UTP e-College System Using AJAX Technology

By

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ABSTRACT

The purpose of writing this document is to report and summarize all the findings and activities during the development phase that have been performed for my Final Year Project 2, titled UTP e-College System Using AJAX Technology. There are six sections which build up the report. The introduction part will briefly discuss about the background, problem statement as well as objectives and scope of study. The second section will explain the literature review of the project. The third section will expand the discussion on methodology / project work. The result and discussion will be discussed in the forth section. Finally, on the last section of the report will be discussing about the conclusion and recommendation. The references section lists out the sources used for references and guidelines in completing the progress report.

CERTIFICATION OF APPROVAL

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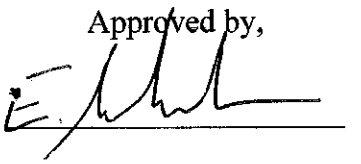
Approved by,



(Dr. Etienne Schneider)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

Jan 2008

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 acknowledges and that the original work contained herein have not been undertaken or done unspecified sources or persons.

Elnadia binti Abd Rahim

Table of Contents

List of Figures

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

I believe that the Residential College Support Unit (RCSU) can streamline operations and increase their productivity by converting the current management registration process to its web-based system, making some information and services accessible to current student.

Residential College Support Unit (RCSU) is the important party that responsible in managing all the issues and provides services to assist UTP's students in locating off and on-campus housing. The registration process will be done by the students. They will fill the registration form and after that the RCSU will decide and assign which block and room number to that particular student. Therefore, all the process is done manually. As a reference, you may refer figure 1.0 below.

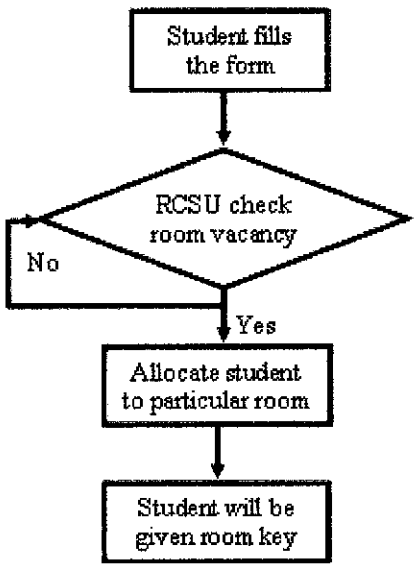


Figure 1.0: The Residential Registration Process

1.2 PROBLEM STATEMENT

Every semester we are having the same annoying problem where no records found in the list or more than one record found in the list, get the wrong room mate, late submission, get to our feet in a very long queue, meet and deal the RCSU officer with their unfriendly face. And after long queue we still have to wait for a couple of minutes to the officer get the house and room number for each student. The entire problems give bad impact to RCSU capability because they cannot perform their duties efficiently and effectively.

UTP: A Leader in Technology Education and Centre for Creativity and Innovation. How this can be achieved if the management is not able to provide a better service for students? Why they still stick to the traditional manual way to manage the residential college while there is solution that they can come out with? Is that because they thought the network connection within UTP is not reliable to support the system? By using the manual process, RCSU have had facing a lot of problems. The problems are;

i) Increasing time of the information storing process.
ii) Increasing time for check the status of room vacancy whether it is available or not.
iii) Have probability to do typing error where the clerk key in more than one data that will cause data redundancy.
iv) Cannot find files randomly.
v) All data is kept in files is not secure enough.

1.3 OBJECTIVE AND SCOPE OF STUDY

Residential College Support Unit's strategic goal is provide a systematic service to assist students in locating off and on-campus housing. The UTP e-College System will support this goal by:

- Improve the unit's performance to serves students by allowing them to access to the online registration system that will improves the efficiency and effectiveness of the employees.
- Provide the reliable system that still can be accessed if there is slow internet connection.
- Produce a user friendly system.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION TO WEB – BASED APPLICATION

The study from Lu Et Al in 1998 has highlighted that with the increasing popularity and advancement of Web technology, many organizations want to Web-enable their existing applications and databases without having to modify existing host based applications. This not only gives all of the existing applications a common, modern look and feel but also can deploy them on corporate Intranets, the public Internet, and newer Extranets.

2.2 TECHNOLOGY IN HIGHER EDUCATION ACADEMIC ADVISEMENT

The challenge to manage and support students has taken on new meaning "in light of relational and networked databases, prolific and assertive e-mails, Internet technology and other World Wide Web-based transactions,[as well as] information dissemination and on-line query servers" (Moneta, 1997). The intersection of technology with shifting missions for student recruitment and retention professionals requires significant changes in the management of academic advisement.

Students, for example, can now review their transcripts, degree audits, and billing status, all from the comfort of their rooms, as students do at the University at Buffalo. Advising services staffs are faced with these evolving challenges. Often, these situations are prompted by institution-wide initiatives that leave advising units "little choice to adapt, regardless of cost, competency, and convenience" (Moneta, 1997). In fact, conversion to uses of technology will inevitably increase efficiency and enhance user satisfaction, but the challenge will be to coordinate the pace and scope of technology in the human resources that compose the core of advising services.

2.3 THE END-USER OF THE SYSTEM

The issues for future end-user systems are self-awareness, detection and notifications, system integrity, and power management. A paradigm shift in system interface design, as today we are facing the dawn of web-base system and application. This new operational environment calls for new solutions (Kimmo E.E.R 2005).

In the journal, the author discussed research challenges in building a web-based system for future end-user systems. It is crucial for me to dynamically build up the most appropriate end-user system that can be easily interacting with the target-user. My target user is UTP students and RCSU officer. This is meant to be useful in the process of designing the user interface, and is therefore built on a relevant subset of any user's characteristics which may include which computer interfaces he/she is comfortable with (having used them before or because of their inherent simplicity), his/her technical expertise and degree of knowledge in specific fields or disciplines, and any other information which is believed to be relevant in this project.

2.4 INTRODUCING HOW AJAX WORK

I got an overview of how Ajax is used today, and what it has to offer. AJAX is made up of several components; Browser-based presentation using HTML and Cascading Style Sheets (CSS); Data stored in XML format and fetched from the server; Behind-the-scenes data fetches using XMLHttpRequest objects in the browser; JavaScript to make everything happen" (Steve Holzner, 2006). There are many applications available that use Ajax, and we can see a good sampling in Gmail, Yahoo mail Facebook and many more. Then I got a solid grounding in JavaScript, the programming language Ajax is built on.

Nowadays, the system developer able to design a code on how to grab data from the server, whether that data is plain text or XML and how to put that data to work. To illustrate how these techniques work, there are plenty of examples using Ajax, Dynamic

HTML to update Web pages without needing a page refresh, and even advanced techniques like connecting to Google behind the scenes for real-time same-page Web searches. At last but not least, from the research and study I found out how to support multiple Ajax requests to the server at the same time.

2.4 AJAX WITH DATABASE

AJAX is a web development technique for creating interactive web applications. The intent is to make web pages feel more responsive by exchanging small amounts of data with the server behind the scenes, so that the entire web page does not have to be reloaded each time the user makes a change (Crane, Pascarello, James 2003, p. 5). I will implement this technology to increase the web page's interactivity, speed, and usability.

For instance, (1) AJAX working by linking to a database. When user select one entry from the list, a call is made to the database in the background and the values looked up for the entry that has been chosen. The information is then populated and all this happens without the need to reload the page. (2) AJAX can be used to populate the contents of a second drop down list depending on what has been selected in the first list. Again, it all happens without the page refreshing. Select one apartment number from the first list and the second list will be populated with all of the related information about the particular apartment. (3) The only problem is that once a page is downloaded, the connection to the web server is broken so that every time new information is required - a new connection has to be made to the server and the page has to refresh. This involves the page reloading each time and can get annoying if there is a slow connection just like what we are having in UTP right now. By implement the AJAX technology in this system, the slow internet connection is not the major problem anymore because AJAX will reduce or eliminate waiting time.

