participants at the center after explaining to them and showing them how the modules were suppose to work they were able to follow the instructions without any aid from anyone.

With the tutors since they already have experience with using web browsers and LMS, they could just read the instructions and know what they had to do. They could also look at the screen and know what information was required where without having to go over the instructions.

The user testing served as an acceptance test since when the participants were asked if they would us the system they all agreed stating that it was easy to learn and to use. They were also asked which functions they found useful and the attendance register scored highest for this question.

6.4.2 Customizability of Moodle

One of the research questions that the project seeks to answer is how customizable Moodle was? From the research conducted and the functioning modules that were load to Moodle a conclusion that Moodle is highly customizable was reached.

This is enhanced by that fact that there is a lot of support for Moodle developers from the Moodle community and there are a lot of people that continue to add functionality to Moodle and those how continue to ask for more functionality to be added into Moodle.

The modules that were added to Moodle were designed for users with basic to no computer experience in mind and since those users were able to use the modules after

a few explanations and seemed enthusiastic enough to use the modules in the future. It shows that Moodle can be used to facilitate learning for inexperienced computer users as it emphasises a user friendly and not too complicated design. It is designed with students in mind.

7 Future Work

Suggestions about changes to the interface and additional functionality were noted during the testing.

One suggestion which was made by Jonathan Hoffenberg was that an integrate of the system so that if a user has been late for a week or so the cell phone system could be used to send a message to that student.

This could be done in the future were a template message is sent out to all the students and tutors who have missed more than a week of sessions.

The other suggestion was that the way the attendance register is presented there should be colour to the feature. This is more an issue of using a different theme since that is where most of the changes to how the appearance of the modules is done.

After receiving positive feedback about the system doing a study for the future to see whether it is actually used by the center and the tutors would be interesting. It would also be interesting to see how much better this makes the students learning experience and readiness for use of LMS in tertiary institutions.

Reference:

1. Qoboka, S. and Herringer, M (Unknown). eTownship new, views and profiles from Cape Towns Townships: Khayelitsha (Unknown). DOI = http://www.etownship.co.za/index.php?option=content&task=view&id=21;Itemid=34.

2. Wikipedia 2007. Khayelitsha October 19, 2007. DOI = http://en.wikipedia.org/wiki/Khayelitsha.

3. Buytaert, D 2007. Drupal October 19, 2007. DOI = http://drupal.org/.

4. SHAWCO (Unknown). Khayelitsha K2 (Unknown). DOI = http://www.shawco.org/content/view/32/62/.

5. SHAWCO (Unknown). SHAWCO IT (Unkown). DOI = http://www.shawco.org/content/view/45/107/

6. Hanov Solutions (Unknown). Sequemce Diagrams October 19, 2007. DOI = http://www.websequencediagrams.com/.

7. Simpson, D. L. 2005. Content for one: developing a personal content management system. In *Proceedings of the 33rd Annual ACM SIGUCCS Conference on User Services* (Monterey, CA, USA, November 06 - 09, 2005). SIGUCCS '05. ACM Press, New York, NY, 338-342. DOI= http://doi.acm.org/10.1145/1099435.1099512.

8. Graf, S. and List, B. 2005. An Evaluation of Open Source E-Learning Platforms Stressing Adaptation Issues. In *Proceedings of the Fifth IEEE international Conference on Advanced Learning Technologies* (July 05 - 08, 2005). ICALT. IEEE Computer Society, Washington, DC, 163-165. DOI= http://dx.doi.org/10.1109/ICALT.2005.54.

9. Beck, E. Learning Management Systems: The Need for Critical Analysis.

10. Chavan, A. and Pavri, S. 2004. Open-source learning management with moodle. *Linux J.* 2004, 128 (Dec. 2004), 2.

11. SakaiProject (Unknown). Sakai. DOI = http://sakaiproject.org/.

12. Blackboard Inc 2007. Blackboard: Educate, Innovate, Everywhere (2007). DOI = http://www.blackboard.com/.

13. EduTools. 2007. CMS: CMS Home. Retrieved October 19, 2007. DOI = http://www.edutools.info/static.jsp?pj=4&page=HOME.

14. Sawhney, A. and Mund, A. 1998. Simulation based construction management learning system. In *Proceedings of the 30th Conference on Winter Simulation* (Washington, D.C., United States, December 13 - 16, 1998). D. J. Medeiros, E. F. Watson, J. S. Carson, and M. S. Manivannan, Eds. Winter Simulation Conference. IEEE Computer Society Press, Los Alamitos, CA, 1319-1324

15. R. Katz-Haas 2005. User Centered Design and Web Development, Society for Technical Communications, September 5, 2005. DOI = http://www.stcsig.org/usability/topics/articles/ucd%20_web_devel.html.

