Campus portal: a framework for development accommodating end-users' online activities

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Campus Portals:
a Framework for Development Accommodating End-users' Online Activities

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CERTIFICATION

I, Tharitpong Fuangvut, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in Information Systems Discipline, School of Economics and Information Systems, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Tharitpong Fuangvut

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ABSTRACT

A Campus Portal is an exciting recent phenomenon forming part of the new generation of online services for all stakeholders in institutions of higher education. Conceptually the general notion of a Portal should be to be distinguished from that of other Web-based applications and the traditional Intranet of the institution. The literature review in Phase One of this research indicates that the major distinguishing characteristics of a Campus Portal are: (i) personalisation, by which end-users are only able to access information and online services pertinent to their activities, and (ii) customisation, by which end-users are able to select their preferred information channels and optional online services.

The major objective of this research is to propose a development methodology specifically suitable for Campus Portal projects. While there are many accepted development methodologies for traditional and Web-based Information Systems, no clear body of knowledge on the development of Campus Portals has yet been recognised. Additionally, as this is a new area, the definitions, terms, concepts and important issues agreed to by academic researchers and practitioners, are still evolving. This research, therefore, needs to clarify and identify some important issues regarding Campus Portals and their development, prior to composing the development methodology. In the second and third phases of the research, two studies were carried out, a preliminary study and a case study. These generated more understanding of the issues and extended the body of knowledge on Campus Portals, especially concerning their development.

The preliminary study explored and investigated the online services and Campus Portals of 40 higher education institutions' sites in Australia, New Zealand, the USA, the UK and Canada. The findings of the preliminary study show that there are no standard patterns in the function of personalisation and customisation in Campus Portals. A set of research questions were then put forward to drive further investigation into design and implementation issues regarding the personalisation and customisation functions of Campus Portals.

The case study was conducted in an Australian university among the major stakeholder groups, namely, the development team and the end-users (students and academic staff). For the study of the development team, interviews were used to gather information on their current practices and their vision for the future direction of the Campus Portal. Students were the primary focus of the end-user study, from whom data was collected using a survey to build up usage patterns of their online activities. In addition, a group of academic staff were interviewed to obtain data from their perspective to identify and clarify some important issues. The results and findings in this phase of the research contribution to the body of knowledge on Campus Portals and their development.

In the final phase of the research, the review of existing development methodologies was continued filtering them through a set of identified criteria based on the findings of the two studies. Finally, the most appropriate development methodology was selected and modified in order to support the requirements identified in this research as critical for the development of a Campus Portal. The result was proposed as a Campus Portal Development Methodology (CPDM) fulfilling the main objective of the research.

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Introduction

1.1 Background and Research Problems

Emerging Internet technologies continue to provide organisations with the ability to improve their relationships with customers and retain a competitive advantage. One of the best known of such technologies was named, “Enterprise Information Portal (EIP)”, by the two researchers, Shilakes and Tylman (1998), of Merrill Lynch in the USA. Although the concept of a “portal” has captured the imagination of many since that time, there is still no generally agreed upon terms for types of portals used in organisations, or even a standardised portal definition (Tatnall 2005b). This study will use the term of “Enterprise Portal (EP)” rather than the original EIP, to emphasis the belief that a portal is more than a central repository of information, but includes the integrated availability of online services for various purposes. This thesis will, however, refer to definitions, terms and views of the concept of a postal from the work of others in recognition that this is an emerging and growing area that still has to formalise its terms of reference.

Since the concept of the Enterprise Portal was introduced in 1998, its rate of adoption has greatly increased. In January 2003 a Goldman Sachs IT manager survey (2003), reported that an Enterprise Portal was one of the highest priorities, when companies preferred to invest over following the 12 months. The report estimated various growth rates from 20% to 40% by 2006 and they estimated that market size would reach an approximately 2-3 billion US dollars by 2006. To confirm its popularity, the giant software maker, Microsoft® Corporation, announced that they would soon release portal functionality, which would be available out of the box in the next version of its development Visual Studio tools, which would be available in the late 2005, via the DOTNET framework (Patel, Acker and McGovern 2004).

On the academic side, an institutional portal was initially pioneered by the University of California in Los Angeles (UCLA) in 1999 in cooperation with the University of Washington and the University of Buffalo (Moskowitz 2001a). However, the costs of Enterprise Portal solutions were unaffordable for most education institutions and this

undoubtedly delayed their development, and the implementation of portals. The term for the kind of portal which is developed for an education institution will be referred to as a “Campus Portal (CP)” in this study; it has already been used by others (Eisler 2001a, Eisler 2001b, Moskowitz 2001a, Eisler 2002, Eisler 2003, Jafari 2003).

It is of interest that many higher education institutions, who have decided to develop and implement a Campus Portal, have preferred an in-house Campus Portal development approach instead of purchasing one from vendors. To support this trend, there is an independent organisation named “The Java Architectures Special Interest Group (JA-SIG)” that aims to promote the use of Java technologies and architectures within the higher educational communities by supporting the development and adoption at low cost, flexibility and open source solutions based on the best practice and open standard (JA-SIG 2004).

Although this JA-SIG offered a free, shareable, and invaluable version of the portal framework for a higher education institution, namely, ‘uPortal’ and is being adopted worldwide for more than 140 institutions and serves more than one million students, it does not mean that the project and its implementation will already guarantee success by only implementing the great tools. In fact, uPortal is a technical framework that allows developers to easily develop the portal functionalities and components for their Campus Portal project; it, however, does not provide a development methodology for the developers.

Of greater relevance to this thesis is the fact that only a small amount of research has been done into approaches to portal development, especially those suitable for Campus Portal development. Although some Campus Portal solutions and development methodologies were used by the software vendors, these were kept confidential and only available to institutions that purchased their solutions. Therefore, most academic institution’s developers constructed their development methodology themselves, to produce solutions unique to their situations and requirements (for example, Ethridge, Hadden and Smith 2000, Bishop 2003, Frazee, Frazee and Sharpe 2003, Thomas 2003a, Bajec 2005).

Consequently, until now, there is no formal development methodology available for Campus Portals. In addition, there are no guidelines to recommend what kind of methodology would be suitable for Campus Portal development. Therefore, most

practitioners apply no development methodology, or just adopted a minimal process of development for the Campus Portal project.

In this situation, there is a high probability of failure for a Campus Portal project. Although most development teams of the higher education institutions have the ability and lots of experience in traditional Information Systems and Web-based application development, the unique characteristics and aspects of the Campus Portal may not be recognised and not truly understood because of its emergent nature. As a result, adoption of an inappropriate development methodology has become a significant issue in the Campus Portal development project.

On another side, users' needs and behaviour when engaged in online activities is believed to be different from those a decade ago. As the Internet becomes an essential part of the service of the academic institutions, they now provided not only an Internet connection but also numerous online services that help students to improve their skills and undertake all aspects of their study. Consequently, the Campus Portal needs to appropriately support the user's online activities and increasingly tailor these to their own personal preferences and ways of learning.

This thesis adopts the view that a Campus Portal is quite different from the rest of the institutional Web site. In general, the traditional Web site was developed for a single purpose, whereas the Campus Portal is designed for multiple purposes supporting various online activities. Multiple online contents, links and services are often available through the customised user-interface, which allows the users to select their preferred optional contents and online activities. Ideally, personalised information, contents, links and online services that directly related to the user are provided instantly on the user-interface when the user has been successfully logged-in. The unique characteristics and functionalities of the Campus Portal that distinguish it from a general Web site, needs to be considered in order to meet the end-users experience, their activities and personal preferences. However, little research in this area was found at the time this research began.

In addressing these issues, this research was conducted in four phases aimed at contributing to a better understanding of Campus Portal development. These phases are: the literature review, a preliminary study of existing Campus Portals, an in-depth single case study and the production of a development methodology for Campus

Portals. The results of this research should help development teams in academic institutions to develop effective Campus Portal projects that support users' online activities and their personal preferences.

1.2 Research Objectives and Questions

The primary objective of this research is:

- to compose a comprehensive and thorough development methodology for Campus Portals which will help practitioners to effectively develop a Campus Portal with regard to its critical and unique characteristics in supporting the variety of users' online activities and their preferences.

In order to accomplish the primary objective, two secondary research objectives need to be completed.

Firstly, the preliminary study explores the online sites of 40 higher education institutions in five countries where English is an official language, Australia, New Zealand, the USA, the UK and Canada. The objective of this study is:

- to understand the practices of developers who are currently implementing Campus Portals regardless of their type or generation.

In order to achieve this nominated objective, these questions need to be answered.

RQ1: What is the current practice of development teams in a selection of 40 higher education institutions in countries where English is an official language.

Additionally, there were sub-questions to be addressed as follows:

RQ1.1: What is the current stage and position of the Campus Portal of each institution in comparison with their Web-based systems?

RQ1.2: What groups of stakeholders are being supported by the Campus Portal projects?

RQ1.3: What kinds of systems and functionalities are normally implemented in these various institutions' online services and Campus Portal?

RQ1.4: What issues appear to be the substantial concerns of Campus Portal development regarding the Campus Portal's unique characteristics identified in the literature review of Phase One?

Secondly, it is anticipated that there will be many problems identified in the preliminary study that need to be studied further, in order to gain more understanding of the important issues in Campus Portal development. Therefore, an in-depth case study method was selected to provide a deeper understanding of the issues. This would be conducted in a suitable higher education institution in Australia. Both the development team and end-users would be studied in order to uncover relevant aspects of a Campus Portal and its impact on the working of the organisation. The objectives of the case study are:

- to understand and reveal the usage pattern of the online activities of the institution's users, in order to inform developers of those design requirements unique to Campus Portals from the user's perspective, and;
- to understand the current practices and vision of the experienced development team of the case institution in order to ground, in practice, the composition of the development methodology for the Campus Portal for Phase Four of the research.

In order to achieve these objectives, this question needs to be answered.

RQ2: What are the essential factors of current practices that appear to enable or obstruct the development of a Campus Portal? How could the development of Campus Portals be improved in light of an improved understanding of these factors?

Additionally, there are several sub-questions as listed here:

RQ2.1: What factors appear to have the most influence on the usage pattern of the online activities of the students?

RQ2.2: In what kind of online activities are academic staff involved? Are there any problems, and if so, what are they?

RQ2.3: What are the current vision, opinion, and practices of the development team? If there are any conflicting requirements for the Campus Portal, how should they be resolved?

From the understanding of all issues mentioned in the research objectives, a comprehensive development methodology for the Campus Portal will be composed in Phase Four of the research. This will be done by evaluating and modifying the most appropriate existing methodologies for the traditional Information Systems and Web development. The resulting comprehensive development methodology for the Campus Portal will be named the Campus Portal Development Methodology (CPDM).

1.3 Significance of the Research

An initial review of the literature on the topic of portals and their development methodologies showed that while there are many publications available on portals in the general area, only a small percentage of them were written by academic researchers. More importantly, there are hardly any articles and papers that provide information on the development of portals, especially Campus Portals.

Many papers and articles talk about the general characteristics and features of portals, new products and so forth, but almost all of them fail to provide information on the development method that can be adopted to build a portal. Many papers mention user requirements that distinguish a Portal from a general Web site, but they often failed to provide the design, management, and implementation aspects of these critical components of the portal. Most importantly, there are no clear definitions and terms that are used in the portal domain.

This research aims to propose a comprehensive development methodology for Campus Portals. However, this is a very early stage in the evolution of such a methodology because the issues and aspects, which are related to Campus Portals, are relatively new and no clear definitions and terms are generally accepted. As a result, many important issues and aspects that related to Campus Portal development first need to be clarified and identified throughout the research before it is possible to build a robust and comprehensive Campus Portal development methodology. The research uses multiple studies to clarify the major issues and aspects regarding the development of Campus Portals, including a selection and modification of the existing development

methodologies, prior to proposing a definitive Campus Portal Development Methodology (CPDM) resulting from the findings of the research.

This research should provide benefits to both practitioners and researchers by clarifying the important issues and aspects of the development process of a Campus Portal project. Without understanding the important aspects of a Campus Portal and its related issues, practitioners may proceed in the wrong direction and may apply inappropriate methods to developing a Campus Portal. As a result, the end-users will refrain from using the Campus Portal because it does not meet their needs or support their particular online activities. As a result, projects will fail because no one wants to use the system. On the side of the researchers, the characteristics, issues and aspects of Campus Portals are identified and clarified in this thesis and a comprehensive development methodology is proposed. There are many opportunities to extend this research as will be discussed in Chapter 10.

In conclusion, this kind of research is significant as it helps both practitioners and researchers to understand the important issues and aspects of Campus Portals, including an effective development methodology that can guide the practitioners to develop a Campus Portal that will be accepted by all stakeholders. As a result, the end-users will benefit when the Campus Portal is developed and it will support their needs. The growing adoption of these systems highlights the significance of this work.

1.4 The Research Approach and Design

1.4.1 The Nature of Information Systems and System Development Research

Information Systems is a multidisciplinary field incorporating both technical and organizational disciplines (Land 1993, Alter 1996, Hasan 1999, Myers and Avison 2002). The main focus of the field of Information Systems is to study the development, use and impact of Information Technology artefacts on people and business in organisations (Keen 1987, Myers and Avison 2002). In fact, Information Systems are social rather than technical systems (Hirschheim 1992). Therefore, Information Systems is not a pure science discipline. The adoption of a research method which is suitable to the science laboratory for the study of Information Systems will almost certainly fail to produce meaningful results (Galliers and Land 1987, Galliers and Land 2002).

A variety of research methodologies have been adopted by Information Systems researchers in order to study the various areas of Information Systems (Burstein and Gregor 1999). System development research is a major area in Information Systems research because it relates to various other areas in the field of Information Systems. According to Nunumaker Jr., Chen, and Purdin (1991), system development can be considered as a hub of the research which interacts with all other Information Systems research agendas to create an integrated and dynamic research program. Whether the organisations purchase a commercial methodology, or adopt a fully or partial in-house development methodology to build their Information Systems, there are many issues involved throughout the whole process that need to be investigated.

Wynekoop and Russo (1997) place system development methodology research into four categories according to the purpose of the research. Because of the different categories of the research, the research questions are different. However, the coverage of the methodology research in one category often overlaps with another. These categories can be summarised as:

- **Use.**
  This category covers the broad group of studies which examine methodologies in practice from various aspects such as frequency of use, experiences of the practitioners, problems which can be identified, and so forth.

- **Selection, Development, and Adaptation.**
  This category covers studying the research selection of a methodology by identifying appropriate criteria in available methodologies, which are suitable to an organization, people, and technology. This would include a commercial methodology if the practitioners intended to use it.

- **Evaluation.**
  This category covers studies that investigate the specific system development methodology or techniques being adopted.

- **Understand/Describe.**
  This category covers the studies which define or describe system development methodologies such as their features and other aspects.

Regarding the categories of Wynekoop and Russo (1997), this research is positioned on the selection, development, and adaptation category. It should be noted, however, that the construction and proposal of the comprehensive development methodology for the Campus Portal arising from this research is only in the early stage of the construction when compared to a fully functional methodology. A mature methodology needs a very long period of time and extensive research outcomes in order to validate it before it will be widely accepted among research scholars and practitioners.

As a portal is an emerging technology and concept, the most important task of this research is to clarify those aspects critical to the Campus Portal development and to the initial proposal of an original but comprehensive development methodology for Campus Portal projects. This methodology will be validated by the findings of this research, which uses multiple data collection techniques to achieve the major and minor objectives mentioned earlier. Further validation of the methodology, in order to build a full version of the development methodology, can be done in the future research.

1.4.2 Research Approach, Paradigms and Methods

In order to achieve the objectives of this research, a bringing together of various types of data collection and analysis is essential. The research methods can be categorised from various perspectives, however, the division into qualitative and quantitative research methods is one of the best known and commonly referred to (Myers 1997a, Myers 1997b, Myers and Avison 2002).

The definitions and descriptions of qualitative and quantitative research approaches are available from many authors; however some interesting examples are as follows.

> "Quantitative research methods were originally developed in the natural sciences to study natural phenomena. Examples of quantitative methods now well accepted in the social sciences including survey methods, laboratory experiments, formal methods (for example, econometrics) and numerical methods such as mathematical modelling.
>
> Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. They are designed to help us understand people and the social and cultural contexts within which they live. Examples of qualitative methods are

> action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions" (Myers and Avison 2002 p.4).
>
> "Qualitative research should not be seen as a unified body of philosophy and practice, whose methods can simply be combined unproblematically. Similarly, qualitative research should not be seen as necessarily in opposition to, and uncomplimentary to, quantitative research. The distinction between quantitative and qualitative methods is not entirely clear cut, and all researchers should think very carefully about how and why they might combine any methods, whether qualitative, quantitative, or both" (Mason 1996 p.6).

Many researchers place themselves solely on one side of this divide, as a quantitative researcher or qualitative researcher. They adhere to each side of the research approach and often have their own research methods and data collection instruments. A survey questionnaire is a popular instrument for a quantitative researcher, while interviews and observations are most commonly adopted as the data collection instruments for the qualitative researcher. However, it is recently more acceptable to combine quantitative and qualitative methods to increase the effectiveness of the results and findings, which can be validated through the triangulation technique (Kaplan and Duchon 1988, Markus 1997, Creswell 2003).

Myers and Avison (2002) say that all research, using both qualitative and quantitative research approaches, need to refer to some principal assumptions about what represents a type of valid research that determines the methods that can be adopted for data collection. In fact, there are a set of research paradigms (positivist, interpretive and critical) that need to be considered when conducting research (Myers 1997a, Carroll and Swatman 2000, Myers and Avison 2002).

However, Myers and Avison (2002) mentioned that the word 'qualitative' is not a synonym for 'interpretive'. Actually, 'qualitative' research can be 'positivist', whereas 'quantitative' research also can be viewed from an 'interpretive' perspective (see Kaplan and Duchon 1988). Summarising Myers and Avison (2002), the characteristics of each research paradigm is as follows.

- **Positivist Research**
  The positivist believes that "reality is objectively given and can be described by measurable properties, which are independent of the observer (researcher) and his or her instrument. Positivist studies generally attempt to test theory, in an attempt to increase the predictive understanding of the phenomena" (Myers and Avison 2002 p.6).

- **Interpretive Research**
  The interpretive researcher normally begins with the assumption through the social construction and attempts to understand the phenomena through the meaning people assign to them.

- **Critical Research**
  "Critical researchers assume that social reality is historically constituted and that it is produced and reproduced by people. Although people can consciously act to change their social and economic circumstances, critical researcher recognize that their ability to do so is constrained by various forms of social, cultural and political domination " (Myers and Avison 2002 p.6).

In addition, Galliers (1992b), Galliers and Land (1987, 2002) and Hunter (2004) proposed a taxonomy which summarises the research methods that can be adopted for Information Systems research methodologies, as displayed in Figure 1-1.

According to this taxonomy of the Information Systems research, the appropriate research approaches suitable to system development methodology research would be: (1) field experiment, (2) case study, (3) survey, (4) simulation and game/role playing, subjective/argumentative, (5) descriptive/interpretive, and (6) action research.

From the broad perspective of the research proposed here, a mixed research methodology will be adopted to enhance the results and finding of the research. It can basically be viewed in overall as, 'interpretive qualitative case study research'. Although this research also adopts a quantitative data collection technique (survey questionnaire) at one stage, it is only used to determine a general usage pattern of the online activities rather than a detailed analysis and interpretation. The qualitative data collection, analysis and interpretation are undertaken because this research needs to generate more in depth understanding of the relevant issues and context regarding

Campus Portal development prior to the actual selection and building of a development methodology for Campus Portals.

Please see print copy for Figure 1-1

Figure 1-1 Information Systems Research Approaches
A Revised Taxonomy based on Galliers (1992a) by Hunter (2004)

Based on the characteristics of the research paradigms described above, this research is more aptly classified as qualitative and interpretive research, which aims to understand the phenomena of the current situation facing the development of a Campus Portal in order to make recommendations and eventually propose a comprehensive development methodology for a Campus Portal.

Because this research is composed of multiple studies, suitable research methods and design are selected to suit each stage. The research methods and designs will be described in the respective chapters dealing with each study (Chapters 4 and 5).

1.4.3 Research Procedures

The spiral model proposed by Carroll and Swatman (2000), the basis of Figure 1-2, was found to be very useful in terms of providing a means to gather together and increase the understanding of using, multiple conceptual frameworks to build theory through interpretive research. This follows the example of other researchers. Cepeda and Martin

(2005) mentioned Carroll and Swatman's work as a valuable and valid research approach for qualitative research. Lynch (2002) also adopted their model for her study.

By adapting the model from Carroll and Swatman (2000), this research is designed to be conducted as multiple studies (see Figure 1-2): a preliminary study, a case study and the development methodology selection. To accomplish these three studies, a literature review is also an important phase of the process. All four phases are now described.

1.4.3.1 Phase One: Literature Review

The literature review is a time-consuming, but very important introductory task in order to gain adequate information and perspectives on the relevant area of the research (Kumar 1996). Additionally, Kumar (1996) mentions the benefits of doing a literature review, which can be summarised as following.

- **Bring Clarity and Focus to the Research Problem.**
  The important role of literature is to clarify the understanding of the research area and help the researcher to improve the conceptualisation on the research problem. Additionally, the relationship between the research problem and the body of knowledge in the research area is more understandable.

- **Improve the Methodology.**
  The literature review reveals a similar type of research, which recommends the procedures and methods to accommodate the problems. Additionally, pitfalls and detected problems from previous research can help the researcher to apply better research methodology.

- **Broaden the Knowledge Base in the Research Area.**
  The body of knowledge is very important to every researcher. The literature review helps the researcher to be able to understand broadly in the research area. Additionally, the literature review helps the researchers to place a finding in a proper existing body of knowledge.

Please see print copy for Figure 1-2

Figure 1-2 A spiral process towards understanding for building a Campus Portal Development Methodology
Adapted from Carroll and Swatman (2000)

The body of knowledge in the research domain and research methodology of this research has been taken from various sources such as books, hard-copy journals, electronic journals, Internet literatures, white papers, reports, audio and video archives, conference papers, and so forth. Moreover, the literature review was taken from various disciplines such as Information Technology, Information Systems, organization studies, human-computer interaction, system development, Web development, Web design, Web programming, portals, cultural issues, people and behaviour, research methodologies, and so forth.

In order to understand and cover all areas of the body of knowledge, the literature review therefore was divided into two major sections.

Step One: General Body of Knowledge

At the beginning, the research topic was defined. However, the scope of the research was still quite general. Therefore, broad areas of the literatures which previously described were studied to gain more understanding in the area of the research, as well as to find a relationship between each area of study and identify the narrow scope of the research.

The University of Wollongong library provides adequate academic resources for this research. Extensive range of most books and hard-copy journals used in this research is often available. Furthermore, a broad range of online materials such as ACM, IEEE, ScienceDirect, Blackwell Synergy, Emerald, Taylor & Francis, Springer, and so forth can be accessed from everywhere on- or off-site of the university.

Some procedures to handle the literature review process were adopted within this research. Short notes and key details from hard-copy references such as books, hard-copy journals, hard-copy conference papers and reports were recorded as documents on a laptop computer for later access. Additionally, soft-copy references such as electronic journals, electronic conference papers, and Internet literatures were saved into organised folders on the laptop. Internet search engine technologies by Google, Yahoo, and MSN that make most practitioner papers and documents can be accessed by using keywords.

Step Two: In-depth Body of Knowledge

The outcome from the previous step provided the researcher with an understanding of the area of study, and was used to shape and scope the study.

In this step, specific areas of study were studied in detail, although some peripheral areas of the study were not completely ignored. The main focus of the study concentrates on specific areas such as portals, system development, Web development, Information Systems, and research methodologies.

The literature was selected regardless of the research methodology. Both quantitative and qualitative papers were reviewed in this research. The researcher categorised the papers by grouping them into different research themes within Information Systems research in order to clearly identify the objective and perspective of the papers.

Finally, the research problems were clearly defined and lead into the following stages of the research. The literature review will be described in two chapters: Chapter 2 and Chapter 3. In Chapter 2, the overall issues that relate to Campus Portals are explained, whereas the issues on the traditional Information Systems and Web development methodologies is discussed in Chapter 3.

1.4.3.2 Phase Two: Preliminary Study

The preliminary study was designed to understand the work of practitioners who are currently implementing a Campus Portal regardless of its generation. As a result, some problems are identified as important questions for the in-depth study.

Information of the research method for this Phase is provided in Chapter 4.

1.4.3.3 Phase Three: the Case Study

The case study was designed to gain an in-depth understanding of the vision of practitioners working on the current generation of the Campus Portal and their view of the future direction of its development. It is also designed to produce an understanding of the current usage patterns of the online activities by major end-users.

Information of the research method for this Phase is provided in Chapter 5.

1.4.3.4 Phase Four: the Composition of the Development Methodology for the Campus Portal

The research methodology for this phase is a specialised approach which cannot generally be found in many other disciplines. However, it can be found in applied disciplines such as computer science and Information Systems, (Iivari, Hirschheim and Klein 1998 cited in Burstein and Gregor 1999). The system development methodology can be considered as a research method in Information Systems discipline (Nunamaker Jr. and Chen 1990, Nunamaker Jr., Chen and Purdin 1991, Burstein and Gregor 1999, Hyland 2001).

In addition, the classification of this approach can be viewed as a constructive type of research, (Iivari, Hirschheim and Klein 1998 cited in Burstein and Gregor 1999), where "useful materials, devices, systems, or methods, including design, systems or methods, including design and development of prototypes and processes" can be produced, Blake (1978 cited in Nunamaker Jr. and Chen 1990 p.631, Burstein and Gregor 1999 p.124).

In Information Systems, the terms 'development framework' and 'development methodology' are often interchangeable. This phase of the research is adapted from the Avison and Fitzgerald (2003a)'s framework, which provides a set of criteria for the comparison of system development methodologies. The framework is compared with the predefined criteria of Campus Portal development in order to select the most appropriate development methodology for Campus Portals. More information is provided in Chapter 9.

1.5 Organisation of this Thesis

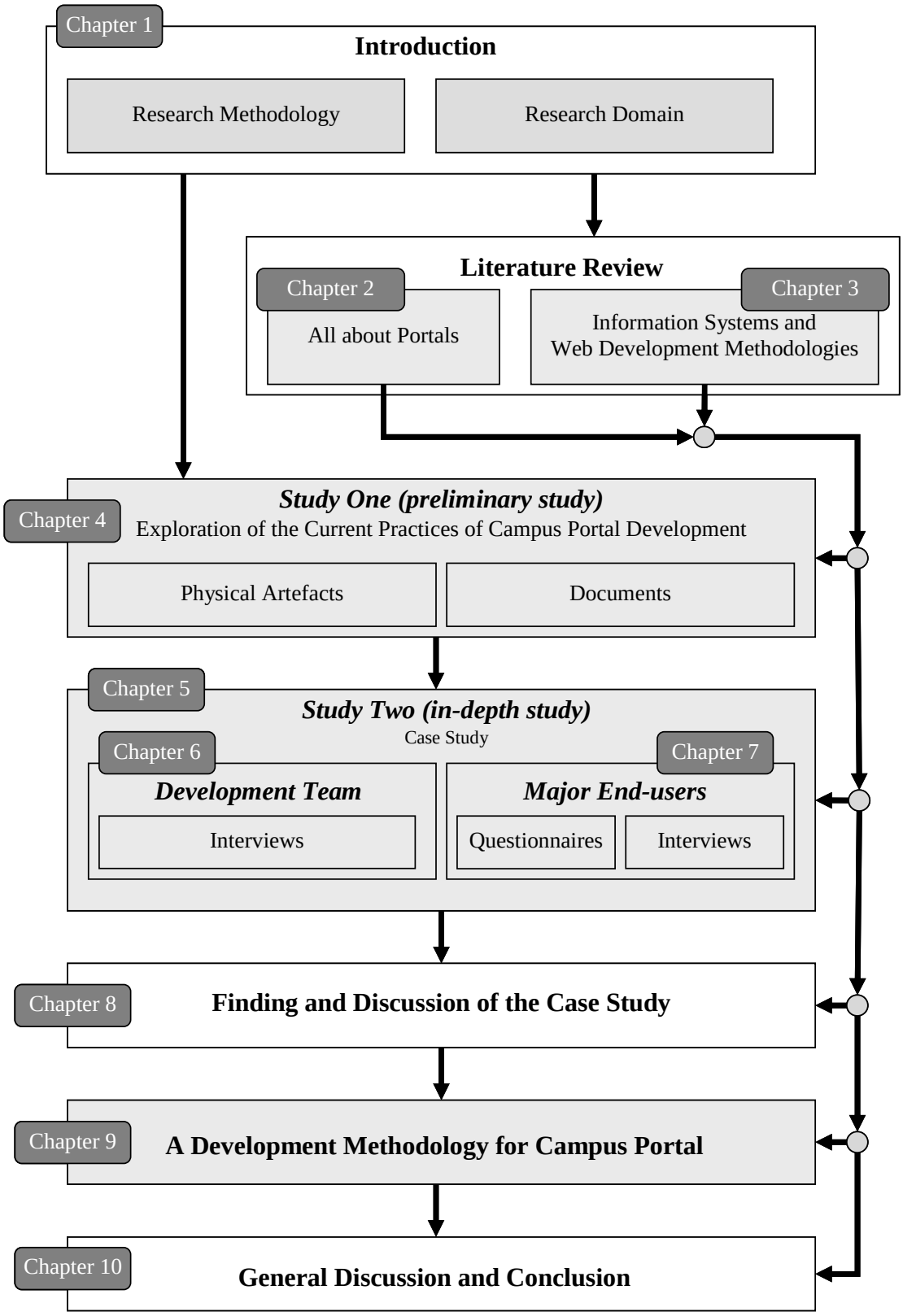

Figure 1-3 Structure of the Thesis

According to the research procedures (see Figure 1-2), this thesis is logically organised into 10 chapters (see Figure 1-3). Excluding this chapter, the remainder of the thesis is organised as follows.

Chapter 2, “All about Portals”, provides the literature reviews of the Campus Portal, which contains the relevant information on Campus Portals and related issues. This chapter begins with a background to the concept of a portal, definitions of important terms, types of portals, the position of Campus Portals among portal types, characteristics of portals, generations, architectures, pitfalls and trends of Campus Portals. In addition, this chapter covers most aspects of portals that need to be understood in order to make sense of Campus Portal development concepts, which will be discussed in other chapters.

Chapter 3, “Information Systems and Web Development Methodologies”, provides literature reviews of traditional Information Systems development and Web development methodologies. This chapter begins with clarification of the position of a Campus Portal within the development methodology theme. Additionally, the important issues on traditional Information Systems development and a review of six traditional development methodologies are provided. Moreover, issues on Web-based development and a review of nine Web development methodologies are discussed.

Chapter 4, “Exploration of the Current Practices of Campus Portal Development”, presents the results and findings of a study, which was conducted on 40 institutional Campus Portal and online services sites in five countries, Australia, New Zealand, the USA, the UK and Canada. Moreover, the research method and research design are also explained. The data collection techniques used are: physical artefact, documents and remote observation. The findings of the study are of significant value for generating a set of research questions for the in-depth case study, which is presented in Chapters 5 to 8.

Chapter 5, “Case Description and Design”, provides information from the chosen case institution and the design of the research methods used throughout the study. In brief, the case is located in a higher education institution in Australia that offers a broad range of courses at all tertiary education levels: undergraduate and postgraduate degree. The research subjects in this chapter are divided into two major groups: the online service’s

development team and the end-users. Additionally, issues about data collection, analysis, reliability and validity are also described in this chapter.

Chapter 6, “Result of the Case Study: Development Team”, provides the results that are analysed from the data gathered from the development team. The interview scripts of key informants are also provided because it is absolutely important to indicate the current vision of the development team, which can affect the development of the Campus Portal.

Chapter 7, “Result of the Case Study: End-users”, provides the results obtained from the analysis of the information gathered from the students. All information is collected using a questionnaire survey; SPSS is used as a tool for quantitative analysis to build a set of usage pattern of their online activities. All activities are viewed from three perspectives: Gender, Student Category and Educational Level perspective. Findings from interviews with staff are also presented here.

Chapter 8, “Finding and Discussion of the Case Study”, provides a discussion on the finding of the whole study of Phase Three: conducted with the development team and end-users. The discussion is divided into two aspects, which reveal the findings from the study of end-users and the development team, respectively. From the end-users, the findings and discussion is focused on the usage pattern of the end-users, especially students, with the supportive finding from the academic staff. From the development team, the findings and discussion is focused on their vision of the Campus Portal. In the final section of the chapter, the discussion combines these two findings together to ensure that issues are identified and an approach to solve the problems is chosen.

Chapter 9, “A Development Methodology for Campus Portal”, explains the approach to selecting the appropriate development methodology for Campus Portals beginning with an analysis of existing Information Systems and Web development methodologies. The criteria for selecting a suitable development methodology are also described as is the one adopted. Finally, a modification of the selected methodology is made in order to guide the development team to properly develop a Campus Portal project, which is described and proposed as a Campus Portal Development Methodology (CPDM).

Chapter 10, “General Discussion and Conclusion”, provides a summary of the whole research, responding to all objectives and questions. The limitation of the research is

also acknowledged. Finally, the contribution of the research and recommendation for future research is noted.

Chapter 2
All about Portals

2.1 Overview

A Campus Portal is a relatively new phenomenon that has arrived on the scene in institutions of tertiary eduction across the globe. The Campus Portal concept is based on emerging Web technology and its implications for the activities of various stakeholders in these institutions. The Campus Portal concept spans many discipline areas, i.e. Web technology, Human-Computer Interaction, technology adoption, management, and so forth. In the current global economy, education has become a major service industry, so that the need for competitive advantage has become a strategic part of many education institutions. A Campus Portal can perform a vital role in facilitating the business processed of all stakeholders within an institution, thereby enabling the achievement of organisation's goals.

However, the mere implementation of any Campus Portal of itself cannot guarantee that the institution will achieve its goals and retain a business competitive advantage. Moreover, misunderstandings of the breadth of the Campus Portal concept will invariably lead to disaster. As the Campus Portal concept has evolved rapidly over the last few years and involves diverse technological, human and organisational aspects, there is confusion over its terminology, concepts, and related issues that need to be clarified. Ignorance and misunderstanding of these issues has become a barrier to cooperation between management, the development team and the various groups of users within the institution. This has led to less than ideal outcomes of many Campus Portal projects.

The concept of Campus Portal is a derivative of the more general notion of an Enterprise Portal, which had been adopted in many business organisations. While some academic research is available in this area, most original literature is in the form of practitioner reports published by business organisations and technical portal vendors.

This chapter, therefore, will begin with a concept of the portal in overall. It will then describe issues of both Enterprise Portal and Campus Portal from both the practitioner

and academic literature identifying and clarifying the major important issues of relevance to Campus Portal development.

2.2 Background of the Portal Concept

An evolution of a portal can be traced back to the original concept of Internet and Web technologies, which introduced the perspective and concept of the Internet, Intranet and Extranet. On a client side, a standard Web browser is an application that is used for connecting to the portal. On a server side, there are many kinds of servers and applications, the front-end, however, will seamlessly be generated as a standard Web page (more details will be explained in section 2.9 Campus Portal Architecture).