2.5 HIGH PERFORMANCE SYSTEM VS LOW BANDWIDTH NETWORK

Moreover, (Crane, Pascarello & James 2003, p 11) highlighted that the key advantage of AJAX applications is the significantly higher performance, which is a result of the small amount of data transferred from the server. This makes the AJAX technique especially beneficial for data-intensive applications (e.g. displaying rich reports, browsing through large data structures) as well as for low-bandwidth networks.

As the UTP e-College System is more efficient through the use of AJAX, and the client can communicate with the server without page-loads, it becomes possible to build some wonderful user interfaces that fit much better with users' needs and expectations. The human factors need to be considered in order to design a friendly user interface. Short-term benefits can accumulate during system development and long-term benefits during system release (Erlbaum 2005, p. 37). Users directly benefit by usability improvements by increases in ease of use, ease of learning, user satisfaction, and user productivity. At the same time, decreases occur in the number of "user" errors, costs for training and support, and maintenance.

This UTP e-College System plus; combination with AJAX technology, will makes administration system more systematic and productive. Students will be able to adjust quickly and effectively to the new environment and will be provided on-going support until the completion of their residential registration process.

2.6 AJAX AND USER INTERFACE DESIGN

When any new technology undergoes fast and widespread adoption, there's always an opportunity for unintended misuse. So it's no surprise that the World Wide Web has seen its fair share of mishandled technologies: (1) Download-heavy Java applets for simple page navigation; (2) Flash movies for superfluous intro animations; (3) Frames that disable simple book-marking and URL-sharing; (4) The overuse of images when simple HTML text would do (L.Wroblewski 2006).

Other source from the same author in 2001, the author has wrote a paper titled Design Considerations for Web-based Applications that tried to bridge the gap between Web application and client application interface design guidelines. Client application graphical user interface (GUI) guidelines did not cover the interaction possibilities available on the Web (hypertext, etc.), nor did they take into account the conventions and behavioural patterns that emerged as the Web became widely used. Available Web usability guidelines, on the other hand, were not flexible enough to accommodate the new levels of interaction needed within Web applications and often were not appropriate because a Web applications user's motivation differs from a Web site users' goals.

2.7 SYSTEM ACCESSIBILITY FEATURES

New technology tends to be inaccessible to people with disabilities. Accessibility features are frequently added as the technology matures; doing so late in the cycle incurs significant costs. The initial omission of accessibility features often results from systems designers' lack of insight into accessibility requirements (P. Brunet 2005).

This author discusses accessibility requirements for accommodating users with vision impairments from the complementary perspectives of the systems architect, the assistive technology developer, and the application developer. The author concludes with a historical perspective of the evolution of the current system accessibility features and gives insight into future industry directions.

As I am aware of, the root cause of inaccessibility is that software designers lack insight into the fundamental requirements of building accessible features. This journal presents requirements for accommodating people with visual disabilities and addresses non-visual user interfaces from several perspectives, including that of the systems interface design, the assistive technology developer, and the application developer. Enabling applications for accessibility can often be both a tedious and error-prone activity. Therefore, I have adding some features in UTP e-College System which can make it more accessible to the end-user. These features will be explained more precise in chapter 3: Methodology and Project work.

2.9 ARCHITECTURAL STYLE – DISTRIBUTED SYSTEM ARCHITECTURE

Based on my study from internet and some books, there are two types of architecture styles that suit the system. I have chosen Distributed System Architecture instead of Call-and-Return Architectures. The purpose of building software is not to create a specific topology of interactions or use a particular component type. It is to create a system that meets or exceeds the application needs. The architectural styles chosen for a system's design must conform to those needs, not the other way around. Therefore, in order to provide useful design guidance, a classification of architectural styles should be based on the architectural properties induced by those styles.

The author of the book of Software Engineering said that most important advantage by applying this model is that it is a distributed architecture. Effective use can be made of networked systems with many distributed processors. It is easy to add a new server and integrate it with the rest of the system or to upgrade servers transparently without affecting other part of the system (Wesley 2005, p. 133 – 148).

CHAPTER 3
METHODOLOGY

3.1 EVOLUTIONARY DEVELOPMENT MODEL

Evolutionary development is an iterative and incremental approach to system development. During the time that the development environment is in place, users will gain experience with the systems, displays, and products and be in a better position to determine how the system will be incorporated into their operational environment during subsequent phases of projects. This is the most popular development model in the contemporary IT industry. Most of the successful software products or system have been developed using this model. Therefore, I use this model because the objective is to offer the user a visual description of the current understanding of the project. Since it is common for the user to define the general objectives of the project but not the specified input, processing, or output, then it is up to me to extract this information. There is no "requirements phase" or "design phase", instead modelling is performed as needed throughout your project in a continuous manner. A graphical representation of the Evolutionary Delivery approach is provided on the next page.

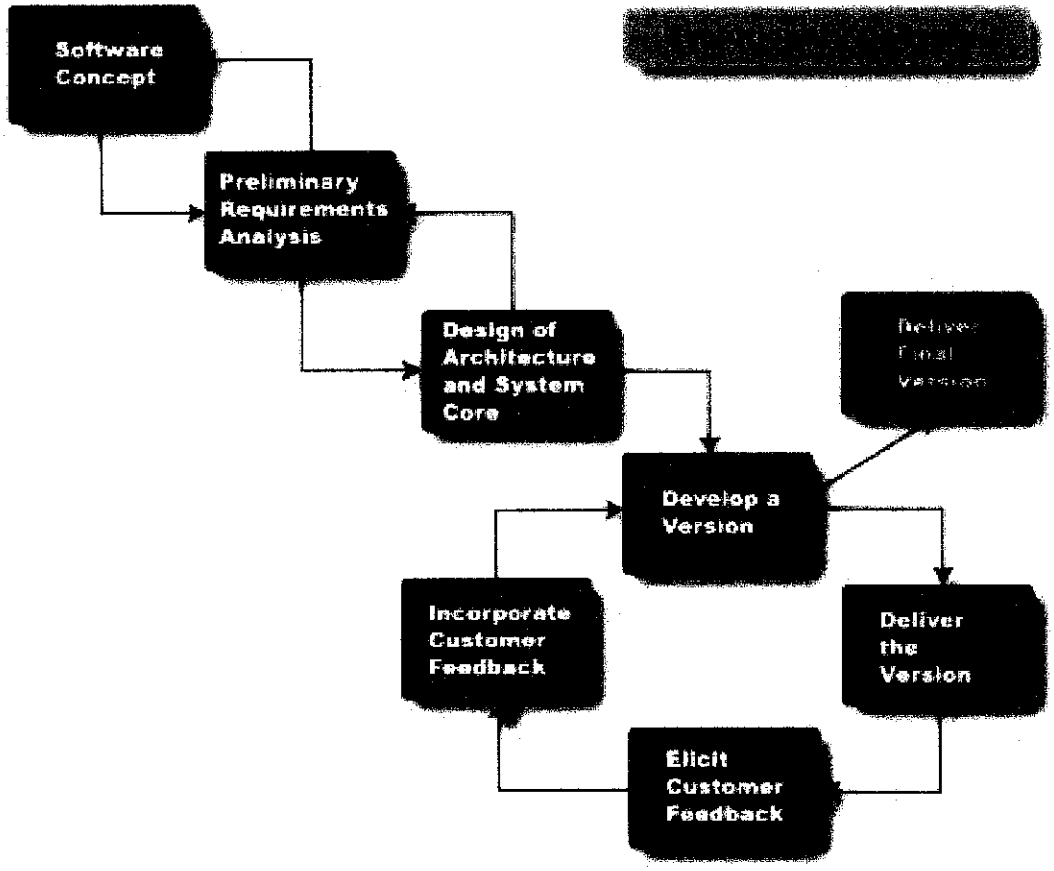


Figure 3.0: Evolutionary Delivery

3.2 PROJECT MILESTONE

Based on the Evolutionary Development model, I have specified the key milestone of the project for each phase so it easy for me as the developer to know that my project is on the right track.

