Consumer Trend & Behavior Management Framework

by

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A project dissertation submitted to the

Computer and Information Science Programme
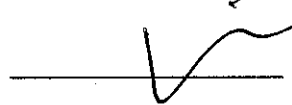
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in partial fulfilment of the requirement for the

BACHELOR OF TECHNOLOGY (Hons)

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Certificate of Originality

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

Liyana Nurulain Binti Zulkefli

Abstract

The objective of this project is to come out with a framework to enhance the management of money as well as the demand and supply of goods in UTP. This framework will be implemented in all transaction within UTP. UTP supply and demand of student is hard to predict. Management of money is a hassle and minor error can cause severe damage to the organization. Therefore, this project study will focus on the UTP demographic and environment. Customer Relationship Management technology is also part of the study as the end system will be implementing Customer Relationship Management basic idea due to its effectiveness result. In gathering the information, surveys and questionnaires were distributed to some of the users in UTP. The survey result was then analyzed to understand the user experience and expectation towards the new framework. A sample size of 35 students for the questionnaire was done. The results were collected and analyzed to come out with the best recommendation for the new framework. The aim of this system is to introduce a more effective and efficient framework to be implemented in all transaction within UTP. The system will be available in cafeteria, bookstore and Kopetro. The implementation using CRM framework is seen as a good foundation to start with.

Acknowledgement

First and foremost, I would like to express my heartiest gratitude to Allah the Almighty, for that without His grace and mercy, I would not be able to make it through this journey till the very end.

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Thank you.

Chapter 2: Introduction

Problem Statement

Food supply and demand in UTP is unpredictable therefore causing inconsistency, inefficient and ineffectiveness in the management of student demand. This is because most cafeterias are mostly having problems with the student demand. The amount is either too much or too little causing problems for both students and cafeteria managements. Food variety is also seen as a problem as the same food is served everyday in UTP.

The demand and supply becomes a big problem when the surplus or shortage occurs in the demanded item supplied by each shopper. When a surplus occurs, the shoppers have problems like food storage and cost consumption that they need to absorb. This is where the inefficient and ineffective management happens. When shortage on supply happens, the student satisfaction and loyalty is tarnished making them reluctant to have another visit to that particular shopper. These shoppers will lose so many income and consumer if this keeps on going unsolved.

This system is aimed to cover the bits and pieces of each problem by coming up with a CRM framework that will be implemented throughout UTP. It will be implemented in the cafeteria, bookstore and Kopetros in UTP. The project feasibility and time line is attached in the appendix with that is logical to cover all scope of the project information gathering and project deliverable submission.

It is relevant to implement this framework because of the aim of this project itself. The student demand is seen to be exceeding supply therefore Customer Relationship Management solution approach is the most suitable and relevant approach to go for. Implementing digital wallet will also ease everyone in automating the processes.

Project Significant

To measure the significant of the framework and system, feasibility study is conducted to identify the possible risk that will imply to the developed system. There are three categories of feasibility study that is technical feasibility, economic feasibility and organizational feasibility.

For technical feasibility, familiarity of the functional area will be analysed. In order to develop the Consumer Trend & Behaviour Management Framework, the developer needs to have a strong understanding on the consumer behaviour and preferences. Because the system will be implementing Customer Relationship Management approach, this area of information needs to be taken into consideration. CRM area knowledge of the developer is in the middle position. Further research needs to be done to strengthen this area. Familiarity of the technology that is going to be implemented for the system is also being analysed. The developer chose to implement the system using HTML, PHP, SQL, wordPress and XML. This is because of the need to have the database virtually accessed from anywhere anytime. The familiarity of the tools is also quiet high as there was experience in developing a system on these tools during the second year of undergraduate study.

Economic feasibility is also looked into to consider the cost of the system development. The cost of the development is bearable but it requires budget on the hardware device. The hardware however is seen a problem as the hardware cost itself is high and the developer does not have the resources for such a cost. The intangible cost on the other hand will measure the satisfaction of the user. The efficiency and effectiveness of the system will also contribute towards the intangible cost satisfaction.

Organizational feasibility will analyse the user acceptance level towards the system. Based on a survey done, 86.8% of UTP students are willing to accept the digital wallet system in their day to day activity.

Based on the problems foreseen in the above situations, it is a good foundation to introduce such system that can minimize the issues stated. It is seen to be significant to be implemented within UTP and its organization. The acceptance of the users is also giving great feedback and impression through the implementation of this system and framework. Through the system implementation, it can increase the effectiveness and efficiency of the current student demand and supply process.

The relevant time given is estimated to be enough to develop and implement the system by the end of FYP2. Based on the Gantt chart, the time allocated for research is completed according to schedule and the project development can start by the end of week 1 next semester.

Project Objective

System prototype objective:

1. To enable tracking the demand and supply of the resources needed for the cafeteria management.

2. To track money flow and expense trend of each student on what item is high demand and profitable.

3. To be able to track the buying trends of each student and provide the right amount of supply within a demanded period.

4. To implement the Consumer Trend & Behaviour Management Framework based on the design requirements.

Main objective:

1. To study the pros and cons of the project that is going to be implemented.

2. To come out with the suitable framework for the background of each process and concepts that will be implemented for the prototype.

3. Applying the most suitable method of data collection and implementation of the prototype.

4. Implementing the best solution in developing the prototype.

Background of Study

Consumer Trend & Behaviour Management Framework is a system to enable digital wallet transaction available within UTP. This prototype is similar to Touch "N" Go and CIMB Tab program. The primary goal of this prototype is to enhance the demand and supply not only through the student food supply but also other student necessity such as their books as well as miscellaneous expenses. The idea is to develop a platform to enhance the supply and demand of the student's need. Several concepts will be studied to ensure that the best strategy is being implemented for the system. The buying trends of each student are tracked to promote effectiveness and efficiency in managing the student demand internally.

There are several fields being identified for the study of this project. It covers the study of the system and the output concepts that are relevant to the prototype. Potential field to be studied includes Customer Relationship. The buying trend and behaviour of the buyer is the major areas to focus into developing the system.

According to the Wikipedia, Customer Relationship Management is defined as a widely-implemented strategy for managing a company's interactions with customers, clients and sales prospects. It involves using technology to organize, automate, and synchronize business processes—principally sales activities, but also those for marketing, customer service, and technical support. The overall goals are to find, attract, and win new clients, nurture and retain those the company already has, entice former clients back into the fold, and reduce the costs of marketing and client service. Customer relationship management describes a company-wide business strategy including customer-interface departments as well as other departments.

The database of the prototype is updated real-time. These results will then be projected in a graphical format to ease the understanding of all parties; students and shoppers. Through these reports, shoppers can predict the best thing to do in ensuring the supply is sufficient with the UTP students demand.

The purpose of this project is to enhance the management process in UTP. It is also aim to provide a platform for improvement to customer service areas such as cafeteria, shops and bookstores. The new system is hoped to be able to provide a digital wallet transaction within UTP to promote efficiency and effectiveness in a technology and researching university. This prototype provides innovative CRM solution offering a broad scope of services and technology applications for managing cards, POS integration, and back-end operational processes. Some of the achievement that this system aims includes integration of resellers with customers; students and lecturers as well as gaining better knowledge for market supply and demand. Not only that, the usage of CRM concept in the system is to have a more articulated market segment and leading to an improved ability of resellers to forecast changes in market requirements and expectation. Through these changes, the resellers can also focus on the supply to be able to respond quickly and adequately to demand requirements.

Project Background

The overall system works by identifying the transaction information in the system. The transaction will then be captured and stored inside the centralized database. These transaction tracking will then be identified and maintained so that a precise and accurate information of the behaviour and trends of the students demand can be tracked and interpreted correctly.

The student has the ability to view detailed information of their own buying trends and expenses. Information like the items bought and the price of each bought thing is captures and displayed in a table format.

As a user of the system, the students, the administrator and the shoppers have the ability to comment on the latest updates and promotion. The shoppers have the advantage of promoting their product through the system. The daily sales of each categorized item will be projected in a graphical format.

Finally, the student demand and buying trend will be recorded for future reference. The graph can only be viewed by the administrator and the shoppers. With the help of the graph, the shoppers have the ability to plan their daily supply effectively based of the students demand trend and buying behaviour.

Scope of Study

The scope of study will be done within the scope of UTP users. This includes by getting feedbacks and answers from the potential users and investors. The study also covers the culture and the acceptance of the UTP society towards the new improvement that will be adapted to their environment.

Strategic and environmental studies of the university also cover by the end of this project. This includes the study of networking, communication and the demographic study of the test environment. Different areas will be verified and surveyed according to user preference for the upcoming prototype. This is to ensure that the society acceptance level is at par with the prototype that will be implemented within UTP for the transaction purposes.

Based on the result, the basic elements that are expected of each user of the system is crafted so that it suites their daily routine and lifestyle. A suitable methodology is needed to craft a perfect prototype for the demographic and the culture of UTP organization and people.

Chapter 3: Literature Review

Literature Review

CRM is about creating sustainable connections between an organization and its customers. It evolved in the late 1990s as a way to redefine customer and company relations, mostly with the help of computerized measurement tools. As with many significant undertakings, undergoing a CRM review requires learners to analyze technical and complicated systems. Based on CRMguru.com, CRM is a strategy used in a business focusing to select and manage customers for optimize long term value. On the CRM portal as well, the experts mentioned that CRM requires customer – centric business philosophy and culture to support effective marketing, sales and service processes which can enable effective Customer Relationship Management through the usage of CRM application. Traditional CRM may be defined as a process that balance the use of corporate resources with the satisfaction of customer needs (Fjermestad & Romano, 2006). Traditional CRM looks at outputs in terms of revenue and profit while taking customer value and motivation into consideration (Fjermestad & Romano, 2006).

The use of technology in CRM architecture is required to automate the front-end processes which integrate them into operational system to feed information to the data warehouse and data mart. The CRM environment is made up of Analytical CRM, Operational CRM and Collaborative CRM (Rajola, 2003). In analytical component, data warehouse and data mart plays an important role. These data will be converted into systemized information to provide better understanding of the business process and promoting better service to customer. Operational component on the other hand supports application integration and supporting activities in back office, front office and mobile office activities. Collaborative CRM allows simplification for customer-bank contacts through the most suitable channel (Rajola, 2003).

Both theories and case study have demonstrated that top management plays a crucial, wide and well defined role in a CRM project. Agreement on the idea of

introducing such a thoroughgoing going change must be consistently supported by constant monitoring, checking, sponsoring and leading the transformation process (Rajola, 2003).