In fact, the conceptual framework of a portal is extended from the original concept of the first personalised Internet portal, My Yahoo™ (White 1999b) which was introduced in 1998. Additionally, Campus Portals are mostly derived from concepts of a Corporate and Enterprise portal that was originally introduced by two researchers, Shilakes and Tylman (1998), of Merril Lynch (New York) in 1998. In addition, the Campus Portal was initially introduced by the University of California in Los Angeles (UCLA) in 1999 and followed by the University of Washington and the University of Buffalo (Moskowitz 2001b p.54).

2.3 Portal Terminology and Classifications

The concept of Enterprise Portal was typically derived from a Web portal, but the Enterprise Portal more emphasises on enterprise related issues. It is true that a standardised definition of the Enterprise Portal is still under development and has not yet been finalised even at the time of studying. Consequently, the words of “Business Portal”, ”Knowledge Portal”, “Internet Portal”, ”Corporate Portal”, “Enterprise Portal”, “Information Portal”, ”Enterprise Information Portal” and so forth are used as synonyms and alternately interchangeable (Finkelstein and Perkins 2000, Dias 2001) according to the authors and their points of view.

According to Firestone (1999 p.1, 2003a p.3), “Enterprise Information Portal definition is a political process” which

> *“the process of definition is a ‘political’ business, an attempt to persuade the Investment/IT and ultimately the user community to define Enterprise Information Portal in a manner favoring one’s own vendor*

> *or analytical interests. If a vendor gets their favored definition accepted, it gets to say that a competing vendor is not really an Enterprise Information Portal vendor, or lacks this or that required Enterprise Information Portal characteristic. If an analyst or consultant gets its definition accepted, it gets a boost for its mind share and all the rewards that accompany such a competitive advantage over other consultants or analysts."*

In early evolution of the portal, a Web portal was recognised as a search engine whose main purpose was to facilitate unstructured information available throughout the Internet (Reynolds and Koulopoulos 1999, Dias 2001). Following an advantage of using a Web portal as a search engine, Shilakes and Tylman (1998) introduced a new potential of implementing a Web portal within a business organisation environment called "Enterprise Information Systems (EIP)" and define Enterprise Information Portal as:

> *"Enterprise information portals are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions…….Enterprise Information Portal as a Browser-based system providing ubiquitous access to business related information in the same way that Internet content portals are the gateway to the wealth of content on the Web" (Shilakes and Tylman 1998 p.2).*

An additional idea by White (1999a) also agreed to the definition that was given by Shilakes and Tylman (1998); he described portals offering business users with a simple and personalised Web interface to any information as enterprise systems regardless of the location of the sources. Eckerson (1999c) has a very similar idea, but points out the name as "Business Portal", which

> *"is the business equivalent of the wildly popular consumer-oriented Internet portals, such as Yahoo! and Excite. Simply put, a business portal provides business users with one-stop shopping for any information object they need inside or outside the corporation. These objects can be any number of things: canned or dynamic reports,*

> *queries, text documents, spreadsheets, e-mail messages, news feeds, Web pages, audio files, video streams, Lotus Notes documents, and so forth" (Eckerson 1999c p.3).*

Murray (1999) extends the original definition of the portal by Shilakes and Tylman (1998) into a collaborative point of view; he argued that the portal should not only be a gateway to connect people to the information, but also provide the connection to every information, people, and tools needed, and be considered as a desktop environment. Morrison (2000 p.2) defined and supported the idea of Murray (1999):

> *"A portal is an application that provides a personalized and adaptive interface enabling people to discover, track, and interact with other people, applications, and information relevant to their interests. Its distinguishing features are: **P**ersonalization for end users, **O**rganization of the desktop, **R**esource division, **T**racking of activities, **A**ccess and display of data stores, **L**ocation of important people and things."*

Another perspective that broadens an original definition of a portal with a user-centric focused was mentioned by Reynolds and Koulopoulos (1999 p.4):

> *"individuals share the responsibility for classifying business-critical information. Publishing and other information-sharing activities generate a rich content environment at the corporate portal level without requiring a comprehensive overview. This new environment creates that single point of access for the increasingly 'knowledge-centric' patterns of today's work world. Corporate portal developers focus on a user-centric Information Systems that provides access to working information within one interface".*

From my point of view, a broad concept from the enterprise portal of the pioneer contributors, which were previously described, is considered equivalent. Nevertheless, a detailed focusing point enhanced an original concept beyond its limitations. In order to maintain a standardisation of the definition of the portal throughout the research and contribute throughout the remainder of this thesis, I will define an Enterprise Portal as

> *a user-centric enterprise-wide Web-based Information Systems that incorporates all types of enterprise and third-party information,*

activities, and services for providing its stakeholders with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser.

2.3.1 Perspectives on the Portal Environment

Generally, a portal user can be anyone who might be customer, employee, manager, venders, and so forth of an organisation. Each person however have different activities and requirements and will be assigned as different roles and access restrictions. There are two main types of the portals considered by this perspective.

2.3.1.1 Public Portals

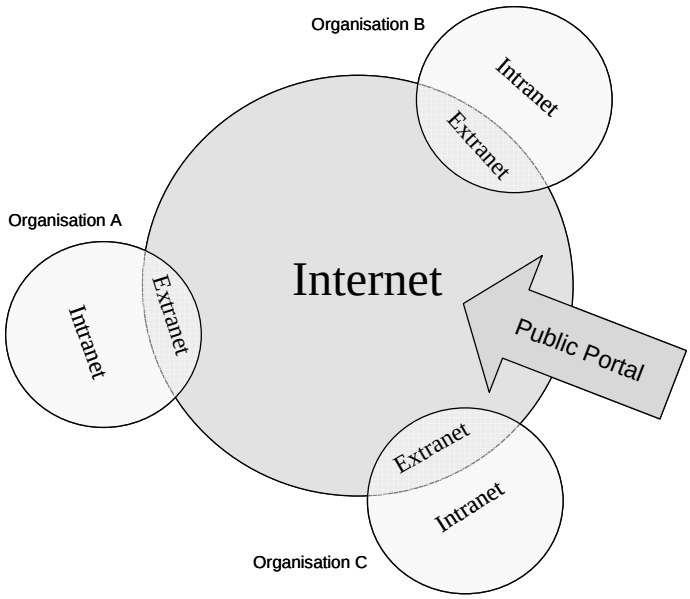

Figure 2-1 Positioning of Public Portal

Regarding Internet technologies positioning, a public portal can be placed on the range of Internet applications as shown in Figure 2-1. This means that anyone who has Internet access can visit a public portal.

> Adapted from Shilakes and Tylman (1998) and Boettcher and Stauss (2000); a public portal is defined in this thesis as *a user-centric Web application that incorporates all types of its and third-party information, activities, and services for providing its users with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser*, such as Microsoft Internet Explorer, Netscape, Mozilla Firefox, etc.

A public portal can be called an Internet Portal (Dias 2001) or General Portal (Collins 2001, Tatnall 2005a). The purpose of the public portal is very similar to the purpose of television, radio and newspaper, that is, to gain a large number of people as subscribers and return back to use the portal as much as possible (Reynolds and Koulopoulos 1999, Dias 2001, Firestone 2003b, Tatnall 2005a).

As a result of that, an Internet Portal provider will be able to attract business organisations to advertise on the Internet Portal to provide an income stream. Some renowned examples of the Internet Portal are http://my.yahoo.com, http://my.msn.com, and http://my.cnn.com.

2.3.1.2 Private Portals

A private portal is either an Intranet or an Extranet, as shown in Figure 2-2. Collins (2001) distinguishes the private portal as two main types: corporate portal and enterprise portal, as follows.

Corporate Portals

> Adapted from Shilakes and Tylman (1998), Boettcher and Stauss (2000), and Collins (2001); a Corporate Portal is defined in this thesis as *a user-centric corporate-wide Web-based Information Systems that incorporates all types of enterprise and third-party information, activities, and services for providing its stakeholders within an organisation with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser*, such as Microsoft Internet Explorer, Netscape, Mozilla Firefox, etc.

Please see print copy for Figure 2.2

Figure 2-2 Positioning of Corporate and Enterprise Portal
Adapted from the idea of (Collins 2001)

Enterprise Portals

Adapted from Shilakes and Tylman (1998), Boettcher and Stauss (2000), and Collins (2001); an Enterprise Portal is defined in this thesis is *a user-centric enterprise-wide Web-based Information Systems that incorporates all types of enterprise and third-party information, activities, and services for providing its stakeholders including customer, suppliers, etc with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser*, such as Microsoft Internet Explorer, Netscape, Mozilla Firefox, etc.

2.3.2 Perspective on Data Management

Roberts-Witt (1999) and Kim, Chaudhury and Rao (2002) recommend three types of enterprise portal that can be viewed from a data management perspective.

- **Data Portals**

  This type of portal is concerned with managing such structured data as corporate databases with a single point of access.

- **Information Portals**

  In contrast to the Data Portals, this type of portal is concerned with managing such unstructured data as e-mail, text, and other documents by using indexing and cataloguing systems and has search and retrieval functionality.

- **Collaborative Portals**
  This type is focused on group interactive functionality as well as the integration of the enterprise by bridging Intranet, Extranet, private source data, and public information. The users are also allowed to access all collaborative functions such as classified topics, conferencing, team discussion, news channel, calendaring, and the abilities to personalise the interface

Moreover, Murray (1999) similarly identifies these types of portals. However there are some different points of view as follows.

- **Enterprise Information Portals**
  The concept of an information portal is to connect people with the information that will be delivered to the user desktop. Collins (2003) expressed that "Enterprise Information Portals are designed for work processes, activities, and user communities to improve the access, workflow, and sharing of content within and across the organisation."

- **Enterprise Collaborative Portals**
  Collaborative portals provide all collaborative features such as conferencing, chat, calendaring, workflow, document management and so forth.

- **Enterprise Expertise Portal**
  Expertise portals connect people to other people based on their expertise for exchanging their skills and knowledge.

- **Enterprise Knowledge Portal**
  Knowledge portals are the integrated features of every type of portals including the personalisation features.

2.3.3 Perspective on Market Segments

Collins (2001) identified and described at least nine types of applications based on available portal market segments on the market. The relationship between the portal market segment and portal terminology is shown in Figure 2-3 and the definition of each segment is described as follows.

Please see print copy for Figure 2-3

Figure 2-3 Corporate portal market segment (Collins 2001, Collins 2003)

2.3.3.1 Information Portals

This is the most common category that connects people to the structured and unstructured information of the organization by categorising into two different sub-types: Intranet Unstructured and Enterprise Reporting. For the Intranet Unstructured, vendors provide systems that enable users to search, categorise, organise, and publish the information over the intranet. For enterprise reporting, the reports are generated from the systems that have access to the data warehouse, data mart or business intelligence space.

2.3.3.2 Enterprise Resource Planning (ERP) Portals

Giant ERP vendors such as SAP, Oracle, PeopleSoft (now merging into Oracle), Baan, and J.D. Edwards have all announced their products that can be classified into this area. The ERP portal uses the advantage of a personalised Web-based user interface that easily allows the users to access the enterprise-wide information and ERP systems.

2.3.3.3 Electronic Commerce (E-Commerce) Portals

The objective of this portal is to use Web-based user interface applications and services to complete the E-Commerce solution, which creates the business relationship between the organisation, customers, partners and vendors.

2.3.3.4 Employee Portals

This portal category focuses on human resource management using Web-based user interface applications and services. The portal allows the human resource department to

manage everything they need, such as managing positions, compensations, recruiting, hiring, training, promoting, relocating, retiring, pension administration, payroll administration and so forth.

2.3.3.5 Corporate Interest Portals

The corporate interest portal focuses on the online and offline interest resources. The portal uses search engine and directory hierarchies for the listing of business-to-business resources, services, and business products that might be of interest to the employee in the organisation. The users are able to search the interested information in this portal instead of exploring the entire Internet searching for particular services.

2.3.3.6 Internet Hosting Portals

The aim of the Internet hosting portal is to provide the Web and application hosting services to organisations including download services, Internet connectivity, and security services. Download services can be used to reduce the printing and mailing cost. Additionally, because the document file can be encrypted, it has a more secure transfer when compared with the traditional mailing systems.

2.3.3.7 Collaborative Portals

Similar to the idea to Murray (1999), collaborative portals provide and focus on communication features such as email, discussion and chat room, project management tools, Internet and Intranet messaging services, and include video conferencing. These tools are based on the Internet-based applications and services.

2.3.3.8 Expertise Portals

The major objective of the expertise portal is to connect groups of people together for sharing and transferring their expertise. Actually, consolidation of knowledge and reasoning methods are not easily represented in the traditional computing approach. The expertise portals, however, have been designed to do these kinds of job. There is a number of functions: librarian who help employees to find, organise, and interpret needed information; advisor who shares the specialised expertise that is needed; an instructor, who helps employees to learn a task; and a general assistant who takes care of defined routine tasks.

2.3.3.9 Knowledge Portals

The knowledge portal plays the most important role of every market segment. It combines all features and functionalities outlined by each individual segment. The capabilities of this kind of portal are retrieving information from organisation Information Systems and presenting it according to the roles of each individual person, maintaining each person's personalisation and providing navigation features, and connecting people for communication and collaboration.

2.3.4 Perspective of Intended Users

Duffner (2003) recommends that a portal should be categorised based on the users who can be internal or external users. In the business organisation, a group of users in general terms are customers, staff members, suppliers, partners, etc. On the other hand, a group of users in a higher education institution are students, prospective students, alumni, faculty, academic staff, administrative staff and so forth. This perspective provides a wide range of focus on a single portal that is specifically designed to suit each group of users by developing an individual portal for each group such as an employee portal, consumer portal, student portal and so forth.

2.3.5 Perspective on Information Seeking

Strauss (2002) recommended and described, as followings, that a portal should be viewed into two major categories: Horizontal Enterprise Portals and Vertical Enterprise Portals.

2.3.5.1 Horizontal Enterprise Portals

A public portal focuses on mass public users. General functionalities of a portal, such as customisation and personalisation, are provided for its users. Normally, this kind of portal provides broad range of contents such as digital storage space, shopping, weather forecast, stock prices, various channels of news, search engines, discussion groups, horoscopes, calendar, etc. On the other hand, this kind of portal will not provide any organisation-specific information, because they are not connected to the organisation Information Systems; but are connected to their own site and third-party contents. Examples of this type of portals are My.Yahoo, My.Excite, and My.MSN.

2.3.5.2 Vertical Enterprise Portals

In contrast to the Horizontal Enterprise Portals, Vertical Enterprise Portals provide organisation-specific information based on a user-centric perspective. Authentication of this type of portals is much concerned when compared to Horizontal Enterprise Portals. When users log-on to the portal, the system will retrieve information, contents and so forth based on the roles of users, such as student, faculty, lecturer, staff, etc.

2.4 The Position of Campus Portals

The current trend of technology adoption within an organisation is moving toward an extension of Web technologies especially as Web-based Information Systems. Almost every enterprise proposes to implement a portal or prioritises it on the top of the list (Kastel 2003).

In fact, higher education institutions are among the most active organisations that always adopt new technologies into their operational and management systems. In addition, most higher education institutions that have already implemented a sophisticated traditional-based Information Systems are converting their systems into a Web-based platform which permits the new system to be integrated with the new functionalities, systems and services of the Internet and Web technologies. A portal is one major Web-based system that a lot of higher education institutions are currently focusing on, and wish to implement in their institution. However, the adoption of the portal and its development methodology are still viewed with suspicion by some.

Generally, a higher education institution is composed of many kinds of stakeholders such as faculty staff (administrative and academic), students (enrolled, alumni, and prospective students), administration and support officers, etc. Although the business model of higher education institution and business organisation is different, there is somewhat of a similarity in terms of the organisation’s structure.

In a business organisation, the business functions are divided into departments such as accounting and financial department, human resource department, IT department, etc. On the other hand, it can comparably be divided into an accounting and financial division, human resource division, IT division, registrar division, and faculties in a higher education.

A customer of a business organisation is the one who purchase its products and services, whereas a student is a customer of a higher education institution. A Web-based Information Systems for a higher education institution usually provides the services to two major stakeholders: a student who can be classified as a customer and primary stakeholder of an organisation, and all staff and its divisions, who can be considered as internal users of an organisation. By considering it from this point of view, the Web-based Information Systems that have been implemented by a higher education institution can be regarded as a type of Extranet. Consequently, a position in a principal site of a portal for a higher education institution should be placed at the same level as an Enterprise Portal, and would be called a Campus Portal.

Although a Campus Portal can be recognised as a type of Enterprise Portal, the nature of a Campus Portal nevertheless can be significantly different from the Enterprise Portal. In fact, both Enterprise and Corporate Portals are more focused to facilitate a business work through their staff in an organisation. External entities such as customers, however, are an extension of the system in the Enterprise Portal.

As opposed to those types of portals, higher education institutions prioritise a customer (student) as a primary stakeholder of their organisation, and attempt to provide the best service to facilitate this group. A Campus Portal project therefore will initially commence from the students and continue to build up to the remainder of the stakeholders within the institution.

Please see print copy for Figure 2-4

Figure 2-4 Positioning of Campus Portal

2.5 The Definition of a Campus Portal

As described in the previous section, a Campus Portal can be viewed as an Enterprise Portal for a higher education institution. A Campus Portal therefore can be defined as *a user-centric campus-wide Web-based Information Systems that incorporates all types of enterprise and third-party information, activities, and services for providing its stakeholders with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser*.

2.6 Characteristics and Functionalities of the Campus Portal

A Campus Portal offers a broad-range of applications and services (Collins 2003) that facilitate all stakeholders of an academic institution. To integrate all applications and services, the functionalities of the portal play an important role in linking all applications and services in order to meet with the user requirements and solve the business problem. However, an integration of the functionalities needs to be consistent with critical portal characteristics. “Due to the breadth of corporate portal functional possibilities, focusing on the key requirements is critical. This framework could be adapted to fit different business requirements” (Aneja, Rowan and Brooksy 2000 p.3).

This section will identify what appear to be the major critical characteristics of portals that are discussed in the literature applicable to all types of portals within education institutions. Importantly, these characteristics should distinguish a portal from a general Web site, and most Internet applications. However as a Portal is a part of Internet technology, some characteristics might unavoidable be already mentioned in the Internet related areas.

Aneja, Rowan and Brooksy (2000) proposed a corporate portal framework (Figure 2-6) which shows the wide-range of characteristics and functions of a corporate portal. This framework was later also adopted by Raol et al. (2002) and will be used here as a guide to those characteristics and functions to be investigated in subsequent phases of the research. These will now be discusses in more detail based on material from relevant literature.

Please see print copy for Figure 2-5

Figure 2-5 Corporate portal framework (Raol et al. 2002)

2.6.1 Personalisation

"The goal of personalization is to deliver content relevant to an individual user or group of users based on their roles and preferences" (Aneja, Rowan and Brooksy 2000 p.4). Personalisation focuses on each individual user's interest as well as an organisation's interest. Because each user has particular information attached to the job position, information and contents on the Campus Portal therefore should be reflected in the user's roles, rights, interests, and specification in the organisation. (Contributed by Eckerson 1999a, Eckerson 1999c, Reynolds and Koulopoulos 1999, White 1999a, Aneja, Rowan and Brooksy 2000, Boettcher and Stauss 2000, Breton 2000, Dias 2001, Eisler 2001a, Ramos 2002, Eisler 2003, Jafari 2003, Nielsen 2003, Terra and Gordon 2003, NEC 2004a, Wojtkowski and Major 2005)

2.6.2 Customisation

From the software implementation viewpoint, "Customization is a socio-technical activity of modifying the properties of packaged software, so that the resulting Information Systems converges with the requirements of the target organization" (Nordheim and Paivarinta 2004 p.2). Adapted from that perspective, customisation is a

socio-technical activity modifying the properties of content and services, so that the resulting information and services converge with the requirements of the user.

In a Campus Portal, customisation is served to suit personal interests and preferences. Because everyone has different needs, each individual user should be able to select a preferred content, personal look-and-feel interface, etc. The most classic example of customisation is a Yahoo Web portal which can be found at http://my.yahoo.com. (Contributed by Eckerson 1999a, Eckerson 1999c, Reynolds and Koulopoulos 1999, White 1999a, Boettcher and Stauss 2000, White 2000, Collins 2001, Dias 2001, Eisler 2001a, Ramos 2002, Eisler 2003, Jafari 2003, NEC 2004a, Wojtkowski and Major 2005)

2.6.3 User and Role Centric

The most traditional Web sites have been designed from the perspective of the provider. A portal should be designed to support the user activities and roles. However, it is unnecessary to have a 100% user-based design. Some information that the provider wants to inform users can also be released to the interface via ‘push’ channels. (Contributed by Firestone 1999, Reynolds and Koulopoulos 1999, Boettcher and Stauss 2000, Frazee, Frazee and Sharpe 2003)

2.6.4 Balance of Pull and Push Information

A term of ‘pull’ and ‘push’ components was clearly defined as “information delivery systems” by Kendall and Kendall (1999a). “Companies will need to use both ‘publish’ (pull) and ‘subscribe’ (push) mediums to ensure the right information is available or distributed to the right people at the right time” (Shilakes and Tylman 1998). However, subscription of the information does not mean that a user has complete rights to subscribe or unsubscribe the minded channels.

A balance between organizational level and personal level needs to be adjusted in order to provide sufficient and efficient information viewpoint. From the organizational level perspective, some information and content that may be classified as a compulsory issue for users within a particular group; it therefore needs to force the information out to the user interface at the same time when the user is logged-on to the system.

From the personal level perspective, channels and information where a user desires to receive information should be displayed and managed as the user’s needs regarding

their privileges. Based on a study of Frazee, Frazee and Sharpe (2003), 88% of students would like to receive announcements and 91% would like to be reminded about important dates such as the due dates of their assignments and appointments.

2.6.5 Easy to Use

Users with minimal experience should easily use a portal with minimal training. Overloading information or access services on the screen is the critical matter for novice users or even experience users. (Contributed by Eckerson 1999a, Eckerson 1999c, Dias 2001, Kim, Chaudhury and Rao 2002, Frazee, Frazee and Sharpe 2003, ICT_EMU 2003)

2.6.6 Categorisation

Because it could be considered as a critical task of an organisation because of the enormous volume of information available on the portal, documents should be organised and indexed into category and sub-categories. All information should be well organised into a set of channels. (Contributed by Aneja, Rowan and Brooksy 2000, Plumtree 2002, Terra and Gordon 2003)

2.6.7 Single Point Authentication and Access

A portal should allow users to have only single secured sign-on. Once users signed on their personal contents, the system should securely pass the user name and password to other pages through the portal without asking for access permission again. Content channels, information, and functionalities subscribed by and related to a user should be available instantly in the first page of the site. (Contributed by Firestone 1999, Reynolds and Koulopoulos 1999, Brosche 2002, Hazra 2002, Firestone 2003a, ICT_EMU 2003, Jafari 2003, Wojtkowski and Major 2005)

2.6.8 Powerful and Unified Search Engine

An internal search engine can be considered as a help desk for most users when they want to find any specific information rather than having to explore the site themselves. It must access all data sources within the rights of signed-on users. (Contributed by Eckerson 1999a, Eckerson 1999c, Aneja, Rowan and Brooksy 2000, Dias 2001, Plumtree 2002, Terra and Gordon 2003, Wojtkowski and Major 2005)

2.6.9 Unified Presentation of Information

A portal should provide a seamless integration of the enterprise information sources, which is a combination of unstructured and structured information and which supports most information formats currently available, and in the future. However, the presentation of that information should look, feel and be accessible regardless of the original source. (Contributed by Eckerson 1999a, Eckerson 1999c, Aneja, Rowan and Brooksy 2000, Dias 2001, Plumtree 2002, Wojtkowski and Major 2005)

2.6.10 Communication and Collaboration

Email, Web board, and chat rooms are tools that should be available to let people who have the same interests communicate and share knowledge. In addition, users should be able to publish their works to like minded groups. (Contributed by Eckerson 1999a, Eckerson 1999c, Aneja, Rowan and Brooksy 2000, White 2000, Dias 2001, Plumtree 2002, Plumtree 2003)

2.6.11 Security

Security is the issue of most concern among users who log into a portal. To protect privacy, the portal should provide some kind of security to make sure that only the right person can access the right account and information. (Contributed by Eckerson 1999a, Eckerson 1999c, White 2000, Dias 2001, Plumtree 2002, Plumtree 2003)

2.6.12 Integration and Extensibility

A portal should provide a standard communication protocol in order to integrate all types of structured and unstructured data, applications and services of an organisation. In fact, the development of Campus Portal is an ongoing process; new modules will be appended into the system after some applications have already been implemented. Additionally, new technologies always reach the sight of the development team, which may offer a great improvement to the existing system. A portal therefore should be adequately flexible for future extension of the system. (Contributed by Eckerson 1999a, Eckerson 1999c, Breton 2000, Dias 2001, Raol et al. 2002, Conway et al. 2003, Jafari 2003)

2.7 Generations of Campus Portals

In general, portal is a large-scale project development that addresses problems within large organisations (Stein and Hawking 2005). As agreed with Cabacungan et al (2002)

and Collins (2001, 2003), the portal development should be considered as a long term process that needs to be continuously developed and later appended, adding new functionalities on top of the previous implemented version (Dias 2001, Hawking and Stein 2003, Stein and Hawking 2005) referred to four generations of portal which originally described by Eckerson (1999b) as shown in Table 2-1.

According to Table 2-1, the development in the first generation puts emphasis on building a content of the portal, which will finally become a basis for the overall system in a portal. A more user-centric viewpoint has been appended in the second generation, which allows users to customise their preferred contents. In the third generation, collaborative functions are a major focus of the development. Finally, all Web-based applications will completely be integrated into a portal system with a role-based personalisation capable. In addition, Dias (2001 p.277) extended Eckerson (1999b)'s generation of portal as shown in Table 2-2.

Please see print copy for Table 2-1

Table 2-1 Generation of Portal (Eckerson 1999b in Stein and Hawking 2005 p.173)

Similar to the proposed generation of Eckerson (1999b), Collins (2001) mentioned that an implementation of the Corporate Portal should be divided into at least three generations. Although Collins (2001) was mentioned in relation to the Collaborative Portal as a part of Corporate Portal segment, collaborative function, however, was not mentioned in the implementation of the Corporate Portal, as shown in Table 2-3. Later in Collins (2003), collaboration and communities was mentioned as one function of the Enterprise Portal.

Please see print copy for Table 2-2

Table 2-2 Extended version portal generation by Dias (2001 p.277)

Please see print copy for Table 2-3

Table 2-3 Implementation of the Corporate Portal (Collins 2001 p.53)

These recommended generations of portals can definitely be adapted into a Campus Portal development. Because each higher education institution is confronted with different problems and situations, the generation and its features nevertheless needs to be appropriately adjusted when determining requirements.

2.8 Campus Portal Stakeholders and Benefits

Many benefits have been clearly claimed for the Enterprise Portal (Firestone 2003a p.35-41). Firestone (2003a p.35-41) described some examples of the benefits such as competitive advantage, increased Return On Investment (ROI), increased employee productivity, accelerated innovation, increased effectiveness, decreased cost of information, increased collaboration, universal access to enterprise resource, and a unified, dynamically integrated and maintained view of enterprise data and information.

From the education institution perspective, there are numerous groups of stakeholders within a higher education institution. However, students in fact are considered as a majority stakeholder with a higher education institution. At the stakeholder level, a student group can be categorised into at least three major types, which are prospective students, current students, and alumni. Unlike other types of organisations, learning is a lifetime process. Bahal (2004) mentioned that new educational model have been drawn that change a range of student profile to 105+ years. Student Group's Life Cycle (see Figure 2-6) is a possible viewpoint that explains the importance of these groups of stakeholders.

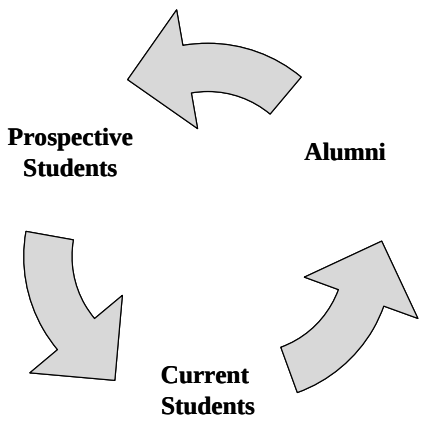

Figure 2-6 Student Group's Life Cycle

Among student groups within the life cycle, the role of a student in this stakeholder level is interchangeable. A student may potentially hold more than one position at a time i.e. John is a Master degree student who finished a Bachelor degree at the university 5 years ago. Therefore, John is a current student, but also has a role as alumni. Additionally, prior to becoming a current student, John also was a prospective student seeking a new course for his Master degree level.

Consequently, each person may experience benefits from a Campus Portal in different ways. Benefits of Campus Portal can be categorised into three types within various levels of an organisation: tangible benefits (SUN Microsystems, Goodridge 2001, Conway et al. 2003, NEC 2004b p.13), intangible benefits (SUN Microsystems, Goodridge 2001, Conway et al. 2003, NEC 2004b p.13), and strategic benefits (SUN Microsystems p.6). Many of them have similar benefits as the Enterprise Portal.

Please see print copy for Table 2-4

Table 2-4 SDSU PORTAL: Benefits for stakeholders (Frazee, Frazee and Sharpe 2003 p.137)

Frazee, Frazee and Sharpe (2003 p.137) proposed a Portal Benefits Matrix for stakeholders based on a study of the San Diego State University (SDSU) Campus Portal, as shown in Table 2-4. The Portal Benefits Matrix explains a brief benefit for each major stakeholder of the SDSU, and can be applied as a fundamental overview

prior to the development of CP. However, it cannot represent and apply to every higher education institution situation. It relatively depends upon the applications, problems' solution, and overall integration of the CP.

2.9 Campus Portal Architecture

As Campus Portal is a part of Internet and Web technology, it therefore derives most of its concepts and technical specifications from the Internet and Web specification. A simple holistic view of a Campus Portal is displayed in Figure 2-7. In terms of connections, a user can access the Campus Portal using their standard Web browser. Furthermore, information and contents relevant to a user's roles and preferences will be seamlessly retrieved from various systems and displayed to the user interface once a user has logged on. Additionally, a connection to syndicate information from third-party providers has become general.

As security issues are a critical issue in all systems, The University of Warwick (2001) presents a secure architecture that will be appropriately applied to the Campus Portal and its related Web applications and systems. "One of the most important design approaches for a Web application is the use of a 'demilitarised zone' (DMZ) to separate the public facing functions of a Web server from any functions that demand connection to internal systems. The DMZ is constructed using another key security product: The Firewall".(University of Warwick 2001) (See Figure 2-8)

Please see print copy for Figure 2-7

Figure 2-7 Adapted from PeopleSoft (2004)

Please see print copy for Figure 2-8

Figure 2-8 Secure Architecture (University of Warwick 2001)

Based on an original diagram of Enterprise Information Portals (EIP) (see Figure 2-9) by Shilakes and Tylman (1998 p.8), Enterprise Information Portal integrates both structured, i.e. business database, data warehouse, reporting, and so forth, and unstructured data, i.e. Web documents, video, audio, email, images, and so forth, by using various kinds of applications and tools to manage and distribute information for users in the organisation.

Please see print copy for Figure 2-9

Figure 2-9 Enterprise Information Portal (Shilakes and Tylman 1998 p.8)

Although each product that available on the market of Enterprise Portal has different characteristics and functions depending upon a major focus of the system, they all share a basic structure, which follows the model of the pioneer of the portal discipline (Dias 2001). White (1999b) is one of the pioneers in the portal area that proposed an architecture of Enterprise Portal, which is shown in Figure 2-10. In fact, Campus Portal architecture is considerably equivalent to the architecture of Enterprise Portal in terms of technical perspective.

Please see print copy for Figure 2-10

Figure 2-10 Enterprise Portal Architecture by White (1999b)

2.9.1 Business Information Directory

The business information directory is an interchange indexed hub which sustains metadata in any kind of information in an organization (White 1999b, Dias 2001). The information can be composed of unstructured and structured information. “The business information directory should have an administration capability for defining user and user group profiles. These profiles should allow the administrator to define and control the types of information a user may see and the features of the portal the user may employ. Users should also be able to modify their personal profiles to indicate the types of information they are, or are not, interested in receiving” (White 1999b). It therefore can be called as a Content Management (CM) tool (Dias 2001).

2.9.2 Publishing Facility

As a collaboration tool, a publishing facility should allow users to create and utilise various types of documents such as word processing documents, spreadsheets, images, video, audio, database queries, HTML, XML and so forth which also require combining security functions on these kinds of documents in order to maintain and protect them from unauthorised users (White 1999b, Dias 2001).

2.9.3 Import and Export Interfaces

Import and export facilities are extremely necessary to modern technological innovation. Under a publishing facility, a portal should be able to exchange some information with internal (organization intranet) and third-party systems (Dias 2001).

2.9.4 Search Engine and Metadata Crawlers

Generally, a metadata crawler is a functional part of a search engine, which searches for the metadata of documents and builds an index prior to being able to use a search engine. A search engine is an important part of the portal that enables users to find any authorised information on the organization.

2.9.5 Subscription Facility

A subscription facility is a personalised channel subscribed by users. A notification and distribution of the message and information are delivered as scheduling (Dias 2001). The supported information should be flexible and compatible with the system within an organization. “It should also support implicit subscriptions whereby information is delivered automatically to users based on their profile or when requested by another member of their user group” (White 1999b).

2.9.6 Web Browser Information Assistant

A portal should provide a single user interface which contains relevant information by referring to users’ roles in an organization (Dias 2001). Moreover, an interface should be able to be customisable to suit the needs of different users and their preferences (White 1999b).

2.10 Portal Pitfalls

Although an emerging technological innovation may enhance in many ways the business process to achieve a business goal, the lack of an appropriate development

methodology and ongoing management could lead to failure. As a Campus Portal project is a large scale development which needs to integrate all Intranet and other online systems within an organisation, a risk of failure is unavoidable.

In order to reduce the possibility of a portal project failing, the planning and developing processes need to be critically investigated. META Group by Roth (2002) mentions that lack of user acceptance and lack of supporting infrastructure is the most common pitfalls of the Enterprise Portal. Roth (2002) additionally identifies a number of other pitfalls and recommends six major steps in the planning process. The following list was adapted from the work of Roth (2002) to the Campus Portal environment:

- **Step 1 – Sponsorship and Ownership**
  Most failures of portal projects are caused by the failure to achieve executive sponsorship and clear ownership. A portal needs a management perspective driven by a top-down approach, which requires an executive-level committee to agree on the project development and sponsor it throughout the life of the portal project. A clear identification of ownership is compulsory in order to maintain the necessary level support for the function of development effort.

  "Thoughtful portal builders will first draw a roadmap and ask pertinent questions, for example about who will use the portal. Will it eventually be rolled out to additional groups within the company, perhaps even to customers and partners? How large a project should it be? If we start small, which interest group should be the initial target?" (Roberts-Witt 2000 p.2)

- **Step 2 – Drivers and Benefits**
  Problems occur through a lack of a clear vision of the goals of a portal's implementation. In fact, just because a new technology does not mean it will be able to solve the problems in which an organisation is currently facing. A lack of a clear statement of goals, and an inability to appreciate the value of the portal to solve the problems could lead to termination of portal projects. A clear description of each stakeholder and organisation benefits is necessary to establish the value of portal development and implementation.