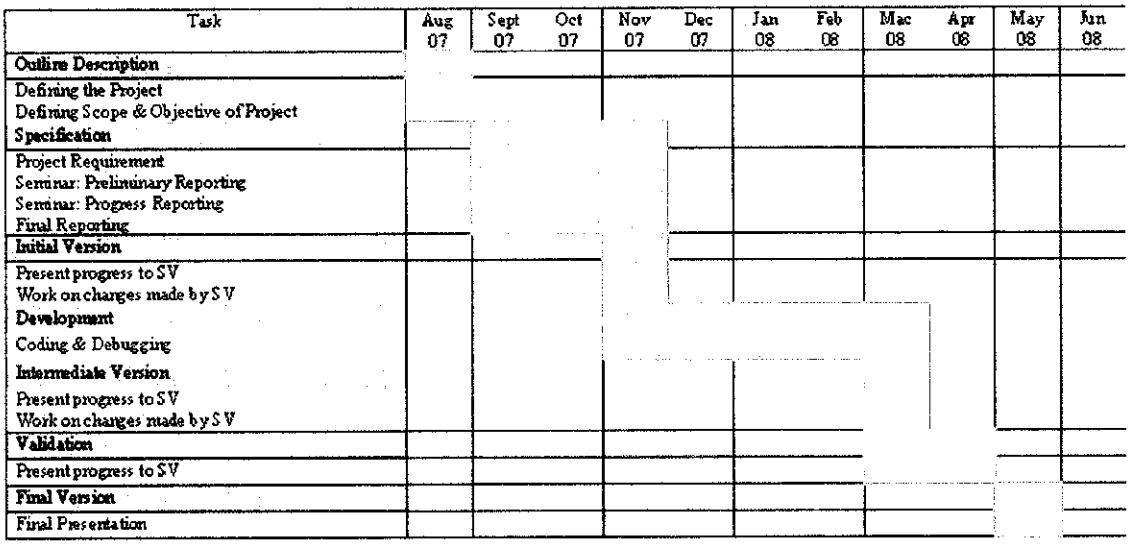


Figure 3.1: Gantt chart –Project Milestone

3.2.1 Outline description

The first step is to defining the project scope and objective. Then this phase also include planning on what kind of developments tools going to be used, time allocation, where and how to start, resources needed, and others.

It is crucial to capture necessary facts to build the required database application. These facts are captured using fact-finding techniques. The formal process of using techniques such as interviews, surveys, and questionnaires to collect facts about systems, requirements, and preferences.

As the developer, I had used several fact-finding techniques for my FYP project including:

- Interviewing,
- Observation organization in operation,
- Research from reference books, articles and journals
- Survey.

Fact-finding used throughout database planning, system definition, and requirements collection and analysis stages. This will enables me as the developer to learn about the terminology, problems, opportunities, constrains, requirements, and priorities of the organization – RCSU and the user of the system.

* The result of the fact-finding is precisely discussed in chapter 4.

3.2.2 Specification

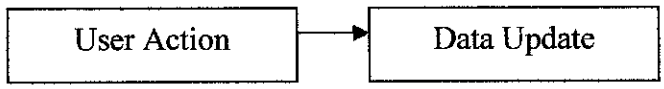
System requirements specification is a structured document with detailed descriptions of the UTP e-College System's functions, services and operational constraints. Based on this system, the system requirements specification may be defined as follows;

- **Fast and Increment**

AJAX enables faster, more responsive Web applications through a combination of asynchronous Javascript, the Document Object Model (DOM), and XMLhttpRequest. What this means for Web interface designers is that a DHTML-based Web application can make quick, incremental updates to a user interface without reloading the entire screen. In the AJAX model JavaScript calls to the server can update a single element in the UI with data retrieved from a server. Because the full screen does not need to be reloaded, the application is much more responsive to user actions.

Traditional Web Interaction

AJAX Interaction

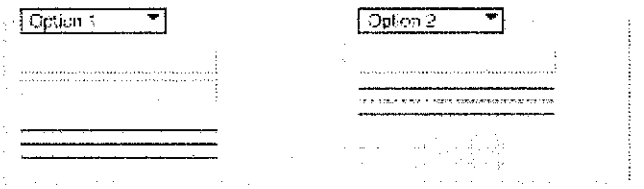


AJAX allows every element within a Web interface to be individually and quickly updated without affecting the rest of the interface. This, of course, is not what most Web users are accustomed to. Initiating an action within most Web sites triggers the inevitable blank screen and page loading process. Though not very responsive, the full-page update makes it very clear to users that their action has resulted in a reaction and that a response will be available as soon as the page is refreshed. Because AJAX-based updates are very fast and incremental (often affecting only a small portion of the UI), users may not notice them -especially when they are used to seeing full-page rewrites.

- **Communicating Change**

In order to communicate content updates to users, many AJAX applications have adopted attention-getting techniques to highlight interface changes. Colour change and animation are two of the most common approaches. To apply this technique in the UTP e-College System, communicating to users that an update has been made after they have taken an action, it's also practical to communicate pro-actively and let them know what response their action will trigger. The area is an update that will occur through a single-pixel bounding box. Change the value of the drop-down menu and the bounded area is updated.

Communicating Change



Here is some other specification of the system;

- Students' record must be added, changed, or deleted only by administrator or themselves
- The system must provide log-on security at the application level
- The system must maintain separate levels of security for student and the administrator
- The system shall provide appropriate viewers for the user to read documents in the document store