Operational part has an active role even if it is not directly involved. According to Rajola, the positive effects of CRM must be accepted and even supported by the operational information system (Rajola, 2003). Rajola also mentioned in [3] that the right people are required to maintain and manage the system. Choosing the right people and providing right training is a necessity to ensure the successfulness of the system. One milestone in the evolution of CRM is the use of embedded analytics in the operational and collaborative CRM application. Analytics however has become a real-time tool for understanding the transactions and the data that operational and collaborative CRM evoke (Greenberg, 2002).

In the context of eCRM, effectiveness or efficiency success includes the ability to tailor the goods or the services provided throughout the supply chain to the needs of each member using an analysis ordering and related information. The success of eCRM may also be measured in a similar fashion with the supply chain operations reference model metrics (Fjermestad & Romano, 2006). eCRM accomplish the same task of traditional CRM with the benefit of electronically gathered information, and in such a way as to tailor the service level specific to each to each customer (Fjermestad & Romano, 2006).

Visible Results has developed two distinct loyalty programme offerings: the unique, sophisticated and highly differentiated Graphicard™, and the entry-level Loyalty Express™ (LEx™) that features one of the most powerful analytics solutions in the industry (Visible Result). Clients use Visible Results' proprietary and marketing solutions to influence consumer behaviour. They accomplish this by:

- engendering purchase preference - increasing brand affiliation via hard and soft benefits provided in return for directed spend

- increasing the wallet-share of existing customers - decreasing spend lost to similar/ competing retailers
- increasing basket lift - giving customers reasons to spend more on targeted products and categories
- improving gross margin - giving customers reasons to buy higher margin products
- increasing customer purchase frequency - driving customers back in store more often

Adding to the uniqueness of the Graphicard™ platform is the "read/write" capability of the Graphicard™ terminal which allows the magnetic stripe on the back of the card to be updated every time it is presented. The card acts, in effect, as a self-contained database. The Graphicard™ can be used at any terminal within a retail network without extensive network communication expense. The terminals can be configured to operate in freestanding mode using the integrated keypad to enter transaction information, or be fully interfaced with the retailer's point-of-sale (Visible Result).

A Purchase Card Program has proven to be one of the more prominent and successful reforms that the Department of Defense (DoD) has undertaken in the procurement arena (Department of Defense Purchase Card Program).

Based on the points and opinions above, the developer of the Consumer Trend & Behaviour Management Framework fells that instead of using the traditional Customer Relationship Management, this prototype will be implementing eCRM solution. According to Robert Thompson, the President of Font Line Solutions Inc, eCRM Technology provide a more systematic way of managing customer relations on a large scale. CRM application has the ability to support in areas like marketing, sales, commerce, and service processes (Greenberg, 2002).

In the accepted META Group – driven, CRM is being classified into three segments that are operational, analytical and collaborative CRM (Greenberg, 2002).

So based on the opinions and finding above, analytical CRM is the most appropriate scope to focus in implementing the suitable segment required for the Multipurpose Smartcard prototype. This is because the Analytical CRM concept is the key success factor to this system. It functions in capturing, storing, extraction, processing, interpreting, and reporting of customer data. The value of this application is not just the algorithm and storage, but also the ability to individually personalize the response.

The usage of Consumer Trend & Behaviour Management Framework prototype is more or less to enhance and track the students' needs and requirements. This is possible through the functionality of tracking the students' buying trends and buying characteristic. This prototype will be implemented throughout UTP in managing the student transaction. The objectives and implementation is possible to be implemented in UTP society.

Each transaction will first need to be notified with the centralized database where it will connect to the database to retrieve the information needed. The total price of the items will then be calculated and the amount of item will then be deducted from the database where real – time update is implemented here. This is possible through the usage of eCRM.

Web application interface design is, at its core, Web design; however, its focus is mainly on function. To compete with desktop applications, Web apps must offer simple, intuitive and responsive user interfaces that let their users get things done with less effort and time (Fadeyev, 10 Useful Web Application Interface Techniques, 2009).

Elements like padded block links, typesetting button, contrast and colours of an element, spacing, auto-focus, hover control and verb usage can give tremendous

result on a website to a user (Fadeyev, 10 Useful Web Application Interface Techniques, 2009)

Functionality and website user-friendliness is an important factor of user acceptance of the system (Fadeyev, 10 Useful Web Application Interface Techniques, 2008)

Many have written about the Three Click Rule. For instance, Jeffrey Zeldman, the influential web designer, wrote about the three click Rule in his popular book, Taking Your Talent to the Web. He writes that the three click Rule is "based on the way people use the Web" and "the rule can help you create sites with intuitive, logical hierarchical structures" (Anderson, 2009).

On the surface, the Three Click Rule makes sense. If users can't find what they're looking for within three clicks, they're likely to get frustrated and leave the site. The Three Click Rule should be implemented by avoiding to put important information on your site that is more than 3 clicks away from an entrance page" This way it will ensure visitors see the important content of the website before they leave (Anderson, 2009).

According to the Three-Click Rule, most people give up after three clicks. However, in a study, users often kept going, some as many as 25 clicks. Based on the data collected, the Three-Clicks Rule is just a myth (Porter, 2003).

Clicks to Completion
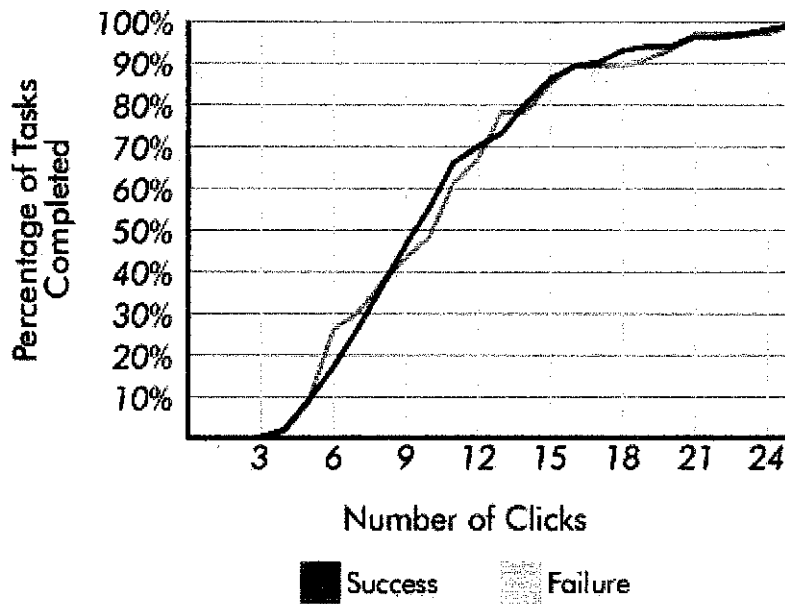
Figure 1 : Click Graph

User experience design incorporates most or all of the above disciplines to positively impact the overall experience a person has with a particular interactive system, and its provider. User experience design most frequently defines a sequence of interactions between a user (individual person) and a system, virtual or physical, designed to meet or support user needs and goals, primarily, while also satisfying systems requirements and organizational objectives (User experience design, 2001).

Chapter 4: Methodology

Research Methodology

The research methodology will cover the methods of completing FYP. At the end of this semester, an interim report is the final deliverable. A thorough research on the project background and job scope is needed to ensure the right method is being adopted to obtain the best result out of the course. In order to maintain consistency in getting the result, a few methods are implemented in the data collection method. They cover surveys, questionnaires and data analysing.

In obtaining the right data and result for the deliverables, the right pool of candidate will be identified. Different user feedback will be obtained through questionnaires and surveys. Electronic and traditional method of questionnaires and surveys will be distributed to the pool of candidates according to their level of usage. This is to obtain the accurate and precise findings on how the user will act towards the new system.

The candidates will be categorized by their level of usage. Based on their user level, the questionnaires and survey questions will be distributed. Different question will be distributed to according to the user level. This is to obtain the characteristic of the system design preference of different user. Based on the result, the system will be developed according to the user preferences. This way, it will provide a system that is accepted widely and with high quality performance.

Through good survey, the developer can obtain information such as user mobility, degree of complexity to the user usage level, usage frequency, data modification if required, scalability and the cost. The cost includes the cost of building the system as well as the cost of providing the system for each user. Not only that, the cost will also cover the possible cost that the users are willing to accept on their behalf.

Other than that, data analysing is also one of the methodologies to obtain data and information. Data mining is a component of the knowledge discovery process which can be defined as a set of techniques that allow data analysis and exploration in order to discover significant rules or hidden models within large archives by means of an entirely or partially automated procedure (Berry, Linoff, 1997). Based on the survey and questionnaire results, the data will be analysed and graphed. This is to ease the reporting and recording process of each result. These data will be analysed and plans will be drafted based of the result and requirement.

The results of the research will be collected and graphed to collect the user preferences and usability needs. Based on the result, the trends are collected and the system design will start to take place. The technical concepts of the systems are also integrated in the system development phase. The most suitable system development methodology is then selected according to the most relevant requirement and concepts that need to be implemented based on the timeline and user requirement specified. Feedback from the system users will also be collected to ensure that the system is user friendly and easy to be used. A standard needs to be met to ensure the system is feasible for UTP environment.
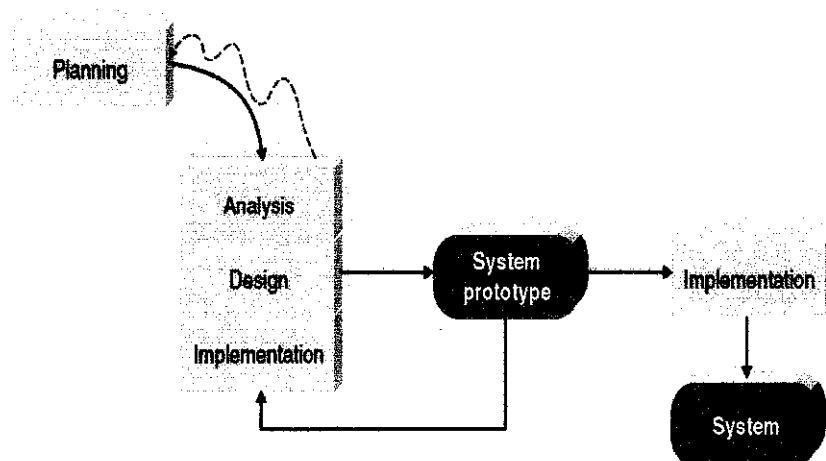
Figure 2 : Rapid Analysis Design Methodology

Because the timeline of the project is tight, the most suitable methodology to equip the development of the system is Rapid Analysis Design Prototyping. By using

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this type of methodology to design the prototype, the development process can be done on a faster pace. The system is being developed part by part where each part can be tested directly by the users to have a better understanding on how the system works. Versions of each module will be developed one by one to have a partial running system to work with. The system refinement can be done directly once tested therefore having a stronger foundation of the system itself. User familiarity of the system is also more efficient as the complete version can be used directly while waiting for the whole system to complete. The complete, perfect and smooth running prototype will turn up to be the running system by the end of the timeline.