- **Step 3 – Features Inventory**
  A single portal that tries to support a range of stakeholders, but practically

allows only a certain number of groups to get involved in design and development process often causes problems. In general, each portal owner has a different request because they have different problems and business processes. The development of a portal should include all representatives from all areas during a portal development, especially in the requirement collecting process. "In planning the deployment, the development team concluded it ought not to put up the portal before understanding how the 2,000 individual users—most of whom work from a remote office or their homes—spend their days" (Roberts-Witt 2000).

- **Step 4 - Infrastructure Impact Assessment**
  Although the implementation of a portal may help an organisation to solve the problems, insufficient infrastructure to support a portal characteristic and functionalities leads to the failure of the portal project. An evaluation of an organisation's Information Technology infrastructure is necessary to be done before making a further decision on the portal development project.

- **Step 5 – Product Selection**
  Selecting an inappropriate product leads to the failure of a portal solution. This does not mean that an organisation always needs to buy portal products from vendors. Prior to the development of a portal, the development team needs to research the advantages and disadvantages of each relevant products and find out whether they can solve the problem and achieve the organisation goal. Additionally, considering on in-house development and purchasing products needs to be done.

- **Step 6 – Internal Marketing and Feedback**
  A portal has always being designed for all stakeholders, which have different roles, activities and purposes. In fact, the content on the portal has to be dynamically generated and needs to reflect the current roles of a stakeholder. However, "By making people, especially those who aren't used to working in a Web environment, struggle to find what they need, you risk losing them altogether" (Roberts-Witt 2000).
  Additionally, some users who already have experience of Internet portals may place self-expectation on the forth coming portal (Rudnick 2004). Even if a

portal has a beautiful, good looking user interface, a full set of portal functionalities and a full set of features, without solving a problem and facilitating the activities of the users will lead to a failure of the portal project. Encouraging all stakeholders to use the portal is required. Additionally, a training session and feedback channel should be strongly implemented to comfort the stakeholders and track the user satisfaction of the user.

2.11 The Global Trend of the Campus Portal

There has been a rapid growth of foreign students in higher education institutions in most developed countries in last 20 years (Bahal 2004). In fact, there are 237,235 international students studying at Australian institutions as of April 2004 (IDP 2004); it has become the third largest export service industry (Bahal 2004). As a result, a competition between inshore and offshore institutions is unavoidable. Most institutions have considered the Information Technology and Information Systems projects as a strategic plan for their institutions.

According to Englert (2003), Campus Portal development is considered an important emerging technology that supports at the in strategic level of the institution: 45% of the institution's executives replied that the Campus Portal is very important as a strategic level; 29% replied as important, and 22% replied as somewhat important. Englert (2003) further revealed a finding on a stage of Campus Portal development: most institutions already have at least a plan to develop a Campus Portal; 34% already implemented a Campus Portal; 39% are underdevelopment, and 23% are planning to develop a Campus Portal.

2.12 Common Questions and Answers on Campus Portal Issues

Question: What are the similarities and differences between Campus Web site and a Campus Portal?

Answer: Both of them are developed and implemented under a Web technology environment, which needs to have at lease two sides of connection: clients and servers. In fact, a Web site can be as simple as a static site where all information and contents are based on unstructured data, i.e. a HTML page, images, etc , or it can be complex as a dynamic site where partial or

all information and contents are based on structured data that were previously designed and organised into the database system. On the other hand, Campus Portal has to be on a dynamic site and needs to compile with the portal characteristics and functionalities, such as customisation and personalisation, single sign-on, and so forth.

Question: Does a Campus Portal URL begin with 'My'?

Answer: According to Jafari (2003 p.25), a framework of Campus Portal aims at the organisation level. It therefore should be placed at an organisational level's URL. It means that a Campus Portal should completely taken place as a root of an institution's URL, i.e. http://www.university.edu.au rather than sub-URL, i.e. http://my.university.edu.au.

In addition, the first page of an institution's home page should have a sign-on box for a user to log-on to the CP. All non-users should be delighted to be a visitor in which all information and contents relevant to the visitor will be retrieved and displayed on the home page interface. Once a user logged-on, the Campus Portal will retrieve all information and contents relevant to a user's roles and preferences right on the next coming screen.

2.13 Unique Characteristics of Campus Portals

From this review of the literature, it is suggested that the characteristics of personalisation and customisation, which were implemented in the majority of the descriptions of Campus Portals, are the most common characteristics that distinguish them from other kind of Web-based systems and applications. It is inferred that it is theses two characteristics, personalisation and customisation, give a Campus Portal a unique nature and place it among the mature generation among Portals. The users of the Campus Portal can be directly provided with the personalised information and online services through personalisation features, whereas the users will also be enabled to select their preferred contents and optional online services by the customisation functionality. Personalisation and Customisation will therefore receive particular attention in the data collection and analysis of the subsequent phases of this research.

2.14 Summary

This chapter provides some background to the concepts of portals in general and to Campus Portals in particular that forms the basis of the rest of this thesis. This

background should be understood before the preliminary and main research study are undertaken and also before commencing the composition of the Campus Portal development methodology in the fourth phase of this research. Although there are many important characteristics of portals that make them interesting, the most unique characteristics identified in Internet Portals, Enterprise Portals and Campus Portals, appear to be: personalisation and customisation. These will be prominent in all remaining phases of this research.

For Phase Four of the research, some background to development methodologies needs to be studied in order to provide a wider understanding on the development approach that may be most suitable to support the development of Campus Portals regarding all the characteristics identified here but especially the unique characteristics of personalisation and customisation. Therefore, the next chapter of the thesis will provide the background of the traditional Information Systems and Web development methodologies that could support the development of Campus Portal projects.

Chapter 3
Information Systems and Web Development Methodologies

3.1 Overview

Countless methodologies for Information Systems development have been recommended since the 1970s, and development methodologies in the area are still being produced. In particular, both practitioners and researchers continue to create and recommend new methodologies to facilitate the development of the Information Systems application using new technologies and tools with a current shifted to support the emerging areas of Web technologies and applications.

Prior to the revolution of Web technology, there already existed Information Systems development methodologies available to the practitioners for development projects. The major players at that period were often a large enterprise, which were willing to pay a lot of money for Information Systems development. The reason is quite simple: the need for competitive advantage. To achieve this goal, methodologies had been adopted for the efficient development of their computer-based Information Systems.

When the revolution of Web technology started, small businesses and individuals could also afford to create their own computer applications including a Web site. Amazon.com, Yahoo.com and Google.com are very good examples. They started from unknown companies to be some of the most renowned companies in the world. In fact, they had taken advantage of the Internet and Web technology to drive their business so that the Web now has become a strategic part of the business.

Therefore, Web site development and Web-based Information Systems are placed at the forefront of new business system development. Many companies have tried to at least have a Web site and need it within a small number of weeks. Although there are many available Web development methodologies for practitioners, they not well- known, or are known but many avoid using them.

Undeniably, there are contrary and supporting statements on both sides of the argument on the benefits of adopting a methodology for the Website development process. While

it is beyond the scope of this research to study in every available methodology, this chapter will focus on both traditional and Web-based Information Systems development methodologies and examine well accepted methodologies in order to find issues relevant to Campus Portal development.

3.2 The Definition of a Methodology

Before further discussion into details of development methodologies, the definition of the term 'methodology' needs to first be clarified. There is controversy among the Information Systems scholars about the distinction between the terms 'method' and 'methodology'. In fact, there is no universal definition of these terms (Tudor and Tudor 1995). Olica (1988) mentions that although methodology and method have very similar meanings, they may however become different where explicit specification is assumed. In this case, the methodology will have a higher level than a method which becomes an approach within the methodology (Oliga 1988, Avison et al. 1998, Avison and Fitzgerald 2003a). Maddison et al (1983) mentioned that individuals and organisation Information Systems developers may develop methods of solving their problems and then combine with their supporting procedures, techniques and tools to form as a methodology.

As agreed upon in this viewpoint, the "methodology" term used in this research has higher level than "method". Therefore, the methodology is

> "*a method of developing Information Systems, with identified phases and subphases, recommended techniques to use in each phase and subphases, and recommendations about planning, management, control and evaluation of development project and its various phases and subphases" (Maddison et al. 1983 p.4).*

In a modern organisation where almost all people have some experiences in computer technology and the Internet, the definition and scope of original methodology, however, needs to be adjusted. More information on the definition of the methodology will be discussed in section 3.4.3 (What is Information Systems Development Methodology?).

3.3 Clarification of a Position of Campus Portal Development

3.3.1 Technological Shift

In the early generation of software development, there is an issue about an appropriate computer system and platform for developing computer-based Information Systems. In that period, developers much considered in terms of the technical perspective, because there was a limitation in the computer hardware. However, a viewpoint of development has recently been transformed into an organisational and people perspective, technology and computer-based Information Systems (hereafter referred as Information Systems or IS); these need to provide essential information to facilitate a business task to achieve the goal.

From a technological perspective, the computer infrastructure technology that has been implemented in an organisation is dramatically changed. In early generations of the computer infrastructure, only a large enterprise would be able to afford to implement the computer and Information Systems, which were platform dependence, and need to be wired as a batch or a central online system.

In later generations, the personal computer and the use of real-time technology, where the client/server system was initially adopted, were widely implemented to replace the expensive computer systems in an organisation. Additionally, the revolution of the Internet has emerged into an organisation. Small companies and individual are affordable to implement their own Information Systems to facilitate their business.

In fact, the Web technologies were coverage in many disciplines. It was started as a research tool and mainly adopted as a publishing channel. Recently, Internet and Web technology are everywhere: schools, universities, offices, homes, cars, and even mobile phones. These extreme changes of the situation force the business to follow the rapid growth trend of the technologies otherwise, they could be out of the business. Therefore, the Web technology has now become a strategic part of most organisations and, of course, higher education institutions.

3.3.2 Position of Campus Portal in System Development

The Campus Portal (CP) is considered to be the next generation of Web technology and may be able to profit a business to have more competitive advantage. There are many

disciplines that are related to the Campus Portal across the area of system development. Based on the definition of a Campus Portal proposed in Chapter 2:

> *Campus Portal is a user-centric campus-wide Web-based Information Systems that incorporates all types of enterprise and third-party information, activities, and services for providing its stakeholders with a secured personalised and customised single point of access regardless of the original resources by using a standard Web browser.*

It can be seen that the proposed definition of the Campus Portal combines with many other areas, such as the user-centric approach, Web technology, Information Systems, portal characteristics and functionalities. Therefore, the development of a Campus Portal should not be emphasised only as Web site development or in the way of developing a traditional Information Systems. It should be balanced between both aspects of development.

To clarify the position of Campus Portal development within Information Systems and the Web technology development area, an Environment of Software Development Diagram (Figure 3-1) is provided to present a position of Campus Portal development.

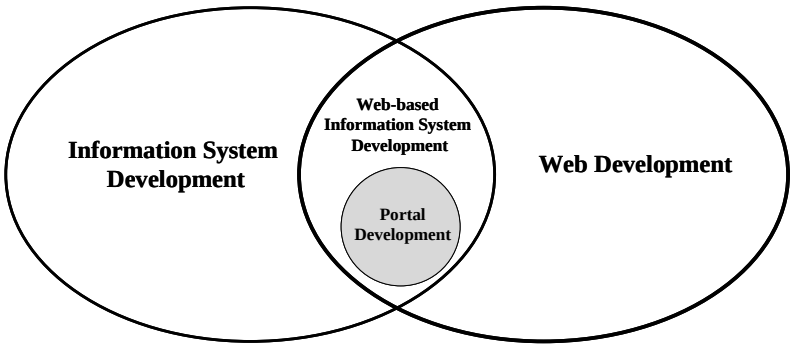

Figure 3-1 Environment of System Development Diagram

As the brief summary in Figure 3-1 describes that there are two distinct areas of development which are Information Systems development and web development. It is true that traditional Information Systems development was generally started in an early generation of the computer-based system in an organisation. After the Internet technology was widely accepted from the public sector, an organisation started to adopt the Internet and the Web to facilitate their business processes. However, an initial adoption of the Web within an organisation was more likely to use as a publishing tool. It, therefore, makes a clear distinction between Information Systems and web development.

At present, the capability of Internet and Web technologies tools are more advanced and completely changed to be a platform of development, a completely replacement of the traditional Information Systems can be done by using Web technology, which then is called Web-based Information Systems (WBIS) (Takahashi and Liang 1997a, Takahashi and Liang 1997b). Moreover, a portal can be considered to be a part of Web-based Information Systems; it, however, has its own characteristics and functionalities which are unique from other Web-based applications as clarified in the Chapter 2. As a result, the portal development needs to be separated from WBIS development. It, however, will be still categorised as a subset of WBIS.

To understand how to approach a methodology for Campus Portal development, all related development methodologies need to be discussed. Details and issues on the development methodology of each segment in the development, which already described in above paragraph, will be further discussed in this chapter.

3.4 Information Systems Development (ISD)

There are numerous numbers of methodologies for ISD that have been developed and used in an organisation for the last three decades; this research, however, will not be able to cover all Information Systems development methodologies (ISDM). In fact, this research therefore will investigate a number of ISDMs, which were well established and well implemented in an organisation. Alternatively, this research will also call ISDMs as traditional development methodologies.

3.4.1 What is Information Systems?

There is an argument among practitioners, students and researchers between the covered area and definition of “Information Systems” and “Information Technology”; it can be differentiated in the definition between Information Systems (IS) and Information Technology (IT) as follows:

> ***Information Systems*** combines people and their requirements (including their activities (Korpela, Mursu and Soriyan 2001)), data, processes, and the use of *Information Technology*, which interrelates to collect, process, store, retrieve, transmit, manipulate and display information regarding to the business and organisation needs; whereas ***Information Technology*** is a combination of computer hardware, softwares, telecommunication,

and other physical devices (see Alter 1996, Laudon and Laudon 1998, Whitten, Bentley and Dittman 2001, Whitten, Bentley and Dittman 2004).

Davis (1974 in Avison and Wood-Harper 1990 p.3) defines information as, "an integrated man/machine system for providing information to support the operations, management and decision making functions in an organisation. The system uses computer hardware, software, manual procedures, management and decision models and a data base."

This means that Information Systems development should cover many aspects i.e. people, organisation, and technology, in order to retain and balance each of these important elements to solve problems and achieve the business goal.

3.4.2 Stakeholders of Information Systems

As was described in the previous section, people are one of major components in the Information Systems. The word "people" in Information Systems does not mean only an individual person; it, however, will more likely include a group of people and department. Whitten, Bentley and Dittman (2001, 2004) classified and detailed a stakeholder group of an Information Systems into four major perspectives:

- **System Owners**
  pay for the system to be built and set the overall vision and priority of the Information Systems project. Therefore, the system owners view Information Systems in terms of costs and benefits to solve business problems and utilise opportunities.

- **System Users**
  identify the business, including their requirements and anticipation for the system, may have more or less technology literacy. They also can be an internal or external system user. Therefore, the system users view Information Systems in terms of functionalities regarding to their jobs, minimal training, and user-friendliness.
  Although many literatures in Information Systems development recommends that user involvement in the process of the development is very important, in practice the user involvement seems to be in a limited condition or completely

disregarded (Nandhakumar and Jones 1997). This situation causes a lot of problems when the Information Systems has been implemented and not meet the user requirements.

- **System Designers**
  are technology specialists who interpret the problem and requirement into a technical viewpoint and design a solution. Therefore, the system designers view Information Systems in terms of a design blueprint for guiding the development of an Information Systems project.
- **System Builders**
  are technology specialists who develop, implement and maintain the Information Systems project. Therefore, the system builders view the Information Systems in terms of integration of hardware and software to develop and implement the Information Systems.
- **System Analysts**
  understand both business and technology perspectives. Therefore, the role of a system analyst is to bridge the gap between both distinction groups. In fact, the system analyst plays a very important role that transform business problems and requirements into technical specifications by balancing between criteria on business, organisation, and available technology and its limitations.

It cannot be denied that there are possibilities in having more groups of stakeholder in the Information Systems development project than in the one mentioned in this section. In the real world of Information Systems development, the stakeholder of the system must be clearly defined before continuing the development process.

3.4.3 What is Information Systems Development Methodology?

There are many types of Information Systems which vary from the operational level to the management level; each kind of Information Systems therefore needs a different kind of development methodology. It can be indicated that many Information Systems development methodologies are started back in the 1970s (Howcroft and Carroll 2000, Avison and Fitzgerald 2003a, Avison and Fitzgerald 2003b). However, a terminology of development methodology varies among Information Systems researchers and

practitioners (Baskerville and Pries-Heje 2001, Avison and Fitzgerald 2003a). Various definitions of methodology are described as follows:

> The most well-known definition of Information Systems development methodology was envisaged by Avison and Fitzgerald (see Avison and Fitzgerald 1988, Avison and Fitzgerald 1995, Kautz and Pries-Heje 1999, Avison and Fitzgerald 2003a p.20), "A collection of procedures, techniques, tools and documentation aids which will help the systems developers in their efforts to implement a new Information Systems. A methodology will consist of phases, themselves consisting of subphases, which will guide the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them plan, manage, control, and evaluate Information Systems projects."
>
> "Information Systems methodology as a recommendation collection of philosophies, phases, rules, techniques, tools, documentation, management, and training for developers of Information Systems" (Maddison et al. 1983 p.4 cited in Avison and Fitzgerald 2003a p.528).
>
> Addition to the well-known definition, Avison and Fitzgerald (2003a p.528) argued the definition of Maddison (1983) that the methodology should address the essential issue of philosophy and further extend Maddison's (1983) definition as "A systems development methodology is a recommended means to achieve the development, or part of the development, of Information Systems based on a set of rationales and an underlying philosophy that supports, justifies and makes coherent such as a recommendation for a particular context. The recommended means usually includes the identification of phases, procedures, tasks, rules, techniques, guidelines, documentation and tools. They might also include recommendations concerning the management and organization of the approach and the identification and training of the participants" (Avison and Fitzgerald 2003a p.528).
>
> "A systems development methodology is a very formal and precise system development process that defines a set of activities, methods, best practices, deliverables, and automated tools for system developers

> and project managers to use to develop and maintain most or all Information Systems and software" (Whitten, Bentley and Dittman 2001 p.78).
>
> Whitten, Bentley and Dittman (2004 p.87) later made minor improvements to their definition in the new edition: "A systems development methodology: a standardized development process that defines a set of activities, methods, best practices, deliverables, and automated tools that system developers and project managers are to use to develop and continuously improve Information Systems and software. A common synonym is system development process" (Whitten, Bentley and Dittman 2004 p.87).
>
> "A system development methodology provides guidelines to follow for completing every activity in the system development life cycle, including specific models, tools, techniques, and a system development life cycle. Some methodologies are home-grown, developed by systems professionals in the company based on their experience. Some methodologies are purchased from consulting firms or other vendors" (Satzinger, Jackson and Burd 2000 p.64).

Essentially, these recent definitions are only an example and part of the Information Systems development methodology definitions which were defined by both researchers and practitioners. Noticeably, the terms "Information Systems development methodology" and "system development methodology" are interchangeable depend upon the context of the proposed definition by respective authors.

3.4.4 Generation of Information Systems Development Methodology

In fact, a generation and development of the Information Systems development methodologies can be retraced back to the computer system generation displayed in Table 3-1. It also can be summarised that popularity on the implementation of the methodologies relatively depends upon the popularity in computer, operating system platform and networking capabilities.

Avison and Fitzgerald (2002, 2003a, 2003b) identified and described an evolution and development of methodologies into three major eras: early-methodology era, which began between the 1970s and early 1980s; the methodology era, which began between the late 1980s and late 1990s; and the post-methodology era, which began from the late 1990s until now. However, they also mentioned a pre-methodology era, which was taking place before the existence of any development methodology. Similarly, Fitzgerald (2000) stated that the concepts of most current available Information Systems development methodologies can be referred back to in the "golden decade", 1967 to 1977.

Please see print copy for Figure 3-1

Table 3-1 Computer System vs. ISDM Perspective, adapted from Unold (2002)

Based on papers by Avison and Fitzgerald (2002, 2003a, 2003b), it is essential to mention their work which reveals a facet of the cycle of the methodology, and create a greater understanding of the possible cycle of the Web, including Portal development methodologies. A summarised version of their works is provided as follows.

3.4.4.1 Pre-methodology Era

This era began between the 1960s and early 1970s when there were no system development methodologies in that period of time. During this period of time of software development, code was written and then debugged with no formal approach of analysis and design (Sorensen 1995). Due to a limitation of hardware, a particular aspect of software development was mainly focused (Wasserman and Freeman 1983). Additionally, developers did not have sufficient knowledge in business and organisation context, users' requirement, therefore, was become low priority. Although the developers might be able to solve the problems, it came from their individual perspective. Regarding accumulating problems of development, a standard regulation

of system development was very much appreciated. As a result, the first methodology was introduced based on the system development life cycle.

3.4.4.2 Early-methodology Era

This era began between the 1970s and early 1980s where the System Development Life Cycle (SDLC), or more generally known as the waterfall model, was introduced by dividing a whole process of development into phases and stages. Because the developers failed to understand the business and organisation context in the pre-methodology era, the objective of using the methodology in this era was to address the need for control and training.

Initially, a life cycle concept is frequently found in many areas of engineering then introduced to the system development (Fitzgerald 2000). Generally, the development process, which uses SDLC, needs to follow in sequential order. One phase needs to be completed before the next process will be able to start. The processes of the SDLC are feasibility study, systems investigation, analysis, design, development, implementation, and maintenance. Unfortunately, the development and implementation of this approach has serious limitations, which will be discussed later in this chapter.

3.4.4.3 Methodology Era

This era began between the late 1980s and late 1990s when an academic discipline in the area of Information Systems certainly matured. Emerging development methodologies in this era came from both practitioners, who developed by practice, and academics, who developed from theory. In fact, a number of users preferred commercial methodologies which were developed by practitioners. The major inspiration for implementing the methodology varied organisation to organisation. The aim however was to have better products which meet the user requirement, better development process, and standardised process. In addition, there were many methodologies which had been used in this era, the majority of them, however, had only one-dimensional perspective.

3.4.4.4 Post-methodology Era

In the era, some organisations have completely declined the use of development methodologies. This era began from the late 1990s where a critical revision of methodology by researchers and practitioners has been taken place, although the

success or failure of the Information Systems development and implementation cannot be evidently proved to use, misuse, or non-use of ISDM. It is true that developers which adopted the methodology for their Information Systems development always expect very high return benefits from the development methodology; failure to prove against that expectation leads to an abandonment of the development methodologies.

In fact, there are many reasons that have been suggested by developers: disappointing productivity, complexity, inappropriate setting for various sizes of projects, unrealistic, and expensive. Additionally, the development methodologies are often not flexible and contingent on the variables of the projects, which may include the size of the projects, technology environment, and organisation context. The reason is that most development methodologies, which are currently available, view the project from a one-dimensional perspective. In the practical, most projects are unique because each organisation has a different context and faces different problems. Consequently, one approach which may fit to one organisation may not well address the different organisation's problems.

3.4.5 Information Systems Development Methodologies

Because of the limitations as previously mentioned, this research will study some well established and accepted methodologies. Traditional System Development Life Cycle (SDLC), Structured System Analysis and Design Method (SSADM), Jackson System Development (JSD), Soft System Methodology (SSM), Effective Technical and Human Implementation of Computer-based Systems (ETHICS) and Multiview will be studied.

3.4.5.1 Traditional System Development Life Cycle (SDLC)

Traditional SDLC is the first system development approach and methodology for the Information Systems project which is generally called the "Waterfall Model" (Blum 1984, Fitzgerald 2000, Avison and Fitzgerald 2003a, Avison and Fitzgerald 2003b). In terms of approach, SDLC can be universally considered as recommended stages which may apply to other development methodologies in different contexts, procedures, technique, and approach. In terms of methodology, it also provides procedure, techniques, tools, and approach to system development projects (see Kendall and Kendall 1999b).

It can be stated that traditional SDLC is a common methodology for Information Systems and software development in many organisations (Bosch et al. 1982, Hoffer, George and Valacich 1996). With the traditional SDLC, a process of Information Systems development is divided into major phases, i.e., feasibility study, planning, analysis, design, developing, implementation and maintenance.

However, the phases may vary depending upon the system developers and development methodology's authors (Blum 1984, Hoffer, George and Valacich 1996, Kendall and Kendall 1999b, Avison and Fitzgerald 2003a). Because the traditional SDLC took place in the early-methodology era, the theme of the following development methodologies were undeniably obtained and influenced some concepts from traditional SDLC (Avison and Fitzgerald 2003a).

SDLC approach has been well tested by many Information Systems development projects and is also very structured and disciplined with good document in order to ensure the development will complete all specifications in all stages (Avison and Fitzgerald 2003a). As a result, it reduces the disregarded details of the development (Davis 1999).

Generally, traditional SDLC methodology has highly sequential structured stages which each stage needs to be completed before continuing to the next stages (Burns and Dennis 1985, Hawryszkiewycz 1994). As a result of inflexibility in a model which all process needs to be completed before making changes to the system are permitted, there may be dissatisfaction from users who really use the system (Burns and Dennis 1985). An accurate reflection of current business environment in additional is an apprehension, because the length of the full cycle of system development may be very time-consuming (Davis 1999).

3.4.5.2 Structured Systems Analysis and Design Method (SSADM)

SSADM is a structured method which was developed by UK consultants Learmonth and Burchett Management Systems (LBMS) and the Central Computing and Telecommunications Agency (CCTA) (Rose 1991, Avison and Fitzgerald 2003a, Yeates and Wakefield 2004). Initially, it introduced methodology for very large government projects (Yeates and Wakefield 2004).

The concept of SSADM was adopted from SDLC, which initially introduced as a first approach to system development (Rose 1991). The objectives of SSADM are to facilitate an IT project team to truthfully analyse the requirement for an Information Systems, and to design and specify and Information Systems to efficiently meet that requirement (Tudor and Tudor 1995).

In the system development process, SSADM covers most aspects of the Information Systems by providing techniques in each aspects and stages of the Information Systems development (Al-Humaidan and Rossiter 2001). In general, the process of structured analysis is to convert conceptual problems into a logical design, whereas a structured design focuses on converting the logical design into a physical Information Systems (Davis and Yen 1999).

The life-cycle of SSADM version 4+ is composed of seven major stages (stage 0 to stage 6): feasibility, investigation of current system, business systems options, definition of requirements, technical systems options, logical design, and physical design (Avison and Fitzgerald 2003a, Yeates and Wakefield 2004). The documentation that is required in every stage remains a major approach to this development methodology.

Large-scale system development projects which generally require well-documented and step-by-step approaches can take benefits from this methodology (Davis and Yen 1999, Avison and Fitzgerald 2003a). Moreover, the distinction between logical analysis and physical design is noticeable in this development methodology (Mason and Willcocks 1994). Additionally, an integration of other approaches such as a rapid application development (RAD) model is acceptable (Avison and Fitzgerald 2003a).

Due to the detailed step-by-step approach which requires well documented, time-consumption and inflexibility is unavoidable (Davis and Yen 1999).

3.4.5.3 Jackson System Development (JSD)

Jackson system development (JSD) is a development methodology that focuses technical aspects in the software development life cycle (McNeile 1986, Rollo 1991), and can be considered as an extension of Jackson Structured Programming (JSP) (Yeung, Smith and Topping 1991, Avison and Fitzgerald 2003a). JSP was developed in 1970s by Michael Jackson (1975), and became a popular design method in Europe

(Ourusoff 2003b, Ourusoff 2003a). Because the JSD emphasis is on the software oriented rather than context and needs oriented in the organisation, it leads to a possible criticism on the overall development of Information Systems (Avison and Fitzgerald 2003a).

The original formulated development step was composed of six steps: the entity action step, the entity structure step, the initial model step, the function step, the system timing step, and the implementation step; these steps were finally modified and rearranged into three major phases in JSD: the modelling phase, network phase, and implementation phases (Jackson 1994, Avison and Fitzgerald 2003a).

Jackson (1994) expressed the detail that the real world is transformed into events, entities, roles, event orderings, and entity attributes in the modelling phase. In the network phase, inputs and outputs are analysed to generate processes for inputs and produce outputs. In the implementation phase, the result of this phase is a final system which also covers physical design of network and databases.

Avison and Fitzgerald (2003a) categorised JSD as a type of process-oriented methodologies that provides a dynamic approach to system development. Additionally, the methodology has clear concepts that combine well-defined activities and fundamental principles (Mathiassen et al. 1996).

Because a core concept of JSD emphasises the development of software, organisational and requirement issues are overlooked (McNeile 1986, Avison and Fitzgerald 2003a). Regarding the recommended phases of the JSD, the implementation phase of this method is complex with lots of technical details and some graphical symbols of its concepts are difficult for developers (Mathiassen et al. 1996).

3.4.5.4 Soft System Methodology (SSM)

SSM can be categorised as organisational-oriented methodologies (Avison and Fitzgerald 2003a). In fact, SSM is one of the most famous soft methodologies originally developed in 1981 by Peter Checkland (Mason and Willcocks 1994, Avison and Fitzgerald 2003a). In general, most Information Systems development methodologies view problem situations as hard problems which are more technological perspectives (Couprie et al. 1997). SSM, on the other hand, views the problem situations in the real world from various perspectives of various stakeholders in the

system (Checkland and Scholes 1990, Mason and Willcocks 1994). SSM was developed to understand the complex problem situations in which hard system methodology fail to address the real problem situation (Vidgen et al. 2002). See Table 3-2 for the differences between 'hard' and 'soft' tradition.

Bulow (1989) in Checkland and Scholes (1990 p.28) describes that "SSM is a methodology that aims to bring about improvement in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, taking action in the real world, and again reflecting on the happenings using systems concepts. The reflection and debate is structured by a number of systemic models. These are conceived of as holistic ideal types of certain aspects of the problem situation rather than accounts of it. It is taken as given that no objective and complete account of a problem situation can be provided."

Please see print copy for Table 3-2

Table 3-2 Two broad traditions versions of which underpin much IS work
(Checkland and Holwell 1998 p.48, Table 2.4)

During the process of system development, it is the fact that there are many other stakeholders rather than end-users and system developers. In practice, each stakeholder requires different needs and have different perceptions (Mason and Willcocks 1994). To approach the best solution to problems, any group and level of stakeholders should also be studied in order to develop an effective Information Systems. Additionally, SSM is also one highly participative approach in the area of system development methodology.

In the time of the first book of SSM was written, numbers of development life cycles that required a sequential process throughout the whole process were being presented (Checkland 1999). Although the SSM recommends a seven-stage model in order to understanding the problem situations, the arrows represents a logical structure rather the step-by-step sequence of the first stage one to seventh stage (Checkland and Holwell 1998, Vidgen et al. 2002). “In practice, experienced SSM practitioners use SSM ideas and framework as a guide to organising an intervention and not as a recipe book” (Vidgen et al. 2002).

Regarding Table 3-2: because a process of inquiry into SSM should be conducted with a qualitative approach, a holistic view of the problem situation can be drawn by using a ‘rich picture’. Checkland (1999 p.A16) states that “the complexity of human affairs is always a complexity of multiple interacting relationships; and pictures are a better medium than linear prose for expressing relationships. Pictures can be taken in as a whole, and help to encourage holistic rather than reductionist thinking about a situation.” Although, it is true that some people may be very good at drawing pictures, some are not. The methodology users need to find the most comfortable way to make a ‘rich pictures’ (Checkland 1999).

3.4.5.5 Effective Technical and Human Implementation of Computer-based Systems (ETHICS)

ETHICS is a methodology based on the participative approach (Nandhakumar and Jones 1997) to Information Systems development, and can be categorised as people-oriented methodologies (Avison and Fitzgerald 2003a). The methodology was developed by Mumford (1983b, 1983a, 1995) as a problem solving methodology, which focuses on maximisation of human gains by assisting organisational systems with new technology to achieve their business goal (Mumford 1983a). In fact, the philosophy of ETHICS is different from most Information Systems development methodologies, because it emphasises on the socio-technical perspective in which IT must rely on social and organisation factors (Avison and Fitzgerald 2003a).

Mumford (1983a in Avison and Fitzgerald 2003a p.449) describe ‘the socio-technical approach’ as “one which recognises the interaction of technology and people and produces work systems which are both technically efficient and have social characteristics which lead to high job satisfaction.” Additionally, Mumford and Weir

(1979 in Avison and Fitzgerald 2003a p.449) defines 'job satisfaction' as "the attainment of a good 'fit' between what the employee is seeking from his work – his job needs, expectations and aspirations – and what he is required to do in his job – the organisational job requirements which mould his experience."

Mumford (1983a) identifies and explains three objectives of ETHICS which related to the management of change. The first objective is to legitimate a value position in which all users at all organisational levels involve a major part in the design of the Information Systems by allow them to influence the design of the system. By doing so, an increase of job satisfaction and efficiency are more likely a result. The reason is that these user groups know their own job satisfaction needs and have more excellent knowledge of day-to-day information needs than any one outside the group of specialists.

The second objective is to facilitate the group participation and position job satisfaction objectives on top of the common technical and operational objectives. Because the human impact of a new computer system is more likely unpredictable, a clear answer on the achievement of job satisfaction and quality of working life objectives, as well as the computer systems and related organisation of work are needed. Otherwise, it may lead to the failure of the system.

The third objective concerns the compatibility between the new technical system and overall organisational system, because technical design is only a small part of the designing process of the Information Systems, which combines work procedures, individual and group activities, specifications regarding the departments, and so forth; it therefore should be well fit to other related systems.

ETHICS is composed of 15 steps (Mumford 1983a) as follows: (1) why change?, (2) system boundaries, (3) description of existing system, (4) definition of key objectives, (5) definition of key tasks, (6) key of information needs, (7) diagnosis of efficiency, (8) diagnosis of job satisfaction needs, (9) future analysis, (10) specifying and weighting efficiency and job satisfaction needs and objectives, (11) the organisational design of the new system, (12) technical options, (13) the preparation of a detailed work design, (14) implementation, (15) evaluation.

3.4.5.6 Multiview

Multiview is a user participative approach (Nandhakumar and Jones 1997) and exploratory approach (Avison and Fitzgerald 2003a) used in Information Systems development. The methodology perceives Information Systems development as a hybrid process which involves with many stakeholders such as computer specialists who will develop the system and users who will use the system during the process of its development; it therefore emphasises both human and technical aspects of the Information Systems (Avison and Fitzgerald 2003a).

Additionally, Avison and Fitzgerald (2003a p.497) state that, "Multiview is a contingent methodology rather than highly prescriptive, because the skills of different analysts and the situations in which they are constrained to work always has to be taken into account in any project." In fact, Multiview can be categorised into two versions: **Multiview1** (see Wood-Harper 1985, Wood-Harper, Antill and Avison 1985, Avison and Wood-Harper 1986, Avison and Wood-Harper 1990) and **Multiview2** (see Avison et al. 1998).