3.2.3 Development

- **System Design**

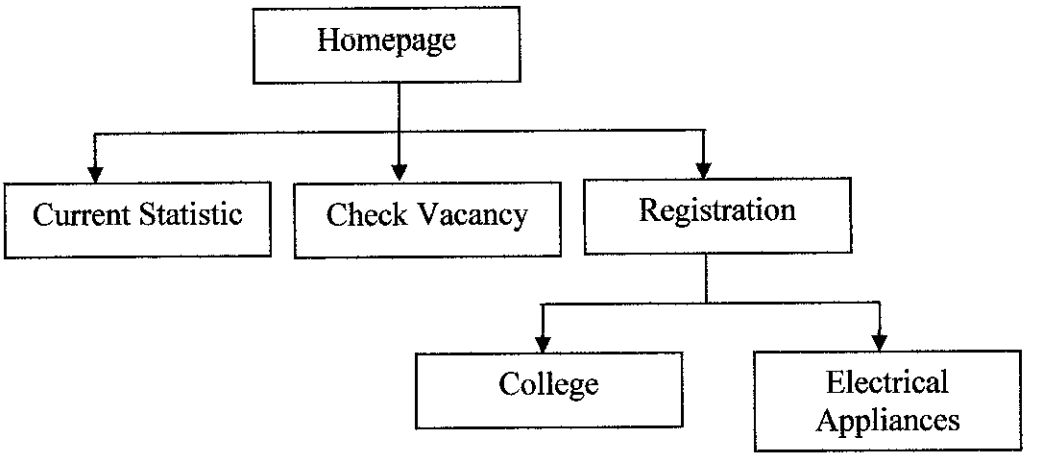
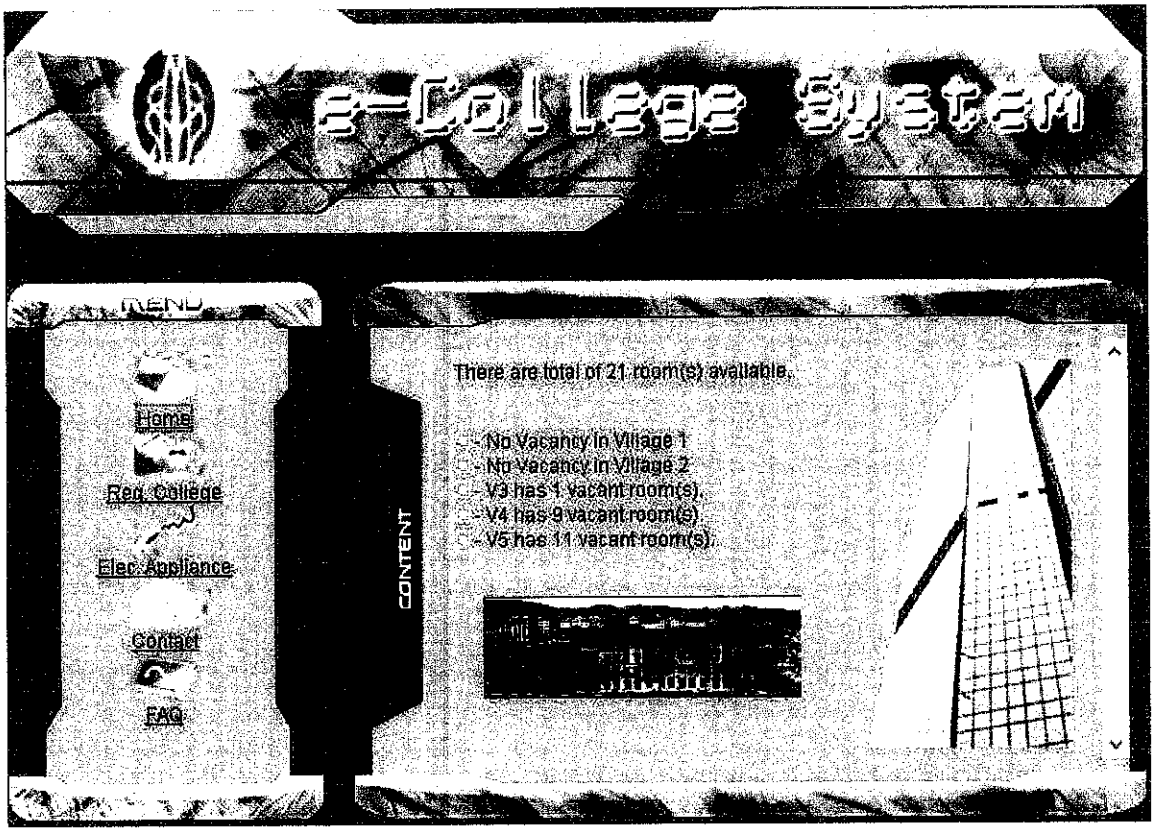


Figure 3.2: The Basic System Navigation

- **Interface Design**

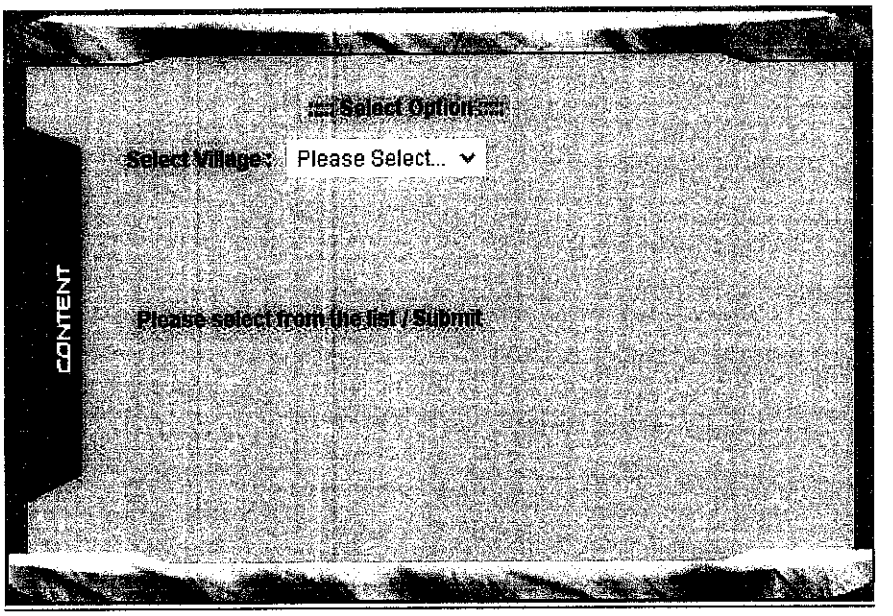
AJAX Pagination – Homepage



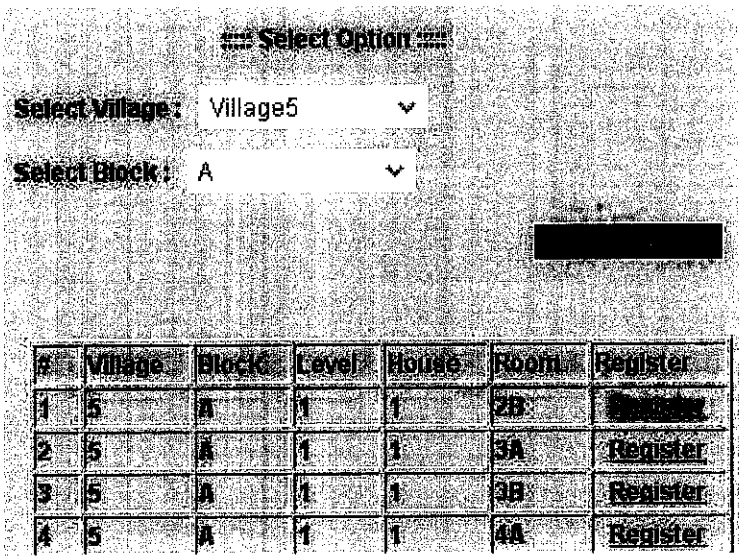
Menu Content

By implementing AJAX pagination, the web page is divided into two divisions, the menu and content. The content loading for each of division is independent with each other. The homepage is displaying the current statistic for each village. Therefore, student will notice which village that is still available to register.

AJAX Dynamic List – Find Vacancy



By applying AJAX Dynamic List in the system, the content division is divided into three sub-division which are "Select Village", "Select Block" and list of vacant room. To check room availability, the user must select village from the list given.



Then automatically, sub-division "Select Block" and Find Vacancy button is appear and after the select block from the list and button is pressed, list of vacant room is appear. By using AJAX, all of this action is done in one page.

- **UML – System Modeling**

After study the information gained from interviews and understand the operation of college registration, I came out with the system design and modelling (UML).

Class Diagram

This system consists of five classes which is student, program, block, village and electric. A student may enrol a program and register to one village. One student is allowed to register more than one electrical appliance. Note that we also added another subclass which is Block that shows each village has many block.

Use Case Diagram

The use case diagram in figure represents an elaboration for the 'Residential Registration' use case in an automated student registration system. The registration will be done by administrator through the web interface. The administrator will look the room availability. If there is an available room, the administrator will allocate the room for that particular student. Students can register their electrical appliances through this system. Students also can check their residential registration status. The users of this system are able to print out the details of registration.