Through the planning phase, a set of requirements is set for a particular version development based on the result from the user and system sponsor. The features and layout of the interface and program interaction is being laid out specifically based on the best solution agreed upon the two parties.

In the analysis phase the features and functions of the version will be laid out. The behavioural and functionality of the decided version will be presented in a diagram to ease the understanding of the system. The database connection and interaction is also plotted in this phase. This diagrams needs to be planned thoroughly so that the system design will be conducted smoothly and more efficiently. Once all the analysing phase has completed and understood well, the design phase can start.

In the design phase, the system development process will take place. This development will be based on the results crafted from the analysis phase. The layout and the system function will be coded and tested. Throughout the development of the system, tools and available source codes will be retrieved if necessary to ease the development of the system. A dry run environment will need to take place to test out the completed version is running perfectly before handing it to the users for testing purposes.

The user testing will be conducted in the implementation phase where the completed version will be setup in cafeterias and kopetro for the usability test to take place. After 3 days of testing, the feedback and comment from all level of users will be collected. The comments will be the foundation of the system enhancement and modification of the tested version. Once the enhancement and modification is completed, the current complete version will be used for the time being until the next version has completed its development.

The whole planning, analysing, design and implementing will be done repeatedly until the whole system development is completed. The whole version of the system will be compiled together and final unit and system test can be conducted. Once the testing phase is passed, the completed system prototype will then be implemented as the final product to be used within UTP.

Chapter 5: Project Activity

Flow Chart

```
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│  Transaction expense │  ⇨  │    Transaction       │  ⇨  │ Total sales of the  │
│     takes place      │      │   information is     │      │   shop is calculated│
│                      │      │     captured         │      │                     │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
                                                                      ⇩
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│                      │  ⇦  │  The trend is        │  ⇦  │  The demand  and    │
│  End of transaction  │      │  projected in a graph│      │  student buying trend│
│                      │      │                      │      │  is recorded into the│
│                      │      │                      │      │     database         │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
```
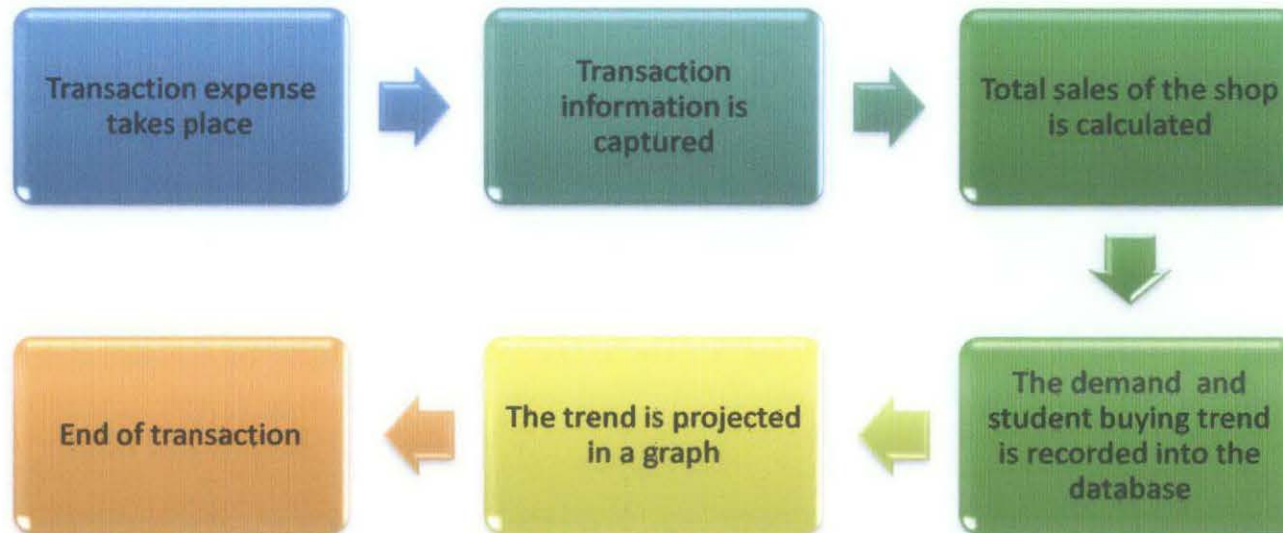
Figure 3 : Program Flow Chart

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Use Case Diagram

Figure 4 : Program Use Case Diagram

The diagram contains the following use cases: Money Transfer, Scholaship Transfer, Money Transfer to Shop, User Registration, Transaction Calculation, Buying Transaction Calculation, Balance Calculation, Retrive Current Balance & User Information, Database, Input Retrieval, Retrive Total Transaction Amount Keyed In, Update Database, Record Buying & Spending Trend.

Actors: User, Petronas, Shop, Admin, Student.
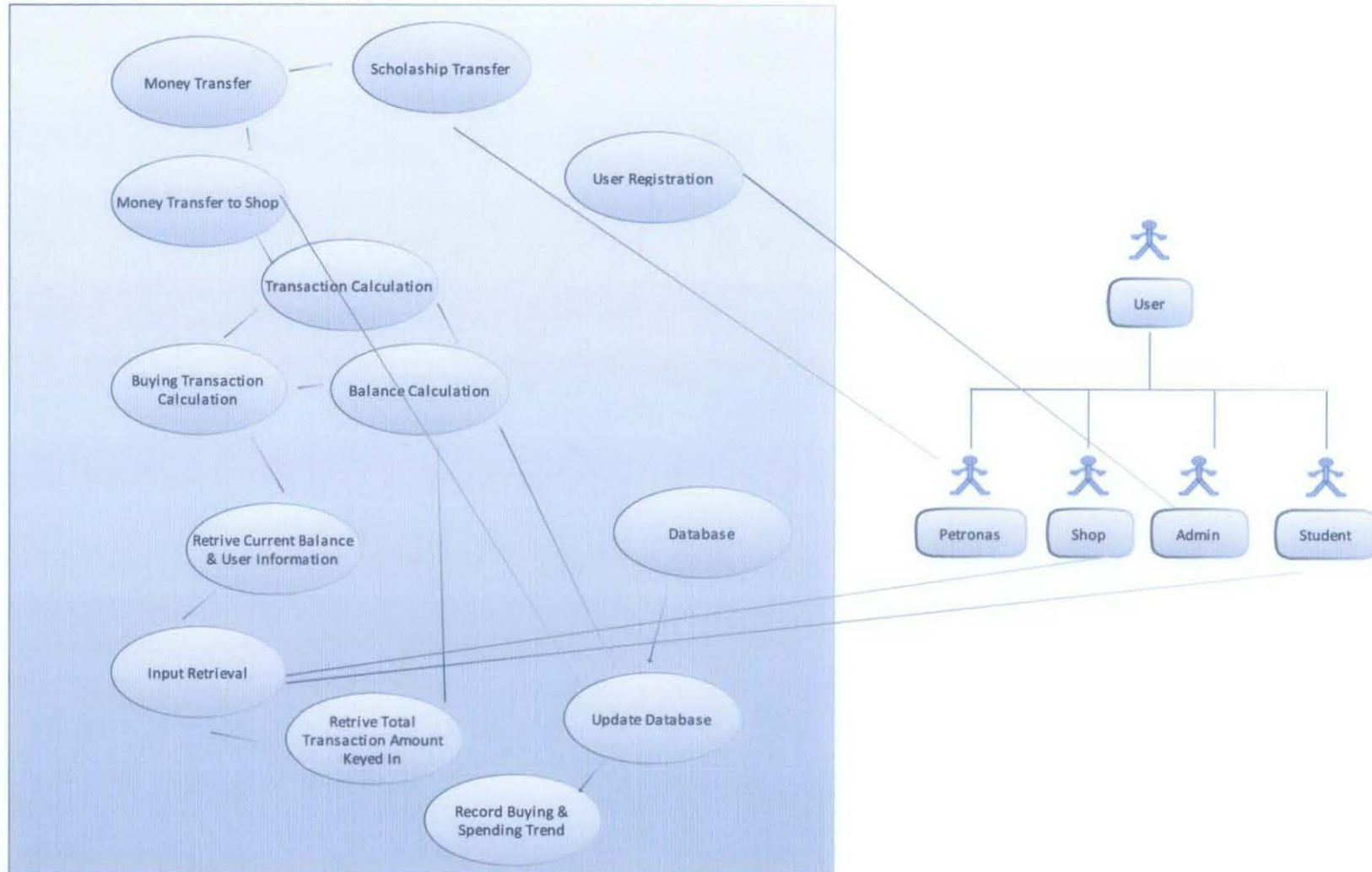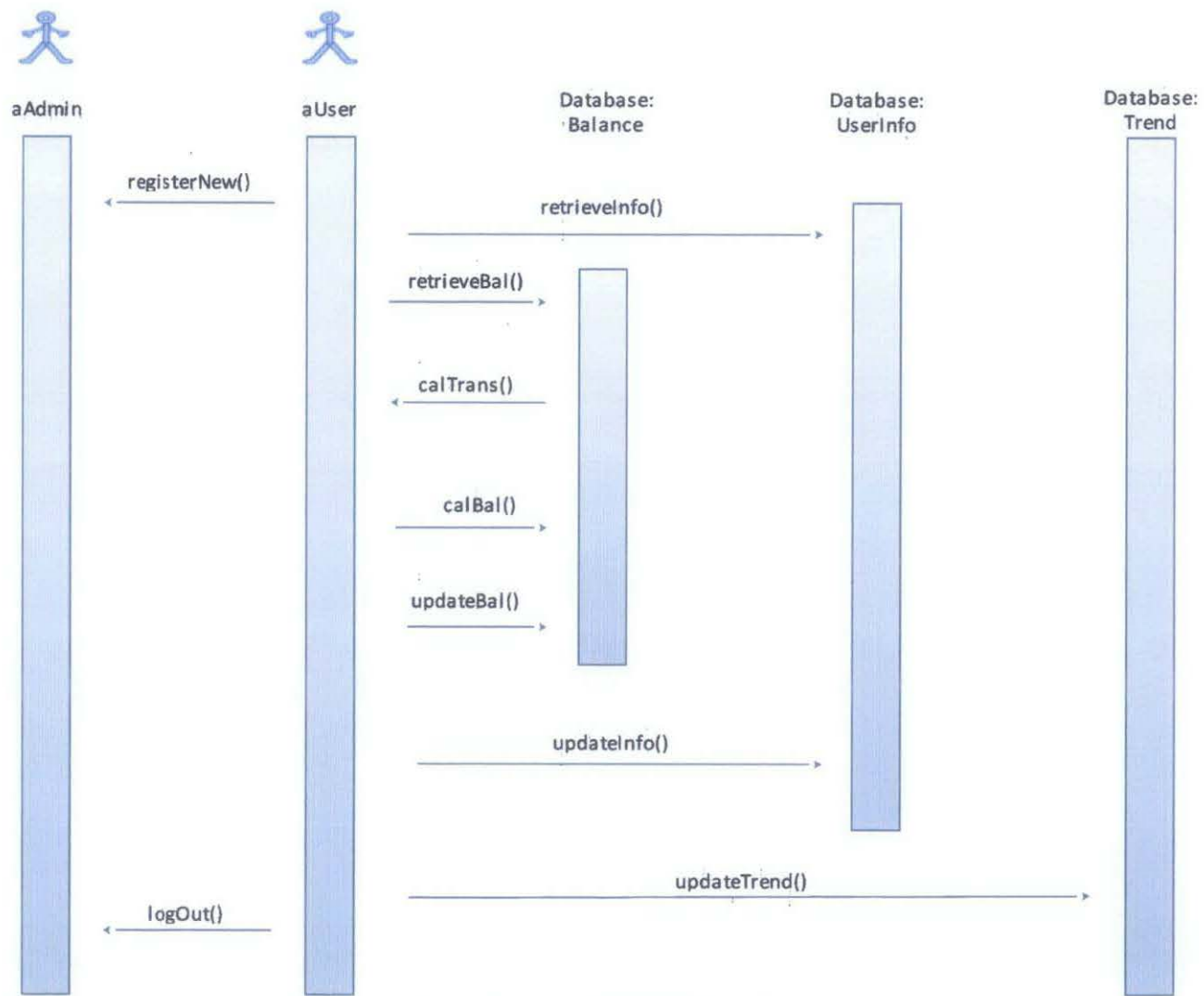
Sequential Diagram