Multiview 1

An original concept of Multiview was developed by Wood-Harper (Wood-Harper 1985, Wood-Harper, Antill and Avison 1985) used action research, which cooperating between researcher and practitioner in order to endeavour to solve a faced problem (Avison and Fitzgerald 2003a). Because the methodology focuses on both human ('soft') and technical ('hard') aspects, integration of other Information Systems techniques and tools from other methodologies (Wood-Harper 1985, Avison and Fitzgerald 2003a) can help to accomplish these perspectives of the methodology.

Wood-Harper (1985) expressed that the Multiview framework (Multiview 1) is composed of five stages with recommended techniques from other methodologies:

- **Analysis of Human Activity System**
  The Human Activity system analysis is based on Checkland's techniques recommended in Soft System Methodology. Rich Picture and Root Definition are the primary techniques (Checkland 1981, Checkland and Scholes 1990, Checkland 1993, Checkland and Holwell 1998).

- **Information Modelling**
  Information modelling is based on the semantic nature of data. Recommended techniques are charts entities, attributes, and relationships and functions on the data (Rock-Evans 1981, Shave 1981).
- **Analysis and Design of the Socio-technical System**
  The socio-technical system is based on the analysis of people, technology, and organisation issues within an organisation. The most influential concepts of the Socio-technical system is originated from ETHICS methodology by Mumford (Land and Hirschheim 1983, Mumford 1983b, Mumford 1983a, Mumford 1995).
- **Design of the Human-Computer Interface**
  Human-computer interface design is based on a study of Blackman (see Blackman 1975)
- **Design of the Technical Sub-system**
  Technical sub-system model design is based on the study and experience of Waters (1979). He detailed that sub-system design focuses on technical perspectives which consist of application, information retrieval, database and maintenance, recovery, control, monitoring, and human-computer interface systems (Wood-Harper 1985 p.172). Wood-Harper (1985), however, argued that human-computer interface systems should be separated from the sub-system as its own major design.

Multiview 2

More than ten years after the first introduction of the Multiview methodology by Wood-Harper (Wood-Harper 1985, Wood-Harper, Antill and Avison 1985, Avison and Taylor 1997), Multiview had finally been enhanced and redefined of its definition as Multiview2 (Avison et al. 1996, Avison and Taylor 1997, Avison et al. 1998). In Multiview1, Avison et al (1998 p.130) detected some problems and identified that the coverage of the methodology is limited only at the design stage of the development. However, there are more stages such as software construction, implementation, operations, and maintenance activities of the software development life-cycle that need to be regarded. Additionally, Multiview1 ties itself to the step-by-step process as

originally recommended in 'Waterfall Model', which could lead to problems when in transition between each stage (Avison and Taylor 1997). While the major purpose of this methodology was defined as a contingency approach to system development, the practical approach of the methodology seems to be a static (Zhu 2002).

Avison et al (1996, 1998) overcomes the problems by reducing and transforming the steps of five stages into a four-box structure, which is composed of four parts: organizational analysis, information analysis and modelling, socio-technical analysis and design, and technical design and construction (Avison and Taylor 1997, Zhu 2002). In the second version of the Multiview, it can be viewed as a 'framework' rather than a 'methodology' (Avison and Taylor 1997, Zhu 2002, Avison and Fitzgerald 2003a).

Avison et al (1998 p.130) continue to express in detail of the Multiview2 that software development, implementation, and production operations have been included in the new version of the methodology to support a full life-cycle of the software development. However, the original themes in organisation, work and technical perspectives introduced in the first version will remain the same. In order to develop the Multiview2 framework, Avison et al (1998) were inspired from the Structuration Theory of Giddens (1984) and a study of Walsham (1993), which adopted Giddens's theory to study the organisational context of Information Systems.

3.5 Web Site Development

Although Web technology can be considered as a part of Information Technology and Information Systems described in the previous section, its characteristics are completely different in many ways.

Firstly, the original purpose of Web development is to build an alternative type of medium that extends a channel of communication to online publishing purpose for internal and external stakeholders. In addition, a purpose of the Information Systems development is to facilitate business transactions and works of an organisation.

Secondly, the development life cycle of a general Information Systems is a long cycle while a short life-cycle of Web development is quite common for many traditional Web projects. A new proposal of the attitude towards the development life-cycle of Web development will be finally reallocated to the long development life-cycle.

Thirdly, a Web site is content intensive, and composed of unstructured information use while structured information and its flow are the major focus of traditional Information Systems.

Finally, Web development is a rich graphical approach, though it may be an optional to most Information Systems development projects. Consequently, the methodology to Web development needs to be discussed separately from the traditional Information Systems development.

Please see print copy for Figure 3-2

Figure 3-2 Range of Web site (Powell 2000 p.11)

Powell (2000) identifies the range of Web sites as displayed in Figure 3-2 (see also Scharl 2000, Ginige and Murugesan 2001b). Because there are various types of Web development projects, this section intends to scope only on the '*Pure Static Web site*' and the '*Static Site with Entry Form*' development, which focuses on a basic approach to developing a Web site that is widely available in short period of time since it was first introducing. The methodology of its development, however, still plays a critical role in modern Web development methodology.

On the other hand, the issues regarding the dynamic Web and Web application development which includes a sophisticated database system, will be discussed in section 3.6, Web-based Information Systems.

3.5.1 Terminology of Web development

Prior to continuing on to the other section of this topic, clarification of terms that used in the area of static Web development is necessary to be underpinned.

- The terms '*Web site development*' and '*Web application development*' in this research are used interchangeably. However, '*web site development*' represents both static and dynamic types of web development while '*web application development*' often represents a dynamic type of the development.
- The term '*Web page*', '*Web document*' and '*HTML document*' in this research are also used interchangeably. However, '*HTML document*' and '*Web document*' will be regarded to a static page, while '*Web page*' can be either a static or dynamic type of document.
- '*Web designer*' is a person who is responsible to designing either a structure or user-interface or both. Based on a study of Newman and Landay (2000), a majority of Web designers have a graphic design background.
- '*Web developer*' is a person who responsible for creating Web site; regardless the site will be a static Web document or dynamic Web page. In general, Web developers have programming knowledge as well.
- The terms '*Hypermedia application*' and '*Web application*' in this research are used interchangeably. In general, the hypermedia application is also covered in the multimedia application; this terms used in this research, however, will only be referred to as Web application.
- The term '*Web author*' in this research refers to a person who responds on the information and content of the Web site. This person will have no responsibility to develop a Web application, but will take a site template to create, modify, and maintain either dynamic or static content.

3.5.2 Characteristics of Static Web Development

A static Web site or read-only information site (Mayhew 1998) can be classified as a type of publishing tool that adopts the Internet as a communication channel to reach the global audience. The original concept of Web development is to use hypertext to enhance the paper-based system in order to be able to publish the information over the

Web. Web development therefore did not initially apply any Information Systems development methodology to develop Web documents in the first period of time.

Because of the potential features of the Internet and Web technologies, i.e. global availability, low-cost, and easy to implementation and maintenance, these features make the traditional Web site to have extremely high acceptance and adoption rate throughout the world (Vora 1998).

In practice, most developers code HTML tags by using a simple text editor (Strauch and Winter 2002). After the release of graphical Web browser 'Mosaic' in 1993, however, the adoption of rich text and images used within the document had thoroughly become very popular. At the same time, many visual HTML editors had been introduced to facilitate Web developers to have a preview of their finished product before officially being published on the online site.

Additionally, a Web developer writes a set of HTML documents and then transfers them to the remote site, which may be located within or outside an organisation. The content and information on the published site will stay unchanged and present exact information to all people and every time they visit. Although it is very handle in terms of there are reasonable numbers of documents, in most cases, however, there are usually uncountable numbers of documents, especially, within business organisations. Therefore, the developers will finally encounter some difficulties to handle and maintain the static Web site.

3.5.3 Needs for Web Design

In general, Web technology covers three major areas: Internet, Intranet, and Extranet. It is true that each area has different goals, user requirements, and so forth. Therefore, Web design in particular user-interface design that should be optimised for each area by concentrating carefully on each objective of the design (Nielsen 2000).

In professional practice, a specialist who has expertise in particular area such as graphic design, information architecture, coding, and so forth will be responsible for each activity of the Web design (Newman and Landay 2000). In real, practical uncountable numbers of Web sites, however, a person who is called a Web master attempts to do everything from graphic design to coding (Vora 1998).

Please see print copy for Figure 3-3

Figure 3-3 Different specialties within web site design (Newman and Landay 2000)

Web design is a multidisciplinary area which combines many themes such as graphic design, coding, user-interface design, human factors, multimedia and so forth (Powell 2000). Newman and Landay (2000) identify areas of Web design into two major groups, which are information architecture and user interface design, each group has a relationship to each other (see Figure 3-3).

3.5.3.1 Information Architecture Design

This is a critical task for every Web site including Web applications to consider and have well designed for this part before building an actual Web project. Uncountable numbers of Web pages show under a construction sign or coming soon, this shows that the site does not have a well designed site structure (Powell 2000). Based on Newman and Landay (2000), information architecture design should cover in two major areas which are information design and navigation design. Whereas information design focuses on the management of information and content structure of the whole site, navigation design focuses on the management and design of linkage access points regarding information design.

3.5.3.2 User-Interface and Graphic Design

In most general cases, information and navigation design were completed prior to continue the graphic design (Newman and Landay 2000). Additionally, graphic design is often considered as a division of art, which can enhance the look and feel of the Web

site. All Web graphic designs, however, should not be represented as artistically perspective. More importantly, the Web graphic should reflect the context and objective of the Web site by facilitating a theme of the overall Web site. Furthermore, most Web pages nowadays allow people to interact with them; the graphic design for the Web development, therefore, should focus on the designing of the user-interface (Borges, Morales and Rodriguez 1998) to optimise the balance between human and technical perspectives.

From the human perspective, there are many issues, for example, user experience, job specification, gender, nationality, education, group of users, and so forth, which need to be considered during the designing stage of the user-interface. From the technical perspective, there are also many issues based on the performance of the site that need to meet the user requirement, i.e. Web site's theme, layout, colour, size of images, typography and so forth.

3.5.4 Static Web Development Methodologies

Although most Web development projects are currently at least a simple dynamic Web site, a study of the original Web development approach to a static Web site is extremely important because a core structure of dynamic Web sites is still involved with similar techniques as a static Web site.

In most cases, static Web developers start to create a document on the editor software without hesitation in order to make an analysis and design; this 'ad-hoc' approach can lead to problems (Linden and Cybulski 2004). Similar to word processing applications, modern HTML editors allow Web developers to easily create, edit, update and publish the documents directly to their online sites. As a result, a broad range of Web developers, who may have no or little technical background in system development, will have an advantage, and seamlessly be able to create their own sites without hiring the programmers.

Although some contents may appear functional, they nevertheless may inefficiently display the contents in acceptable responded timing. Misunderstanding of the method of usage leads to suffering. Only a short period of time after a massive increase in Web sites, some concerns regarding Web development had become very important issues. Additionally, increasing image usage and a large scale of documents are primary concerns to most Web developers (Fuangvut 2000). Adoption of some techniques and

methodologies may help Web developers to reduce these kinds of problems. Developing a Web site without analysis and design is actually comparable to the pre-methodology era of the system development methodology mentioned by Avison and Fitzgerald (2002, 2003a, 2003b).

Power (2000 p.26) states that, "today a crisis similar to the 'software crisis' of the late 1960s exists in Web development. A few years ago most Web sites were little more than digital brochures, and were often termed 'brochureware'. Creating such a site didn't require a great deal of planning – often, simply developing an interface and then populating the site with content worked adequately. Today sites are becoming much larger and more complex. With the introduction of e-commerce and dynamic pages, sites have clearly moved away from brochureware to full-fledged software application. However, many developers have yet to adopt a robust site-building methodology and often continue to rely on ad hoc methods."

Although Powell (2000) mentions about the needs for Web development methodology and adoption of information development methodology such as the Waterfall Model, Modified Waterfall and Joint Application Development (JAD) to Web development, he did not clearly explain a procedure and method of doing so. However, he recommends a site-building methodology for Web design and development which explains a guideline for users, site, page, and user-interface design.

Site-building methodology recommends some guidelines, techniques and tools for a dynamic Web development projects, on the other hand it may more suitable for static Web development projects rather than completely fulfilling a requirement for developing a complex Web application development projects. Similarly, site-building methodology also can be found in many books by different authors (see also Sklar 2000, Concepcion 2001, Valqui and Freire 2001, Sklar 2003). Most of them have a very similar idea and are very useful for basic Web development projects including dynamic Web development, it, however, will guide only basic techniques to design a Web site in overall.

3.6 Web-based Information Systems Development (WIS or WBIS)

Web-based Information Systems (Takahashi and Liang 1997a, Takahashi and Liang 1997b) can be considered as a superset of Information Systems (Strauch and Winter

2002). In the traditional Information Systems, a set of computer applications is usually developed dependent to the operating system platform. In the past five years, most medium to large organisations, however, start to transform their computer application into Web-based applications which offer more independence to the operating system as well as increasing the flexibility of development, implementation, and maintenance. The Web now has become a development platform for computer applications.

Web-based applications are usually combinations of multi-functional systems (Standing 2002). An approach to develop a business application within most organisations has rapidly changed. Previously, the Web applications were developed as a front-end application supported by a traditional Information Systems back-end. Currently, both front-end and back-end applications are generally developed in a Web platform.

There is a fact that a number of organisations rush to develop and implement Web-based applications in order to maintain and gain a competitive advantage. However, the current practice of Web development is more likely an overemphasise on an ad hoc approach which reveals problems such as unmaintainable and user dissatisfaction when developing medium to large Web applications (Koch 1999, Linden and Cybulski 2004). Although there are many existing web design methodologies available; the practitioners do not apply these development methodologies (Linden and Cybulski 2004).

This research will not argue on the matter whether practitioners should adopt the Web design methodologies or not. Conversely, this research would strongly support that the appropriate selection of the methodology should it be applied to both traditional Information Systems and Web-based Information Systems

3.6.1 Characteristics of Web-based Information Systems Development

In general, it is quite common that technology adoption needs some time before repositioning itself in order to be able to develop additional functionalities (see Moore 1991, Norman 1998, Scharl 2000). The reason is that the development technology available in that period of time may have some limitations such as hardware capability, cost, user experience and so forth before being able to overcome these limitations (Bhavnani 2005, Gates 2005). Undoubtedly, the Web development compiles in the same manner as other technology developments.

As it was previously mentioned, the introduction of the methodology for the Web-based Information Systems comes from massive needs of Web site and application development. Most Web sites currently extend beyond an original concept of the Web from the inventor and becomes much more complex than its origin. Ginige and Murugesan (2001b) mention categories of Web application as shown in Table 3-3.

Please see print copy for Table 3-3

Table 3-3 Categories of Web applications (Ginige and Murugesan 2001b p.14)

Adapted from Scharl (2000) and Ginige and Murugesan (2001b), it can be simply identified and described characteristics of Web applications, putting them into two major categories which are:

- **Basic Web System**.
  The major purpose of this characteristic is to develop Web documents and publish them online to inform and promote them to the internal (via Intranet) and external stakeholders (via Internet). The performance and availability of the site are not a major critical issue to an organisation. Most available pages within the Web site are static pages.

- **Advanced Web System**.
  Adoption of database, transaction server, server-side technology programming, and many other business servers are implemented to facilitate business transactions in the organisation. Consequently, fresh content of structured information can be retrieved from the databases and displayed directly to Web page. The performance and availability of the site are a major critical issue to an organisation. Because of the complexity of the site, specialists are required to carefully design in every single component of the site. In general, these kinds of Web sites are deployed in the environment of the Intranet and Extranet, which is available only to employees and business partners.

3.6.2 Web-based Information Systems Development Methodologies

A Web-based Information Systems development methodology has derived a concept from hypermedia development methodology. Usually, hypermedia is a combination of rich texts, graphics, audio, video, and so forth by using the concept of a hyperlink in order to provide a cross reference and navigation to other pages or sections of the application. Any hypermedia design and development methodology should be able to adopt to the development of a Web-based Information Systems (Coda et al. 1998).

3.6.2.1 Relationship Management Methodology (RMM)

Relationship Management Methodology (RMM), one of the hypermedia development methodologies, is the most widely accepted for developing Web applications (Scharl 1999). Isakowitz, Stohr and Balasubramanian (1995) views "hypermedia as a vehicle for managing relationships among information objects" and proposed RMM to accommodate the design and development of hypermedia applications. In fact, RRM addresses design and implementation of large and highly structured hypermedia applications (Lowe and Hall 1999 p.479).

A major concept of this development methodology was taken from E-R approach (Barna et al. 2003), and is as known as the '*Relationship Management Data Model*' (RMDM) (Koch 1999). With the data model, a part of the abstract of the real world is revealed and will be able to expresses an application's design (Isakowitz, Stohr and Balasubramanian 1995). In fact, the E-R approach has been used long-time in many traditional Information Systems projects. Most practitioners therefore are very familiar with it and should understand it easily with this methodology.

Isakowitz, Stohr and Balasubramanian (1995) mentioned that feasibility, requirement analysis, and testing are very important phases in software development. However, these are outside the scope of their article. Therefore the original version of RMM focuses on seven steps of the designing phase, which are Entity-Relationship (E-R) design, slice design, navigational design, conversion protocol design, user-interface design, protocol conversion design, run-time behaviour design, and construction and testing.

A while after the development methodology had taken place in many real project developments, the major author, Isakowitz, mentioned that there are some limitations of this development methodology in particular to the Web-based Information Systems projects (Isakowitz, Kamis and Koufaris 1998a). Isakowitz, Kamis, and Koufaris (1998a) listed some limitations, which are: poor slice contents, lack of context in navigation, top-down design only, and loss of the big picture. The extended version of RMM therefore was introduced to overcome these limitations.

In the extended version of RMM, Isakowitz, Kamis and Koufaris (1998a, 1998b) differentiate Web-based Information Systems applications into three major modelling levels: presentation level (see also Frasincar, Houben and Vdovjak 2001), storage level, and logical level (see also Frasincar, Houben and Vdovjak 2001). At the presentation level, information is grouped and hyperlinked into web pages. At the storage level, the information including its related images is organised and detailed into physical storage units such as databases, folders, files, and so forth. At the logical level, the presentation level and storage level are linked through a range of modelling techniques such as object-oriented and E-R design.

To overcome the limitations, Isakowitz, Kamis and Koufaris (1998a) introduce two new components and extend the whole process from requirement to implementation. The first component is an application diagram where it is possible to represent the whole application by focusing on both top-down and bottom-up approaches. The second component is called ‘m-slice’, which extends the ability from the original version allows combining elements from any entity in the E-R diagram.

3.6.2.2 Object-Oriented Hypertext Design Method (OOHDM)

Object-Oriented Hypertext Design Method (OOHDM) was originally developed by Daniel Schwabe and Gustavo Rossi who tried to recommend an object-oriented approach to Hypermedia application design including Web-based applications (i.e. Schwabe and Rossi 1995, Schwabe and Rossi 1998a, Schwabe and Rossi 1998b). This development methodology was claimed to be suitable for building large and complex hypermedia applications such as web sites, Web-based Information Systems, interactive multimedia applications and so forth (Schwabe and Rossi 1998a, Rossi, Schwabe and Lyardet 1999).

Originally, the methodology consists of four major activities, namely, conceptual design, navigational design, abstract interface design, and implementation (i.e. Schwabe and Rossi 1998a, Schwabe and Rossi 1998b, Koch 1999, Rossi, Schwabe and Lyardet 1999). Based on the original authors, it can be summarised as follows.

- In conceptual design, OOHDM uses its own modelling, which is similar to those in UML. A model of a system, however, can be constructed using any object-oriented modelling (Schwabe and Rossi 1998a). "Conceptual modelling is aimed at capturing the domain semantics as 'neutrally' as possible, with little or no concern for the types of users and tasks (Rossi, Schwabe and Lyardet 1999 p.242)".
- Navigation design is an essential for every hypermedia and Web applications and is constructed by taking from a conceptual model. Therefore it allows the developers to build regarding to different user profiles (Schwabe and Rossi 1998a).
- A concept of an abstract interface design is to describe the user-interface of the hypermedia application by using Abstract Data Views (ADVs) (i.e. Carneiro, Cowan and Lucena 1993, Carneiro et al. 1994, Cowan and Lucena 1995) to model static aspects of the interface while a technique based on Statecharts (i.e. Harel 1987) is used to model dynamic aspects of the user-interface (Koch 1999).
- In the final phase, implementation, all models were already constructed and should be implemented regardlessly of the computer platform (Schwabe and Rossi 1998a).

A separation of activities allows designers and developers to focus on each activity at a time. However, a sequential order of each activity seems to be needed as the outcomes of each activity are strongly related to the next activity. The authors of the development methodology claim that OOHDM can be used regardless of whether the system is purely object-oriented or a hybrid environment. Additionally, OOHDM has claimed to be sufficient design of most Web-based Information Systems.

Recently, a requirement gathering phase was added to be the first step of OOHDM to capture stakeholder requirements (Rossi, Schwabe and Guimaraes 2001). Based on the information from the official site of OOHDM by the original authors (OOHDM_Site

2005), stakeholders of the system and the tasks they must perform need to be identified. Then scenarios can be obtained for each task and type of stakeholder. User Interaction Diagrams were adopted to represent the scenarios in a form of Use Case (Rossi, Schwabe and Guimaraes 2001).

3.6.2.3 Web Information Systems Development Methodology (WISDM)

Web Information Systems Development Methodology (WISDM) was developed by Richard Vidgen and the inventors of Multiview, David Avison, Bob Wood and Trevor Wood-Harper (see Vidgen 2002, Vidgen et al. 2002, Avison and Fitzgerald 2003a). The methodology adapted the Multiview2 framework, which originated the design for the traditional information development to the design of a Web-based Information Systems. Therefore, the fundamental assumption of WISDM is derived from Multiview2 (see Avison and Wood-Harper 1986, Avison and Wood-Harper 1990, Avison et al. 1996, Avison et al. 1998).

"The foundations of Multiview as an enquiring framework for IS development rest on a recognition that needs of computer artefacts, organisations, and individuals must be considered jointly" (Vidgen et al. 2002 p.30). The WISDM has exact foundations as found in Multiview. However, the authors of the methodology proposed a critical designing component, Human-Computer Interface (HCI) that needs to be added into a framework.

According to Vidgen et al (2002), the framework of the methodology is consisted of development method matrix to help developing a Web-based Information Systems. However, there is no sequential ordering of each phase of the development process. The development method matrix is comprised of two dimensions: socio (organisations and people) and technical, and analysis ('what' is required) and design ('how' it will be accomplished) (Vidgen et al. 2002). In fact, one side represents a hard approach and the other represents a soft approach to Web development.

Stages of Web Information Systems development are: organisation analysis, which represents the value creation, work design, which represents the user satisfaction, information analysis, which represents the requirement specification, technical design, which represents the software model, and human computer interface design, which represents user interface (Vidgen et al. 2002).

Additionally, Vidgen et al (2002) explained that the methods matrix uses the metaphor of a still camera where the focus of attention changes as the camera zooms in and out to find the aspect and situation and it can move from one to another when the situation changes. All fives aspects are potentially seen at the same time; the level of resolution, however, may be different.

3.6.2.4 Web Site Design Method (WSDM)

Web Site Design Method (WSDM) was originally developed by De Troyer, O. and Leune, C. (see De Troyer and Leune 1998, De Troyer and Decruyenare 2000, De Troyer 2001, De Troyer and Casteleyn 2003). There are two major characteristics of the methodology. Firstly, the WSDM has a user-centred approach ('audience-driven') to Web development. Secondly, the methodology makes a clear distinction between a conceptual design which does regardless of any implementation detail, and presentation design, which focuses more on the technical issues (De Troyer and Leune 1998, De Troyer 2001).

The development methodology originally focuses on a kiosk type of the Web site (De Troyer and Leune 1998). It however, was enhanced to support the Web application in its latest version (De Troyer and Casteleyn 2003). In contrast to a data driven approach, WSDM starts with a set of potential Web site's users who are classified into user classes. Each user class will have a different set of data which is modelled on a perspective from the user classes. The authors claim that by this approach there is more satisfaction from users regarding a better set of available data, which is tailored to each user group (De Troyer and Leune 1998).

Originally, the development methodology consists of four major phases: user modelling, conceptual design, implementation design, and implementation. In user modelling, there are two sub-phases, namely, user classification and user class description. Potential users of the Web site are first identified and categorised into classes. The authors mention that "each organisation or process can be divided in a number of activities. Each activity involves people. These people are potential users of the site. The activities and parties involved can be represented in a schema" (De Troyer and Leune 1998 p.88).

In conceptual design, there are two sub-phases, namely, object modelling and navigational design. The information requirements of users in each class are

transformed into object modelling, while an appropriate set of navigation for each class is also designed. In the implementation design, the look and feel of the Web site is designed based on the conceptual design phase. In the final phase, implementation, the emphasis is to work on a technical perspective that combines all related web technologies.

A minor changed version of WSDM was mentioned by De Troyer (De Troyer 2001); it, however, still be concentrated on kiosk-type of Web site. The first step of the methodology is recommended with a mission statement, which was assumed to be a dummy part in the original version. In the conceptual design, object modelling has been renamed as information modelling.

Currently, De Troyer and Casteleyn (2003) mentioned that the revision of the conceptual phase of WSDM is to handle a complex Web applications development. Task modelling was recommended to replace information modelling. This gives more details of the process of each task regarding the users and their requirements.

3.6.2.5 Internet Commerce Development Methodology (ICDM)

The Internet Commerce Development Methodology (ICDM) was created by Craig Standing (see Standing 2001, Standing 2002). Although Internet commerce is a primary concern of this methodology, the author of the methodology claims that it can be adapted to other Web-based Information Systems. Based on a paper from Standing (2001, 2002), the methodology can be summarised as follows.

Major objectives of ICDM are to focus on different aspects of the development, which includes both technical and organisational issues, and providing a framework for developers. In fact, ICDM considers e-business development as part of a combination of many different issues within an organisation. It therefore needs to address other parts such as business strategy, managerial and organisational culture issues in the development. In contrast to the majority of Information Systems development methodologies, ICDM is a business analysis methodology and system development methodology.

ICDM provides both management and technical strategies by dividing the process into a set of components: Web management strategy, strategy development phase, meta-development strategy, user involvement, site and component development, requirement

analysis techniques, functional requirements framework, physical architecture framework, design phase, and implementation and evolution phases.

- In the Web management strategy, a big picture of the management and development of the e-commerce project is divided into three tiers: meta-development and management perspectives which provide a framework for development, components development, and developing and implementation of the system, which needs to include various perspectives from specialists.
- In the strategy development phase, a competitive situation of the organisation is analysed using a SWOT analysis, which examines the Strength, Weakness, Opportunities, and Threats of the business. Additionally, value chain analysis and scope of change should be performed.
- In the *meta-development strategy*, the Web management team is responsible for selecting appropriate strategies for developing the Web site based on regulation or control in both content and design.
- In terms of *user involvement*, users of the Web site should be able to be involved in various stages of operations and reviews. Questionnaire and interview can be used during the process of the development.
- In *site and component development*, a multi-disciplinary team is still necessary in order to manage and implement business strategy perspective, rather than only a technology perspective.
- In *requirement analysis techniques*, gathering techniques are implemented for obtaining information from users. Prototypes also can be developed in order to facilitate and define requirements.
- In the *functional requirements framework*, a detailed definition of each function needs to be defined in this stage.
- In *the physical architecture framework*, this phase is to identify techniques for defining the requirements for the Internet project by referring to a type of the project.
- In the *design phase*, various types of design such as desired image, usability, promotion and so forth are considered.

- In *the implementation and evolution phases*, the implementation and evolution plan needs to be set in order to oversee the site by the Web management team.

3.6.2.6 Lowe-Hall's Hypermedia and Web Engineering Approach

Lowe and Hall (1999 p.15) defines a definition of Hypermedia engineering as "the employment of a systematic, disciplined quantifiable approach to the development, operation and maintenance of hypermedia applications". Because hypermedia applications such as CD-ROMs and Webs have become very complex and large, hypermedia applications are at risk of repeating the failure of Information Systems applications (Lowe and Hall 1999).

Lowe and Hall (1999) identify general sets of hypermedia developing activities which are: *specification* where all important issues of content, targeted audiences and so forth need to be identified, *design*, where all important issues of information structure, links, navigation, user interface, and so forth need to be addressed, *content generation*, which is involved with text, audio, video, image and so forth, and *authoring*, which manages all previous designing materials.

A framework of hypermedia applications according to Lowe and Hall (1999) supports many stages of the traditional development cycle. It consists of domain analysis, product modelling, process modelling, project planning, development, and documentation. Based on the works of Lowe and Hall (1999), it can be summarised as follows.

- Domain analysis provides an understanding of the model of the hypertext application. Lowe and Hall (1999) identify three major elements related to the domain: the problem domain, the development domain, and the solution domain. The problem domain allows the developers to understand the reason for developing the hypermedia application. The development domain allows the developers to encompass the development process. Finally, the solution domain allows the developers to encompass the solution of the development.

- Product modelling is a critical part of hypermedia application development. All important aspects about products such as information, structure of information, functionality and so forth need to be clarified. Then, the product model is

selected. Several models were mentioned by the methodology's authors; they however may not be suitable for Web development, except the information-centred model.

- Process modelling is simply a life-cycle of hypermedia application development. The whole process from conception to maintenance may extend until the retirement of the application. Additionally, the process modelling considers the development of each phase and its integration with other processes. Later, the development process will follow these process models.
- The project planning guides the development team in the procedure of the development project. The project manager should benefit from overseeing from the starting point until the project is done.
- According to the authors of the methodology, the documentation is a formal record and communication of the finished products and knowledge. Actually, documentation is very important to every traditional and hypermedia application development.

3.6.2.7 Takahashi-Liang's Web-based Information Systems Analysis and Design

This method was originally developed by Takahashi and Liang (1997a, 1997b). In fact, they proposed a different approach to the development of Web-based Information Systems. The approach focuses on the architectures and functions of the web sites rather than the visual interface of the site. Takahashi and Liang (1997a, 1997b) mentioned that most Web development methodologies cannot answer clearly on how the users will accomplish the business goals, how the Web-based Information Systems will process in order to respond to the user inputs, and how people will communicate to each other by using Web-based Information Systems.

Additionally, Takahashi and Liang (1997a, 1997b) proposed two supporting tools for this method: WebArchitect and PilotBoat.

- WebArchitect is composed of graphical clients and notification agents. It works with enhanced HTTP server. The server is able to handle two methods namely LINK and UNLINK methods.

- PilotBoat is a client application which can navigate the users through meta-level linked web resources. This application is compatible to the Web browsers. Additionally, it contains two functions, namely, navigating meta-level links and sharing a web resource.

The method is composed of these activities: E-R analysis, scenario analysis, architecture design and attribute definition. The flow in the analysis and design of this method which presented in Takahashi and Liang (1997b p.1168) also shows some other activities which were mentioned but they are not covered by this method. These activities are: requirements analysis, program design and test. Based on Takahashi and Liang (1997b p.1168), it can be summarised as follows:

- **E-R Analysis**.
  The purpose of Entity-Relation (ER) analysis activity is to identify the relationship of the domains and scope of the system. The entity will be categorised into agent, event, and product.

- **Scenario Analysis.**
  The scenario analysis is well accepted in the area of software engineering (Takahashi and Liang 1997b) and aims to understand people and their requirements.

- **Architecture Design.**
  This method adapts Relationship Management Data Model (RMDM) for designing based on the scenario analysis. However, the original RMDM was enhanced to be able to distinguish agents, events and products and to describe how web resources are composed of entities.

- **Attribute Definition**
  A major objective of defining the attribute is to record some relevant information for the maintenance purposes. The common attributes are: title, managed by, access right, created by, created date, version and so forth

3.6.2.8 Howcroft-Carroll's Methodology for Web Development

This development methodology was proposed by Howcroft and Carroll (2000). The methodology is consisted of four phases: analysis, design, generation and

implementation. Additionally, all phases are line up in a sequential process, which can be summarised as following.

- **Analysis**
  In the first phase, the aims is to decrease the risk of a project failure by setting the project objectives and goals; the Web site will be designed to achieve these objectives and goals. In this analysis phase, many related areas such as strategy, technology, information, skills, users, cost and risk will be defined. There are several steps in this phase such as development of a Web strategy, defining the objectives, and the objective analysis.

- **Design.**
  After completion of the analysis phase, the designing phase can be started. The major objective of this phase is to design many parts of the Web site. The design is divided into two steps. The information and graphic design are designed in at the first step. Additionally, testing of web site design against the goals and objectives is placed as a second step. In the testing step, if the outcome of testing was not satisfied, the process can go back to do the first step again.

- **Generation**.
  The generation phase will follow the document completed in the design phase. There are four steps: resource selection, design review, code generation and installation and testing. In fact, the process in these steps is basically viewed in a technical perspective. Howcroft and Carroll (2000) mentioned that web site testing is extremely complicated than the traditional Information Systems because of the broader groups of audience.

- **Implementation.**
  Once the Web site has been completely developed, it is now ready to be implemented. However, this phase includes maintenance and objective review in order to ensure the Web site complied to the aims and objectives.

3.6.2.9 Intranet Design Methodology (IDM)

The Intranet Design Methodology (IDM) was developed by Lee (1998). The methodology emphasises on the navigation and user-interface design for the

construction of the Intranet site which was generally implemented within an organisation. Additionally, the users are employees.

This methodology provides a set of feedback loops which located in many sections of the methodology. The feedback loops are flexible to improve the quality of the design. Lee (1998) claimed that the methodology enables the designer to alternate use between top-down and bottom-up approach because the abstraction which the information is categorised into a local and global coherence, and the instantiation mechanisms, which application components can be evaluated and redesigned, are supported in this methodology.

The methodology is composed of many stages: navigation requirement analysis, information requirement analysis, navigation design, file structure design and virtual structure design, user interface design, and implementation and testing. Based on Lee (1998), it can be summarised as follows.

- **Navigation Requirement Analysis**.
  The navigation can be divided into navigation domains which are the sub-application domains and the navigation thresholds which represents a group of the information elements.

- **Information Requirement Analysis**.
  This phase is a continuing analysis process regarding the navigation requirement analysis. An appending of missing or removing the redundancy information will need to be done. Additionally, this phase concerns about information security which the individual access privileges can be identified.

- **Navigation Designs**.
  The identified information will be categorised into nodes with links. In order to complete this task, two concepts, which are metainformation structure and information structure, are recommended. The metainformation structure implements a set of node types to manage the information, whereas each node of the metainformation structure are organised using the classes, sub-classes, instances, attributes, and attribute values in the information structure process.

- **File Structure Design and Virtual Structure Design**.
  A file structure can be simply explained as a set of files which contain a structure of nodes and links.
- **User Interface Design**.
  The concept of the user interface design was adapted from the frame concept that mentioned by (Minsky 1975). Lee (1998) mentioned that user interface is a collection of metainformation structure frame systems, which composed of the menu, index, and the content sub-frame systems.
- **Implementation and Testing**.
  In the implementation process, the specification according to the design phase can be implemented by mapping identified nodes and links into the files and links.

3.7 Summary

This chapter reviews the issues from selected development methodologies, which have already been well-accepted within the area of traditional and Web Information Systems development. Although the characteristics of them are somewhat different, their major objectives are considered the same as they try to facilitate the developer team in developing the system.