Sequence Diagram

There are four form of sequence diagram which are for the Residential Registration by admin and student, Electrical Appliances Registration, and Student Update. Beside the diagram is the brief description for each of the diagram about the message being passed from one subsystem to another sub system.

State Chart Diagram

Administrator registers for a room for a student. Administrator will get student details and room availability. If that particular student has been registered then it will be cancelled. If the student has not been register yet, then he will be placed at a given village and block. After the student confirm, they will get the room number.

* You may refer the UML diagrams in the appendix (3.1-3.7).

3.2.4 Validation

This phase will be carrying out when the system is totally complete. I perform this testing to ensure all the links, process, data retrieval, displays, website layout / interface and others are correct and error free.

- **Verification and Validation**

The best defence against incorrect data is to identify and correct errors before the user enter the system by using data validation check. A data validation check improves input quality by testing the data and rejecting any entry that fails to meet specified conditions. For these testing, I have performed the existence check and the data type check. You may refer to page 26 and 27 in Chapter 4 for result of these testing.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 SPECIFICATION

Here are the results that I have gained from several activities during the outline description and specification phase.

4.1.1 Interview

The purpose of the interview is to finding out facts, verifying facts, generating enthusiasm, getting end-user involved, identifying requirements, and gathering ideas and opinions.

From the interview session with the RCSU officers, Encik Mior and Cik Noor Idahwati, I have collected a lot of information about residential college. There are five villages that are being used which are Village 1, Village 2, Village 3, Village 4, and New Village 5. Village 1 and 2 consist of 320 rooms for each of it. Each of Village 3 and 4 has 384 rooms and the New Village 5 has 1320 rooms. Therefore, the total rooms that are available in UTP Residential College are 2692. The residential registration process will start a month before the end of the semester. Whereby, students have to submit their registration form to RCSU.

4.1.2 Observation Organization In Operation

Residential College Support Unit (RCSU) is the important party that responsible in managing all the issues and provides services to assist UTP's students in locating off and on-campus housing. The registration process will be done by the students. They will fill the registration form and after that the RCSU will decide and assign which block and room number to that particular student. Therefore, all the process is done manually.

4.1.3 Research From Forums, Reference Books, Articles And Journals

I have gained a lot of useful information from the reference books, articles, journals from the internet including forums which discuss about the integration of AJAX with web development. By speeding up Web application response time, AJAX has also set a more aggressive pace for industry change and business evolution. AJAX will be fully integrated into Web application server platforms, but in the meantime, it's already begun to alter the marketplace. This enable me to clarify about what are AJAX and its architecture, why AJAX should and should not be used, how AJAX could benefit web development by increasing user satisfaction and conferring competitive advantage and some example of who is using AJAX.

4.1.4 Survey

I had conducted a survey through poll in Kampung5, which is the unofficial Village 5 forum. The purpose of this survey is to allow facts to be gathered from a large number of UTP students. I need to know how many students, who will be the end-user of the system, agree whether we need to have the UTP e-College System. From the total votes of 328 students, 89% agree that UTP should have the UTP e-College System, 2% not agree and others are just does not care. You may refer to figure 4.1 and figure 4.2 that are shown below.

- Agree 89% - It is a necessary to have the UTP e-College System in order to increase the RCSU capability in providing a better service for students.

- Disagree 2% - The small amount of students did not agree with the idea because they thought the network connection within UTP is not reliable to support the system. This caused by they did not get the exact idea because I did not explain about the benefits of using AJAX in the system which can eliminate the problem.

- Do not care 9% - Probably they just not bothered and concerned about the current situation.

Therefore, from the survey, I have received positive responses from the UTP student to develop the UTP e-College System using AJAX Technology.

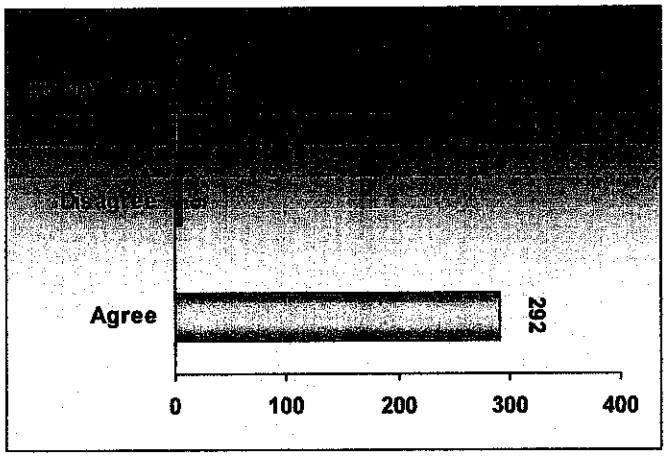


Figure 4.1: Bar Chart – Number of students who are agree/ not agree/ do not care that UTP should have the UTP e-College System

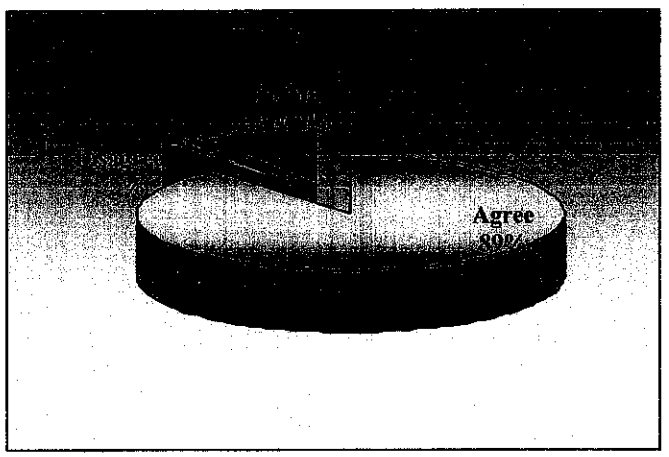


Figure 4.2: Pie Chart – Percentage of students who are agree/ not agree/ do not care that UTP should have the UTP e-College System

4.2 DEVELOPMENT

During the time that the development environment is in place, users will gain experience with the systems, displays, and products and be in a better position to determine how the system will be incorporated into their operational environment during subsequent phases of projects. The cycle continues until development time runs out in which the project schedule constraint. Here are the results that I have gained from design and development activities during the development phase.

4.2.1 Early version

Early versions of the system are presented to the client, Encik Mior (RCSU Officer). The early version of the system is not full functioning because I just design the interface and navigate the menu with some basic function. Then the system is refined and enhanced based on his feedback.

4.2.2 Intermediate version

The development environment will continue to be used after the early version is delivered to support ongoing developments and enhancements based on the feedback from Encik Mior. After the adjustment on the system is done, demonstration activity is taking place whereby the intermediate version of the system is presented once again to the client.

The intermediate version is completed with the functioning navigation button, forms and database. After receive approval from the client, the next phase is validation phase where the system will be tested with several testing procedures.

4.2.3 Final Version

The final version of the e-College System is released when test cases execution reports shows that functional and non functional requirements are met. Defects found during the system testing are either fixed after doing thorough impact analysis to know the limitations.

4.3 VALIDATION

Here, the result of two testing that I have done for the system.

4.3.1 An existence check

It is used for mandatory data items. For example, if a student is requires filling in all the text field in a form, an existence check would not allow the student to register until he/she enters a suitable value in each field. If not, the system will prompt a warning message.