Figure 5 : Program Sequential Diagram

Deployment Diagram
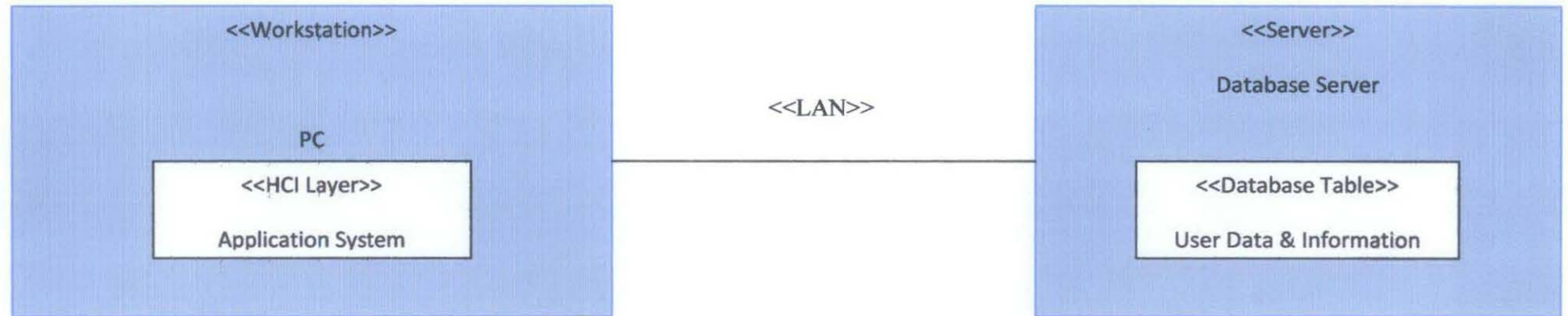
Figure 6 : Program Deployment Diagram

Development Tools and Hardware

The system prototype for Consumer Trend & Behaviour Management Framework is planned to be an online system. By developing online system, the development tools required are mostly internet based tools. Some of the internet based tools that is use for development are HTML, Javascript, PHP and SQL. Tool like Cascading Style Sheet (CSS) is used to produce consistent output for the whole system. These are the essential tools needed to develop an internet based system. Automated tools like flash might be used for developing the interface. Tools like to enhance the development of the system like BlueVoda is seen to be a great help in developing the framework because of its automation function in certain component that enables the system development process to be more efficient.

The usage of internet based CRM system is to enable the database to be available anywhere around UTP. Using tools like Visual Basic, C++ and Java is not efficient as the system will only be available in the installed machine. To ensure real-time update is applicable, an internet based technology is the most appropriate approach. Not only that, the developer is also equipped with the tools algorithm therefore reducing the risk of the system development process. Foundation information on internet programming is able to equip and facilitate through the system development.

There are also many resources and source code in helping to enhance the system. The source codes are widely available on the net. Not only that, there are many lecturers in UTP who are well versed with the internet programming language in case of any assistance and guidance needed. A working domain is part of the requirement for the database foundation setup.

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Tools Required

1. Xampp

Xampp is a free and open source cross-platform web server solution stack package, consisting of mainly of the Apache HTTP server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages.

2. Visual Studio

Microsoft Visual Studio is an integrated development environment(IDE) from Microsoft. It can be used to develop console and graphical user interface application along with Windows Forms application, web sites, web application, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight.

3. NetBeans

Netbeans refers to both a platform framework for Java desktop applications, and an integrated development environment (IDE) for developing with Java, JavaScript, PHP, Python, C, C++ and others.

4. Programming Languages

- **eXtensibleHypertext Markup Languange (XHTML)**

  XHTML (eXtensible Hyper Text Markup Language) is a family of XML markup languages that mirror or extend versions of the widely used Hypertext Markup Language (HTML), the language in which web pages are written. Features of XHTML is:

  i)   Could be writing using several of software such as notepad etc.

  ii)   Does not need compiler and can be read by almost all explorers.

  iii)   May included java, image, button, sound lots more to the source.

- **Hypertext Preprocessor**

  PHP is a server side scripting language that can be used in a variety of platforms such as Linux, UNIX, and major Windows. The main objective of PHP is to be to allow web developers to design web pages dynamically.

  Among the advantages are:

i) PHP can be used with a large number of relational database management systems, runs on all of the most popular web servers and is available for many different operating systems.

ii) The syntax of PHP is very easy to use and learn. PHP is usually mixed in with HTML and can be easily included in HTML files

iii) Having a short life cycle.PHP always is updated regularly in accordance with the development of internet technology.

5. Web Server

- **Internet Explorer**

   Internet Explorer (IE) is web server developed by Microsoft and it is one of the software in Microsoft Windows package. Internet Explorer had beed designed to view a broad range of web pages and to provide certain features within the operating system.

- **Mozilla Firefox**

   Other than Internet Explorer, Mozilla Firefox is one of the web browser that being used. Descended from the Mozilla Application Suite and managed by Mozilla.

- **Google Chrome**

   Google Chrome (GC) is a web browser developed by Google that uses the Web Kit layout engine and application framework. Google Chrome has minimal user interface, which is a typical of modern web browsers. GC's strength is its application performance and JavaScript processing speed, both of which were independently verified by multiple website to be the swiftest among the major browsers of its time. Many of Chrome's unique features had been previously announced by other browser developers but Google was the first implement and publicly release them.

6. Operating System

- *Windows XP Professional*

Operating System is a part of the computing system that manages all of the hardware and software. Windows XP is an operating system that was produced byMicrosoft for use on personal computers, including home and business desktops, laptops, and media centers. The name "XP" is short for "eXPerience

Advantages of Windows XP Professional:

i) Facilitate the use of wireless

ii) Can prevent crashing from happening due to the installation of web browser's additional software.

- ***Database***

The database is a structured data storage system. It is usually available in electronic form. Through conventional methods, data and information are stored in paper files inside the special cabinet. Files are stored according to alphabetical order and reference number so that files can be searched thoroughly. The use of Database Management System (DBMS) is intended to allow users to define, create, update, manage and maintain databases. DBMS also control the access and maintain databases. DBMS also controls access to the data in the database. Database applications are programs that interact with the database at the time of execution-time. PASCAL, COBOL, or C + + are some examples of the programming language that can be used to write programs using the database application. For this project we will be using MySQL for the database development.

7. WordPress

WordPress automates the comment and feedback process. This is a complex tool to develop a website as wordPress is a new thing for the developer. WordPress however ease the build up process of the website where developers can simply use the function in the development process.

Survey

A survey was done to clarify the patents of the current scenario in UTP. 6 questions was setup to capture the acceptance level of the users towards the new system that is going to be introduced within UTP. Sample sizes of 35 students were collected to clarify the requirements and user preference of the system to be developed. Questionnaires were distributed to all batches of student to identify the different preferences and requirement if there is any.
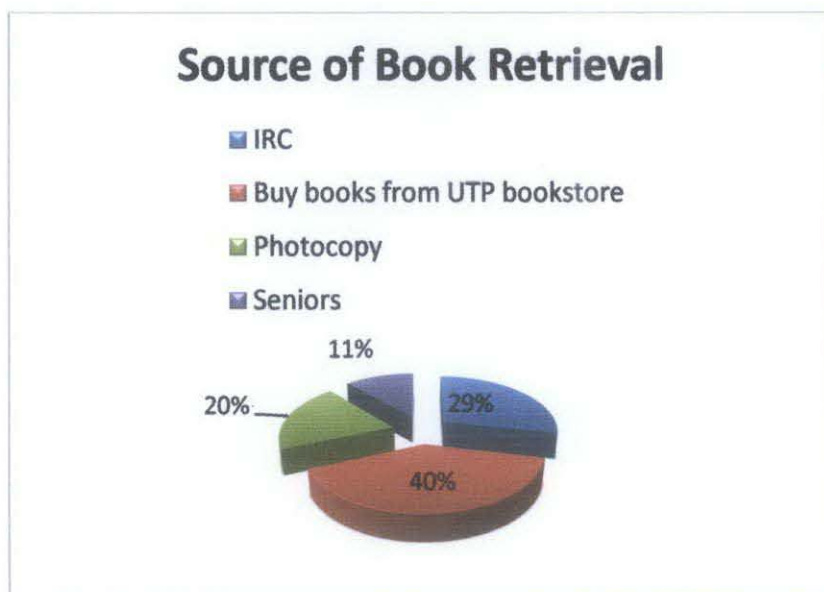
Figure 7 : Survey Result 1

The first graph shows how the trends of UTP students go about finding their reference book for a particular subject each semester. Through this chart, it is plotted that about 60% of the students uses money as part of the transaction in retrieving their books rather than borrowing from seniors and IRC. From the result above the implementation of the new system can be implemented on a strong foundation that is to enable the efficiency and effectiveness of the money transaction and management.