Developers may already realise that a single development methodology may not fit with all situations facing the Information Systems and Web project. Until now, the methodology for portal development, especially in Campus Portal is not widely mentioned by practitioners and researchers. In fact, some of Campus Portal and enterprise portal methodologies are hidden from the public because they are embedded with the commercial portal system.

According to the literature reviews, it can be realised that there is no comprehensive formal development methodology for the Campus Portal available for the practitioners. Therefore, an adoption of the formal development methodology, that suitable to the characteristics of the Campus Portal and the users' requirements is in doubt.

Before evaluating and selecting an appropriate formal development methodology, which suitable in major aspects of the Campus Portal development, a clear understanding in the current practice from the other institutions can reflect the direction

of the development. Moreover, some limitations and problems on the current implemented sites may be detected. The preliminary study of the current practice of the development team will be followed in next chapter.

Chapter 4
Exploration of the Current Practices of Campus Portal Development

4.1 Overview

This chapter describes the design, analysis and findings of an initial preliminary study of current Campus Portal development practices in order to specify the questions for the in-depth study, which will be presented in the next chapter. This study of the work of current practitioners is very important because there are many aspects of the current development and apparent future trends that are not acknowledged or understood. Although this is an indirect analysis of their work, it reveals some indication of the significant issues involved.

This chapter begins with the aim of the study, followed by its setting, approach, design, and findings to give an overall picture of the current practice of Campus Portal development teams in universities over five countries on three continents where English is an official language. The chapter concludes with a discussion that addresses some questions which relate to the main case study of the research.

4.2 Aim of the Study

The main aim of the study was to identify the research questions for the major phase of the research, which is a case study. In order to achieve this aim, this preliminary study needed to reveal the views, design and implementation strategies of the current development teams working on various higher education institutions' Campus Portal including the related online services.

An additional benefit to be derived from understanding the current situation of campus portal development was that it could provide a broader understanding for the case study which will be discussed in the next chapter and will help to determine the evaluation of a generic development methodology for Campus Portals.

This preliminary study will address a number of the overall research questions posed in the chapter. The major question was as follows:

RQ1: What is the current practice of development teams in a selection of 40 higher education institutions in countries where English is an official language?

Additionally, there were sub-questions to be addressed as follows:

RQ1.1: What is the current stage and position of the Campus Portal of each institution in comparison with their Web-based systems?

RQ1.2: What groups of stakeholders are being supported by the Campus Portal projects?

RQ1.3: What kinds of systems and functionalities are normally implemented in these various institutions' online services and Campus Portal?

RQ1.4: What issues appear to be the substantial concerns of Campus Portal development regarding the Campus Portal's unique characteristics identified in the literature review of Phase One?

4.3 Setting of the Preliminary Study

Before the study began, a desired setting for the subjects of the study was articulated. The group of subjects were focused in countries which have similar social environments and facilities to the Case University, which will be the site for the case study of the research. The Case University is a higher education institution in Australia that enrols both domestic and international students. More details of the Case University will be provided in the next chapter.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Australia	11	27.5	27.5	27.5
	Canada	7	17.5	17.5	45.0
	New Zealand	3	7.5	7.5	52.5
	UK	6	15.0	15.0	67.5
	USA	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

Table 4-1 Demographic grouping of the institutions studied

A total of 40 higher education institutions were accessed remotely, using the Web browser to visit and collect information from their Campus Portal and online services.

The institutions were grouped demographically by the location of the institutions and their home page, as show in Table 4-1.

The group studied was randomly selected among higher education institutions in Australia, New Zealand, Canada, the United State of America, and the United Kingdom. The reasons for selecting these countries were their similarities to the site of the main case study in the following aspects:

- English is the primary language in these countries. However, language is not a major issue in this research.
- These countries have both domestic and international students enrolled in various courses at their in-shore campuses. Therefore, the institutions have very similar group of students.
- These countries are classified as developed countries, where the information technologies including the Internet are accessible to a similar extent.

According to Table 4-1, there were 11 institutions in Australia, 7 in Canada, 3 in New Zealand, 6 in the United Kingdom and 13 in the United State of America. It was notable that these groups of subjects have very similar living environments, numbers of students, a multicultural group of students, and so forth.

An observation sheet was created and used to record and compare general information on the students of the institutions, although it was not always possible to trace facts and figures of the statistics of enrolled students and staff. However, it can be assumed that all the institutions studied had a very similar pattern of enrolled students even though the statistics were arranged differently.

The numbers of international students ranged from 15% to 35% when compared to domestic students. In addition, all the universities studied categorised the students into particular groups such as undergraduate students, coursework postgraduate students, and research students. However, the words used may vary slightly from institution to institution. It was clear, however, that staff were considered in two main categories in all institution, that is, academic staff and other staff.

4.4 Research Approach and Design

4.4.1 Data Collection Techniques

The qualitative research was also known in many other terms such as field research, naturalistic research, interpretive research, ethnographic research, postpositivistic research, phenomenological research, hermeneutic research, humanistic research, and some kinds of case studies (Wolcott 1990 p.10 cited in Kaplan and Maxwell 1994) (also see Merriam 1998 p.5).

Source of Evidence	Strengths	Weakness

Please see print copy for Table 4-2

Table 4-2 Six primary sources of evidence (Yin 1994 p.80)

As stated by Merriam (1998 p.5), “qualitative research is an umbrella concept covering several forms of inquiry that help us understanding and explain meaning of social phenomena with as little disruption of the natural setting as possible.”

Kaplan and Maxwell (1994 p.47) described the nature of qualitative research that some defining characteristics and purposes of the various qualitative approaches are shared, although there are significant differences among these approaches. Additionally, the qualitative research focuses on understanding the phenomenon from the points of view of the subjects and participants, the natural setting, therefore, is preferred in order to achieve this goal.

In this study, the quantitative result from the data collection was less of a priority but still important. According to the addressed research questions, the qualitative approach in the data collection techniques and the interpretation of the result were placed in higher priority.

Yin (1994) identifies six primary sources of evidence for the case study research. However, these sources should not only be restricted to the case study research but should be able to facilitate other types of research as well. Table 4-2 discusses the strengths and weaknesses of the evidences.

Regarding the nature of evidence that can be reached in the exploratory phase of this study, two kinds of sources of evidence were selected and described as follows.

4.4.1.1 Physical Artefacts

According to Yin (1994), physical artefacts are one kind of source of evidence that allows the researcher to be able to examine the actual finished products in order to obtain an understanding of a broader perspective regarding to the physical artefacts. Additionally, Yin (1994) provides an example which is extremely useful in terms of presenting the concept of using physical artefacts as a source of evidence.

> "For example, one case study of the use of microcomputers in the classroom needed to ascertain the nature of the actual use of the machines. Although use could be directly observed, an artefact – the computer printout – was also available. Student displayed these printouts as the finished products of their work and maintained notebooks of the printouts. Each printout showed not only the type of schoolwork that had been done but also the date and amount of computer time used to do the work. By examining the printouts, the case study investigators were able to develop a broader perspective concerning all of the classroom

applications, beyond that which could be directly observed in a short period of time" (Yin 1994 p.90).

Borrowing this approach, 40 campus home pages of higher education institutions were selected to be studied. This included their student services sites and portals, which can be viewed as physical artefacts.

Based on the observation on the institutions' online sites before commencing the preliminary study, it can be classified the development teams of the higher education institution into two major groups: current developers and prospective developers.

- **Current Developers**.
  The current developer is a development team of the higher education institution that has been implementing the third or forth generation of the Campus Portal (see Chapter 2 for more information on the generation of the portal), the visualisation of the user interface, coverage of the services and functionalities, and the supported group of stakeholders.

- **Prospective Developers.**
  The prospective developer is a development team of the higher education institution that has implemented the early generation of the Campus Portal. This group is actually a major target of the methodology products, because they may adopt the campus portal development methodology for their future development of the Campus Portal.

In fact, both groups can definitely contribute some perspectives to the study regarding their current practice of the development team, which can be created from their physical artefacts (any generation of the Campus Portal). Although more analysis and discussion will be heavily based on the current developers, both current and prospective group of development team in order to provide a perspective on the development team and a holistic view of the Campus Portal at the current situation as well as the trend of the possible development, can be integrated into the analysis of the current developers to generate more understanding on the development of the Campus Portal.

Because the studied groups were located in different places, some data collection techniques such as face-to-face interviews and discussion groups are almost impossible to be processed. Although there are some available online communication tools such as

messaging services that enable researchers to be able to conduct the interview, the success of net-based interviews rely on many factors such as the degree of trust, attitude of the participants on the net-based interview, insecurity of discussion over the internet, and so forth (Anderson and Kanuka 2003).

The open-ended email survey is another example. It was quite easy to send a questionnaire over the Internet via email to someone in a remote area. However, a spam email and viruses are very serious issues among the current Internet communities. Additionally, most institutions were aware of the situation and installed a spam filter service on their network system. The questionnaire might not be able to reach the destination. Moreover, the best practice of most people to avoid the computer viruses is to not open the email from unknown people.

In fact, the current Web technologies are efficient enough to allow observing and investigating of the actual sites by using a Web browser. As a result, I finally selected an approach to study on the actual implemented Campus Portal and related online services. Although there was in fact a limitation on the access to a restricted area of the Campus Portal, the supporting evidence of the documents was applied in order to verify the investigation.

4.4.1.2 Documents

According to Yin (1994), the documents are important in the sense that they can be relatively used to corroborate and augment evidence from other sources. “Documents such as evaluation reports, technical reports, and case studies can now be used in analysed that not only aggregate common information but lead to new insights into public policy and its formulation” (Guba and Lincoln 1981 p.227).

There were no participants in the process of document collection in this study. All documents which had been collected from the Internet were released by the development teams for various purposes, such as executive reports, technical reports, summary of meetings, case studies, evaluation reports, help documents and so forth. In fact, the documents are limited to their origins based on the previously mentioned countries.

4.4.2 Data Analysis

> "Qualitative analysis transforms data into findings. No formula exists for that transformation. Guidance, yes. But no recipe. Direction can and will be offered, but the final destination remains unique for each inquirer, know only when - and if – arrived at" (Patton 2002 p.432).

Regarding the data collection approach, the qualitative data analysis was selected to interpret the result. The data in the close-ended section was recorded into a software package SPSS to reveal some basic quantitative numbers such as frequency and percentage in overall of the studied sites; at the same time, the analysis of the open-ended question was completed in qualitative approach.

4.4.3 Overview of the Procedure

The campus web sites were randomly visited by selecting from the list of higher institution pages at Yahoo!® directory services.

- **Australia**
  http://dir.yahoo.com/Education/Higher_Education/Colleges_and_Universities/By_Region/Countries/Australia/Complete_List/
- **New Zealand**
  http://dir.yahoo.com/Education/Higher_Education/Colleges_and_Universities/By_Region/Countries/New_Zealand/Complete_List/
- **Canada**
  http://dir.yahoo.com/Education/Higher_Education/Colleges_and_Universities/By_Region/Countries/Canada/Complete_List/
- **USA**
  http://dir.yahoo.com/Education/Higher_Education/Colleges_and_Universities/By_Region/U_S__States/
- **UK**
  http://dir.yahoo.com/Education/Higher_Education/Colleges_and_Universities/By_Region/Countries/United_Kingdom/Complete_List/

There was an agenda behind each visit to the Campus Portal and online services. Firstly, the information regarding to all addressed questions was recorded into a study form

which composed of close and open-ended questions. The information which related to a close-ended question was grouped into a specific category in order to unify the focus of each question. It is true that the recorded information can be considered from the quantitative viewpoint. However, the use of information that was represented in terms of numbers not only describes the sense of population among the developers' practice, it possible tells the perspective of their thinking behind the number. However, it needs to be interpreted along with the comment section, which is an open-ended question. For the open-ended question, the comments were made and recorded into a study form for the analysis process, in order to make sense of the perspective behind each site.

Secondly, the observation had no intention to evaluate or mention the user interface design of the site. The functionalities of the Intranet or portal which normally can be seen as a part of the interface were included in the study. Therefore, some overlapping of the area may occur.

Thirdly, the interpretation of the result will be processed in qualitative approach. Although the study explored only 40 academic portals out of thousands, I found that all addressed questions have already answered since I was investigating the 30th portal. In order to validate the result of the study, I further collected the reports from other Campus Portal development teams to find out whether both results were synchronised.

4.4.4 Design of an Physical Artefacts' Study Form

According to Geer (1991), both close-ended and open-ended questions are useful for collecting the information. There were two main sections within the form. The first section was composed of close-ended questions which identified the site's characteristics to understand and reflect the design of the development team. The second section was a comment section which allows me to write a free passage describing the major noticeable context relevant to the objective of this study.

4.4.4.1 Section 1 (Close-ended Questions)

The objective of this section is to record a set of common characteristics of the implemented Campus Portal. The section composed of eight questions is described as follows.

Question 1-3

Question 1 "What is an institution name?"

Question 2 "What the country is the institution located?"

Question 3 "What is the URL of the site?"

Question 1-3 were designed to record general information regarding to the campus web site and portal. No analysis was required in these questions. In this research, the name of institutions remained anonymous because there is no intentions to direct criticise the existing production of each observed institution. In fact, the study and research interpret the study as a whole case to contribute the knowledge and recommendation regarding the campus portal development to the practitioners and researchers' communities without direct criticism of the observed sites.

Question 4

Question 4 "*Is there any sign of the Campus Portal on the institution's home page?*"

Question 4 was designed to observe whether there is any sign of the Campus Portal displayed on the home page of the institution. The major objective of this question was that the sign of the campus portal should be able to indicate how the development team and the institution view and position the Campus Portal with other Information Systems s and services.

The possible answers are:

- **No**.
  The answer '*No*' means that a sign or trace of the Campus Portal could not be found anywhere within the institution's home page.
  Yes, as a normal link.
  The answer '*Yes, as a normal link*' means that a sign or trace of the Campus Portal could be found in the general area on the home page, though it looks very similar in colour and font with surrounding hyperlinks.

- **Yes, as a link with an image or in a menu zone.**
  The answer '*Yes, as a link with an image or in a menu zone*' means that a sign or trace of the Campus Portal could be found in a special or main menu area of

the home page with bold font, special colour, special image with links and so forth considered as some kind of special notification to visitors.

- **Yes, as a clear section with login.**
  The answer '*Yes, as a clear section with login*' means that a sign or trace of the Campus Portal could be found in a very clear section on the home page with a sign-on section and submit command button that allows users to log-in directly to the Campus Portal from the home page.

Question 5

Question 5 "*What is the generation of the Campus Portal?*"

Question 5 was designed to observe a generation of the studied Campus Portal, which provided to the stakeholders of the institution. The major objective of this question was that the production of the development (Campus Portal) should be able to provide the current practice of the institution and development regarding the current situation of each institution. However, the study was not to discover a perspective of the whole web site of the institution. In fact, the purpose was quite straight forward and only aimed at the specific Campus Portal that was developed in order to facilitate the stakeholders. This study adopted the generation of the portal which proposed by Eckerson (1999b) as a framework to investigate the Campus Portal of the studied institutions.

However, it is not necessary that all characteristics of the Campus Portal must be presented; some major characteristics, such as single sign-on, personalisation and customisation, however, should be available in order to be able to classify as a type of Campus Portal.

The possible answers are:

- **First Generation**
  The answer '*First generation*' means that there is the first generation Campus Portal available to the stakeholders of the institution. Although there are some online services available to the stakeholders, they, however, are more likely lacking of the portal's characteristics.

- **Second and Third Generation**
  The answer '*Second and third generation*' means that there is the second or third generation Campus Portal available to some groups of stakeholders.

Additionally, major characteristics of the Campus Portal such as single sign-on, personalisation and/or customisation should be available.

- **Forth Generation**
  The answer '*Forth generation*' means that there is the forth generation Campus Portal available to all stakeholders of the institution. The stakeholders generally are prospective students (visitors), current students, staff, management team, alumni, and so forth. Additionally, major characteristics of the Campus Portal such as single sign-on, personalisation and customisation should be available based on each person roles.

Question 6

Question 6 "*What stakeholders are supported?*"

Question 6 was designed to observe the groups of stakeholders supported by the Campus Portal and the related online services. The major objective of this question was to understand the priority that had been positioned among the stakeholders of the education institution. In general, there are many kinds of stakeholders within the institution. However, the clearest distinction between groups is classified regarding the current status of the role within the institution.

The possible answers are:

- **Students.**
  The answer '*Students*' means that the developed Campus Portal supports the current students of the institution. In general, the current students are the majority of the users of any institution.

- **Staff.**
  The answer '*Staff*' means that the developed Campus Portal supports the current staff of the institution.

- **Alumni.**
  The answer '*Alumni*' means that the developed Campus Portal supports the former students (alumni) of the institution.

- **Others.**
  The answer '*Others*' means that the developed Campus Portal supports other

stakeholder groups of the institution. Additionally, group names supported by the system were recorded on the study form.

Question 7

Question 7 "*Where is a domain level of the Campus Portal?*"

Question 7 was designed to observe the domain level of the Campus Portal. The major objective of this question was to find out how the development team prioritises the Campus Portal among other services. Although the study cannot definitely know the reason behind the decision, it can show to some extent a viewpoint and vision among the development team.

The possible answers are:

- **N/A.**
  The answer '*N/A*' means that there is no Campus Portal available or the default URL of the Campus Portal cannot be recognised as a domain type. However, it may or may not be referred to as a directory or virtual direct directory type i.e. http://www.institution.edu.au/portal.

- **The Institutions' Home Page.**
  The answer 'The Institution's Home Page' means that the default URL of the Campus Portal is the institution's URL.

- **My.**
  The answer '*my*' means that the development team implemented 'my' sub-domain to refer to the Campus Portal. Since 'my' is a popular subdomain name that widely recognised as a portal type web site i.e. http://my.yahoo.com and http://my.msn.com, I placed the 'my' sub-domain as an individual type of sub-domain in the study.

- **Subdomain.**
  The answer '*sub-domain*' means that the development team referred to the portal using other sub-domain names rather than 'my' sub-domain name, i.e. http://portal.institution.com.au. Subdomains or child domains are the second-level domains from the main domain of the institution, which are normally used to manage the web site content at an individual site rather than a long URL address.

- **Individual Domain Name.**
  The answer '*Individual Domain Name*' means that the development team registered a new domain name for the Campus Portal, i.e. http://www.myportal.com, or http://www.myportal.edu.au.

Question 8

Question 8 "*How does the development team provide the personalisation and customisation functionalities to the users?*"

As previously identified in the second chapter, personalisation and customization are unique characteristics of the Campus Portal. Question 8 was designed to observe the availability pattern that the development team provided these unique characteristics to the users. In fact, the implemented pattern of personalisation and customisation varies depending upon the criteria of its definition and difficult to be specified. However, the study simply categorised it into a certain viewpoint as following shown.

The possible answers are:

- **Low Level**
  The answer '*N/A*' means that the Campus Portal maintain a very low implemented level of the functionality of personalisation and customisation for the users. In fact, the users may be able to receive personalised information once they were logged-on. The content's channels, however, were already selected by the development team and system owner, i.e. the registrar office. However, the user may not be able to select their preferred information content and online services.

- **Medium Level.**
  The answer '*Medium-Level*' means that the Campus Portal did offer some stages of functionality of personalisation and customisation to the users. Once the users log on to the portal, the system will retrieve all personalised information, customised contents and channels, and will be displayed them on the screen for the users.

- **High Level.**
  The answer '*High-Level*' means that the Campus Portal offers full functionality of personalisation and customisation to the users. Once the users log on to the

portal, the system will retrieve all personalised information, customised contents and channels, and will be displayed them on the screen for the users.

4.4.4.2 Section 2 (open-ended question)

Because some characteristics of the site were quite unique and cannot be grouped in general terms, the second section that was an open-ended question allowed me to record a free text that described what I had found on the Campus Portal.

4.5 Result and Finding

4.5.1 Current Stage and Position of Campus Portal

This section aims to answer the addressed sub-question:

> **RQ1.1:** What is the current stage and position of the Campus Portal of each institution in comparison with their Web-based systems?

There was a variety of stages in the Campus Portal development that could be found among 40 studied institutions. In concluding the current stage and position of the implemented Campus Portal, three indicators were investigated.

4.5.1.1 A Trace of a Campus Portal

A trace of a Campus Portal provides a reflection on the perspective of the development team as to how the Campus Portal was positioned among other Web-based systems. In general, promotion and advertising play extremely important roles in marketing discipline (see McCarthy 1964, Kotler 1976, Booms and Bitner 1981, Mindak and Fine 1981, Kotler 1986, Rafiq and Ahmed 1995, Kotler and Armstrong 1998), which allows people to have a better understanding and motivate them to buy and use the products. In fact, the Campus Portal can be considered as a product which designed and developed by development teams to in order to facilitate the institution's stakeholders during doing their business in the institution.

Table 4-3 shows the result among 40 home pages of the studied institutions. More than half (55%) of the institutions' home pages did not provide any link or mentioned the stakeholders' Campus Portal, while 45% of the institutions somewhat mentioned their Campus Portal.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	22	55.0	55.0	55.0
	Yes, as a normal link.	5	12.5	12.5	67.5
	Yes, as a link with image or in a menu zone.	12	30.0	30.0	97.5
	Yes, as a clear section with login	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

Table 4-3 Trace of Campus Portal

Additionally, 12.5% promoted the Campus Portal as a general link within the home page while 30% provided a link into the main section or menu, and some of them placed a graphic image to promote the site. Additionally, only 1 out of 40 sites provided the users with the ability to log-on to the Campus Portal on the first page of the institution home page.

4.5.1.2 Type of Campus Portal

A type of Campus Portal is a direct indication that shows the availability of the existing Campus Portal. It can be found that a category of Campus Portal is relatively associated to the trace of Campus Portal. Therefore, a cross tabulation between the type of portal and a trace of the portal was displayed in Table 4-4.

			Any Trace of Portal				
			No	Yes, as a link.	Yes, as a link with image or in a menu zone.	Yes, as a clear section with login	Total
Type of Portal	First Generation	Count	18	1	2	1	22
		% within Type of Portal	81.8%	4.5%	9.1%	4.5%	100.0%
		% within Any Trace of Portal	81.8%	20.0%	16.7%	100.0%	55.0%
	Second/Third Generation	Count	4	4	10		18
		% within Type of Portal	22.2%	22.2%	55.6%		100.0%
		% within Any Trace of Portal	18.2%	80.0%	83.3%		45.0%
Total		Count	22	5	12	1	40
		% within Type of Portal	55.0%	12.5%	30.0%	2.5%	100.0%
		% within Any Trace of Portal	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4-4 Cross tabulation between Type of Portal and Any Trace of Portal

Table 4-4 shows the result where half of the subjects (55%) implemented only the minimal set of the functionalities on the Campus Portal for facilitating the stakeholders of the institutions.

Most interestingly, no forth generation Campus Portal was found in any institution among 40 institutions. Furthermore, first generation Campus Portal (81.8%) did not provide any hyperlink on the institutions' home page whereas 4.5% provided as a

normal link and 9.1% highlighted the Campus Portal as an image or place in the main menu. For the second and third generation, 22.2% did not provide a hyperlink to the Campus Portal site, whereas 22.2% provided at least a simple hyperlink. Moreover, the majority of the second and third generation Campus Portal (55.6%) provides the users with a very clear image links or placed the link in the menu zone.

As it can be noticed from the result, the majority of the studied Campus Portal was just in the beginning process of the whole development of the Campus Portal, which may take a lot of time to complete and achieve the firth generation Campus Portal.

Based on the literature review, because the Campus Portal is now considered as a strategic part of many institutions, it can be understood and summarised from the result that most development teams distinguished and promoted the Campus Portal for their stakeholders as a system that should have a direct link from the institution's home page.

4.5.1.3 Portal's URL Location

The portal's URL location is an indirect indication that can be used to determine the decision of the development team behind the Campus Portal. The reason is that most major online services' site such as Intranet as well as the Campus Portal often have at least a sub-domain name for their project. The Campus Portals were often referred to as 'my' sub-domain after such popular Web portal sites such as http://my.yahoo.com, http://my.msn.com, http://my.excite.com, http://my.aol.com and so forth; but they are not limited to other sub-domain names.

Table 4-5 shows the results of the domain level, which were used to organise the Campus Portal within the studied institutions. It can be seen that most first generation Campus Portal (68.2%) ignored implementing the subdomain level for their site, whereas 94.4% of the second and third generation Campus Portals managed a subdomain level for their sites (including 'my' subdomain).

			Type of Portal		
			First Generation	Second/Third Generation	Total
Portal Location	N/A	Count	15	1	16
		% within Portal Location	93.8%	6.3%	100.0%
		% within Type of Portal	68.2%	5.6%	40.0%
	my.institution.edu	Count	1	9	10
		% within Portal Location	10.0%	90.0%	100.0%
		% within Type of Portal	4.5%	50.0%	25.0%
	Sub domain	Count	4	8	12
		% within Portal Location	33.3%	66.7%	100.0%
		% within Type of Portal	18.2%	44.4%	30.0%
	Individual domain name	Count	2		2
		% within Portal Location	100.0%		100.0%
		% within Type of Portal	9.1%		5.0%
Total		Count	22	18	40
		% within Portal Location	55.0%	45.0%	100.0%
		% within Type of Portal	100.0%	100.0%	100.0%

Table 4-5 Domain level of Campus Portal

Among the subdomains used within the second and third generation Campus Portal, it was clearly shown that ‘my’ subdomain (50%) became a common subdomain name used for representing a portal site while some development teams may introduce their unique portal site name (44.4%) and present it as a unique name in the subdomain level. Additionally, only a few sites introduced their Campus Portal as a new domain name, for example, www.mystudentportal.edu.

According to the result, it could be summarised that most development team view the Campus Portal as an addition system that should be separated from the main site, which generally aims to act as an information site. According to Jafari (2003), the Campus Portal should be seamlessly integrated into the main campus web site because there is no benefit in separating them into two distinctive sites. In fact, the users can log-in into their accounts if there is a sign-in section available on the home page of the institution.

Although the functionalities, services, and context regarding visitors are very different from currently enrolled students, the visitors also could be considered as one of the stakeholders of the institution, and should be treated at a similar level as other stakeholders. By allowing them to manage their profile, the relevant information as their wishes can be directly delivered to them and it may influence them to make a decision to join the institution.

4.5.2 Supported Groups of Stakeholders

This section aims to answer the addressed sub-question:

> **RQ1.2:** What groups of stakeholders are being supported by the Campus Portal projects?

The supported groups of stakeholders vary from the institution to institution. Based on my physical artefacts study, they can be grouped them as students, staff, faculty, alumni, and visitors. Although it is possible to have more groups of stakeholders, this study was focused only on the mentioned groups of stakeholders, but not limited to discussing other emerging groups if applicable.

	Frequency	Percent
Students	26	65.0
Staff	17	42.5
Faculty	9	22.5
Alumni	4	10.0
Visitor	2	5.0

Table 4-6 Supported Groups of Stakeholder

Table 4-6 and 4-7 show the result of the remote site of study which found that student groups were the first prioritised stakeholders supported by the Campus Portal, whereas staff, became the second prioritised stakeholders. Based on the result, 65% of studied institutions offered a service for students, while 42.5% and 22.5% additionally provided a service for staff and faculty, respectively. Moreover, alumni and visitors are rarely supported in using the Campus Portal.

			Groups of Stakeholders				
			Student	Staff	Faculty	Alumni	Visitor
Type of Campus Portal	First generation Campus Portal	N	8	4	1	0	0
		%	30.8%	23.5%	11.1%	0.0%	0.0%
	Second/third generation Campus Portal	N	18	13	8	4	2
		%	69.2%	76.5%	88.9%	100.0%	100.0%
	Total	N	26	17	9	4	2
		%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4-7 Cross tabulation between Type of Campus Portal and Groups of Stakeholder

Table 4-7 shows the cross tabulation between the type of Campus Portal and groups of stakeholders. It can be found that the student group also is the most prioritised group that supported by the Campus Portal in every category. In addition, the Campus Portal

for faculty, alumni and visitor were almost totally found only in the second and third generation Campus Portal.

It is true that some stakeholders may not be supported by the Campus Portal in the same period of time. Based on my observation and analysis from the documents found on the studied sites, most institutions often try to build a supporting system for the students and then expanded to staff and other groups of stakeholders.

4.5.3 Implemented Functionalities

This section aims to answer the addressed sub-question:

> **RQ1.3:** What kinds of systems and functionalities are normally implemented in these various institutions' online services and Campus Portal?

Because every institution has different problems and situations that need to be solved, the available types of Campus Portals, its systems, functionalities and solutions were also applied to this rule. Not all institutions implemented the Campus Portal, and neither of them developed a full scale Campus Portal. In fact, many institutions were initially developing the Intranet to help their stakeholders to maintain the activity while studying and working at the institutions.

Based on the study on the institutions' site, the majority of the Campus Portals were believed to be developed in-house. Some of them wrote their own scripts by using a set of programming language scripts for Web development such as JSP, ASP and Cold Fusion. Most of the 'my' portal sites I found were developed under a freeware portal framework named 'uPortal'. Regarding the study of NEC (2004a), they found in very similar to my finding that PeopleSoft, ColdFusion and PHP are primary technologies for developing a Campus Portal.

uPortal is a free portal development framework that enables the development team to be able to create functionalities that apply to the portal, such as personalisation, customisation, single sign-on and community tools into the development. Based on the official site of uPortal, "uPortal is an open-standard effort using Java, XML, JSP and J2EE. It is collaborative development project with the effort shared among several of the JA-SIG member institutions. You may download uPortal and use it on your site at no cost" (uPortal.org 2005).

4.5.3.1 Common Functionalities

In general, most studied institutions where there was the first generation Campus Portal implemented offered the applications and functionalities based on their Intranet application. The systems, such as students' online registration systems, students' online self services, web-based email systems and online learning systems were commonly found. On the other hand, systems and applications, which related to full Campus Portal characteristics such as customisation and single sign-on, were not commonly found in addition to the systems and applications of the first generation of the studied Campus Portal, they however were quite commonly found in the second and third generation of the Campus Portal.

4.5.3.2 Availability of the Systems

One surprising thing about the studied sites was that I found many Campus Portals that the development team called as a portal only was available in a certain period of time. One of the advantages of the Web site is that it is available 24/7; this advantage was found as a contrast to what the development team did. The Campus Portal of one university in Australia, for example, was found it was available between 1:00am and 11:30pm. More examples are the Campus Portal of the universities in New Zealand and Canada that were only available between 7:00am and 12:00am, and 6:00am and 12:00am, respectively.

Based on my observation on the studied sites, there are two reasons behind these circumstances. Firstly, the site was closed due to the regular maintenance process. Secondly, the development team tried to protect and against the intruder who tried to hack into the system to access sensitive information of the stakeholders which available on the institution's computer systems.

The availability of the Campus Portal was set regarding the best practice that suitable to each individual institution, as the nature of the web and Internet technologies, however, the development team should find other solutions to solve the limitation of availability problem. The system should allow users to access anytime they wish because the living and studying patterns of people are different.

4.5.4 Implementation of the Campus Portal's Unique Characteristics

This section aims to answer the addressed sub-question:

> **RQ1.4:** What issues appear to be the substantial concerns of Campus Portal development regarding the Campus Portal's unique characteristics identified in the literature review of Phase One?

As was identified in the literature reviews, the unique characteristics of all types of the portal that make them distinguish from other kinds of the Web-based system are personalisation and customisation. However, it was very difficult to determine the implemented level of personalisation and customisation in this study because the Campus Portal was not quite accessible due to the fact that they were protected from unauthorised access. My approach, therefore, was to discover what documents such as help file, user manual and demo site were provided by the development teams to have more understanding on the implemented Campus Portal.

			Type of Portal		
			First Generation	Second/Third Generation	Total
Implemented Level of Unique Functions	Low Level	Count	22	4	26
		% within Implemented Level of Unique Functions	84.6%	15.4%	100.0%
		% within Type of Portal	100.0%	22.2%	65.0%
	Medium Level	Count		4	4
		% within Implemented Level of Unique Functions		100.0%	100.0%
		% within Type of Portal		22.2%	10.0%
	High Level	Count		10	10
		% within Implemented Level of Unique Functions		100.0%	100.0%
		% within Type of Portal		55.6%	25.0%
Total		Count	22	18	40
		% within Implemented Level of Unique Functions	55.0%	45.0%	100.0%
		% within Type of Portal	100.0%	100.0%	100.0%

Table 4-8 Cross tabulation between implemented level of unique functions and type of portal

Based on the result displayed in Table 4-8, it can be concluded that the first generation Campus Portal provides low level of the unique characteristics and functions of the Campus Portal. On the other hand, the implemented level of personalisation and customisation in the second and third generation Campus Portal could be found on various levels. It can be found that 22.2% of the second and third generation Campus

Portal maintain a very minimal implemented level of the personalisation and customisation, whereas 22.2% offered a medium implemented level, and half (55.6%) offered a high implemented level of the unique functions of the Campus Portal.

4.5.5 General Issues on Personalisation and Customisation

As it can be seen in Table 4-8, 44.4% of the second and third generation Campus Portal ranged from a minimal to a medium implemented level of personalisation and customisation for their users. Based on my observation, it can be divided into two major issues regarding the style of the development and supporting of the implemented level of personalisation and customisation.

Firstly, the Campus Portal, in fact, was built on top of an existing system. The implementation level of personalisation and customisation was gradually added into the system to make the transformation of the existing system into a Campus Portal.

Secondly, some development teams made a fresh start with the development of the Campus Portal. As a result, a certain level of implementation of personalisation and customisation was added to allow the users to be able to select some contents which they preferred. The approach of offering the personalisation and customisation of the Campus Portal was not standard. It in fact varies from institution to institution.

Summarising the results of the preliminary study, it can be seen that the term personalisation, is used interchangeably with the term of customisation by some researchers and practitioners. The term personalisation was found to be arranged into a few categories as follows.

1. Personalisation is a functionality that allows users to be able to select and change their layout, colour, and language.
2. Personalisation is a functionality that retrieves the relevant information and pre-assigned applications to the users when they have successfully logged-in.
3. Personalisation is a system that directly pushes the information that the faculty and university want the users to be informed.

These are somewhat different uses of the terms personalisation and customisation than those described in the literature review of Chapter 2 that will be used throughout the remainder of this thesis.

4.6 Summary

This chapter provides the findings of a review pf current practice of the development of Campus Portals in higher education institutions in five countries where there were similar environments to the case study planned for Phase Three of this research. It clearly shows that every institution had a different approach to design, develop, and implement the Campus Portal. This indicates a need for this research to investigate the composition of a comprehensive development methodology.

The results show that only half of the studied sites implemented at least the second and third generation Campus Portal. Additionally, the major end-users are students and follows by staff. Although results on many issues were revealed in this study, the most interesting issues relate to personalisation and customisation.

Based on the literature review, these characteristics and functionalities are considered as unique to the Campus Portal. According the results, there was no standard pattern on the implementation level of personalisation and customisation found among the 40 institutions in particular those with second and third generation Campus Portals, which were expected to have sufficient level of personalisation and customisation for comparison.

Furthermore, although the limitations and situations of the development of the Campus Portal in each institution are different, the students and staff who are the majority of the users have very similar characteristics in each institution studied. Therefore, the implemented level of the personalisation and customisation should not be substantial different.