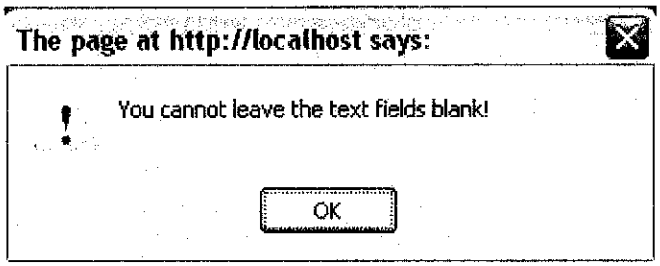


Figure 4.3: Warning prompt for existence check

4.3.2 A data type check

Tests to ensure that the data item fits the require data type. For example, a numeric field must have only numbers or numeric symbols and an alphabetic field can contain only the characters A through Z (or a through z)

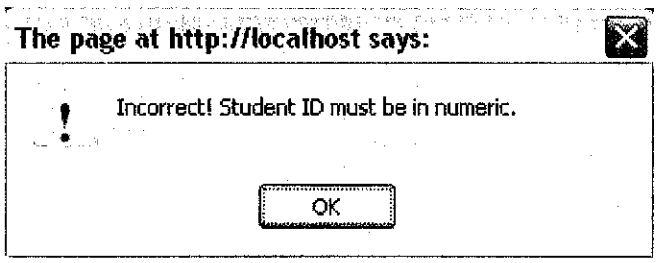


Figure 4.4: Warning prompt for data type check

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

From all the findings that I have done, I can conclude that UTP students think that it is necessary to have an online residential registration system. AJAX is great for improving the usability of the Web applications that are there today. The fact of the matter is that AJAX is here today and working, it is cross-browser and cross-platform, and both users and developers like what it can do. By implementing this technology in UTP e-College System, it will make registration process more practical for both students and RCSU.

Software architecture forms the backbone for any successful system. Architecture is the primary carrier of a software system's quality attributes such as performance or reliability. Based on our study from internet and some books, I have chosen architecture styles that suit UTP e-College System which is Distributed System Architecture.

I belief that the right architecture is correctly designed to meet its quality attribute requirements, clearly documented, and conscientiously evaluated which is the linchpin for software project success. The wrong one is a recipe for guaranteed disaster.

5.2 RECOMMENDATION

There are several risks involves with this project. The foremost risk is a lack of interest in the new system by the stakeholders who is the administrator and the students. User inputs are crucial for populating information into this system and realizing the potential benefits from using the system.

Therefore, it is very important to get close with the stakeholders so they will experience with the system. They will be better position to determine how the system will be incorporated into their operational environment. When the system development is finished, I need to provide training for the stakeholders so that they can use and manage the system properly.

The e-College system is expendable. For future enhancement, it can be integrated with the current course registration system. UTP can combine all the web-based system in one web centre. For example UTP can develop Student Web Portal which is integration of e-College system and Course Registration system so students will have one stop centre to access.

REFERENCES

Articles, Journals form Internet:

1. Brown, H. 1994, *Citing Computer References*, URL: http://neal.ctstateu.edu/history/cite.html, (accessed 3 April 1995).

2. Garrett, J. 2005, *Ajax: A New Approach to Web Applications*, URL: http://adaptivepath.com/publications/essays/archives/000385.php, (accessed 3 August 2007).

3. *Learn AJAX*, URL: http://javascript.about.com/od/learnajax/, (accessed 11 September 2007).

4. *The Incredible Ongoing Story of Ajax*, URL: http://web2.wsj2.com/the_incredible_ongoing_story_of_ajax.htm, (accessed 11 September 2007).

5. *AJAX Patterns*, URL: http://ajaxpatterns.org/, (accessed 11 September 2007).

6. Scott W, 2006, *Evolutionary Software Development: How Data Activities Fit In*, URL: http://www.agiledata.org/essays/evolutionaryDevelopment.html, (accessed 17 September 2007).

7. Wikipedia, The Free Encyclopedia, 2007, *AJAX*, URL: http://en.wikipedia.org/wiki/AJAX, (accessed 15 August 2007).

8. Roy Thomas Fielding, 2000, *Architectural Styles and the Design of Network-based Software Architectures*, URL: http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm, (accessed 15 August 2007).

9. Garlan, David and Shaw, Mary, 1993, *An Introduction to Software Architecture,* URL: http://plg.uwaterloo.ca/~itbowman/CS746G/Notes/Garlan1994_ISA.html, (accessed 20 September 2007).

10. Jen Her, Yung Cheng, Li Min Lin, 2004, *Empirical evaluation of the revised end user computing acceptance model,* URL: http://www.sciencedirect.com, (accessed 14 March 2008)

11. Chris Bolson, 2008, *AJAX Dynamic List,* URL: http://www.dhtmlgoodies.com/index.html (accessed 15 March 2008)

12. *AJAX-MYSQL Database,* http://www.tizag.com (accessed 15 March 2008)

13. P. Brunet, 2008, *Accessibility Requirements For Systems Design To Accommodate Users With Vision Impairments,* URL: http://www.research.ibm.com/systemaccessibility.html (accessed 16 March 2008)

14. Luke Wroblewski, 2007, *AJAX & Interface Design,* URL: http://www.lukew.com/ (accessed 18 March 2008)

Books:

1. Dave Crane, Eric Pascarello & Darren James. 2003, *AJAX In Action.*

2. Stone & Debbie. 2005, *User Interface Design and Evaluation*, Morgan Kaufmann Publishers, USA.

3. Galitz, Wilbert O. 2007, *The essential guide to user interface,* Indianapolis, IN : Wiley Technology Publishers.

4. Mary J, 2005,*Handbook of human factors in web design*, Lawrence Erlbaum Associates Publisher, New Jersey.

5. Addison Wesley, 2005, *Software Engineering (7th Edition)*, Sommerville Publisher.

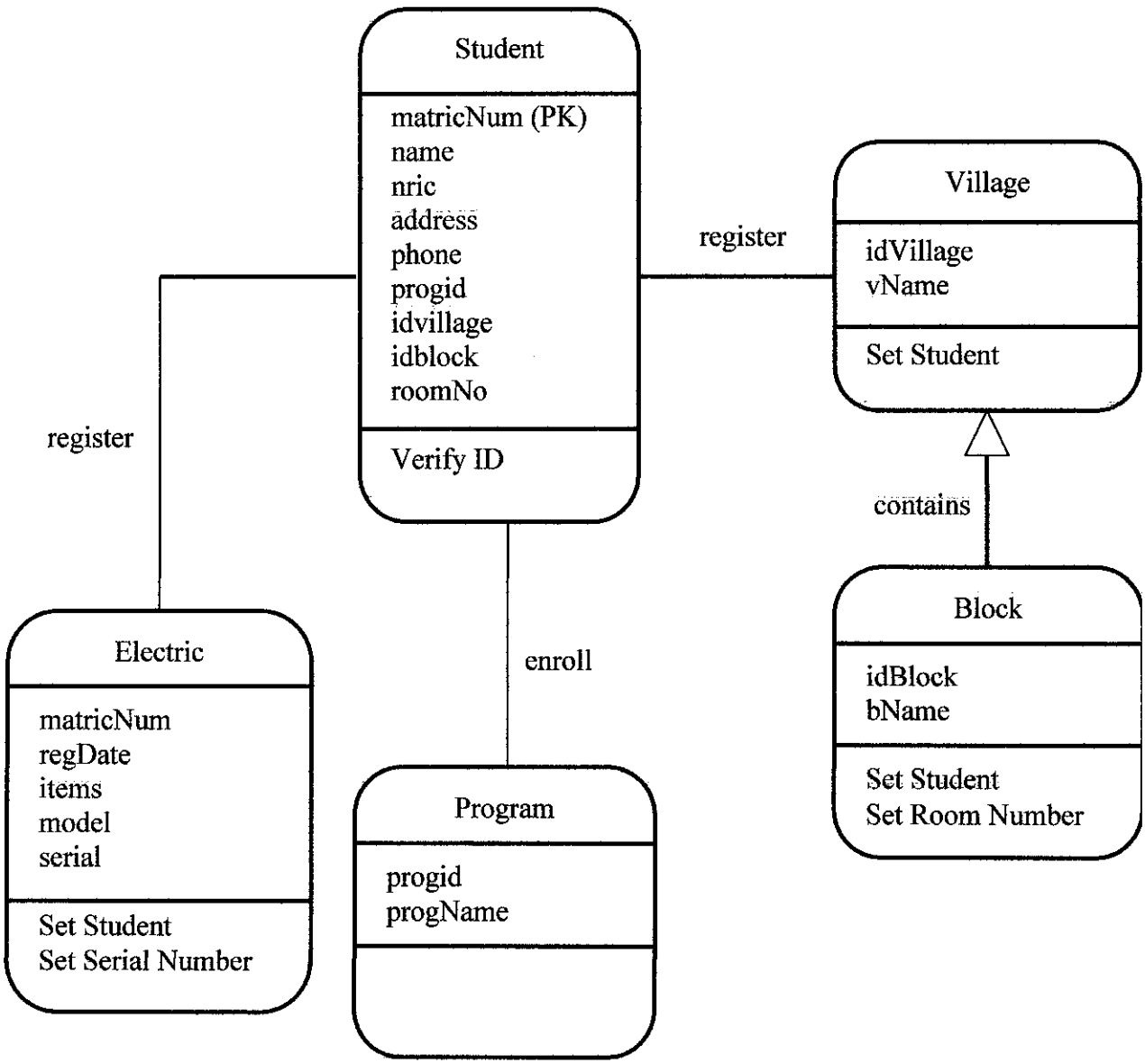
6. Garlan, David & Shaw, 1993, *An Introduction to Software Architecture, Advances in Software Engineering and Knowledge Engineering, Volume 1*, World Scientific Publishing Co.