Digital Wallet

42.10%

57.90%

■ Yes
■ No
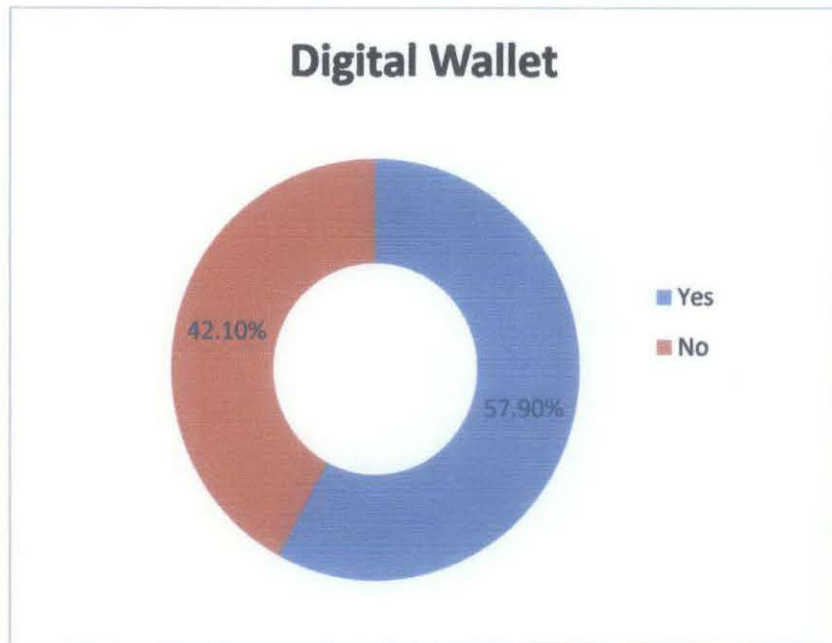
Figure 8 : Survey Result 2

The second question tested the knowledge of the survey participant on digital wallet. The relevancy of testifying this question is to see the exposure of UTP students towards digital wallet technology. By collecting this information from the questionnaire, it can ease the process of capturing their experience and preferences for the system development. From the survey, it shows that the exposure of UTP students towards digital wallet is on the bright sight therefore making the result more accurate and reliable to be used as the system development requirement.

Implementation of Digital Wallet

No — 13.20%

Yes — 86.80%

0.00%   20.00%   40.00%   60.00%   80.00%   100.00%
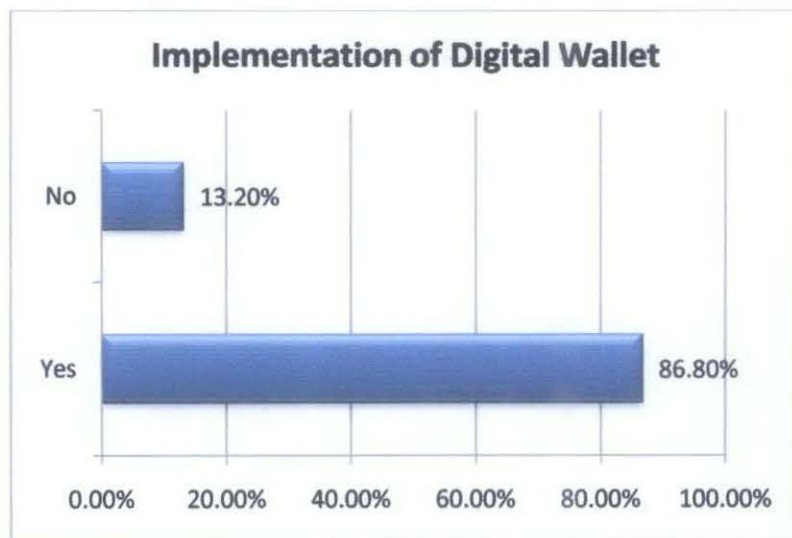
Figure 9 : Survey Result 3

User acceptance of a digital wallet technology implementation is also collected. This is to ensure that the new system implementation is widely accepted and does not go to waste. Based on the survey conducted, up to 87% of the people took the survey would like the digital wallet system to be implemented in their daily life. This result really supports the acceptance test of the system. Therefore this result can strengthen the feasibility analysis of the system.
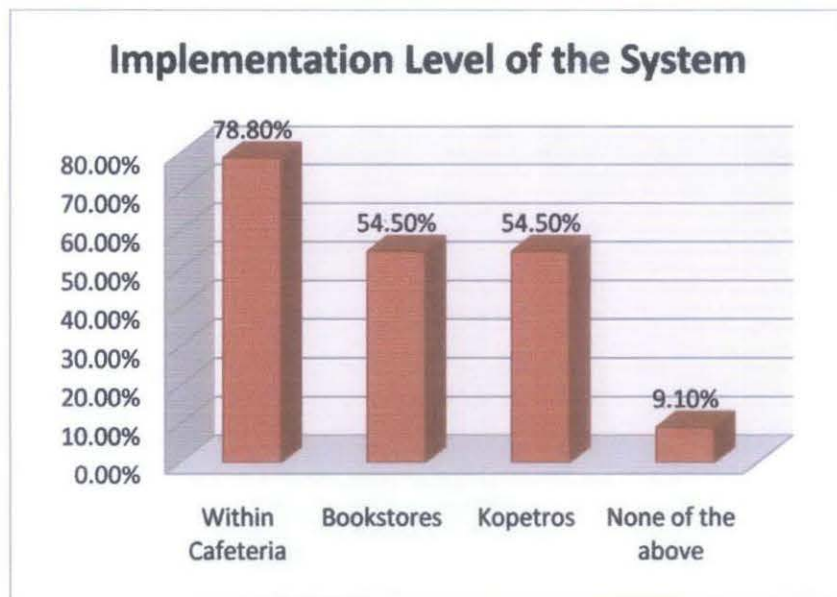
Figure 10 : Survey Result 4

The above graph on the other hand is to retrieve the response on where the system the user prefers to be implemented. The percentage seems good where more than 50% are really open to accept the new system implementation. Through the survey result, the student feedback for the system implementation is to be adapted to all transaction within UTP. Only 9% is not accepting the system implementation.

Balance Update Acceptance

9.10%
9.10%
45.50%
36.40%

■ It is good
■ It's OK
■ Neutral
■ I don't like it
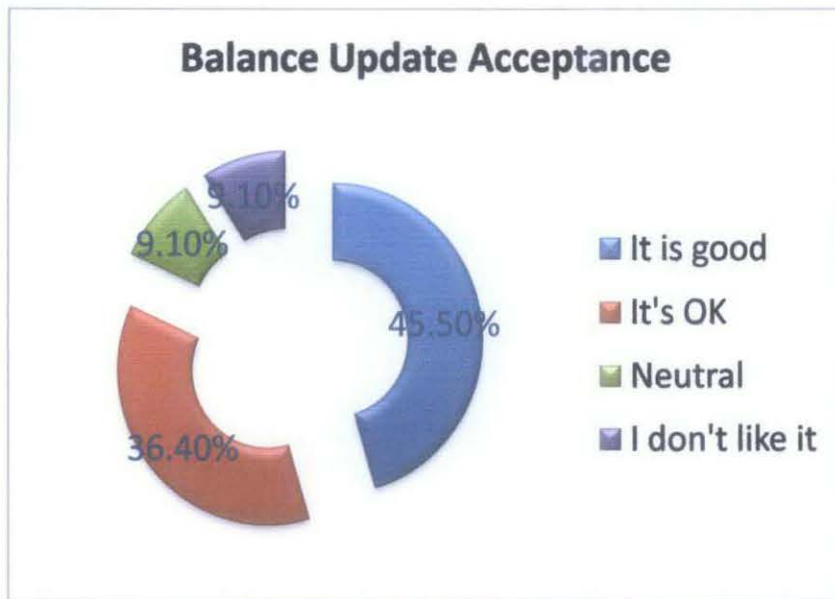
Figure 11 : Survey Result 5

The balance update procedure was also part of the survey question. Based on the result, the smartcard face update is more or less in the middle. The result does not show a significant result for a certain answer but well distributed. The question might not be clearly stated and affect the result of the question.

Transaction Detailed Reporting

50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%

21.20%   45.50%   33.30%

SMS   E-Mail   Displayed each
                              time a transaction
                              is completed
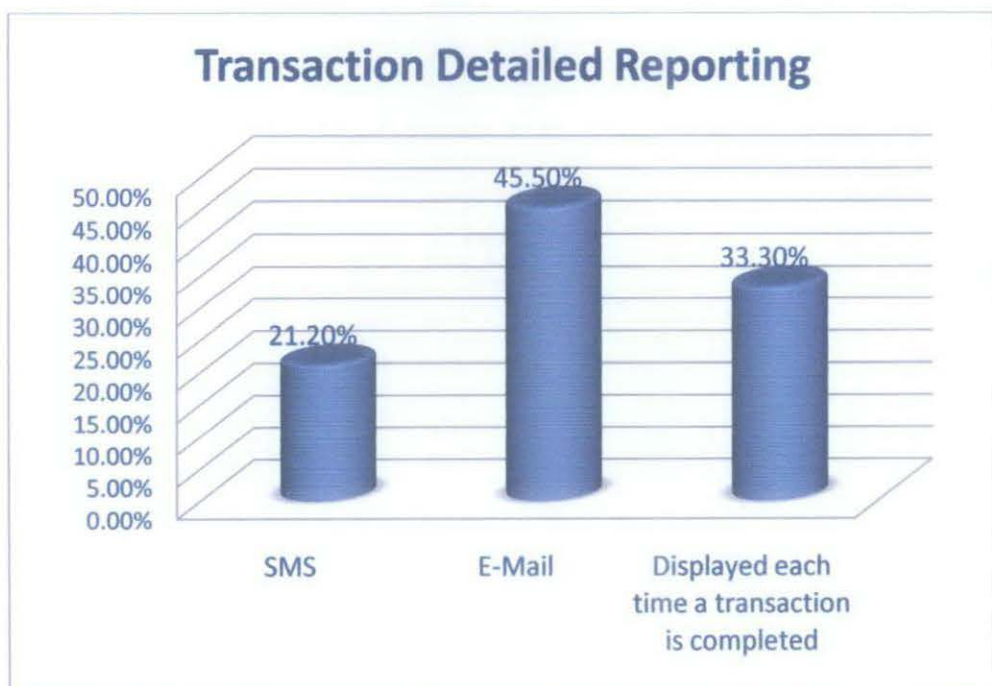
Figure 12 : Survey Result 6

The last question tries to capture the user preferred transaction detail report of the final balance of the smart card. So based on the result, the most significant result preferred by users is email and during transaction reporting format. Basically the trend of the result is more popular for the free reporting service like emails rather than SMS reporting format.