16. Wikipedia 2007. Apache HTTP Server October 19, 2007. DOI = http://en.wikipedia.org/wiki/Apache_HTTP_Server.

17. The Apache Software Foundation 2007. Apache, October 19, 2007. DOI = http://www.apache.org/.

18. Wikipedia 2007. MySQL Server October 19, 2007. DOI = http://en.wikipedia.org/wiki/MySQL.

19. MySQL AB 2007. MySQL, October 19, 2007. DOI = http://www.mysql.com/.

20. Wikipedia 2007. PHP October 19, 2007. DOI = http://en.wikipedia.org/wiki/PHP.

21. The PHP Group 2007. PHP, October 19, 2007. DOI = http://www.php.net/.

22. Jones, M. and Marsden, G 2006. Mobile Interaction Design, October 19, 2007.

Appendix A: User Tests and Questionnaires

<div align="center">

University of Cape Town

Department of Computer Science

CSC4000W: Honours SHAWCO K2 Project Consent Form

</div>

This is to acknowledge that _____participated in the user evaluation, and agrees that the information will be used for research purposes.

<u>Participants:</u>

Name: _ _____   Signature: _____

Date: _____

<u>Researcher:</u>

Name: (Mr.) Marvin Ngobeni

Signature: _____

USER TESTING
TASK 1: BOOKMARK

> • Logon to the system
> • Navigate to 'Student Bookmark' and click on 'Bookmark'
> • Enter the information into the fields provided
> • Submit the form by clicking on 'Submit' button

1) How useful do you consider the bookmark feature?

Useless   extremely useful

1	2	3	4	5

2) How useful do you consider the **tutor comment** to be?

Useless   extremely useful

1	2	3	4	5

3) How useful do you consider the **student comment** section to be?

Useless   extremely useful

1	2	3	4	5

4) How useful do you consider the **priority** option?

Useless   extremely useful

1	2	3	4	5

5) Did you find bookmark feature easy to use?

Hard   very easy

1	2	3	4	5

6) Did you find the bookmark feature easy to understand?

Hard   very understandably

1	2	3	4	5

7) Which input field did you find un-necessary and why?

8) Did all the inputs make sense to you, and if not which ones did not make sense?

9) How can the bookmark feature be improved?

[ ]

10) General comments?

[ ]

USER TESTING
TASK 2: Upload Work

- From the K2 course page navigate to the 'Current work' block
- Click on View work
- Click on the browse button
- Navigate to desk top and selected the first file specified and click open
- Then click on the upload button
- Click on the continue button

1) How useful do you consider the upload work feature?

Useless   extremely useful

1	2	3	4	5

2) Did you find the upload work feature to be easy to use?

Hard   very easy

1	2	3	4	5

3) Did you find the upload work feature easy to understand?

Hard   very understandably

1	2	3	4	5

4) Do you find the way the uploaded work presented understandable?

Hard   very understandably

1	2	3	4	5

5) How can the upload feature be improved?

6) General comments?

USER TESTING
TASK 3: Download Work

- Click on the document you just uploaded
- Click on the 'Continue download'
- Then confirm the download

1) Did you find it easy to download the document you uploaded?

Hard   very easy

1	2	3	4	5

2) Did you find the second download link useful?

Useless   extremely useful

1	2	3	4	5

3) How can the download feature be improved?

4) General comments?

USER TESTING
TASK 1: Tutor Attendance Register

- Navigate to tutor attendance
- Click on 'Take Attendance'
- Select a day and click the submit button
- Confirm the selection
- Randomly select a group of tutors to take register of and submit
- Navigate to view report

1) How useful do you consider the attendance register feature?

Useless   extremely useful

1	2	3	4	5

2) How useful did you find the view report feature?

Useless   extremely useful

1	2	3	4	5

3) Did you find the feature easy to use?

Hard   very easy

1	2	3	4	5

4) Did you find the view report easy to understand?

Hard   very easy

1	2	3	4	5

5) How can the attendance register feature be improved?

6) Any comment on how the information can be displayed better?

7) Which way of taking register do you prefer; using the system or paper?

8) General comments?

USER TESTING
TASK 2: Tutor Attendance Register Settings

> - Navigate to the Tutor attendance block
> - Click on the 'Settings' link
> - Select a day
> - Click on the check box to allocate tutors to that day
> - Click on the 'submit' button

1) How useful do you consider the attendance register settings feature?

Useless   extremely useful

1	2	3	4	5

2) How useful did you find select day option?

Useless   extremely useful

1	2	3	4	5

3) Did you find the attendance register settings feature easy to use?

Hard   very easy

1	2	3	4	5

4) Did you find the view report easy to understand?

Hard   very easy

1	2	3	4	5

5) How can the feature be improved?

6) General comments?