Webs/Forums:

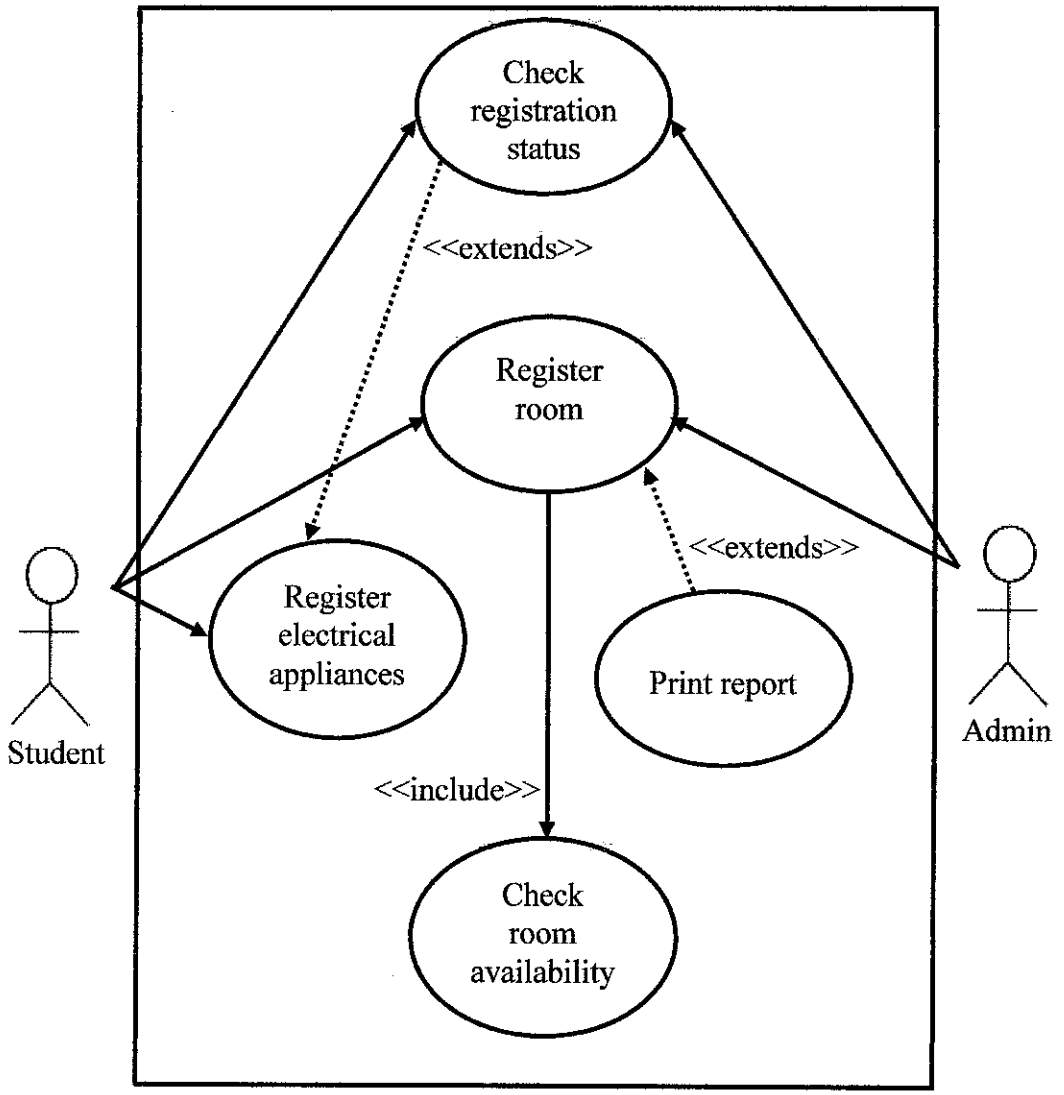
1. URL: www.ajaxtalk.com/, (accessed 24 August 2007).
2. URL: www.ajaxforums.net/, (accessed 25 August 2007).
3. URL: www.ajaxtechforums.com/, (accessed 27 August 2007).