User Interface Prototype

The system prototype is named Tasty Drooling Diner. The system has different level of users. The users will consist of UTP Students, the system administrator, and Cafeteria owners/shoppers. These users have different level of access within the system. The system registration is made by registring to the administrator. This is to limit 1 registration per user.

The system enables the cafeteria owners to promote their cafeteria promotions and menu through the system. Each promotion request needs to be requested to the administrator. The update is done by the system administrator. Once completed, the user will be notified by the administrator through e-mail.

Students however will be able to view the promotion and their spending trends through the system. The trend will be projected in a table formating for easy and fast tracking process. The students will be able to track what are the things they have spend and the total amount of their day to day expences.

Administrator on the otherhand is responsible to register all users. Not only that, they are also responsible to update the promotion and menu requested by the cafeteria owners. Request e-mail to update sent by the cafeteria owners will be replied once the update request is completed.

Figure 13 : User Interface 1

Without loging in through the system, users only has the ability to view the latest updates, promotion and testimonials of previous users using the system. These testimonials are posted by the administrator from the feedback received from a user. The advantage of the testimonial is to attract unregistered users to use the system also.
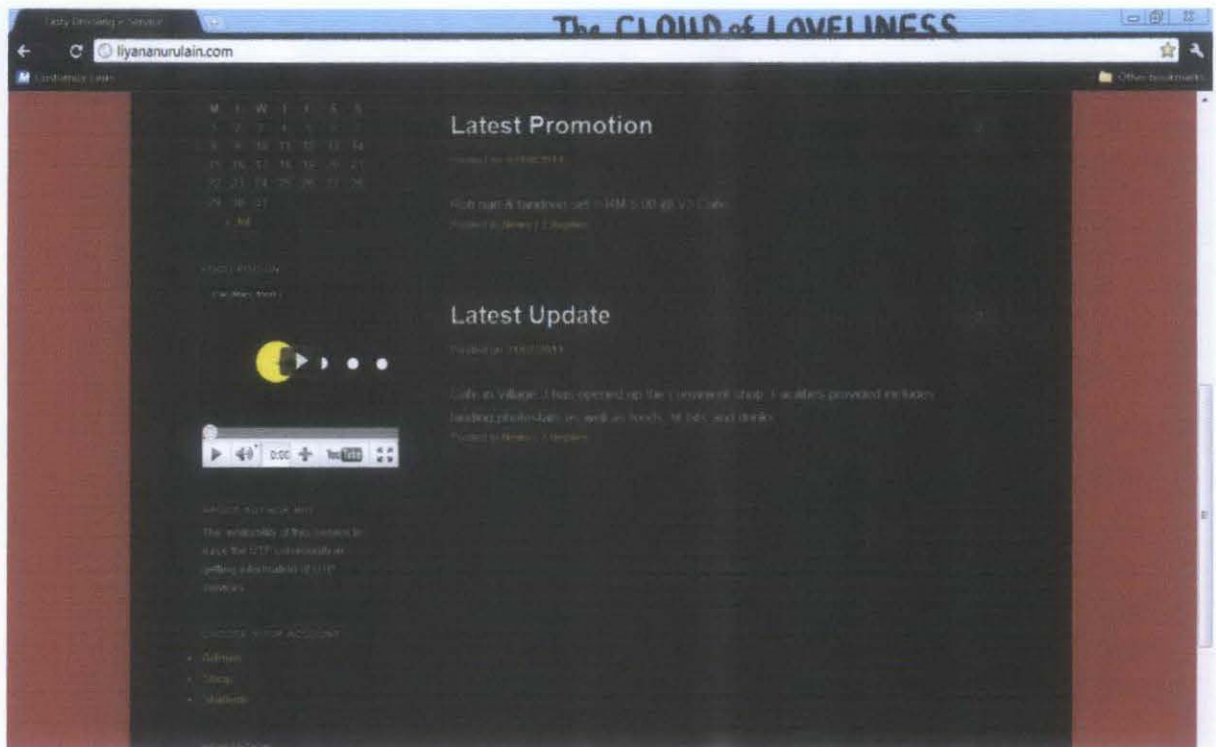
Figure 14 : User Interface 2

In the above screen shot, the system is connected to various UTP Services. Latest update and promotion will be posted online. For problems and enquiries, the system helpdesk is also available through Contact Us. All menus will be available online to provide convenience to users in making choices.

On the menu page, users will be listed with the different type of food available in UTP. User will be navigated to the list of cafeterias providing the user selected food. On this page user will be able to view the cafe they desire. Once the user completed selecting the cafe of their choice, the list of price for each food is displayed as follows.

Figure 15 : User Interface 3

The purpose of having this function is to attract the UTP Community to the main dish of a certain food provided by each cafeteria. By listing a cafe by the food category that the users wish to eat the promotion could be more effective and more attracting. The price is also listed to ensure the information gets through the audience.
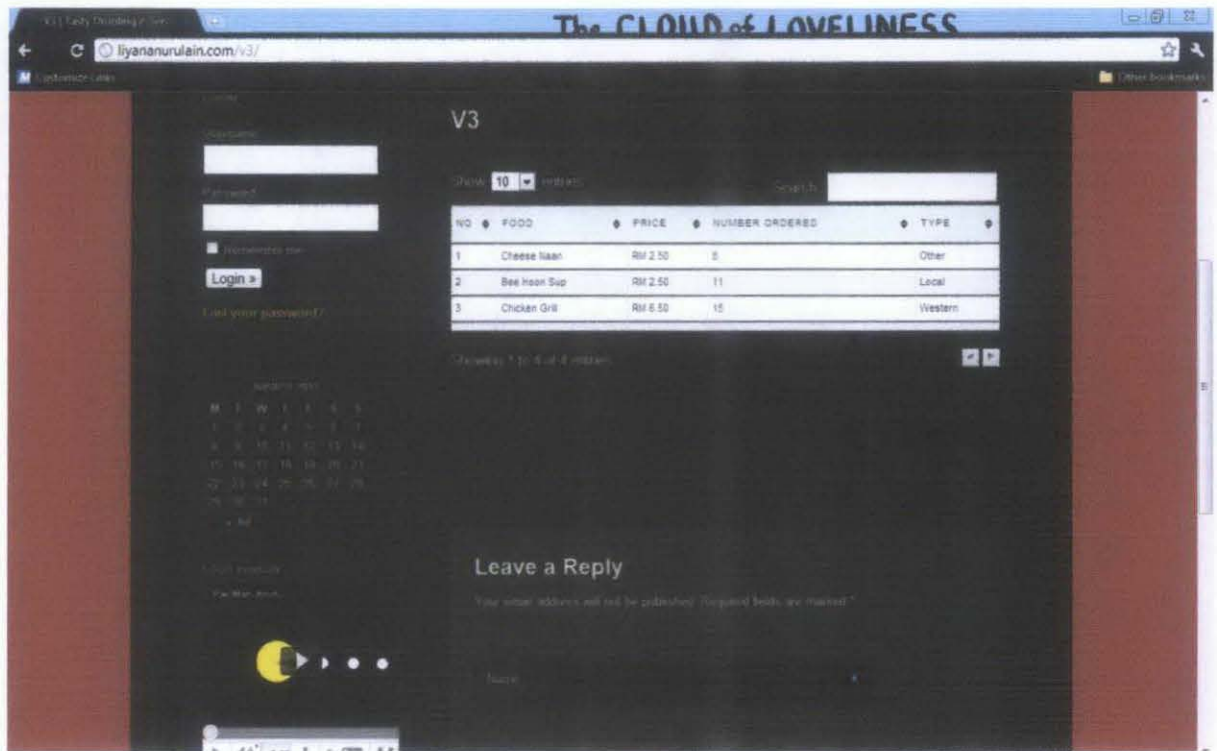
Figure 16 : User Interface 4

Database connection to enable user accessibility is also up and running. mySQL is the chosen database to implement this project. Currently, the system accessibility is occupying the students and administrators need. It is running efficient and effectively.

Figure 17 : Database

45
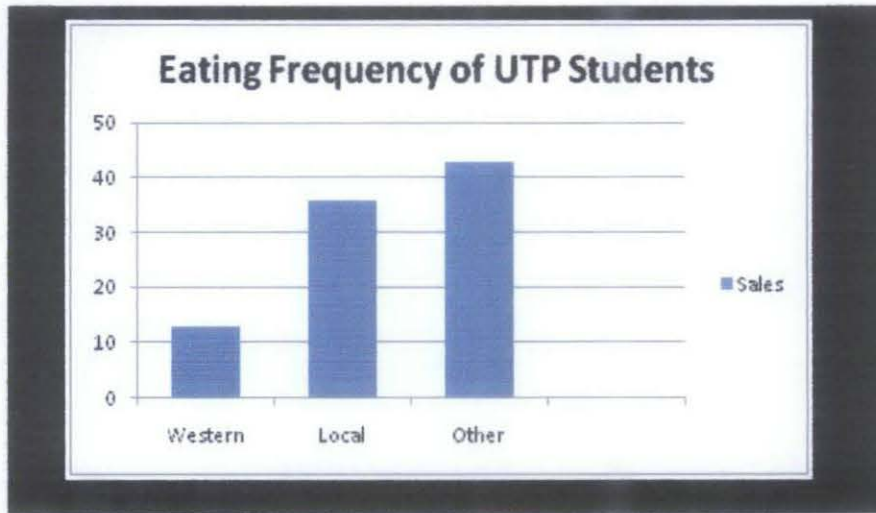
Figure 18 : Reporting Trend

Information like the student buying trends can also be capture by the system. This element will be plotted in a graphical format to ease the analysis phase. The graph is only accessible by the administrator and shoppers.
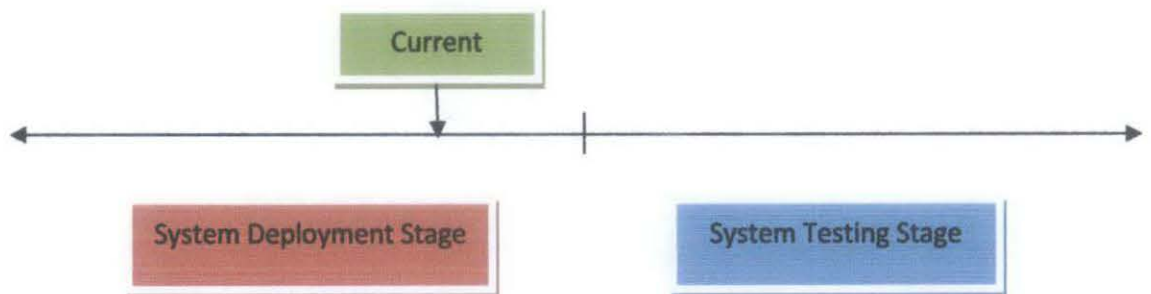
Figure 19 : System Progress

Currently, the project progress is still in deployment. This state of the project is still within the timeline planned based on the gantt chart. The system testing will be implemented to all UTP Community.