These results substantiated the claim made in Chapter 2 that the design and implementation of the personalisation and customisation functionalities could be a substantial factor that determines the appropriate approach to the development of the Campus Portal. Therefore, the case study is deemed to be needed in order to gain more in-depth understanding on the issue of personalisation and customisation as well as in-depth understanding on the working of a development team. The research questions of

the case study will be presented in next chapter of the thesis and the conduct and findings of the case study in subsequent chapters.

Chapter 5
Case Description and Design

5.1 Overview

According to Hedrick, Bickman and Rog (1993), the selection and development of a research design can be compared to a blueprint for a detail of research planning.

This chapter presented the blueprint for the second phase of the research. It provides information on the background to the study, the objectives of the study, the selection of the case study, the data collection techniques, an overview of the research procedure, the design of the study, the data analysis, including the determination of its reliability and validity, and the ethical issues. Each of these will be described respectively in their own section.

5.2 The Background to the Study

The findings of the preliminary study of the current practices with respect to Campus Portals were presented in Chapter 4. The most interesting and important aspect arising from these finding was that there is a need for further investigation into the personalisation and customisation attributes of Campus Portals; this investigation could lead to more appropriate approaches to designing, managing and implementing these functions in order to develop more effective Campus Portals.

In general, personalisation and customisation appear to be the most distinctive characteristics and functionalities of Campus Portals which differentiate them from general Web sites. However, there was a definite lack of standardisation in the design, management and implementation of the personalisation and customisation functions of the Campus Portals in the findings of the preliminary study. This was also found in the review of the academic literature and practitioner documentation reported in Chapter 2.

Although the design, management and implementation of the personalisation and customisation functionality of a portal is ultimately the responsibility of the development team, user involvement during the designing process is essential, because these functions needs to be adequately designed, managed and implemented at a level appropriate to meet end-user and other stakeholders' needs.

In order to understand the responsibilities of all stakeholders of a Campus Portal particularly the development team and end-users, an in-depth case study was undertaken. A tertiary institution currently adopting an online student application that could be called a Campus Portal was selected to gain better understanding of the vision, situation, limitations and philosophy of the development team, as well as the needs of all stakeholders with respect to the personalisation and customisation issues.

In order to study the needs of end-users, this study investigated the usage pattern in the course of those regular online activities that directly and indirectly forced them to use the Campus Portal and other online services. The usage pattern of online activities in fact was very important in the sense that it was a fair indication of those links and functionalities users need to complete their most frequent activities. These need to be readily available on the first page of the Campus Portal once they have successfully logged-in. The activities of other stakeholders were also investigated such as academic staff and management related to the Campus Portal,.

5.3 Objective of the Study

The finding of the preliminary study indicates that the personalisation and customisation functions of a Campus Portal should be shifted from the implementation level to the design and management levels. This shift would develop an effective Campus Portal to genuinely satisfy the users and support their online activities during time spent studying or working at the institutions.

The major objective of the case study was to obtain a better understanding of the important role of personalisation and customisation in a Campus Portal, and to determine how they should be designed, managed, and implemented to optimise the needs of the various groups of stakeholders within higher education institutions. The identification of the important roles of personalisation and customisation through the findings of the case study will lead to the selection and modification of an appropriate formal development methodology for Campus Portals. This will be addressed in Chapter 9 after the results of the case study are presented and discussed.

Of the research questions identified in Chapter 1, this case study will provide answers to those that are listed here.

The major question addressed here is:

> **RQ2:** What are the essential factors of current practices that appear to enable or obstruct the development of a Campus Portal? How could the development of Campus Portals be improved in light of an improved understanding of these factors?

Additionally, there were several sub-questions as listed in the following two groups:

> **RQ2.1:** What factors appear to have the most influence on the usage pattern of the online activities of the students?
>
> **RQ2.2:** In what kind of online activities are academic staff involved? Are there any problems and, if so, what are they?
>
> **RQ2.3:** What are the current vision, opinion, and practices of the development team? If there are any conflicting requirements for the Campus Portal, how should they be resolved?

5.4 Selection of Case Study

As described in Chapter 4, the type of development team required for a Campus Portal in higher education institutions can be classified according to the generation of portal being developed, ranging from prospective to current developers. The study of any group of the developers, can lead to the construction of a legitimate development methodology for Campus Portals. But teams involved in different generations of portals may require different approaches.

However, the first priority of the study which is described in this chapter is not the construction of the development methodology. In fact, the study first attempts to understand the core issues, especially personalisation and customisation, for the development of a Campus Portal, particularly those which appear to mislead most current developers.

It appears that merely the implementation of a Campus Portal is no guarantee that all or any stakeholders will be satisfied or effectively use the system to facilitate their information related activities. Moreover, taking the wrong direction in the development

of a Campus Portal so that it does not genuinely support stakeholders' online activities costs a great deal of time and money.

The case chosen for this phase of the research involved an institution with what could be considered an immature or second generation Campus Portal. There are some beneficial viewpoints to study at the institution that has not yet developed and implemented a fully functional Campus Portal. These benefits can be summarised as follows.

- Some barriers and limitations to developing a Campus Portal can best be revealed at the time they surface from current situations facing the development team;
- The view of required online activities, including the computer and Internet experience of the stakeholders, may be biased by experience with a fully functional Campus Portal. And so, accounts from less experienced might lead to a better understanding of important issues affecting the introduction of a Campus Portal.

The decision to conduct this case study research at the chosen university arose from the needs identified in the preliminary study, and an informal interview with a member of the development team there. The informal interview was used to discover information on the current projects under the responsibility of the development team, in order to determine its suitability for an in-depth study relevant to the current research topic.

Although this university has not yet implemented a mature third or fourth generation Campus Portal, it is actively addressing issues highly significant to the study. Their work is particularly relevant in understanding the importance of personalisation and customisation. In the context of this research, this has the potential to lead to the construction of a suitable Campus Portal development methodology based on well established formal Information Systems development methodologies.

It is desirable that the development methodology for a Campus Portal should be generic for adoption in any higher education institution. Although the finding of the study may reflect the unique situation and perspectives of the case university, the particular issues of the personalisation and customisation should be similar for other higher education institutions. It is the generalisability and significance of these issues that will guide the

selection and modification of the formal development methodology deemed most appropriate to the development of a Campus Portal.

Thus, the following reasons influenced the selection of the university for the case study, hereafter called the Case University, as the subject of the in-depth study.

- This Australian university was easy to access by the researcher.
- The university is composed of typical groups (i.e. students, staff, etc.) and sub-groups (i.e. undergraduate, postgraduate, research students) of stakeholders, which are found in most universities.
- The university consists of multicultural groups of stakeholders, which includes both domestic students who are native English speakers and international students, who are mainly non native English speakers. This mix is similarly found in New Zealand, the USA, the UK and Canada.
- The university has a sufficient Information Technology infrastructure to support the development of a comprehensive Campus Portal.
- The university has already developed a number of Web-based applications which can be integrated into the Campus Portal.
- The students of the university have sufficient experience in the Web-based environment and online activities.
- The university has experienced system development teams which have designed, developed, and implemented both traditional Information Systems and Web-based Information Systems for the university for a long period of time.

5.5 The Institution

According to the information available to the public on the web sites, it can be summarised that the case university is a higher education institution in Australia which has more than 21,000 students: approximately 13,600 undergraduates and 6,700 postgraduates, including 350 research students. Among these are 5,100 onshore and 2,900 offshore international students. There are approximately 700 full time academic staff and 700 general staff.

Additionally, the case university is a multi-campus institution with a main city campus and over eight smaller regional and off-shore campuses.

Moreover, the case university has been one of the largest sites of Information Technology, multimedia and telecommunications research in the Southern Hemisphere. Additionally, the Internet bandwidth of the University has become greater than one gigabit.

The teaching, research, and study life of the university is supported by state-of-art information facilities, which provide extensive ranges of online learning medias including online databases, journals, lecture notes, and so forth.

5.6 Design of the Study

5.6.1 Overview of the Procedure

The data collection process started once the approval of the Human Research Ethics Committee (HREC) was granted in early 2004. However, it was not officially conducted in the field study until October 2004.

According to Rosnow and Rosenthal (1999), a pilot testing for the questionnaire is absolutely essential. Therefore, the pilot testing was implemented before October 2004 in order to refine the questionnaire question and structure for the actual collection of the data.

Simultaneously, the identification of the development team people was made by informal conversation with a member of the development team who helped to specify and recommend other key people from the development team that related to the development of the service site and Campus Portal. As a result, the pre-defined question of the interview had been designed according to the responsibility and role of the participants.

After the final design of the questionnaire and interview questions were completed, the study began with the distribution of the questionnaire survey to the students at the case university. Once the questionnaire survey was completed, the interviews of academic staff were held between January and February 2005.

Every participant and respondent as informed about the study from the Participant Information Sheet, which describes the detail of the study including privacy and confidentiality statements. In addition, all participants were asked to sign a consent

form before the questionnaires were given or the interviews started. Because of this approach, the response rate to the study questionnaire was very high.

5.6.2 Data Collection Techniques

In case study research, it is quite common to combine data collection techniques such as interviews, document analysis, questionnaires, and observations which provide evidence that may be qualitative, quantitative, or both (Eisenhardt 1989, Eisenhardt 2002). In order to accomplish this objective, multiple data collection techniques were applied to each group of stakeholder.

Although multiple data collection techniques such as questionnaires and interviews were implemented for this case study, the major interpretation of this research was based on qualitative data which revealed detail on the meaning behind the findings rather than merely statistics. In fact, the only quantitative data involved came from a survey questionnaire that was mainly used just to produce a usage pattern of the stakeholders' online activities.

The following sections of the chapter describe the data collection methods in detail.

5.6.2.1 Interviews

In order to provide richness, diversity, accuracy, and contextual depth, a qualitative data collection technique such as interview can be implemented (Abramson and Mizrahi 1994). Interviewing is a combination of art and science (Judd, Smith and Kidder 1991). In fact, the interview is a type of conversation with a people or group of people under a set of assumptions and understanding about the situation where raw data from the interviewing can be used for analysis at a later time (May 1993, Thomas 2003b, Wilkinson and Birmingham 2003).

According to Dexter (1970 p.11 cited in Guba and Lincoln 1981 p.154-155), "Interviewing is the preferred tactic of data collection when in fact it appears that it will get better data or more data or data at less cost than other tactics".

May (1993) categorises the interviews into four distinction types. The practical research, however, normally needs to combine two or more types that are, the structured interview, the semi-structured interview, the groups interview, and the unstructured or focused interview. It can be summarised based on May (1993) and appended with other literatures as follows.

- **Structured Interview**.

  Structured interviews are used in situations where the participants who are representatives of samples are questioned about something that interests the researcher (Guba and Lincoln 1981). In general, the structured interview and survey research are correlated and become common among the researchers.
  By using this method, the interviewer has control on the serial of the predetermined questions (Wilkinson and Birmingham 2003).
  Although the structured interview can be a face-to-face encounter between the researchers and informants, the informants will be strictly requested to answer the predefined questions.

- **Semi-structured Interview**.

  The semi-structured interview is more flexible than the structured interview. The interviewer generally prepares a series of less structured questions to obtain deeper understandings and insights (Anderson and Kanuka 2003). The participants are allowed to answer more on their own terms when compared with the structured interview.
  "As with all of the interviewing methods, the interviewers should be not only aware of the content of the interview, but also able to record the nature of the interview and the way in which they asked the questions" (May 1993 p.93).
  By using this method, the interviewers have greater flexibility to vary the context and content of the interview.
  Many researchers apply the semi-structured interview for their research as they deem it to be appropriate to s qualitative research approach, as described by Turner (1983) who analysed the organisational behaviour with Grounded Theory.

- **Focused Interview**.

  The focused interview that is also known as the unstructured interview (i.e. Guba and Lincoln 1981, Merton, Fiske and Kendal 1990, Yin 1994, Anderson and Kanuka 2003), or in-depth interview (i.e. Kumar 1996, Anderson and Kanuka 2003) is an open-ended method that allows the participants to freely talk about the topic. The focused interview is more likely to be used in the situations where the researcher is looking for non-standardised and/or singular

information (Guba and Lincoln 1981).

"In this situation, the specific questions must be carefully worded, so that you appear genuinely naïve about the topic and allow the respondent to provide a fresh commentary about it; in contrast, if you ask leading questions, the corroboratory purpose of the interview will not have been served" (Yin 1994 p.85).

- **Group Interview**.

  The group interview or focus group discussion is a common data collection technique for qualitative research.

  "A focus group is a carefully planned and moderated informal discussion where one person's ideas bounce off another's creating a chain reaction of informative dialogue. Its purpose is to address a specific topic, in depth, in a comfortable environment to elicit a wide range of opinions, attitudes, feelings or perceptions from a group of individuals who share some common experience relative to the dimension under study. The product of a focus group is a unique form of qualitative information which brings understanding about how people react to an experience or product" (Andersen 1996 p.200 cited in Wilkinson and Birmingham 2003 p.90).

  Guba and Lincoln (1981) mentioned that the danger in interviewing a number of people at the same time is, "either everyone may want to talk at one or certain member of the group being interviewed may defer to stronger or more vocal members" (p.161). Additionally, "the group may become too large to allow for much give-and-take with the interviewer" (p.161).

  The balance between the groups being too small and too large, therefore, is also an issue of the focus group discussion. Stewart and Shamdasani (1990) mentioned that the focus group interview normally involves 8 to 12 individuals who are asked to discuss a specific topic under the direction of the researcher.

The interviews of this study were separated into two different groups of participants. The first group was the development team of the case university and the second group comprised the academic staff, who were considered as the major stakeholder of the group utilised Web-based applications to facilitate their activities.

In fact, these two groups were found to be focused on completely different objectives, as will be shown in subsequent chapters of the thesis. However, this section only provides details of the data collection techniques common to both groups for description purposes only. More information on the design and procedure of the study will now be explained.

Development Team

The development team of the case university was studied to understand the process of the development, vision, and relevant information regarding the development of Web-based applications and the Campus Portal.

Three participants holding different positions in the team were selected from Information Technology Services (ITS) where ITS is the division of the university that has responsibility for designing, developing, implementation, maintenance, and training everything related to the Information Technology within the institution.

The interviews were planned and conducted individually with a set of pre-defined questions, although all participants were encouraged to freely discuss any matters and issues within and outside the scope of the pre-defined questions. In order to do so, all participants were assured anonymity and the profiles of the participants in this research do not contain the names of the participants; their names will be replaced with the codes as shown in Table 5-1.

In order to get an in-depth understanding of the work and views of the development team both semi-structured interviews and focused interviews were implemented. Each participant was asked some predefined questions. Because of the distinction between the roles of participants, predefined questions were uniquely designed for each participant in terms of scope and content.

According to Mahoney (1997), a good interviewer should be a good listener and questioner who becomes an attentive listener and shapes the process into the familiar and comfortable form of a conversation. The predefined questions, therefore, were designed to shape the interview scope and initialise the conversation of the participants rather than leading or guiding their idea into a narrow topic. All participants were encouraged to freely discuss any issue, make comments and express any thing they wanted to say. Moreover, their reactions to the questions and answers were noted.

Participant	Position	Responsibility
DT1	Manager	The manager is not directly related to the actual software design and development. His role, however, is involved with the strategic direction of the development of the system, making sure that all aspects are linked together.
DT2	Web Coordinator	The role of the web site coordinator is to formulate the policies that related to web site development, working with the graphic designers. Once the graphic designers come up with the graphic design, he implements it as user HTML pages. In addition, he assists and trains the Faculties and Departments who actually use the templates.
DT3	System and Online Learning Administrator	The system and online learning administrator is directly involved with the evaluation of the commercial products, their development and the maintenance process of the online learning system. He is additionally responsible for the management of the campus-wide accounts of the stakeholders.

Table 5-1 Development Team's Responsibilities

Academic Staff

If a Campus Portal is developed and implemented at a university, the academic staff, sooner or later, will become a user group of the system. In fact, both students and staff, are the users of the Campus Portal, although their roles and purpose of their online activities are somewhat different.

In this research, the main objective in studying the academic staff was to find evidence that can support the findings from the study of the students. Therefore, qualitative in-depth interviews were implemented to understand their views in a deeper context, which could not be found from the quantitative data collection techniques.

In order to protect privacy and maintain a level of confidentiality, all participants were assured anonymity and the profiles of the participants in this research do not contain

the names of the participants; their name will be replaced with the codes L1, L2, and L3.

5.6.2.2 The Student Survey Questionnaire

In the preliminary study that was described in the previous chapter, it was clearly shown that the majority of the stakeholders within the university were students, followed by academic staff. This part of the study aims to gather a greater understanding of the students, especially their online activity usage pattern as they interact with the Internet and Intranet technologies while they are studying at the case university.

In order to select an appropriate data collection method for students, a number of data collection techniques were inspected to select the best techniques for gathering relevant data for generating a usage pattern of the online activities of students.

In general, qualitative data that is collected from interviews, observations, documents and so forth can be used to explain in-depth details of the participants' experiences, opinions, feelings, and knowledge (Merriam 1998). However, in its ability to reflect the usage pattern in the online activities of students, a qualitative data collection technique would have a limitation in terms of drawing the pattern from a large number of people.

A quantitative data collection instrument such as a survey questionnaire seems to have more advantages than other instruments in terms of its capable of building a usage pattern of the online activities. In fact, questionnaires can be sent to a large number of students and enable the transmission of useful information from the students to the researcher (Wilkinson and Birmingham 2003). The survey questionnaire method was, therefore, applied in order to accomplish the objective of drawing a usage pattern of the online activities of the students in this study.

According to Wilkinson and Birmingham (2003), the survey questionnaire method can be categorised into three broad types. These can be summarised as:

- **Mail Survey**
  The mail survey is the most general type of questionnaire that is generally delivered by mail, including emails to collect vast amount of data. It, however, sometimes experiences very low response rates.

- **Group-administered Questionnaire**
  The group-administered questionnaire is a supportive instrument that allows the researcher to collect data from a sample of respondents who can be brought as a group for the purpose. The response rate of this kind of questionnaire can be better than a mail survey.
- **Household Drop-off Survey**
  The household drop-off survey is a crossbreed between mail and group-administered survey. By this approach, the researcher delivers the questionnaires by hand to the identified group of respondents and collects the questionnaires later.

In the data collection process in this research, a type of household drop-off survey was selected. A suitable questionnaire was created whose rationale and development is described below. Copies of the questionnaire were randomly distributed by hand to the students regardless to their genders, nationalities, and educational levels, and collected after they had been completed.

5.6.3 Study of Development Team

Each informant was interviewed individually. The length of each interview was between 20 minutes and 45 minutes. Although there were only three interviewees in the study of the development team, this group of people were key informants involved in the decision making and the implementing of the service applications of the university.

The interview questions were uniquely based on the responsibility of each person. A semi-structured interview question had been prepared before approaching the interview. In fact, the informants requested to read the semi-structured interview questions before acceptance of the interview. Furthermore, immediate analysis and interpretation from the informants during the conversation was also taken to generate further instantaneous questions.

5.6.4 Study of the Major End-users

5.6.4.1 Students

Students are the primary group of this research. According to Wilkinson and Birmingham (2003), the questions which can be implemented in a questionnaire can be

categorised into various types, namely, closed questions, multiple-choice questions, and open-ended questions. These are summarised in the following list.

- **Closed Question**
  This is a common type of question which can be widely found in most questionnaires. The most often-used form of this type of question is composed of a 'Yes' and 'No' response.
- **Multiple-choice Questions**
  Using the multiple choice questions allows the researcher to be able to obtain multiple answers from the respondent within one question.
- **Open-ended Questions**
  By using this kind of question, the respondents are allowed to express answers with no restrictions. However, it makes routine analysis more difficult.

In general, most questionnaires integrate at least two types of questions in order to cover all areas that need to be investigated. Both closed and open-ended questions are very useful for collecting the important information (Geer 1991). In this study, the questionnaire was designed to include all types of questions to cover all issues under investigation.

An attitude scale was included in the questionnaire where appropriate in order to determine the level of online activities of the students. In fact, there are many scaling techniques, i.e. numerical scales, forced-choice scales, graphic scales, semantic differential methods, Likert scale, Thurstone scale, and so forth, which are available to the researcher (Rosnow and Rosenthal 1999). The Likert-Type Scale, which is traditionally the most popular tool that is used for discovering the attitude of the respondent, was adopted to draw a usage pattern of the students' online activity (i.e. Fraenkel and Wallen 1993, Rosnow and Rosenthal 1999).

The pilot testing of the questionnaire commenced in April 2004 with 10 respondents. These respondents were not in the same group as in the actual questionnaire study. Based on the results of the pilot testing and prior to release of the actual questionnaire

survey, it was found that the traditional point-scale of the Likert-Type was not quite appropriate to draw out the usage pattern regarding the online activities.

In the Five-point scale, for example, the scale such as ‘Always’, ‘Often’, ‘Average’, ‘Sometimes’, ‘Seldom/Never’, seems to have a different meaning from person-to-person. For example, the meaning of ‘Average’ for some people may be represented as the range from 2 hours to 3 hours, and it may range between 30 minutes and 45 minutes for some other people.

Therefore, a second version of the questionnaire survey was created by adopting the 6-point Likert-type scale, which was found to be successful in previous research on computer and Internet use (Igbaria and Zviran 1996, Teo and Lim 1997, Teo 1998, Teo, Lim and Lai 1999 cited in Li and Kirkup 2002). The 6-point Likert scale uses the terms ‘never’, ‘rarely’, ‘less than once a month’, ‘at least once a month’, ‘at least once a week’ and ‘daily’.

However, the feedback from the second set of participant showed that the scale was not fine enough to draw usage patterns that showed the required distinction between perspectives. In a second pilot testing of the questionnaire, it was found that almost every participant usually spends time on email and information searching. The ‘daily’ usage pattern was not a distinguishing factor.

To eliminate this kind of problem, the scale in the questionnaire regarding to the frequency of the students’ online activities was time-specified on the Likert-scale to specify a more exact range of time so that a fine range of time was implemented. (see Appendix for a copy of questionnaire).

The fixed-time scales that were adopted in this study were categorised into two major types. Firstly, time was blocked into five values designed as “Up to 10 minutes”, “11 to 30 minutes”, “31 to 45 minutes”, “46 minutes to 1 hour”, and “More than 1 hour”. This type of scale was adopted in “Part III: Internet and Intranet Activities” of the questionnaire in the specific part on “Online Activity for General Purposes”.

Secondly, another scale was adjusted as, “A couple times per session”, “up to 30 minutes”, “31 to 45 minutes”, “46 minutes to 1 hour”, and “More than one hour”. This type of scale was applied to the questions on “Online Activity for Academic Purposes”

and “Online Activity for Administrative Purposes” in the same part of the questionnaire mentioned previously.

In the feedback from the pilot testing of the questionnaire survey it was found that in some kinds of activities it is necessary for students to work online continuously to facilitate their studying. Using a scale that specified the daily frequency of access such as “1-2”, “3-4”, “5-6” and so forth was difficult for them to estimate. However, by the scale that specified a length of time, as previously mentioned, it was easier for the students to answer the questionnaire.

These adjustments in the scale gave flexibility for each question to be appropriate to the style of the activities in each respective section of the questionnaire. However, in Part III, the questions were presented randomly regardless of the scale used in order not to prejudice the results. The result of the study should reflect the views of the respondents and not the redistribution of researcher and his preferences in the order of the listed activities.

The questionnaire was divided into three parts: personal information, computer and Internet usage, and Internet and Intranet Activities.

Design of Part I: Personal Information

The first part of the questionnaire was designed to collect personal information from the respondents. Major details such as gender, nationality, educational level, enrolled faculty and work experiences were asked for.

In addition, this section was composed of both closed and opened-ended questions which allow the researcher to be able to gain more information on the respondents. The information gathered from this part was mainly used to analyse the results with regard to different sets of perspectives.

“As almost everyone belongs to a number of different groups and categories of people at the same time, people unavoidably carry several layers of mental programming within themselves, corresponding to different levels of culture” (Hofstede 1994 p.10). Hofstede (1994 p.10) mentioned that there are many levels of culture:

- “a national level according to one’s country (or countries for people who migrated during their life time);

- a regional and/or ethnic and/or religious and/or linguistic affiliation level, as most nations are composed of culturally different regions and /or ethnic and/or religious and/or language groups;
- a gender level, according to whether a person was born as a girl or as a boy;
- a generation level, which separates grandparents from parents from children;
- a social class level, associated with educational opportunities and with a person's occupation or profession;
- for those who are employed, an organisational or corporate level according to the way employees have been socialised by their work organisation."

In this study, some levels of cultures, i.e. national level, gender level, and social class level (educational level), were selected to investigate in the usage pattern of the students' online activities.

Design of Part II: Computer and Internet Usage

In general, students obtain their technology literacy in two major ways: formally through the education institution or workplace and informally at home from parents, friends or by themselves (Hoffman and Blake 2003).

Applying from the statement of Hoffman and Blake (2003), the second part of the questionnaire was designed to understand the computer and Internet experiences of the students, and hours spent on the computer and Internet at home, workplace, university, and public places such as Internet Café.

Additionally, some major activities for which students used their computers were also investigated. The activities listed on the questionnaire were derived from similar categories used by Stafford and Gonier (2004).

Design of Part III: Online Activities

The third part of the questionnaire was designed to determine the pattern of online activities that the students engaged in. This part was composed of three sections:

general online activities on the Internet, online activities on campus for academic purposes, and online activities on campus for administrative purposes.

A list of general online activities was adapted from Pew Internet & American Life Project Tracking surveys (see Pew Internet 2005). Some activities such as messaging (email and chat rooms), information searching, entertainment (listening music, playing online games), downloading (softwares, etc), and purchasing (online shopping) were identified from other literature (Teo and Lim 1997, Teo 1998, Teo, Lim and Lai 1999 cited in Li and Kirkup 2002). For online activities on the campus, a list of activities was randomly selected from the list of Web-based applications available on the University's web site and student online services (SOLS).

5.6.4.2 Academic Staff

Academic staff is focused as a supportive group which provides a supportive statement to the main study. The study of academic staff was a follow on from the results of the survey process where the questionnaire was used in the study of students. Therefore, the structure of each staff interview was similar to the questionnaire survey which started with some personal information, computer and Internet literacy, and the online activities.

In fact, the process of interviewing of the academic staff was very similar to the interviews of the development team, but in a different context. However, the academic staff did not request for the copy of questions prior to the time of the interviewing.

The semi-structured interview questions were prepared to shape the scope of the interview. However, all informants were encouraged to freely talk as in as normal a conversation as possible to reduce the stress and produce more data on their opinions.

5.7 Data Analysis

According to Patton (2002), the lines between the analysis and data collection process of quantitative research are clear, whereas the data gathering and analysis of the qualitative research is beyond this distinction. The data gathering and analysis processes of qualitative research is often integrated, for example, in the interview process, "once the interviewee is thanked and field notes are complete, the analysis, evaluation, and tabulation or integration of the interview data can begin" (Guba and Lincoln 1981 p.183).

The major analysis of this study was heavily based on the qualitative analysis. This enabled the researcher to understand and make sense of the data in the context of the personalisation and customisation issues which are necessary for the development of the Campus Portal.

Although a questionnaire survey was employed to collect the data from the students, there was no attempt to analyse this heavily using quantitative data analysis. The data which was collected from the students was stored and analysed as a descriptive statistic using SPSS software. However, only frequencies from the data was used, to determine the general usage patterns of online activities. In the detail of drawing a usage pattern of the online activities from the students, cross tubulation was used to produce the usage pattern against selected levels of culture as mentioned previously.

The data analysis process continued with the interpretation of the usage patterns, and making sense of the data with supporting evidence from by the interviews of the academic staff, as the other major stakeholder group of the institution. This interpretation was done in order to understand the importance of the personalisation and customisation when developing the Campus Portal. Moreover, the discussion and recommendations regarding the methods for developing a Campus Portal were finally integrated with the findings from the interviews with the development team.

5.8 Reliability and Validity

According to Firestone (1987 cited in Merriam 1998 p.199), the qualitative researchers try to provide the readers by describing the details of people, the situation and the environment for making sense of data, whereas the quantitative researchers try to convince the readers that “procedures have been followed faithfully because very little concrete description of what anyone does is provided” (p.19).

According to Leedy (1993) and Leedy and Ormrod (2005), “reliability is the consistency with which a measuring instrument yields a certain result when the entity being measured hasn’t changed” (Leedy and Ormrod 2005 p.29) whereas “validity is concerned with soundness, the effectiveness of the measuring instrument” (Leedy 1993 p.40).

5.8.1 Reliability

Jick (1979) mentioned that it is difficult to maintain on the reliability within the case study because the case is generally unique and cannot replicate the exact finding from another case study. However, Merriam (1998 p.206) argued that "the question then is not whether findings will be found again but whether the results are consistent with the data collected". Merriam (1998) mentioned several techniques to ensure the result are trustworthy.

- **The Investigator's Position**
  The investigator should explain the assumption and theory behind the study, the basis for selecting informants and a description of them, and the social context from which data were collected.
- **Triangulation**
  Triangulation uses multiple methods of data collection and analysis to strengthen the reliability and internal validity.
- **Audit Trail**
  Audit Trail is the process which allows the independent judges can authenticate the finding of a study by following the trail of the researcher Guba and Lincoln (1981 cited in Merriam 1998).

5.8.2 Validity

Maxwell (2002 p.41) described the nature of validity in qualitative research that all qualitative researchers have the same opinion that "not all possible accounts of some individual, situation, phenomenon, activity, text, institution, or program are equally useful, credible, or legitimate". Additionally, Maxwell (2002 p.41) mentioned that "as observers and interpreters of the world, we are inextricably part of it; we cannot step outside our own experience to obtain some observer-independent account of what we experience. Thus, it is always possible for there to be different, equally valid accounts from different perspectives."

Merriam (1998) mentioned that the internal validity can help a researcher to deal with questions of how research findings match the reality. In addition, Merriam (1998) recommended some strategies to enhance the internal validity of the qualitative

research. The following list and explanation of the internal validity strategy was summarised from Merriam (1998 p.204).

- **Triangulation**
  Using multiple investigators, multiple sources of data, or multiple methods to confirm the emerging finding can be used as a triangulation for validity.
- **Member Checks**
  Doing by taking the data and tentative interpretations back to the people from whom they were derived and asking them if the results are plausible.
- **Long-term Observation**
  A long-term observation at the site or repeated observations of the same occurrence can increase the validity of the findings.
- **Peer Examination**
  Asking the colleagues to comment on the finding as they come out.
- **Participatory or Collaborative Modes of Research**
  It involves participants in all phases of research from conceptualising the study to writing up the finding.
- **Researcher's Biases**
  Doing by clarifying the researcher's assumptions, worldview, and theoretical orientation at the beginning of the study.

By using triangulation, the researcher was enabled to be more confident of the results and get close to the situation, which allows the researcher to have more sensitivity to the multiple sources of data (Jick 1979).

For this study, the triangular strategy was used for validating and improving the reliability of the finding. In fact, the study of each group within this case study, i.e. development team and major stakeholders, was designed to have its own internal validity within itself. For the development team, several data collection instruments and techniques such as interview, observation, document review and the actual implemented Web-based application and service sites were blended to generate the finding of the study. Similar to the study of the major stakeholders, the data collection techniques such as the questionnaire survey and interview were implemented to ascertain the validity and maintain the reliability of the findings.

5.9 Ethical Issues and Confidentiality

It is a compulsory procedure that every research involving human subjects needs to be approved by the Human Research Ethics Committee (HREC) before commencing the data collection. Therefore, the approval of the HREC was sought for this project and granted in 2004 in order to maintain the highest level of rights, liberties and safety of the participants under the terms of the National Statement on Ethical Conduct in Research Involving Humans 1999.

A participant information sheet which contains the information about the study project was handed to each participant for understanding the general purpose, procedures, risk factors (if any), benefits, confidentiality, contact information and rights of withdrawal. If the participant agrees to join the study, the consent form is issued requesting a signature.

The participant may freely withdraw from participating in the study at any time without a reason or loss of benefits.

All information that was collected during the study will be treated with confidentiality. Additionally, all participants remained anonymous, and it will not be possible to identify the participants. The information collected from the study will be safely stored for five years, after which time it will be completely destroyed.

5.10 Summary

This chapter demonstrates how the case study was performed and explains major aspects that should be understood before presenting the findings from the case study, which will be reported in the next two chapters.

This study was generally focused on two major groups that were the development team and the major end-users of the Case University. It was found that the sample of the participants used in this study was sufficient for making sense of the results. Using the mainly qualitative research methods allows the researcher to understand the context of the study and to draw conclusions of the importance of personalisation and customisation to the development of the Campus Portal

In the next two chapters, the findings of this study will reveal why and how the personalisation and customisation are critically important to the success of a Campus Portal.

Chapter 6
Result of the Case Study: Development Team

6.1 Overview

This chapter provides the result which collected from the development team of the Case University. Based on the analysis and interpretation of the interview, it can be found that the gathered data that was collected from the participant, in especially, DT1 was relevant to the objective of the study needed for the investigation.

DT1 is the key informant who has been working at the Case University in the division of Information Technology Service (ITS) for many years. When he was started as a project manager for software development for student systems which currently includes the Student Online Services (SOLS), DT1 is now a manager who is responsible for the strategic direction rather than the actual development of the online services. Therefore, his vision and thinking could strongly influence on the development direction of the Campus Portal and online services.

As a result, numbers of interview scripts of the DT1 which are extremely important for reflecting the view of the development team by his leading, will also be provided within this chapter in order to maintain the important sense of the finding with the supporting statements of the gathered data from the DT2 and DT3. However, only some important scripts of DT2 and DT3 will be inserted.

6.2 History of the Development of the Campus Portal and Online Services

A history of the development of the Campus Portal and online services was provided in order to understand how the current stage of the online service was developed. The participant, DT1, one of the pioneers involved in the development of the online services since the systems were initially developed within the Case University informed that”

> *The university on the administration side of things looking after student enrolments, marks, and database sort of management of students has been developed in-house. Both the current system and previous system which was used for 10 to 15 years was also developed in-house. We didn't go out and buy one. The system which is in there at the moment which we called SMP, Student Management Package, has been developed in-house over the last 5-6 years. It's coming to 6 years now.*
>
> *Basically, at the time I was starting working here, we were looking at an external system to replace our administration, the whole student system, and we couldn't find any system that met our requirements. We found a lot of systems that looked at the administrative point of view rather than from the student point of view, so it was looking how to automate back-office work by looking at the interface with the students and then working backward to how it work out at the back.*
>
> *So in last 6 years, we've gone from having a heavily paper-based administrative system, the sort of way that people do enrolments on paper and then got to handed to somebody in admin and they punch that in the data entry where now none of that happens as student actually does it all online themselves. So, we cut out a lot of the middle.*

However, not all online services were developed in-house. Regarding the online learning service at the Case University, the participant, DT3, who response for the management of the Unix systems and online learning service expressed that the online learning service was started in 1999 as a type of testing environment. Currently, there are approximately 700-800 sites a year were implemented in the online learning service, WebCT. However, these sites were not fully online teaching and studying; they are a kind of complement to the current courses and tutorials.