Appendices

1 CLASS DIAGRAM

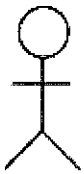


2 USE CASE DIAGRAM



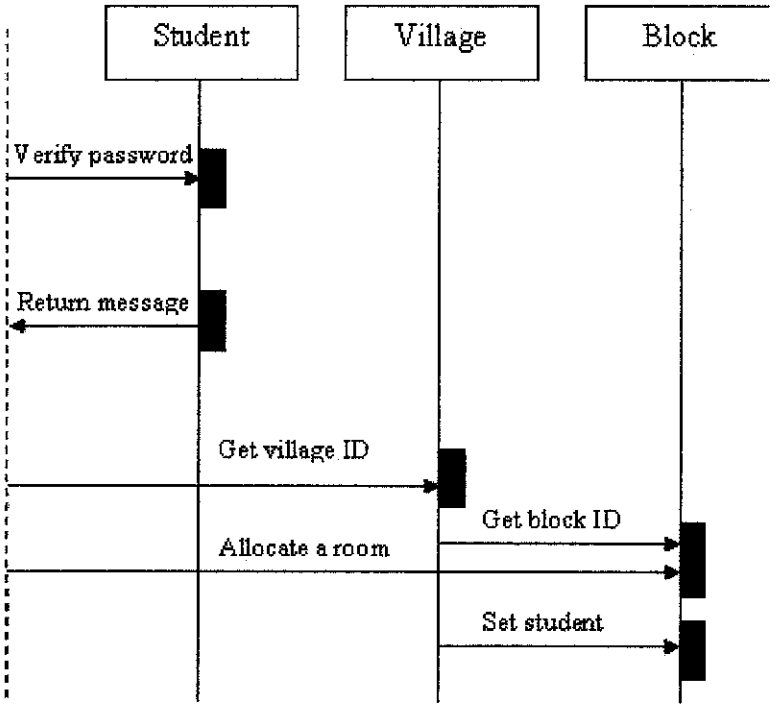
3 SEQUENCE DIAGRAM

Residential Registration by Admin



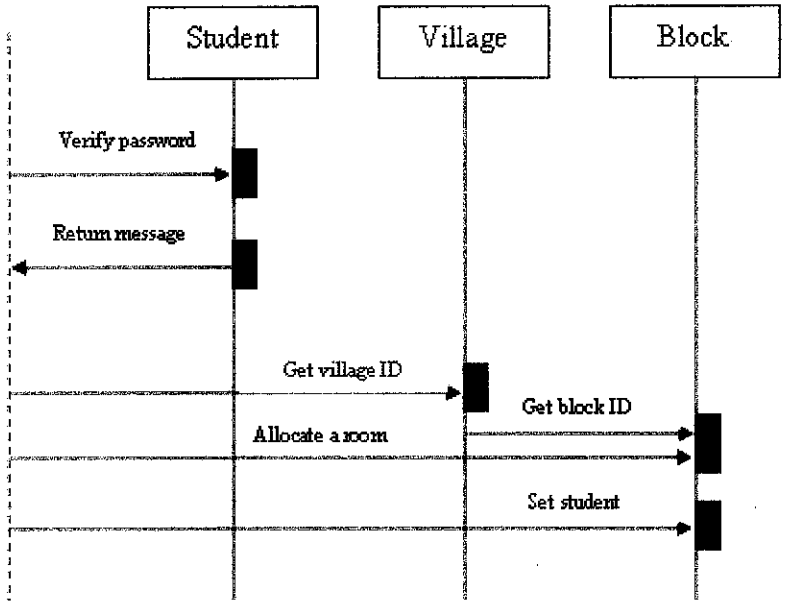
Admin

Description:
Admin key in User/password
Verification
  If matched
  Return message "Sorry, Login incorrect. Try again"
End verification
For each village
  Get village ID
  Get block ID
  Allocate a room
Set student information
  Set student
End for

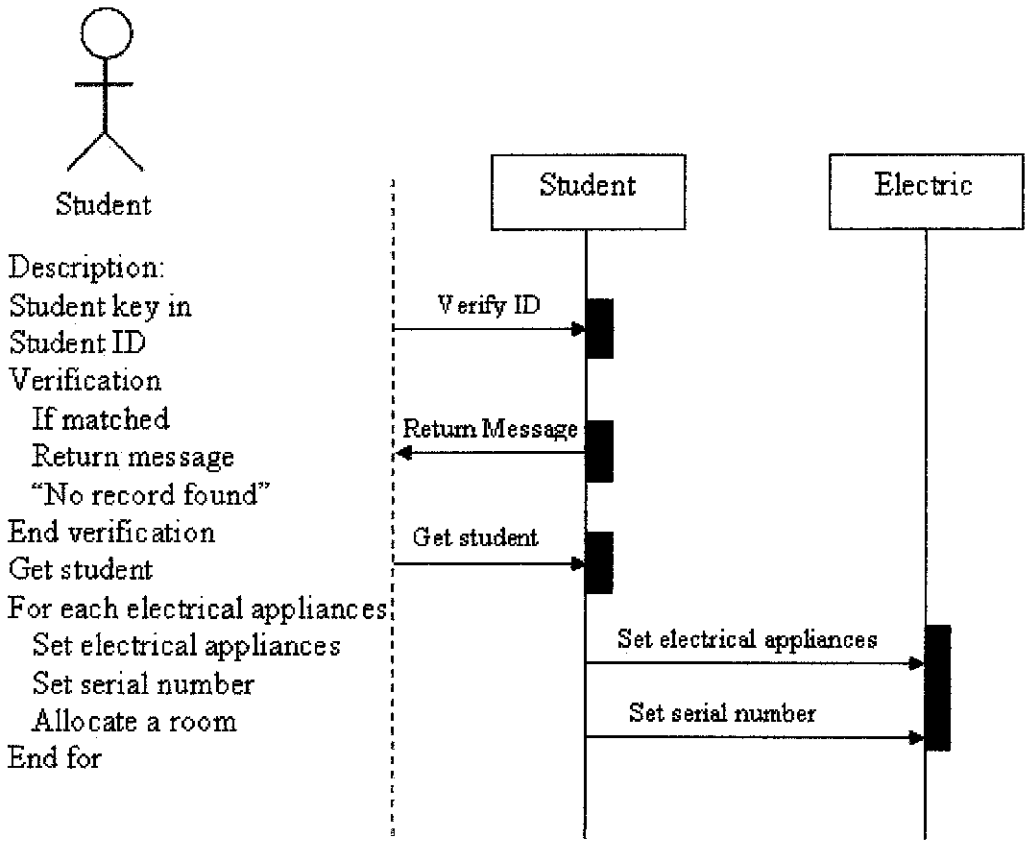


Student

Description:
Student key in
Student ID
Verification
  If matched
  Return message
  "No record found. Please
   register."
End verification
For each registration
  Get village ID
  Get block ID
  Allocate a room
Set student details
  Set student
End for



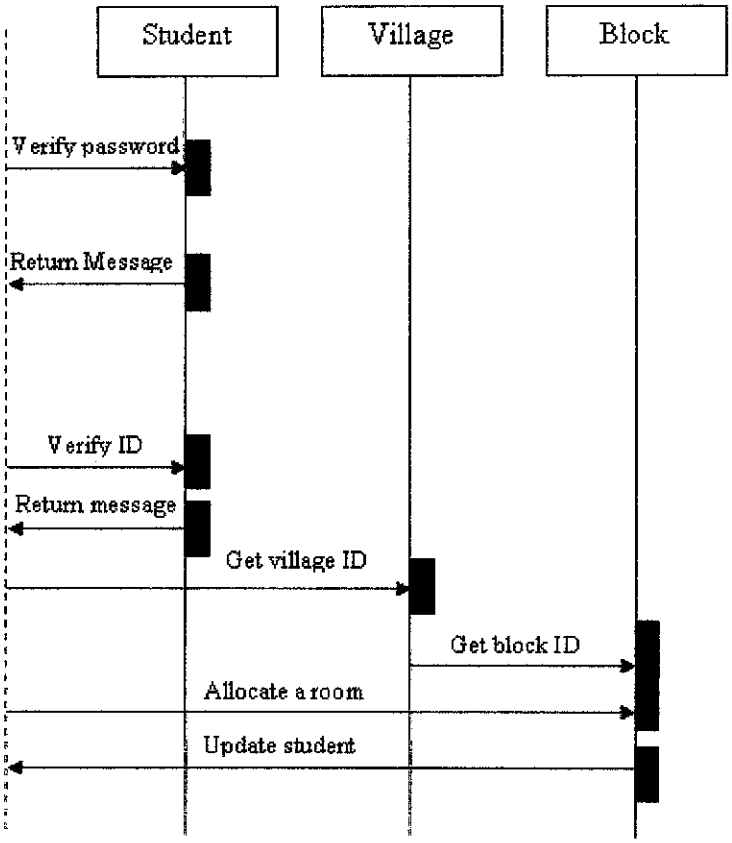
Electrical Appliance Registration by Student



Student Update by Admin

Admin

Description:
Admin key in User/password
Verification
  If matched
  Return message
  "Sorry, Login
  incorrect. Try again"
End verification
Student ID verification
  If matched
  Return message
  "No record found"
End verification
For each village
  Get village ID
  Get block ID
  Allocate a room
Update student information



4 STATECHART FOR STUDENT