Chapter 6: Discussion & Recommendations

Discussion

Based on the result of the survey, user requirement collected is quiet helpful in the system development process. Some feature might need to be altered to the user requirement. This is to ensure that the system suits the demographic elements of UTP.

Through this new framework, it does not only benefit the students but also the lecturers and UTP shop owners. This is because the system enables the shop owner to see the buying trend of student therefore enables them to supply food at the right amount every time. This will then reduce wastage and reduce cost of production from day to day.

In developing the system, the developer may need to consult with the industry experts concerning the technical areas of the study like CRM. The consultation may include the major concepts in the development part of the system. This is to ensure that the concept implemented is correct and precisely used to be fit into the system.

Recommendation

In this section, some recommendation will be discussed for the ongoing system development. User preferences will also be taken into consideration in developing the system. To ensure this is taken into count, the result of the survey will also be considered as part of the system requirement.

The original plan of the system was to develop a system be used for Cafeteria transaction only. Based on the students respondent it showed impressive result on the development of the system to be expended throughout UTP. This will include the Cafeteria, bookstore and Kopetro. This respond is actually impressive and brilliant in terms of the acceptance level as well as their openness towards a new introductory system in UTP.

Basically the system was to be done by the developer from scratch. Because of the time constrain and limitation of the resources the developer has, the system will be using an automated drag and drop website developing tool. This is to ease the coding section of the system implementation.

This breakthrough is extraordinary making UTP one of the most prominent technologies and researching university in Malaysia. This breakthrough will not only help to enhance the management of demand and supply in UTP but also the buying trend of UTP students. The detailed transaction information is originally for the review of the management bodies. With high respondent for detailed transaction information of a user request, the system will be enhanced with an interface for detailed transaction check. The respondents however requested to have an email detailed feedback of the day to day transaction. This will be taken into consideration as the system will be developed with its own interface for the detailed day to day transaction check.

Finally the final prototype of the Consumer Trend & Behaviour Management Framework will need to be enhancing by making the transaction within UTP more efficient and effective through the usage of a smartcard. This smartcard will be uniquely identified to a single user connected to a database with all the information and current balance. The card will be equipped with an interface where user can be informed with the latest updated information like the balance of each card.

A Graphicard terminal will be used to connect the card to the main database in order a transaction to take place. The buying trends, student demand and supply will also be collected in making the management of supply in hand with the students demand. This will enable the shop owners to have a better control of their shop management making the day to day transaction more smoothly and efficient.

These recommendations are to be enhanced in future for the betterment of the system function. The budget of the hardware implementation is one of the things that need to be taken into consideration. Further advancement on the graphing element of the system is also needed to be enhances. Better quality and concept of the graphing technique to be implemented to gain better value of the system. A barcode setup for the type of transaction can enable a more effective and efficient transaction to be conducted. This will totally reduce the time of each transaction to better meet the objective of the project.

Shoppers' point of view and enhancement requirement also need to be taken into consideration. Their needs and necessity is required to make adjustment in order to make the system more efficient and effective in its implementation. Therefore a through survey needs to be conducted mainly for the shop owners themselves.

User Acceptance Test

Given a large pool of such statements, there will generally be some where there is a lot of agreement between respondents. In addition, some of these will be ones where the statements provoke extreme statements of agreement or disagreement among all respondents.

It is these latter statements which one tries to identify for inclusion in a Likert scale, since, we would hope that, if we have selected suitable examples, there would be general agreement of extreme attitudes to them. Items where there is ambiguity are not good discriminators of attitudes. For instance, while one hopes that there would be a general, extreme disagreement that "hanging's too good" for those who perpetrate parking offences, there may well be less agreement about applying this statement to serial killers, since opinions differ widely about the ethics and efficacy of capital punishment.

SUS was constructed using this technique. A pool of 50 potential questionnaire items was assembled. Two examples of software systems were then selected (one a linguistic tool aimed at end users, the other a tool for systems programmers) on the basis of general agreement that one was "really easy to use" and one was almost impossible to use, even for highly technically skilled users. 20 people from the office systems engineering group, with occupations ranging from secretary through to systems programmer then rated both systems against all 50 potential questionnaire items on a 5 point scale ranging from "strongly agree" to "strongly disagree".

Using SUS

The SU scale is generally used after the respondent has had an opportunity to use the system being evaluated, but before any debriefing or discussion takes place.

Respondents should be asked to record their immediate response to each item, rather than thinking about items for a long time.

All items should be checked. If a respondent feels that they cannot respond to a particular item, they should mark the centre point of the scale.

Result

Based on the usability testing done to the UTP Community, the system implementation needs to be trained to the users like the administrators and shoppers. Students however feel the system is easy to be used even with little knowledge of the system. This might be due to the fact the system is more to web based application where students are well exposed to web based application in their day to day life.

The system has the ability to educate the users on what items required to ensure the transaction is completed successfully. The process of trial and error promises the precise data captured and stored in the system.

The reporting and result is easy to understand and analyze. Shoppers will be exposed to the reporting and graphical forms of report which enables faster and effective reporting and analyzing process.

The overall layout and colors of the system is soothing and attracting to the users. This advantage enables the users to keep using the system in order to have a more effective and efficient food management process.

The system contingency is only seen in the management of demand and food supply. This will be very helpful to the shop keepers in order to keep track of the supply of their day to day business.

Some users feel that the system can be unnecessary as the functions are not really needed in managing demand and supply from 1 shop to another. System correct ability needs to be enhanced and implemented in the system. This will definitely put a marking point of the system intelligence and putting an additional point for the implemented system.

The reaction of the users towards the system was very welcoming on the system implementation especially from the shoppers responds. This may be due to the impact of the system implementation in different user day to day activity. Their experience on the system testing and previous implemented system is also affecting the result.

Gantt Chart

Figure 20 : Gantt Chart FYP 1

ID		Task Name	Duration	Start	Finish
1		FYP 2	71 days	Mon 23/5/11	Tue 30/8/11
2		System Planning Phase	4 days	Mon 23/5/11	Thu 26/5/11
3		Gantt Chart Planning	1 day	Mon 23/5/11	Mon 23/5/11
4		Supervisor Meeting 1	1 day	Tue 24/5/11	Tue 24/5/11
5		System Interface Planning	1 day	Wed 25/5/11	Wed 25/5/11
6		Progress Update	1 day	Thu 26/5/11	Thu 26/5/11
7					
8		System Development Phase	51 days	Fri 27/5/11	Fri 5/8/11
9		Project Requirement Gatherin	6 days	Fri 27/5/11	Fri 3/6/11
10		System Interface Developmer	5 days	Mon 6/6/11	Fri 10/6/11
11		Database Development	5 days	Mon 13/6/11	Fri 17/6/11
12		User Page Development	5 days	Mon 20/6/11	Fri 24/6/11
13		Administrator Page Developm	6 days	Mon 27/6/11	Mon 4/7/11
14		System Fuction enhacement	5 days	Mon 4/7/11	Fri 8/7/11
15		Hardware Retrieval	2 days	Mon 11/7/11	Tue 12/7/11
16		Connecting Harware and Syst	1 day	Wed 13/7/11	Wed 13/7/11
17		Usability Testing	5 days	Mon 25/7/11	Fri 29/7/11
18		Deploy	5 days	Mon 1/8/11	Fri 5/8/11
19					
20		Deliverable Preparation	30 days	Mon 27/6/11	Fri 5/8/11
21		Progress Report Preparation	5 days	Mon 27/6/11	Fri 1/7/11
22		Literature Review Enhanceme	1 day	Wed 29/6/11	Wed 29/6/11
23		Interface Enhancement	1 day	Wed 29/6/11	Wed 29/6/11
24		Documentation Enhancement	1 day	Thu 30/6/11	Thu 30/6/11
25		Supervisorr Meeting 1	1 day	Fri 1/7/11	Fri 1/7/11
26		Viva Preparation	10 days	Mon 25/7/11	Fri 5/8/11
27					
28		Submission	41 days	Mon 4/7/11	Tue 30/8/11
29		Progress Report Submission	0 days	Mon 4/7/11	Mon 4/7/11
30		Pre-EDX	0 days	Fri 5/8/11	Fri 5/8/11
31		Technical report	0 days	Fri 26/8/11	Fri 26/8/11
32		Project Submission	0 days	Tue 30/8/11	Tue 30/8/11