By initialising the online learning service, Centre of Educational Development and Interactive Resources (CEDIR) started to look at online education, and the online learning was initially going to prove that direction. There were six different products evaluated from the technical and academic perspectives. Initially, the system named 'WebCT CE' was selected and implemented.

Recently, another product evaluation was completed to replace the current 'WebCT CE'. However, both systems will be operated in parallel. All current existing sites will be migrated into the new systems, 'WebCT Vista'. The migration process should take at least nine months to complete and cease the implementation of the 'WebCT CE' within one year.

On the Web site development side, DT2 who formulates the policies related to web site development, work with the graphic designers to arise with a graphic design, implements complete graphic design as user HTML pages, and then assists with faculties and departments who actually use the templates as well as providing training for the users described in the history of Web development that the University's Web site originally presented in the early 1990s.

Basically, the University home page was a very basic page; everything was done back in the 1990s done by IT people in ITS. In fact, minimal design was implemented into it. Then, the faculties, where someone had the resources or knowledge of how to do it, developed their own pages. Very serious development of the Web site became stronger when they actually purchased their own servers where they could do the development on that and manage to get links from the central web site.

The University started to realise the importance of having a corporate control of the web site, probably around 1996. Therefore, a graphic design company was hired to come up with a new University design in 1997. The participants DT3 mentioned that:

> *It turned out to be a shock with sort of roll out and the sort of marketing. At that time I was working on the template. And it didn't last long that one. We come up with the new design which is all done in-house. We put various designs together which student could evaluate to see which one they like the best.*

6.3 Philosophy behind the Campus Portal and Online Services Development

According to the interview with the participant DT1, a whole philosophy regarding to the development of Campus Portal and online services which are extremely important in reflecting the perspective of the development team was described that:

The whole philosophy went from let's not look at how to automate our administrative functions, let's look at what's the best outcome for our customers which is students and staff and then work backward from there.

How the product come through the vision test like SOLS, Student Online Services, where you can look at the interface. It's not as fancy a looking interface as you've ever seen, but it's a lot of functionalities in there.

We've designed and we want functionality over looking pretty. We want to roll out the functionality quickly and accurately, and so the actual coming back and making it look pretty and that's sort of things. It's pretty low on our agenda.

And it turns out a good way to go because we have been some bounds ahead of other universities for a long time. They may start to catch up now because we just went straight in there and automated the student interface.

So they could go there and change their own address, they could go there and change their enrolment rather than having to line up, fill out a piece of paper, and handed across the counter, so we could then retype that in.

On the back side of that development was the interface for lecturers, they could actually have a look at the class roles, manage the classes, enter the marks. All of that was paper-based as well. So once again, they would complete sheets of paper, they'll send out manual list of their class, they would complete sheets of paper with marks, and grades, and they'll send it back in, and then admin staff would type into the system. And each element of this data entry has a potential error and things like that. So, once again we went found out what was required from the user in this case was lecturers, admin staff, and faculty and basically end with the design the system where they look up their own class, information they can put it all online basically it's all automated.

The main aim was to get the information that we hold on students out to the users who actually want to see it and use it directly. So, they didn't have to go through any second of third party to actually get to that information. So, instead of people being half in the middle so everything have to go to admin, all of us sudden, lecturers for example could go in and have a look with their own class, they could manage their own class, and work from there.

In the same way as students didn't have to go to admin, they could go to the portal, if you like, update their own personal details, update their enrolment, look at their marks, and they can even go there and put in the request for special consideration, basically, all of the transactions that normally go to ask it for.

That's the whole design philosophy is basically roll out pieces and pieces as we identify an issue and it continue thing. We're rolling out weekly as need to identify. We meet our users about once a fortnight, I think it is, the academic registrar division is the owner all of this software. ITS, we build it, we manage it, but we don't make a decision on the priority of what's get works on next.

That's a deliberate thing as well. We don't think it's our decision to make. We meet with them and they basically have a list which has several hundred items on it that people requested, and they're gone through and said 'right' that's the most important and basically they give us top ten. We just work out our way through an ongoing process like that.

6.4 Adoption of the Development Methodology

As it was mentioned in Chapter 3, an adoption of the system development and Web-based development methodology is among the most important factors in the Information Systems and Web development. Some development team decided to construct their own development methodology; some may adopt the formal development methodology, or some may purchase the development methodology from the vendors.

The participant DT1 was asked whether best practice or any kind of development methodology was adopted for developing the online services. The answer was expressed as follows.

> *We're always aiming at best practice I mean something that we do we don't formally have as part of our accredited work but we certainly do measure ourselves against what we believe to be best practice in the industry, I suppose, the university.*
>
> *But as far as our development processes, I couldn't tell you we've got a formal best practice, it's not an accredited system but we do believe it's best practice, when our fundamentally design is a minimum of 3 months delivery .. so we've got a sort of major project, we won't have any thing back out to the user within 3 months without a test, and then we'll move to the next stage.*
>
> *So, we've never spend 12 months developing something, hand the whole thing over and found out it's not the what user wanted. It's the way we do it, those chunks are tested here and then handed to the users. They're tested by the user and then they are roll out. So, that's the main philosophy that we used.*

6.5 Development Process of the Campus Portal and Online Services

The time frame of each development generally depends on many factors, such as the size of the project, budgets, number of development staff, and so forth. As it was mentioned in Chapter 3, the development cycle of the Web-based development was expected in a very short period of time (Baskerville and Pries-Heje 2001).

Therefore, the participant DT1 was asked about this issue to understand how the development team had managed the time frame of the development. As a result, he explained that:

> *As I said, we've got several hundred items on the list from the users out there who said I'd like to be able to do this and that. So, the majority of our project start from the user…say this is requirement. We would then write a project to say this need to be done, this requirement needs to be*

met, this is the time line, and this is impact, the risks, the actual amount of resources that are required.

We work normally a year ahead as far as the majority, the high level projects, which are approved through executive. But then we're working quarters, for example, projects for this year for ITS were set late last year, and we are going to the Vice Chancellor (VC) any time now to get a final signed off it. Those are projects broken up into four quarters.

And then as we work out the way through if there's any delay or anything in those projects then we will write an adjustment and extend to another quarter. I suppose the main thing from the dollar and resources side of things, it's all pre-approved, when we get a bunch of money we try as much as we can. We said this is a project, this is a cost, and we get money allocated specifically for that project.

If we come in under budget, the money goes back to the pool. If we come in over budget, we need to write another project to extended and get more money. That's very different from a lot of areas where you can get a bunch of money and you try to use it all up. It's not the way it works.

So, we've got a very good grasp on what we are going to be doing any period of time. As I said that it's always an issue come up in enrolment period we can identify that we always can do something better, and it's still flexible enough for us to go back and say… look...we can make some changes here that will make things better. They'll get approved through various area of the university. Groups called ITPAC.

ITPAC is basically a sort of executive user group if you like who sign-off on IT related things of the university. It a mixed of academic and general staff, and executives who we take our things to have a look and say yes or no. They made a recommendation to the VC. So, it's not just ITS goes to the VC, actually we go through this different group which includes deans and senior executives. Things like that. So, it is all pretty transparent.

Furthermore, the participants DT2 explained the process of developing a Web site in a very similar process as described by DT1. He explained the process; the Web development team made a decision which one will be accepted as an actual design, then the VC signed off an approval on the project.

Within the process of the Web development, there were many groups of people involved from marketing, ITS and users. However, the structure of site was basically done by two people, participant DT2 and the director of ITS. Moreover, DT2 mentioned in the approach that was used to designed a structured of the site that

> *It wasn't an ideal way to go but we did it anyway. We got the project done.*
>
> *The last project was pushed very hard by the academic registrar, and she basically wanted to start from the ground up. Just build from scratch again which is I want to do it anyway. So, we went through that, we did two brief users testing on the current site, and we built a site called a white site which is just contents.*
>
> *We structured the links based on what we thought and based on user test that had done previously. From the user tests we have done minor modifications based on that. That's link to the foundation in terms of design, we have information structure supported. The designer came up with a few graphic designs, and then the academic registrar chose her favourite design from that. Once they pick up the design, we developed a template for that and roll out to the various faculties. That's still going on today, still pushing the template out there.*

6.6 Involvement of the Executive Members

In general, every project should have an involvement of the management of the organisation (Keil et al. 1998, Wallace and Keil 2004). Therefore, the participant DT1 was asked whether he needed to report or be approved on the development of the project from the management of the university. The explanation was:

> *Absolutely, the university was going down a path of the third party, an external software, we are actually part of a group of the university who are all looking at a new administrative system. So, yes we had to put a*

> *proposal for to the executive saying this is what we recommend and we basically said give us 12 months, and we'll show you what we're talking about. Then we will make a decision to whether we can continue to go down to the home grown software path. Yeah, we basically went to that 12 months period. Great wins, things did really well, and then we continue to go down that path.*
>
> *All of our software developments in ITS, these are all pre-approved as a project first before we get funding or any source of approval. So, myself as well as the other ITS managers actually prepare a project plan with specification of what we want to do, how much it will cost, and that basically goes to our director, and then reported to the Vice Chancellor (VC), and he basically signs-off on the project and allocates money to those project. So, it's something that always got from the above. There's always more developments and more projects than money. So, ultimately the director and VC need to set a priority on it.*

It is very interesting that there is uncertainty as to whether the executive members of the University understood the project that had been approved. The participant DT1 described the executive views on the approved projects as follows.

> *I suppose in any organization by the time it's going to the senior executive for sign-off. I have already explained to my director, and he won't take it any further unless he's sold on it. Something the university should do strategically. Once, he sold one it, than it's a matter of him speaking to VC or ITPAC committees and recommend them to go forward. On the whole, if he recommend go forward, normally people will go forward with it because they know that he already knows what he is doing.*
>
> *So, I mean it's not very often that I put something forward to my director and he takes it forward and gets knocked back. It's more the case that there are many projects that we have to prioritise that means some get to the bottom and may be happening next year something like that.*
>
> *There's always more projects than there's funding. Just a matter of someone prioritising them to get the best outcome for the university.*

6.7 IT Development and the Organisation's Policy

An investigation about the influence of the university's policy on the project development was enquired to explain on their relationships. The participant DT1 described that:

> *Absolutely, a lot of policies are IT related, and so we have to aware of those policies. I mean a lot of our development is trying to assist in making those policies possible and reality, but yes I mean it does impact on us, we need to be aware of it.*
>
> *But it's not a negative thing for us and most of what we doing allowing people access to the information that they have a right to get to anyway. The actual development of software is not impacted so much. A lot of policies were set in the strategic planning unit which is under the direction of our chief director anyway. He's a director of ITS and strategic planning unit. So, we're pretty intimately involved in a lot of policies type decision anyway.*

6.8 Current Stages of the Online Services and Supporting Infrastructures

Prior to the development of the Campus Portal, various types of the Web-based Information Systems and applications should be adequately equipped. As it was mentioned in Chapter 2 which referred to four generations of portal, originally described by Eckerson (1999b), most development team introduced the portal as step-by-step from the first generation to the forth generation.

Therefore, I asked the participant DT1 about the percentage of current development and implementation between traditional and Web-based Information Systems and applications. He expressed that:

> *The majority is web-based. One of the things we decide when we're doing the development is whether some thing would be better web-based or client-server based. The majority I would say 90% would be web-based 10% it isn't. It's application where we need some more power in the client-end where we have control over the machine the client actually on.*

> *So, it's no good for us, for example, to put on our Student Marks Package, SMP central which lecturers use to look at the class role, it's no good for us to put it on a platform that it's only PC-based because they use out there with McIntosh. So, any thing that has to go out to all of university community is web-based.*
>
> *The units likes UniAdvice who manage our students marketing and applications, they're on a very specific managed desktop where their PCs are always up-to-date PC. So, where I'll be able to say that we can give you more powerful client, we know what your environment is and there is control there, and so they work on that client-server application.*
>
> *The academic registrar division has two applications that are client-server, one to manage marks, and one to manage our fees system, but every thing else the majority of them were as I said 90% would be web-based.*

In addition to online services, the University's official Web site is another place where many end-users, including visitors, often search and reach for information. According to the interview with participant DT2, he was enquired to explain about the length of the t life cycle of the University's Web site.

He described that it is now more likely a priority issue, which was focused on cleaning up the current design. Additionally, he mentioned that it is true that some people might want it a little bit brighter. Finally, he confirmed that:

> *I think the information structure is ongoing things people looking at various part of site for modifications. The top level of site, at the moment, it think is working well. So, we just leave it for now. Let's see what we can add to the site, extra functionalities, navigation, putting for the Intranet, staff this year. Yes…just to add-on. For the major over rolling, we have no plan for that in the near future.*

On the other hand, the Information Technology infrastructure was also very important to the development of the reliable and stable in both traditional and Web-based Information Systems. The development of a Campus Portal also needed the stable availability and reliability of the system to provide the best service to the customers

who are end-users of the institution. As it was found in the preliminary study, some institutions limit the availability of the online services for a certain period of time. The security concerns might be an issue of the action to protect the Campus Portal from unexpected intruders.

Therefore, I asked the question regarding this concern to the participants DT1. He described the Information Technology architecture that was currently implemented.

> *I'll give you my best impression of it. We run on a 3-tier structure where web server is up front. They speak to the file server and application that running as I understand there is a firewall between those, and then behind that again. Behind another firewall is actual file service, the actual data is hosted on file service which is mirrored. They mirrored across to like our main site here and disaster recovery site. So, we actually have hot file over capable, warmish file over capability, where if we loose this room up here, we can go down disaster recovery and will be able to bring up application and data with pretty minimal of time.*

In addition, the participant DT3 informed me that there were 15,000 student accounts and 2000 staff accounts as of the beginning of 2005. A lot of services such as Web site, email, directory service, calendar services, and a lot of databases being provided were running under Unit environments. Moreover, the University was linked to the Internet backbone with the bandwidth of approximately 1 Gigabit.

6.9 Problems and Limitations of the Campus Portal and Online services Development

Every project, of course, has some kinds of problems and limitations that occur during the process of the development. However, it varies and was solved in a unique approach depending upon the particular technique of each institution. The participant DT1 informed me about this issue.

> *Resources are always an issue, people put a lot of things up that ITS would like to do. But simply the development team did not have enough time, money, or resources.*

> *That was a common theme throughout the organization as in most universities . As a result, the ITS had to make the best use of resources that ITS had for the university's strategic goal.*
>
> *With some of the challenges, it was simply a matter of managing them in multiple environment as they have in the university. If ITS could control what everyone's machine was, that would make the development is much easier. If the ITS could say everyone has to use Internet Explorer 5, then the software development for Web-based applications will be simple.*
>
> *As it stands the development team needs to account for students who may be overseas in a country and do not have very good Internet connection and are still allowed to come in and have a look at the results in the student online services if they are at home country during a holiday. That was probably one of the biggest challenges is to make the software work across multiple Web browsers and Operating Systems.*

When asking about the same question to the participant DT2, he gave a very similar explanation to the passage by the participant DT1.

6.10 Vision on the Future Campus Portal and Online Services Development

A perspective on Campus Portal and online services of the development team leader is extremely important to drive the direction of the development. The participant DT1 expressed his viewpoint on the online services and Campus Portal.

> *My current view on that, we've comes a long way from where we started. It's achieving the outcome that initially it was designed to achieve and that was what I initially designed so it's very interesting this one.*
>
> *At the time when I started here there were links to all sources of information in all different pages. There was no central system. All the faculties would have their own system in place and the academic registrar's division would have their own system, none of these really available. You have a lot of emails, or course notes going out which had their own URL. The students had to type it all in, it was really messy.*

Student Online Services started as a system which tried to bring those URL into one place, so students could go in there. As we developed enrolment system and everything it became more customised interface that you would sign-on, and you will see your personal records there as well.

You will be able to do enrolment things like that, and it continues to grow basically all of our administrative functions now happen under SOLS by students do it themselves. That's given us a few benefits; one is that the person who entering the data is the person who knows database, so we don't have to double entry. We know now that students typing in the personal address he's going to type it in right. If he doesn't, he will fix it because he can see it straight away if it was wrong. And similarly, if he does enrolment, he knows in enrolling in what he wants enrolling.

So, I mean as far as it goes, we have a feedback from students and that a good thing. It can be better. I mean things like timetable, exam timetable that customised in there. If you click on your timetable, you'll see your personalised timetable. But inter-relationship between the tutorial system, for example, and your lecture timetable isn't there yet. I mean there is room to go, so it might end up with laying on the same calendar things like that.

The learning management systems, WebCT, up until recently it was a separate sign-on, it's now actually distributed in Student Online Services. So, even though the system of backend are difference, a different look-n-feel once you get to them, we have actually include that if you sign-on you'll see you subject, you'll see if any WebCT site you can access them without logging in again.

So, we're filling the need as we understand it, I believe that we can …. Because there are so many functions in there now, it starts to get messy because there are too many things. And I think the next stage is going to be that try to categorise those or even customise those. Our other campus students don't need to see the links on their which only applicable to main campus, for example, we have students in overseas

campus, all of Tax File Number, or HECS, government, statistic or any information there which doesn't apply to the students in overseas campus. So, it will be nice if they disappeared.

So, the customization is certainly what we are looking toward now. You're only see the thing that your are interested in, you can hide some if you want to, you can add some if you want to, and yeah It will become more customise to the user.

Indeed, a direction of the Campus Portal development is unique from institution to institution. In order to obtain an understanding of the vision on this matter, the participant DT1 was invited to give his opinion on this issue. He described his opinion.

I don't think that will never happen. Not because of it wouldn't be nice, but there are a few reasons.

Because of three separate functions here, the student portal and staff portal, I think is one division where it is going to be separate now. What the students want and what the staff want, the system will be difference. The staff's view of the world as far as the university concern, I think should be quite separate from the student see.

There is a lot of information in our web page, even before the student sign-on to their portal that I don't need to see. It would beneficial to us to be able to say "Welcome to the University of……" and then presents the information that they want, not just a customised stuff like enrolment record and things, but also the university links that relevant to current students that at the moment they have to click on "current students". We should know them they are current students and then give them some information.

The staff should be separated that's what Intranet is all about, that's some thing we are working toward now, the administration interface. We could do some more works on that, nothing formal yet. I think if we need to get an interface for staff where all staff go in the interface and then we provide them with the access to various systems that they have permission to use.

> *We don't have that at the moment and very low in the priorities. Our main focus is what students see on student interface and because of so much works we're still do there. Unfortunately, the staff' interfaces don't get work as much as they normally do. Certainly the introduction of new learning management system, I'm hoping it will help toward try to get a little bit more a portal happening of the staff.*
>
> *At the moment is not existing, our interface to look at our pay, human resource, our effectively as a Student Online Services, one system with own user name and password. That's different from the user administrative interface, that's total separate. That's nothing consistent about it. And that's something we can start to look at.*
>
> *I think the division between students and staff will always be two separate portals.*

In addition, the participant DT2 was also asked to give an opinion on the issue of the development and implementation of the Campus Portal whether the development team would find it possible to implement full customisation functionality on the service sites. The result based on the participant DT2's opinion was very similar to the vision reflected from the participant DT1. He described that:

> *We're thinking about it. A lot more thing we're doing at moment we use the template and we use the technology to include the template the specific style sheets to change the way of page displayed. We're probably looking to use a style sheets to display the customised content as well. It will change the way of template display.*
>
> *But as far as the university go, it's not a priority. If it became easy to do, something we've done and it tight nicely. Yes, want to do it. I think the Intranet of the staff might be interesting because it's more about function rather than flashy nice things.*
>
> *As far as the students go, I have no plan to do anything. The student system is very much a tool. I don't thing they went to fitting around with the sort of fun things to do with the web site.*

> *Now we have a new academic registrar, I don't know what he might say. He might want looking for something some way attracts the students to use to web site. But I don't think the advantages of it were great at the moment because we have to spend a lot of money on it.*

6.11 Summary

This chapter provided the results of the development team, which is very important in order to construction an understanding on the current situation, vision, and limitation that the development team of the Case University are currently facing. These results will be discussed again when incorporated with the results which conducted from the major end-users of the University.

Next chapter, the result based on the study of major end-users will be provided before further discussion in the following chapter.

Chapter 7
Result of the Case Study: End-users

7.1 Overview

The purpose of this chapter is to describe the results of the case study based on a group of students considered as one of major end-users of the Case University. The result regarding the students was achieved by conducted based on the questionnaire survey, which was designed to generate a usage pattern of the online activities related to the students for both general and academic purposes.

However, the result of another group of end-users, academic staff, which was conducted with the interview instrument, will not be revealed in this Chapter. It will be used as supportive evidence to the findings of this study, which will be discussed in the next chapter.

This chapter has three major sections. The first section reveals the result regarding the overall information on the participants. Additionally, this section described the nature of information of the participants, i.e. age, educational levels, work experience, current year of study of the participants. This kind of information can be used for understanding the cause and reason of the result in other sections.

The second section reveals the literacy of the participants on both computers and the Internet. Moreover, the purposes of their usage of computers and the Internet were also described. This section provides a benefit when combined with other sections in order to generate the finding of the study.

The final section reveals the usage pattern of many activities related to general and academic purposes. This section generated a usage pattern of each activity as an evidence for supporting the finding of the study.

Moreover, the approach in describing the results in this chapter will be based on three major perspectives which were aimed at providing a clear picture to draw a finding from this study: Gender, Student Category, and Education Level perspectives.

In order to understand each perspective, an overview on each perspective was provided as following.

- Gender: this perspective is composed of ‘Male students’ and ‘Female students’.
- Student Category: this perspective is composed of ‘Domestic students’ and ‘International students’.
- Educational Level: this perspective is composed of ‘Undergraduate students’, ‘Postgraduate students by Coursework’, and ‘Postgraduate students by Research’.

Excluding the Gender Perspective, a clarification of the definition of each term will be described as follows:

- Domestic student: a student who is a permanent resident of Australia and has been being living in Australia since then, or stayed in Australia since his/her childhood.
- International student: a student who is a permanent resident of an other country and has come to Australia for studying purposes.
- Undergraduate student: a student who is enrolled in an Undergraduate degree at the Case University.
- Postgraduate student by Coursework: a student who is enrolled a coursework degree in a Master degree at the Case University.
- Postgraduate student by Research: a student who is enrolled a research degree at the Master or Doctorate level at the Case University.

7.2 Overall Information on Participants

A set of questionnaires, including participant information sheet and consent form, was randomly distributed among 115 students regardless of their Gender, Educational Level and background, nationality, and computer and Internet literacy. However, students currently enrolled English language courses at the Case University College were excluded from this study because they are not eligible to use the University’s Information Systems, Campus Portal and online services.

104 participants finally returned the questionnaires; two questionnaires, nevertheless, need to be exempted from the analysis due to incompletion in major sections of the questionnaire.

As a result, a total number of valid questionnaires is 102 respondents (n=102). The interpretation of the result will be expressed based on the information in which generated by using descriptive statistics. However, the purpose of this survey is to reveal the daily usage pattern of online activities that might affect to the use of Campus Portal and possibly reflect on the importance of design, develop and implementation of personalisation and customisation.

			Student Category		
			Domestic	International	Total
Gender	Male	Count	26	25	51
		% within Gender	51.0%	49.0%	100.0%
	Female	Count	29	22	51
		% within Gender	56.9%	43.1%	100.0%
Total		Count	55	47	102
		% within Gender	53.9%	46.1%	100.0%

Table 7-1 Cross tabulation between Gender and Student Category

In addition to the overall information on the participants (see Table 7-1),

- there are 51% of Domestic and 49% of International students among the male participants. Compared to female students, there are 56.9% of Domestic and 43.1% of International students. All international student participants moreover are full-time students, however, 7.3% of Domestic students study as a part-time student.
- By looking into specific details, there are 83.7% of Domestic students who have been born and been living in Australia since their birth. For International students, 91.5% of participants do not use English as their native and primary language, and 59.6% of them have a strong Asian background.

7.2.1 Age Range

By arranging the ages of the participants into various perspectives, it can be summarised that there is no significant difference on Gender perspective; however, it is

extensively noticeable when focusing on the Student Category and Educational Level perspective.

			Age Range of Students				Total
			18 to 22	23 to 27	28 to 32	32 and above	
Student Category	Domestic	Count	46	5	4		55
		% within Student Category	83.6%	9.1%	7.3%		100.0%
	International	Count	10	21	9	7	47
		% within Student Category	21.3%	44.7%	19.1%	14.9%	100.0%
Total		Count	56	26	13	7	102
		% within Student Category	54.9%	25.5%	12.7%	6.9%	100.0%

Table 7-2 Cross tabulation between Student Category and age range

- By focusing on the Student Category (see Table 7-2), the majority of Domestic students (83.6%) are between 18 and 22 years of age, while 78.7% of International students are above 23 years of age.

			Age Range of Students				Total
			18 to 22	23 to 27	28 to 32	32 and above	
Educational Level	Undergraduate	Count	53	8	3		64
		% within Educational Level	82.8%	12.5%	4.7%		100.0%
	Postgraduate - Coursework	Count	2	15	6	3	26
		% within Educational Level	7.7%	57.7%	23.1%	11.5%	100.0%
	Postgraduate - Research	Count	1	3	4	4	12
		% within Educational Level	8.3%	25.0%	33.3%	33.3%	100.0%
Total		Count	56	26	13	7	102
		% within Educational Level	54.9%	25.5%	12.7%	6.9%	100.0%

Table 7-3 Cross tabulation between Educational Level and age range of students

- In focusing on the Educational Level perspective (see Table 7-3), the ages of most Undergraduate students (82.8%) ranged from 18 to 22 years old, while more than half of Postgraduate students by Coursework (57.7%) ranged from 23 to 27 years old, and two thirds of Postgraduate students by Research (66.6%) ranged from 28 years old and above.

7.2.2 Educational Levels

According to Table 7-4, it is clearly displayed that the majority group between Domestic and International students are enrolling differently.

			Educational Level			Total
			Undergraduate	Postgraduate - Coursework	Postgraduate - Research	
Student Category	Domestic	Count	52		3	55
		% within Student Category	94.5%		5.5%	100.0%
	International	Count	12	26	9	47
		% within Student Category	25.5%	55.3%	19.1%	100.0%
Total		Count	64	26	12	102
		% within Student Category	62.7%	25.5%	11.8%	100.0%

Table 7-4 Cross tabulation between Student Category and Educational Level

- It can be found that 94.5% of Domestic students are currently studying at the Undergraduate level, whereas 74.4% International students are studying at the Postgraduate level, which includes Master and Doctorate degrees, and both coursework and research programs.

7.2.3 Work Experiences

Although both Undergraduate and Postgraduate students have already had work experiences before and/or during studying at the University, nevertheless, by looking at the details on the questionnaire of each relevant participant, the following can be concluded.

- Work experience of Undergraduate students are more likely a part-time job, i.e. fast food cashier, waiter, waitress, baby sister, sales, and so forth that are not related to their educational background.
- The Postgraduate students, on the other hand, have work experiences as a permanent job, i.e. accountant, dentist, secretary, programmer, lecturer, researcher, and so forth, which can be traced back to their educational background.

7.2.4 Current Year of Study and Enrolled Faculty

			Year of Study				Total
			1st Year	2nd Year	3rd Year	4th Year	
Educational Level	Undergraduate	Count	28	10	22	4	64
		% within Educational Level	43.8%	15.6%	34.4%	6.3%	100.0%
	Postgraduate - Coursework	Count	26				26
		% within Educational Level	100.0%				100.0%
	Postgraduate - Research	Count	2	3	5	2	12
		% within Educational Level	16.7%	25.0%	41.7%	16.7%	100.0%
Total		Count	56	13	27	6	102
		% within Educational Level	54.9%	12.7%	26.5%	5.9%	100.0%

Table 7-5 Cross tabulation between Educational Level and Year of Study

According to Table 7-5, a cross tabulation between Educational Level and Year of Study was provided in order to explain the facts that were collected from the participants who study at various Educational Levels and Years of study. It can be summarised that:

- The majority of the participants at the Undergraduate level are in their first (43.8%) and final year (34.4%), while 15.6% are in their second year.
- In addition, there are 56.3% of Undergraduate students enrolled in the art and social faculties, e.g. Arts, Commerce, Creative Arts, Education, and Law, and the remaining students (43.7%) are enrolling in science faculties such as Engineering, Health and Behavioural Sciences, Informatics, and Science.
- All participants who are taking the Postgraduate by Coursework program, which is generally a one year program, are definitely in the first year.
- Moreover, the most popular programs for the Postgraduate by Coursework programs are in the Faculty of Informatics (42.3%), and Faculty of Commerce (23.1%). Similar to the program for research students, there are 41.7% participants in both of the Faculty of Commerce and the Faculty of Science.
- Years of study of Postgraduate by Research students varies depending on their year of their education: 16.7% are in the first and forth year, 25% are in their second year, and finally, 41.7% are in their third year.

7.3 Computer and Internet Literacy of the Participants

In the second section of the questionnaire survey, the participants were requested to identify their computer and the Internet experiences, and their general activities and behaviours while using a computer and the Internet. It can be grouped and summarised as follows.

Computer and Internet literacy are among the important factors that influence people to use the computer and the Internet. When people feel more confidence, they can productively use a computer and the Internet to handle their activities when applicable.

7.3.1 Computer Literacy

In general, the range of experiences and literacy among users, especially between developed and developing countries, can become an issue that affects to the usage of Computer and Internet related activities.

By considering the three perspectives as previously mentioned, it can be concluded that there are no significant differences in terms of years of experiences in using a computer among participants (see Table 7-6, 7-7, 7-8).

			Year of Experience					Total
			1 year or less	2 years	3 years	4 years	5 years or more	
Gender	Male	Count		1	7	7	36	51
		% within Gender		2.0%	13.7%	13.7%	70.6%	100.0%
	Female	Count	1		3	7	40	51
		% within Gender	2.0%		5.9%	13.7%	78.4%	100.0%
Total		Count	1	1	10	14	76	102
		% within Gender	1.0%	1.0%	9.8%	13.7%	74.5%	100.0%

Table 7-6 Cross tabulation between Gender and Year of Experience

			Year of Experience					Total
			1 year or less	2 years	3 years	4 years	5 years or more	
Student Category	Domestic	Count		1	4	5	45	55
		% within Student Category		1.8%	7.3%	9.1%	81.8%	100.0%
	International	Count	1		6	9	31	47
		% within Student Category	2.1%		12.8%	19.1%	66.0%	100.0%
Total		Count	1	1	10	14	76	102
		% within Student Category	1.0%	1.0%	9.8%	13.7%	74.5%	100.0%

Table 7-7 Cross tabulation between Student Category and Year of Experience

- From the Gender perspective, there are 70.6% of males and 78.4% of females who have been using a computer for more than five years.
- When exploring the Student Category perspective, 81.8% of Domestic students have experience in using a computer for more than five years compared to 66.0% of International students and 19.1% have four years of experience.

			Year of Experience					Total
			1 year or less	2 years	3 years	4 years	5 years or more	
Educational Level	Undergraduate	Count		1	6	9	48	64
		% within Educational Level		1.6%	9.4%	14.1%	75.0%	100.0%
	Postgraduate - Coursework	Count	1		4	5	16	26
		% within Educational Level	3.8%		15.4%	19.2%	61.5%	100.0%
	Postgraduate - Research	Count					12	12
		% within Educational Level					100.0%	100.0%
Total		Count	1	1	10	14	76	102
		% within Educational Level	1.0%	1.0%	9.8%	13.7%	74.5%	100.0%

Table 7-8 Cross tabulation between Educational Level and Year of Experience

- Additionally, very similar results were found in the Educational Level perspective. The majority of overall students (74.5%), especially all Postgraduate by Research students, have computer experience of more than 5 years, where both Undergraduate and Postgraduate students by Coursework have at least four years of experience.

In summary, it can be found that the majority of people viewed from any perspective have significant numbers of years using a computer. Even though a large group of students were originally from developing countries, the experience on the Computer in terms of number of years is equivalent to developed countries.

7.3.2 Personal computer

Fascinatingly, almost every student owns at least one personal computer. In fact, a desktop computer is the most popular among students. Notebook computer, however, have become more popular, especially for International students. In fact, some of them might own both desktop and a notebook computer.

- By focusing on the Gender perspective, 70.6% of male students own a desktop computer and 39.2% have a notebook computer, whereas 62.7% of female students have a desktop computer and 41.2% have a notebook computer.

- From the Student Category perspective, 85.5% of Domestic students own a desktop computer, while 23.6% of Domestic students have notebook computers. Moreover, 44.7% of international student own desktop computers, while more than half (59.6%) of International students own notebooks, compared to 23.6% of Domestic students.
- From the perspective of Educational Level, most Undergraduate students (81.3%) and half of Postgraduate students by Coursework (53.8%) have a desktop computer, while the majority of Postgraduate students by Research (83.3%), and a half of Postgraduate students by Coursework (46.2%) have a notebook computer.
- In addition to a preferred computer type, 92.2% of personal computers have Microsoft Windows ® as the Operating Systems (OS).

Computer systems, nowadays, are more than word processor, spreadsheet, and other offline computer applications. It is more like a kind of communication tool that allows students to communicate to their parents and friends in their countries.

The nature of academic activities of students is that they are required to work individually or group, and they usually work in both places: home and the University. A notebook computer is more flexible and portable to use and is perfectly suited to the needs of students.

7.3.3 Time and Place for using a Computer

Recently, people are now experiencing on the activities related to the computer systems. Additionally, a computer is currently becoming a more common tool to support people's daily activities for both personal and business purposes. It is also enhanced with the integration of Internet technology which produces a new generation of communication and information channel.

As revealed in previous sections, the majority of students now have at least one personal computer to facilitate their academic activity, entertainment, and communication. This part, therefore, will reveal the result involved in the usage pattern on a computer, including places that the participants had been using it.

However, this section was not intended to investigate deeply on any specific activity, it will basically provide a broad detail for the overall usage time that the participants are

using the computer for major activities. More information on Internet usage time and its activities will be disclosed in the following major sections.

- From the Gender perspective:
    - Half of male students spend at home on a computer for more than three hours a day rather than the University, where approximately half of male students often spend only one hour. Moreover, 80.4% have never used computers in an Internet Café.
    - In addition, the majority of female students (70.6%) uses a computer at home between one and three hours while 49% spend one hour at the University on a computer, and most of them have never used a public Internet service. Furthermore, one in five of female students do not use a computer at the University.
- Based on the Student Category perspective:
    - Most Domestic students (72.7%) spend between one and three hours on a computer at home, while one forth of Domestic students (23.7%) spends at least four hours. At the University, 16.4% of Domestic students do not use a computer at the University, whereas 56.4% spend only one hour. In addition, most Domestic students (90.9%) have never spent their time on a computer at an Internet Café.
    - Compared to International students, there are no significant differences in the usage pattern. In fact, the usage pattern the time they spend on a computer a day varies. However, it can be summarised that most International students definitely use a computer at home and spend some time at the University. Additionally, 69.1% of International students use a computer at the University for one to two hours and most of them, unsurprisingly, do not use a computer at an Internet Café.
- Based on an investigation from the Educational Level perspective,
    - Most Undergraduate students (73.5%) spend one to three hours a day on a computer at home. In addition, 59.4% of Undergraduate students usually spend one hour on a computer at the University, whereas some Undergraduate students (15.6%) do not use any computer. However,

there are approximately 10% of Undergraduate student who visit an Internet Café for using a computer as well.