Project: FYP 2.mpp
Date: Sun 3/7/11

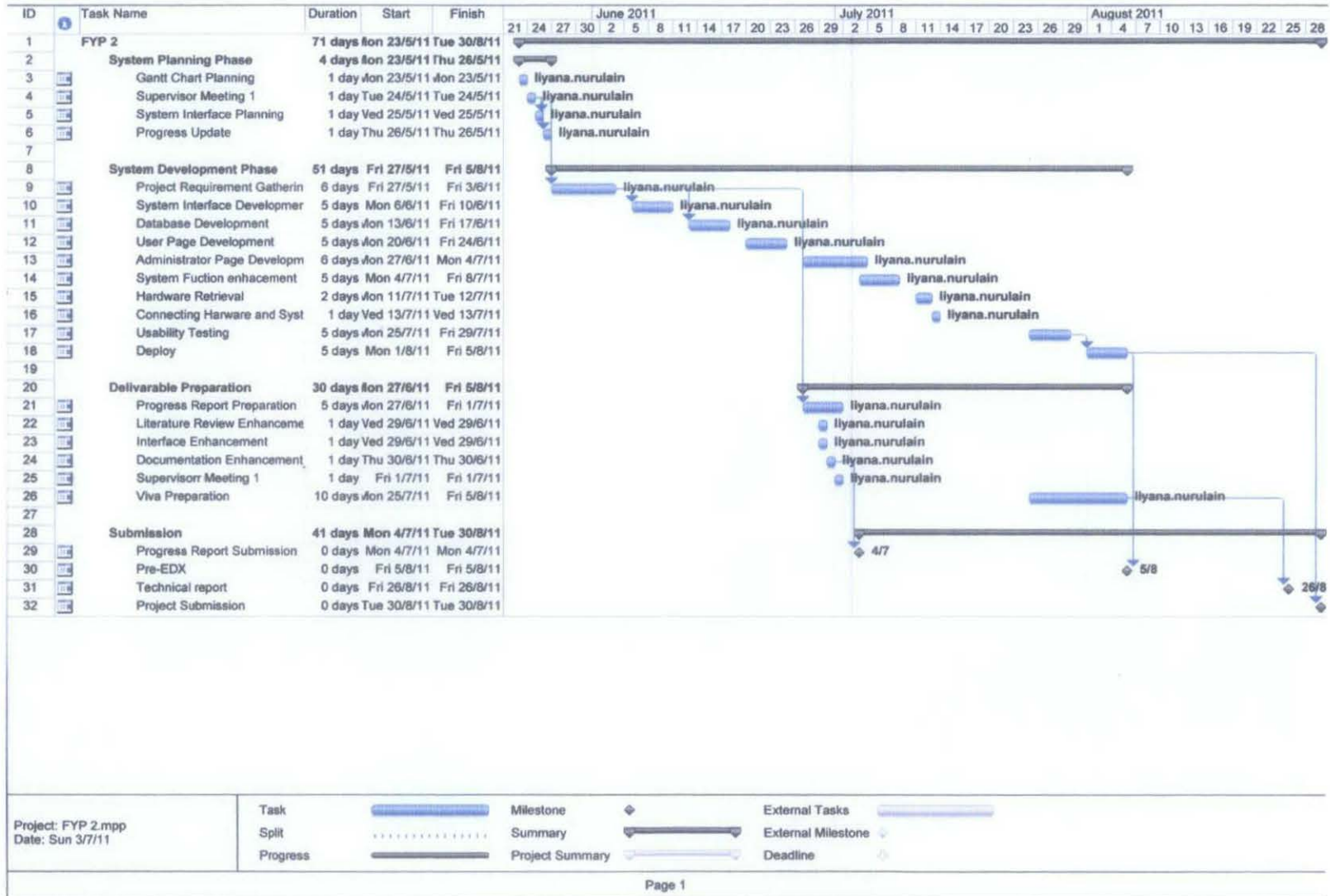| Task | | Milestone | ◆ | External Tasks | |
| Split | .... | Summary | | External Milestone | |
| Progress | | Project Summary | | Deadline | |

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Figure 21 : Gantt Chart FYP 2

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Chapter 7: Conclusions

In conclusion, the system development is relevant to the required time of introduction due to its objective to overcome the most prominent problem with in UTP that is the demand and supply of student food. By developing this system is foreseen to be able to overcome these obstacles in making the management system more prominent and effective. It is relevant to implement this framework because of the aim of this project itself. The student demand is seen to be exceeding supply therefore Customer Relationship Management solution approach is the most suitable and relevant approach to go for. Implementing digital wallet will also ease everyone in automating processes.

The project duration is going according to schedule with good prospect to be able to make the system available before the FYP duration ends. This is due to many opinions and help in making this system a success. The acceptance of the users towards the new system is also tremendous seen from their feedbacks and their requirement as well as their preferences towards the planned framework.

The system implementation in UTP is seen to be having a great future as the system feasibility analysis is reported to be good with minimal risk. The UTP society is also open to accept a new improvement into their live making this prototype foundation in UTP stronger.

The project has a large scope for expansion. This can be listed by introducing the framework to other institutions and private sectors. Organization having the same process of food allowance can also adapt this system into their organization making them more efficient and effective in transaction management.

Bibliography

[1] Fjermestad, J., & Romano, N. C. (2006). *Electronic Customer Relationship Management.* New Delhi: Prentice-Hall of India.

[2] Greenberg, P. (2002). *CRM at the Speed of Light: Capturing and Keeping Customers in Internet Real Time.* California: McGraw-Hill.

[3] Rajola, F. (2003). *Customer Realationship Management: Organizational and Technological Perspective.* Germany: Springer-Verlag Berlin.

[4] Berry M., Linoff G. (1997): *Data Mining Techniques,* New York: John Wiley & Sons.

[5] Kimball R. (1996): *Data Warehouse Toolkit,* New York: John Wiley & Sons.

[6] Adriaans P., Zantinge D. (1996): *Data Mining,* Addisson-Wesley, Harlow.

[7] *Department of Defense Purchase Card Program: A Financial Management Reform Success Story.* (n.d.). Retrieved March 22, 2011, from http://www.allbusiness.com/finance/813646-1.html

[8] *Department of Defense Purchase Card Program: A Financial Management Reform Success Story.* (n.d.). Retrieved March 22, 2011, from http://www.entrepreneur.com/tradejournals/article/78902698_2.html

[9] Anderson, S. (2009, July 15). The 3 Click Rule of Website Design & SEO – Myth or Fact? Retrieved 2011, from HOBO: http://www.hobo-web.co.uk/3-click-rule/

[10] Fadeyev, D. (2008, December 15). 10 Useful Web Application Interface Techniques. Retrieved 2011, from Smashing Magazine: http://uxdesign.smashingmagazine.com/2008/12/15/10-useful-techniques-to-improve-your-user-interface-designs/

[11] Fadeyev, D. (2009, January 12). 10 Useful Web Application Interface Techniques. Retrieved 2011, from Smashing Magazine: http://uxdesign.smashingmagazine.com/2009/01/12/10-useful-web-application-interface-techniques/

[12] Porter, J. (2003, April 16). Testing the Three-Click Rule. Retrieved 2011, from User Interface Engineering: http://www.uie.com/articles/three_click_rule/

[13] User experience design. (2001, July 29). Retrieved 2011, from Wikipedia: http://en.wikipedia.org/wiki/User_experience_design

[14] Bevan, N, Kirakowski, J and Maissel, J, 1991, What is Usability?, in H.-J. Bullinger, (Ed.). Human Aspects in Computing: Design and use of interactive systems and work with terminals,

[15] Amsterdam: Elsevier. Kirakowski, J and Corbett, M, 1988, Measuring User Satisfaction, in D M Jones and R Winder

[16] (Eds.) People and Computers IV. Cambridge: Cambridge University Press. Pratchett, T., 1990 Moving Pictures. London: Gollancz

Appendixes

Figure 22 : Appendix 1

Figure 23 : Appendix 2

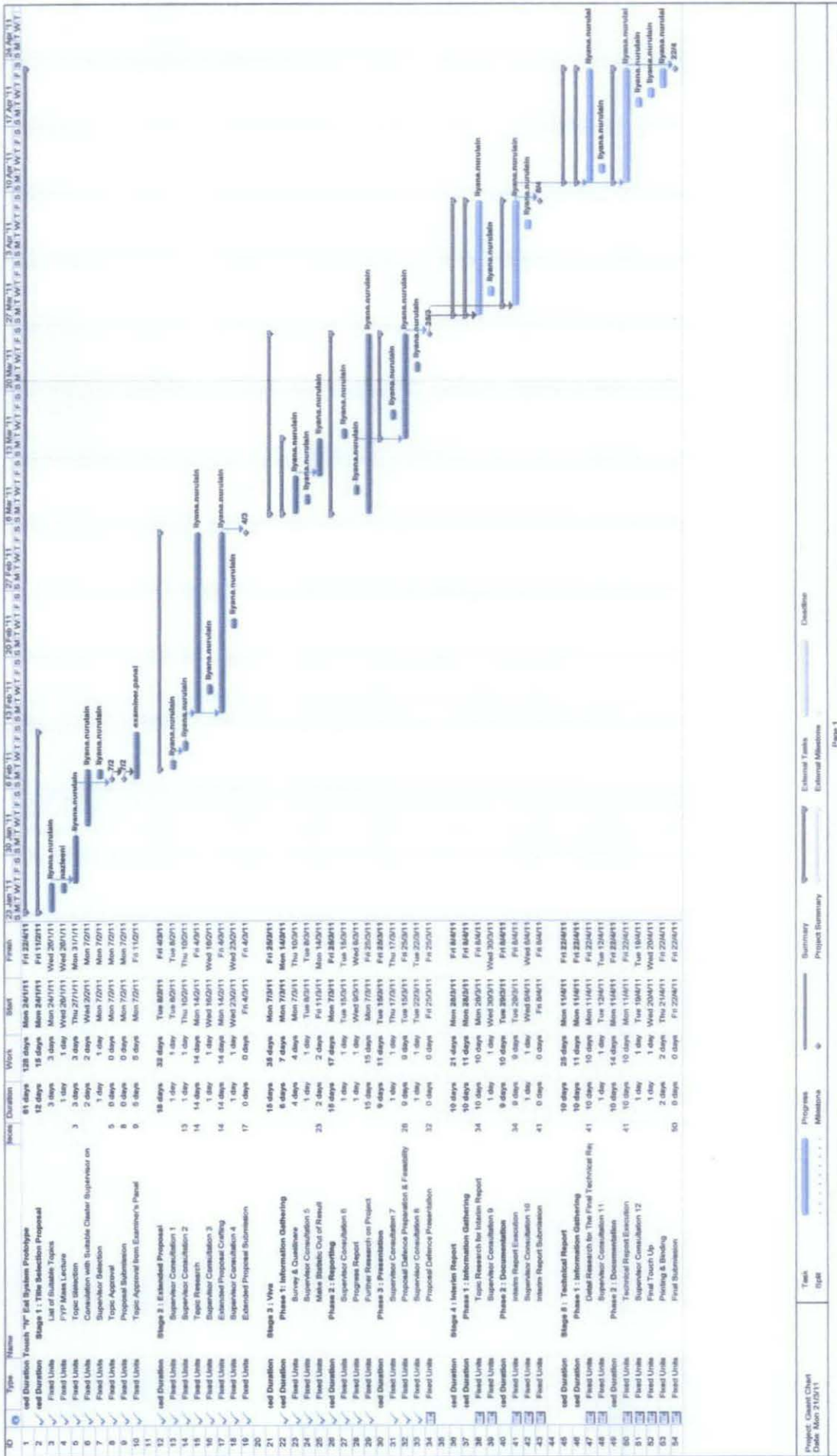
Figure 24 : Appendix 3

Figure 25 : Appendix 4

Figure 26 : Appendix 5

Figure 27 : Appendix 6

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Task · Milestone · External Tasks
Split · Summary · External Milestone
Progress · Project Summary · Deadline

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Figure 28 : Appendix 7