- On the side of Postgraduate students by Coursework, the usage pattern on a computer at home varies from one to five hours. In fact, there is only a slightly different percentage from each hour. On the other hand, most Postgraduate students by Coursework (80.7%) spend between one and three hours on a computer at the University.
- In contrast, the usage pattern of computer use by Postgraduate students by Research are quite different from the Postgraduate students by Coursework. Half of Postgraduate students by Research spend at least four hours on a computer at home. In addition, half of Postgraduate students by Research use a computer at the University between one and two hours. Moreover, one third of Postgraduate students by Research (33.3%) spend at least five hours on a computer at the University and all Postgraduate students by Research do not use a computer at an Internet Café.

In conclusion, it can be summarised that home is the place that everyone prefers to spend most of their time on a personal computer. In addition, the university seem to be a parallel place that almost every student spends at least one hour on a computer. In contrast, other public places such as Internet Cafés are hardly a choice to use a computer due to the fact that most of students own at least one computer.

Although the computer usage pattern of female students is very similar to the male student pattern, the usage pattern on computers at home and the overall usage pattern clearly shows that male students spend a lot more time on computers than female students.

In terms of places of using a personal computer, both Domestic and International students have mostly the same appreciation of using a computer at home rather than other places such as the university or an Internet Café.

In terms of the overall usage pattern on a computer, every Educational Level has very comparable patterns in terms of places. However it has somewhat of a difference when considering to the time of their usage. Most Undergraduate students spend a shorter

period of time on a computer compared to most Postgraduate students especially the research students.

7.3.4 Purpose and Length of Time using a Computer

The computer has actually become a centre for people's digital lifestyle and ranges from writing documents, browsing a Web site, writing an email, searching information, doing business applications, accessing online banking, and home entertaining. Additionally, Microsoft has recently introduced its new version of Microsoft Windows Operating Systems, Windows XP Media Centre Edition, which enables the personal computer to be a centre of home entertainment. Moreover, there is the fact that the Internet has been tightly merged into an education institution and become a part of the new academic lifestyle.

Almost every higher-education institution around the world has introduced and integrated the Internet as a core infrastructure of its Information Technology to implement and maintain state-of-art information services generally available to staff members and students. Many institutions furthermore commenced e-learning programs to extend the ability of traditional learning and teaching into self learning, which allows students to be able to access the online campus at any time from anywhere.

Consequently, this section is to investigate some major purposes when the participants use a computer in each day. In addition, an investigation will be studied into four major purposes: studying purposes, online for non-academic purposes, and entertaining purposes. The result will show how much time the participants have spent on each purpose when using a computer.

7.3.4.1 For Studying Purposes

The 'for studying purposes' is to investigate how often participants use a computer for their studying such as writing assignments, writing a thesis, searching documents in the library, taking notes, downloading course materials, and so forth. It also includes using the Internet, but is limited to for studying purpose only.

- As shown from the result of the questionnaire survey, there are no significant differences between these activities and the usage pattern of each activity between male and female students. A usage pattern in both Genders is considerably very similar.

- A majority of males (72.6%) spend from one to three hours on studying while 19.6% spend more than five hours.
- Compared to female students, approximately two thirds of female students (64.7%) spend between one and two hours on a computer for their studying, and only 11.8% use a computer for at least five hours on the same activity.

- There is a difference, however, when investigating into the Student Category perspective. As shown from the result, a moderate number of International students spend longer time on a computer for their studying. However, this can be relatively linked to other factors such as ages and their Educational Level.
  - Based on the result, it shows that 83.5% of Domestic students spend between one and three hours a day on a computer for their studying while just 9.1% spend more than five hours a day.
  - Compared to International students, 64.1% of International students use a computer for their studying (between one and three hours), whereas 23.5% spend time on this activity for more than five hours.
- Based on the Educational Level perspective, there are significant differences between Undergraduate, Postgraduate by Coursework, and Postgraduate by Research students. As revealed in the result, Postgraduate students by Research have spent much more time on a computer for their studying when compared to Undergraduate students, especially, and Postgraduate students by Coursework.
  - In detail, most Undergraduate students (86%) spend between one and three hours on a computer for studying purposes, while only 6% spend time for more than five hours a day.
  - Additionally, half of Postgraduate students by Coursework (50.0%) spend between one to two hours on a computer for studying, while 19.2% spend time for more than five hours.
  - Moreover, more than half of Postgraduate students by Research (58.3%) spend time for at least five hours on a computer for studying purposes.

In conclusion, the result has clearly shown that there are some significant differences when compared with a particular perspective. As previously mentioned, there is no significant difference regarding to the Gender perspective. However, it does matter when compared to the Student Category perspective. International students spend a longer time on a computer for studying purposes than Domestic students. Additionally, it is clearly shown in the result that there is a significant difference when focusing on the Educational Level. Postgraduate students by Research spend the longest time on a computer for their studying purposes while most of Undergraduate students spend only a short period of time on a computer for same purposes.

7.3.4.2 Going Online for Non-Academic Activities

Distinguished from academic purposes, there are a large number of non-academic activities on the Internet such as searching favourite entertainment sites, chatting with online friends with messaging applications, selling and buying products from the E-Commerce sites, and so forth. It is undeniable that almost everyone needs to do non-academic activities while they are studying or working at the University. Consequently, this section investigated the usage pattern on a computer for Internet accessing in non-academic activities.

- Based on the Gender perspective, a pattern of time usage on a computer for non-academic related activities on the Internet in both male and female students are comparable.
    - Almost two thirds of male students (62.8%) access the Internet between one and two hours, whereas 11.8% spend more than five hours on this activity.
    - Similarly, 64.8% of female students use a computer between one and two hours, only 5.9%, however, spend more than five hours.
- Based on the Student Category perspective, there is a slight difference in the usage pattern between Domestic and International students using a computer to access the Internet for non-academic activities.
    - While most Domestic students (78.2%) use a computer between one and three hours for these activities, 53.2% of International students spend the same number of hours doing this.

  - In addition, 12.7% of Domestic students spend at least five hours on these activities while only 4.3% of International students spend time on these kinds of activities.

- By considering the Educational Level perspective, there are somewhat significant differences on the usage pattern of non-academic related activity, and a number of students who do not use their computer to access the Internet for these kinds of activities.
  - Firstly, 68.7% of Undergraduate students spend between one and two hours on these activities, whereas 9.4% spend more than five hours.
  - In the mean time, 57.7% of Postgraduate students by Coursework use a computer for one to two hours on non-academic related activities, and 7.7% spend more than five hours.
  - Finally, 50% of Postgraduate students by Research spend between one and two hours on a computer for accessing the Internet for non-academic activities, while 8.3% spend more than five hours.

Interestingly, there are some students who do not use a computer for these kind of activities: 7.8% of Undergraduate students, 19.2% of Postgraduate students by Coursework, and 25.0% of Postgraduate students by Research.

In summary, a significant difference between each group of students can be found in two perspectives: the Student Category and Educational Level perspective. However, it is more obviously shown in the educational perspective.

In fact, there is a relationship between the Student Category and the Educational Level perspective, because most Domestic students are studying at the Undergraduate level, while the majority of International students are studying at the Postgraduate level. It can be summarised that Undergraduate students who mainly are Domestic students spend more time on a computer for using non-academic related activities than Postgraduate students who mostly are International students.

7.3.4.3 For Entertainment Purposes

Entertainment has become a vital role in personal computers which enable a user to play music, movies, multimedia, gaming, and much more. As a result of that, students possibly spend some time for entertainment on their personal computer. This section is

to discover how often students spend time on entertainment activities on their computers.

- Based on the Gender perspective, it is apparently shown that there is a difference between male and female students in the number of people who use a computer for entertainment. There are a larger number of male students who spend time on a computer for entertainment when compared to females.
    - A result showed that 74.5% of male students spend some time on a computer for entertainment. The majority of male students (31.4%) spend only one hour, 15.7% spend time for three hours, and 11.8% spend more than five hours on this activity.
    - At the same time, only half of the total female students use a computer for entertainment and most of them spend between two and three hours for entertainment.
- Compared to the Student Category perspective, there is a significant difference on the numbers of students who use a computer for entertainment. It shows that there were a larger number of International students who spend time on entertainment on their computer compared to Domestic students.
    - Based on this result, approximately half of Domestic students (47.3%) do not use a computer for entertainment, and the majority of another half can be found as two groups: 20.0% spend only one hour, while 12.7% spend more than five hours for this activity.
    - In addition, 72.3% of International students spend some time on a computer for their entertainment; the majority of them spend between one and three hours a day.
- By focusing on the Educational Level perspective, it is clearly shown in the result that there is a smaller number of Postgraduate by Research students who spend time on entertainment when compared to Postgraduate students by Coursework and Undergraduate students.
    - Based on the result, 60.9% of Undergraduate students spend some time on a computer for the entertainment; approximately half of them spend

between one and two hours, and the rest of them spend at least three hours for entertainment.

- In the meantime, a third of Postgraduate students by Coursework do not use a computer for their entertainment, another one third spend only one hour, and the remaining spend between two and three hours on this activity.
- Moreover, only a half of Postgraduate students by Research spend some time on a computer for their entertainment. This group can be categorised into two main groups: 25% spend between one and two hours, and another 25% spend more than four hours for this activity.

By considering the details of each group and perspective, it can be summarised that there is a significant difference in entertainment purposes in every investigated perspective. Revealed in the result, male students spend more time on a computer for entertainment when compared to female students. Additionally, International students spend more time for entertainment purposes when compared to Domestic students. Finally, Postgraduate by Research students is the group that least uses a computer for entertainment purposes when compared with other groups.

7.3.5 Internet Connection

Although most Internet connections are being accessed from personal computers such as desktop and notebook types, a future of wide usage of smart phone and PDA integrated with a wireless network are making a new possibility of the Internet connection through various kinds of channels.

A type of Internet connection can actually be taken for more analysis in order to forecast the new possibilities of activities among the users. Since the price of a broadband connection in Australia, for example, has been dropped to match the price of a dial-up connection cost, the number of people changing from a dial-up to high-speed Internet connection has dramatically increased. As a result of this phenomenon, richer graphics and dynamic contents of Web sites are now much more possible to be introduced. Prior to the expression of the result and further analysis, some participants may have both types of connection (dial-up and broadband).

- Regarding the Gender perspective, 49.0% of male students have a dial-up connection and 43.1% have a broadband connection, whereas 68.6% of female students have a dial-up connection and 23.5% have a broadband connection.
- Based on the Student Category viewpoint, approximately half of both categories, 65.5% of Domestic students and 51.1% of International students, have owned a dial-up connection, while 29.1% of Domestic students and 38.3% of International students have a broadband connection.
- Based on the Educational Level perspective, over half of Undergraduate students (59.4%) and half of Postgraduate students by Coursework (50.0%) have a dial-up connection, while one third of these groups have a broadband connection. In the mean time, a majority of Postgraduate students by Research have a dial-up connection, while only 8.3% of this group have a broadband connection.

In summary, a dial-up network is a major preferred connection for at least half of students. In fact, this does not totally mean that a broadband connection is unpopular among students. There were some factors that could generate this kind of result.

- Pricing. A broadband connection within Australia is starting to be widely available nationwide and the price of the service is due to be reduced. There is the fact that Broadband Internet plans generally vary regarding the speed, bandwidth, and monthly traffic. According to the sample prices from the ADSL plan listed in Table 7-9 and Table 7-10; broadband, however, is still considered as very expensive when compared to a dial-up connection, which is currently as low as $9.90 per month.
- Long term contract. Most broadband Internet plans from many providers require the customer to have at least a 12 month contract, while there is minimal period of contract required for a dial-up connection.

Please see print copy for Table 7-9

Table 7-9 Broadband Pricing in Australia (Optus)
(Source from www.optusnet.com.au as of January 2005)

Please see print copy for Table 7-10

Table 7-10 Broadband Pricing in Australia (Bigpond)
(Source from www.bigpond.com.au as of January 2005)

- Portable difficulty. A dial-up network is virtually accessible from anywhere using a single telephone line with local numbers provided by most Internet providers, whereas a specific physical address and digital equipped telephone line were required for a broadband connection in order to route back to the broadband Internet provider. Therefore, there is hardly access to broadband outside their premises. However, a broadband connection for students who use laptop computers, especially at the University, is available in major outdoor areas and indoors of most buildings by using their e-mail account.

By looking into the detail of the questionnaire and observation of the researcher, a decision to select an Internet plan is not influenced by the Gender perspective, but it has a relative connection to the Student Category and Educational Level. It can be concluded as follows:

- Most Domestic students live with their families in which they already have an Internet connection at home. In fact, some of their families have planned to upgrade from a dial-up to a broadband connection.

  On the other hand, a lifestyle of living among International student can be differentiated into three major styles.

- Firstly, accommodation sharing. This group of students prefer to share a house, or two-three bedroom units with friends. Broadband is the most preferable selection among them because most of them own a personal computer, especially notebook type, and they have to share the Internet connection over a single telephone line. Therefore, broadband is the best choice for them because they can share the Internet connection with everyone as well as an extra available telephone line for the voice communication.
- Secondly, home-stay family. Some International students live in a home-stay (living with an Australian family) that might have difficulty in accessing to the Internet. Luckily, some home-stay families may provide either a dial-up or a broadband connection for students.
- Finally, university accommodation. Many students prefer to stay in a university's accommodation. Additionally, they usually have at least one kind of Internet connection. Moreover, some accommodation campuses provide a broadband connection for students via the university's Internet network.

- The Case University provides every research students (Master degree by Research and Doctorate degree) some necessary facilities such as a personal computer, desk, chair, bookshelf, and high-speed Internet access at the office with an extra dial-up connection to work at home.

  As a result, most research students always have access to a computer including the Internet and most of them spend a lot of time at the office. Not many research students, therefore, have a broadband connection at home.

7.3.6 Length of Time Spent Online

Online activities might have had no meaning in the early 1990s. Conversely it is currently quite common and has completely become a part of human life since the booming age of the Internet in the late 1990s.

A lot of people are spending their time doing online activities for various purposes. In this section, however, will not be focused on the kind of activities that students might be using when they are online, but will deeply investigate on how long they are

spending online in particular places such as home, university, and Internet Cafés. More information on the online activities will be shortly discussed after this section.

This study, once again, will deeply focus on three perspectives: Gender, Student Category, and Educational Level perspectives.

- Details from the Gender perspective:
    - 43.1% of male students go online from home between one and two hours a day while 39.2% spend at least four hours on the Internet. At university, most males (74.5%) spend a short period of time between one and two hours on the Internet whereas approximately 10% of male students spend more than five hours on the online activities. Moreover, the majority of male students are not online at the Internet Cafés.
    - On the side of female students, at least half of female students (53.0%) spend between one and two hours on the Internet activities while about a third of females access the Internet for at least four hours. Interestingly, 31.4% of female students are not online at the University, whereas 60.8% of females spend between one and two hours, and only 3.9% of females spend at least five hours. Undoubtedly, most female students (92.0%) do not access the Internet from an Internet Cafés.

  In brief, regarding Gender, there are a few differences and similarities among the participants regarding Gender's point of view.

  - Similarity, both males and females spend most of their time on the Internet at home. In addition, the majority of them spend time at home between one and two hours being online.
  - On the other hand, there is clearly a noticeably greater number of males when compared to females who spend at least five hours using the Internet.
  - Surprisingly, approximately one third of females do not access the Internet at the University, while most of the remaining spend between one and two hours.
  - In the same case, only 3.9% of male students do not go online at the University, while 74.5% spend between one and two hours a day. It is very

clearly shown in the results that both of males and females do not go to Internet Cafés for using the Internet at all.

- Based on the Student Category perspective, it can be summarised that:
  - 61.8% of Domestic students usually access the Internet at home between one and two hours, while 16.4% spend at least five hours going online. Furthermore, most Domestic students (74.5%) spend between one and two hours at the University to go online. Undoubtedly, almost everyone (92.6%) does not use the service at Internet Cafés.
  - On other hand, almost half of International students (44.7%) spend time at least four hours on the Internet at home, while 31.9% spend between one and two hours. Additionally, most International students (70.1%) spend between one and three hours using the Internet access at the University, while there are only 10.6% that use the Internet for at least four hours. Again, most of them do not use the Internet at an Internet Café.

In the summary based on the Student Category perspective, the major characteristic of Domestic and International students is quite different when considered in detail. It can be summarised that:

- The age range of most Domestic students is between 17 and 22 years old while most International students, in contrast, are over 22 years old.
- Most Domestic students are studying for a bachelor degree, while most International students are doing a Master and Doctorate degree. Some relationships, therefore, might overlap each other.
- From these characteristics, it could be applied to understand the reasons for the Internet usage pattern of both Domestic and International students. From the observation of researcher and data collected from the questionnaire, it can be concluded that:
- Firstly, most students own at least one kind of personal computer and Internet connection. The University, additionally, always provides computer facilities and broadband connection for students. This means that all students are entitled to access the Internet in any place between home and

the university. Based on this information, this is the reason why most students do not need to visit an Internet Café for using the Internet.

- Finally, most International students use the Internet to contact their families and friends living in their origin countries, listening to their favourite latest songs from online music stations, reading news, and even watching some TV stations and video clips from their countries. This could lead to the possibility of increasing more time on the Internet for International students.

- Based on the Educational Level perspective:
  - Over a half of Undergraduate students (56.3%) spend between one and two hours at home online while there are approximately one third of Undergraduate students who spend at least four hours a day doing this. Interestingly, 18.8% of Undergraduate students do not access the Internet at the University, while most Undergraduate students (73.4%) spend between one and two hours. Undoubtedly, most students (92.1%) do not use the Internet at the Internet Café.
  - On the side of Postgraduate students by Coursework, more than 10% of Postgraduate students by Coursework do not go online at home, while 38.4% spend between one and two hours, and 42.3% access the Internet for at least four hours. In fact, nearly 20% of Postgraduate students by Coursework do not spend their time on the Internet at the University whereas 69.2% spend between one and two hours, and no one spends more than four hours. Once again, none of this group uses the Internet at the Internet Café.
  - Almost half of Postgraduate students by Research (41.7%) do not access the Internet from their home, while 25% spend only a short period of time as little as one hour. However, 33.4% spend at least four hours. In fact, Postgraduate students by Research spend most of their time accessing the Internet at the University; approximately one third of students (33.3%) spend only an hour, while 16.7% spend up to three hours, and 41.7% research students spend at least five hours on the Internet.

In conclusion, regarding the Educational Level perspective, although most Undergraduate students have an Internet connection at home, Postgraduate students spend more time on the Internet when compared to the Undergraduate students.

However, the Internet usage pattern at the University is comparable between Undergraduate and Postgraduate students by Coursework in which most of them spend between one and two hours on the Internet.

Nearly half of Postgraduate students by Research, in contrast, spend at least five hours accessing Internet at the University. From the observation of the researcher, this could explain the usage pattern of students, and especially why. Because the Postgraduate students by Research have an office space and a computer provided by their faculties, most of them, therefore, spend more time at the University for accessing the Internet and doing their research without needing to be concern about the Internet connection at home.

7.3.7 Internet Literacy

Recently, a number of the Internet users have dramatically increased and most people already have some experiences doing Internet related activities. This section will show the number of years that people have been using and been involved with the Internet.

- On the perspective of Gender, it has been revealed that more than half of males (51.0%) and females (58.8%) already have at least five years experience on the Internet while most of the remaining of students in this group have between two and three years experience.
- In addition, approximately half of Domestic (52.7%) and International students (57.4%) have been using the Internet for at least five years, and the majority of the remaining group in both groups have between three and four years experience.
- Compared to the Educational Level perspective, at least half of Undergraduate students (51.6%), Postgraduate students by Coursework (57.7%), and Postgraduate students by Research (66.7%) have at least five years experience in using the Internet, and the remaining group have between three and four years of experience.

In conclusion, it is clearly shown that experience regarding the Internet on each perspective have comparable skills. Indeed, half of them have been using the Internet for at least five years, while the remainder of them already have at least three years in experience on the Internet.

This means that almost every student has been starting to use the Internet while they are studying in high schools. Therefore, it is much more possible that they could seamlessly adapt their existing knowledge which is related to the Internet and its environment to the University's online services, such as online enrolment, electronic library catalogue, electronic journals, WebCT, and so forth, with minimal training.

7.3.8 Comments from the Participants

Based on the open-ended section of the questionnaire survey, every participant agrees that the Internet is an essential tool for the studying. Without the Internet, there is a difficulty of effectively studying in a modern learning environment.

Most participants mentioned that WebCT, a leading online learning system implemented by the University, seems to be central in their studying and in getting access to lecture notes, assignments, previous exam papers, and so forth. Additionally, SOLS (Student Online Service) is another major tool that allows student to manage their related personal information such as updating their current address, enrolments, writing and submitting an Annual Progress Report, making Internet payments, summiting a request for graduation, and so forth.

A general practice in academic industries that has been forever changed is that most publishers are now digitising their contents in Web-based form, rather than using a certain type of medium such as CD-ROM and DVD-ROM.

Indeed, the Case University has been subscribing to many popular online databases and journals, conference papers, books, and so forth to make them available to students. Additionally, this information is also available to students on and off-campus via the library's Web site. It is compulsory for every student to be able to know how to search their desired information from the electronic sources.

Moreover, many university applications are available online and most documents are also in paperless form and made available through the University's Web site. Therefore,

Internet access becomes a compulsory for every student in order to maintain their studying on today and in their future education.

7.4 Online Activities

Undoubtedly, the Internet is an important medium and platform that enables students to achieve their educational goals. Every university generally provides Internet infrastructure and facilities to all students and staff members to be able to access internal and external online services. In addition, online learning has already been merged into the educational systems within the Case University. As a result, involving in online activities is unavoidable for every student.

This section is to disclose and summarise the result from the data collection based on three perspectives, as previously mentioned: the Gender perspective, the Student Category perspective, and the Educational Level perspective by comparing them to each of listed activities (see also the Appendix A for the tables of results).

7.4.1 Usage Pattern of Online Activities for General Purposes

The purpose of this section is to explore some of the most common activities available on the Internet and to reveal the usage pattern of each listed activity among participants by referring to the three perspectives as mentioned. The Internet applications and activities covered in this study are email, Internet messenger, Web board, search engine, reading news, entertainment, downloading and evaluating software, online shopping, job searching, and Internet banking.

7.4.1.1 Email

Email is one of the oldest and most popular Internet applications. Everyday, most people spend some time to check, reply, or write an email. In fact, a lot of people have more than one email address for both personal and business purposes.

In general terms, there are two major types of email services: free Internet email and organisation email account. Based on my observation, students, for instance, were provided with the University account which enables them to use campus email, access the Student Portal, and access to their subject materials, and so forth. However, a lot of them have additionally owned at least one free Web-based email account.

This study, therefore, asked the student about frequency of usage, which related to the email activities such as composing, replying and reading both campus and non-campus emails.

- By focusing on the hour usage based on the Gender perspective, it shows that there is no significant difference in the usage pattern between males and females. Almost every male student uses email only a short period of time. In fact, 37.3% spend up to 10 minutes a day, while 41.2% spend between 11 and 30 minutes, and 19.6% do this activity up to 45 minutes. In addition, every female student definitely uses email; 29.4% use email up to 10 minutes, 43.1% spend at least 10 minutes to half an hour, and 21.6% spend up to 45 minutes for email.
- Based on the Student Category perspective, there is variation in the usage pattern between Domestic and International students. In more detail regarding this perspective, every Domestic student goes online for emailing. Among this group, it can be found that most of them (80%) spend less than half an hour a day for this activity, and 16.4% use email up to 45 minutes. Once again, there is confirmation that every International student uses email daily. Most of them (70.2%) spend a short period of less than half an hour, while 25.5% spend slightly more time.
- From the Educational Level perspective, there is a similarity between Undergraduate students and Postgraduate students by Coursework. However, in the usage pattern of both groups there is a comparable difference to Postgraduate students by Research, who spend more time on this activity then other groups. The result shows that every Undergraduate student accessed the email service. In detail, 39.1% of Undergraduate students accessed email services for less than 10 minutes, while 40.6% spend longer up to half an hour. Additionally, 17.2% of Undergraduate students spend between half an hour and 45 minutes. Compared to Postgraduate students by Coursework, every Postgraduate student by Coursework definitely uses email. However, it seems that most students (73.1%) spend time using their email service for up to half an hour a day, while 26.9% Postgraduate students by Coursework use email for a little longer time but less than 45 minutes. Additionally, no Postgraduate

students by Coursework use email for more than an hour a day. In terms of the result regarding Postgraduate students by Research, all students use email as their daily activity. In fact, 8.3% do this activity for up to 10 minutes, a half of Postgraduate students by Research spend between 11 minutes and half an hour, 25% use email for up o 45 minute, and 16.7% spend time for more than one hour daily.

In conclusion regarding time usage of email activity, there is no significant difference regarding the Gender perspective, however it has a minor difference when compared in detail. More Domestic students spend time up to 10 minutes, while more International students spend time from half an hour to 45 minutes. Moreover, there is somewhat of a difference in Educational Level; a majority of Postgraduate students by Research spend longer time on email than other groups.

7.4.1.2 Instant Messaging Service

Instant Messaging service (IM) is a text-based communication tool that allows users to send and receive short messages over the Internet in real-time (Shiu and Lenhart 2004, Microsoft XP Team 2005). Generally, users need to install an IM client into their computer prior to using the service, however, some major providers have already introduced and released a Web-based version, which is not required to prior to installation of software. Once users sign-in to use the IM, the system will check the availability status of a friend's list to see whether they are online, off-line, away, busy, and so forth.

The most popular IM softwares are ICQ, Yahoo Messenger, MSN Messenger, and AIM. The current ability of IM is not limited to only text-based conversation, but also includes the ability of sending and sharing files, pictures and music.

This study will focus on the usage pattern of IM rather than the types of activities, while the participants using the IM.

- Based on the Gender perspective, the result revealed that nearly 40% of male students do not use IM to communicate with their friends and families, while 21.6% spend more than one hour for this activity, and 15.7% of male students spend time on IM for a maximum of 10 minutes. Compared to male students, more than half of female (62.7%) use instant messaging service; 29.4% use it

for half an hour, 17.7% spend between half an hour and one hour, and 15.7% spend time for more than one hour a day using IM.

- According to the results based on the Student Category perspective, approximately half of Domestic students (52.7%) regularly use IM. By investigating the details, 25.4% of Domestic students access the IM service for up to half an hour, whereas 20% spend more than one hour on the same activity. Correspondingly, most International students (72.3%) participate in the IM service; 29.8% spend up to half an hour for this online activity, while 25.5% access it between half an hour and one hour. Moreover, 17.0% spend more than one hour a day on this activity.
- Based on the Educational Level perspective, 60.9% of Undergraduate students regularly use IM as a daily activity. Indeed, 23.4% spend less than half an hour, while 25% of Undergraduate student use IM for more than one hour. In addition, more than one third of Postgraduate students by Coursework (38.5%) do not use the online messaging service, while the majority of the remainder spend up to 45 minutes a day on this activity. In terms of the usage pattern of Postgraduate students by Research, approximately two thirds of students in this group frequently use IM. However, the majority of IM users in this group spend only 10 minutes a day for this activity.

In conclusion of Instant Messaging use, approximately two thirds of the overall participants have used of IM services daily. Actually, there is no significant difference between male and female students. Based on the result, approximately 60% of participants of both male and female students spend daily to using IM.

However, the differences are clearly shown when comparing in the Student Category perspective. More International students use and spend longer time on IM than Domestic students.

Similarly, there is a significant difference when focusing on an Educational Level perspective. Although a number of students that use IM are considered to be the same, a majority of Postgraduate students by Research spend less than 10 minutes a day for this activity. Furthermore, Undergraduate students spend the longest time on IM; 25% of them spend more than one hour a day on this activity, while most of Postgraduate students by Coursework spend less than 45 minutes a day.

7.4.1.3 Discussion group

A discussion group can be considered as a part of a pioneer application among other Internet services. Initially, it was known as Newsgroup, which acted as an electronic bulletin board where users can read and post any comment and opinion related to the topic on the subscribed groups that the users of newsgroups need to subscribe to before being able to read or write a message to those particular forums.

Currently, a new form of discussion group that was also mentioned is the Web board, which is generally based on a Web-based interface accessible by using a Web browser. Web board's concept, however, is different from the original discussion group's concept. In fact, Web board is available on a particular Web server which the users need to go to in order to read or write their messages. The original discussion groups, nevertheless, are placed into a pool of servers, which are linked together into a gigantic pool and can be accessed from most email client softwares pointed to a news server of an Internet Service Provider.

An expecting result from this part is to reveal that how much time students spend on any activity related to the discussion group.

- Based on the Gender perspective, 37.3% of male students participate the discussion group. In addition, only 3.9% spend more than one hour on this activity, while most of the remaining spend less than half an hour. For female students, 41.2% of them participate in online forums no more than half an hour.
- Regarding the Student Category perspective, one third of Domestic students do not use discussion groups, while a majority of the remaining (16.4%) spend a short period of time, 10 minutes, for this activity. In addition, 3.6% spend more than one hour. For International students, 46.8% have been participating in discussion groups. Although another half of this group do some activities in the discussion groups, most of them (23.4%) spend just a short period of time less than 10 minutes a day while 14.9% take more time on this activity no more than half an hour a day.
- Focusing on the Educational Level perspective, 39.1% of Undergraduate students have joined a discussion group. Again, most of them spend a short period of time on this activity; 17.2% spend time less than 10 minutes a day

while 12.5% spend more than 10 minutes, but less than half an hour a day. In addition, approximately half of Postgraduate students by Coursework participate in doing some activities on a discussion forum, but most of them spend less than 10 minutes a day. On the side of Postgraduate students by Research, 25.0% of this group have contributed to online forums; 16.7% spend between 10 minutes to half an hour, and 8.3% use the discussion forum for more than one hour.

In brief, it is not noticeably different when compared with the Gender perspective. All aspects are quite similar in terms of number of participants who spend on a discussion forum, and the usage pattern of each time block in the questionnaire survey.

The Student Category perspective, on the other hand, was reflected a minor difference: there are 14.1% more International students when compared to the Domestic students. However, the pattern of time spent is generally very similar.

The Educational Level perspective reveals the notable difference between Research students and Coursework students. Moreover, only 25% of Postgraduate students by Research are involved in the activity of the discussion group.

7.4.1.4 Search Engine

Search engines are among the most popular Web applications on the Internet. It enables the users to be able to search various types of documents, images, audio, and videos throughout the Internet world. In addition, it can be considered as a very large database that contains the information of the Internet and Intranet sites.

As of February 2005, there are more than 8 billion pages that can be found by an Internet search engine (Google 2005) excluding protected pages within the enterprises. Generally, a search engine service provider offers three major categories of search engine service.

- Firstly, an Internet search engine: it allows anyone who visits a provider Web site to search for information, documents, music, video, news, and so forth.
- Secondly, an enterprise search engine: it allows users of the enterprise to search for information and other related documents within the organisation.

- Finally, a desktop search engine: it allows users to search their local files and documents within their personal computer by the search engine software created as an indexing system of the entire drive prior to searching.

In terms of its functionality, a search engine, undoubtedly, is very helpful for students and academic staff. The results are displayed as follows.

- Based on the Gender perspective, most male students (94.1%) recently use the service of search engines to find information on the Web. As shown in the result, two thirds of male students (60.8%) spend less than half an hour for this activity, while there is approximately 10% who spend more than one hour. Compared to male students, most of females (94.1%) spend some time to search for their information on the Internet daily; 53.0% spend time up to half an hour on this activity, 29.4% spend between 30 minutes and one hour, and 11.8% spend more than one hour.
- Based on the Student Category perspective, most Domestic students (90.9%) have been using the search engine service. In detail, 36.4% of Domestic students spend up to 10 minutes for this activity, while 29.1% search up to half an hour, and 14.5% use a search engine for up to 45 minutes. However, only 3.6% of Domestic students spend more than one hour. In addition, almost every international student (97.9%) has been regularly using a search engine service. Approximately half of them (46.8%) search for information up to half an hour while 32.9% spend no more than one hour. Moreover, 19.1% spend more than one hour for this activity.
- Based on the Educational Level perspective, almost every Undergraduate student (93.7%) uses a search engine. Additionally, the majority of them spend time on this activity less than 45 minutes while only 3% spend at least one hour. For Postgraduate students by Coursework, most of them (96.2%) uses a search engine service. In contrast, 53.8% of Postgraduate students by Coursework spend time for a short period of time less than half an hour a day, on this activity, 26.9% spend between 30 minutes and one hour. Furthermore, 15.4% use a search engine for more than one hour a day. On the other hand, 41.7% of Postgraduate students by Research spend more than one hour for information searching.

In conclusion, more than 90% of participants have contributed their time on this activity in a number of different ways. There is no significant difference when focusing on the Gender perspective. However, there is a significant difference when focusing on the Educational Level. Moreover, there is of a somewhat of a difference when focusing on the Student Category perspective.

7.4.1.5 Online Newspaper

Newspaper is one of the most popular publications among many different groups of people. In addition, there are many kinds of newspaper categories such as social, business, financial, Information Technology, and so forth. Currently, with the new digital technology era, a newspaper is published online as well.

An online newspaper has become quite popular because it provides not only a nice passage of text, but also is integrated with multimedia technologies such as audio and video archives. Based on current research from the Online Publishers Association, it shows that news clips are the most commonly watched type of videos when compared to other types of the video clips such as movie trailers/clips, music videos, and sports highlights (Frank N. Magid Associations 2005).

This section investigated the usage pattern of how students spend their time reading online newspapers.

- Based on the Gender perspective, 56.9% of male students usually read an online newspaper; 35.2% spend time up to half an hour on this activity and 15.7% spend between 30 minutes and one hour. In addition, 9.8% spend more than one hour. Compared with male students, approximately half of female students (54.9%) read online news. A majority of female readers (41.1%) spend time up to 30 minutes on this activity, while only 2% of females spend for more than one hour.
- Referring to the Student Category perspective, the result shows that more than half of Domestic students do not read news on the Internet. A majority of Domestic students (27.3%) read an online newspaper in less than half an hour. Furthermore, only 3.6% spend more than one hour on this activity. On the other hand, most International students (70.2%) read newspapers on the Internet. In

addition, 51.0% spend up to half an hour for reading newspapers online, while 4.3% take more than one hour on this activity.

- Based on the Educational Level perspective, half of Undergraduate students read news from the online newspaper sites. Additionally, most of them (34.4%) spend up to half an hour on this activity and only 1.6% spends more than one hour on this activity. Among Postgraduate students by Coursework, 69.2% read online newspapers. 34.6% spend less than 10 minutes a day, while 15.4% spend from 10 minutes to half an hour, and 15.4% read online newspapers for half an hour to 45 minutes. In fact, a number of online newspaper readers who are Postgraduate student by Coursework coherently relate to a reader group of International students. For Postgraduate students by Research, 58.3% of them read online newspapers. As show in the result, 25% spend between 10 minutes and half an hour on this activity, while 16.7% read the news more than one hour.

In concluding this activity, a significant difference in the usage pattern can be found in both the Student Category and Educational Level perspective. In fact, there is a relationship between these two perspectives.

Based on the characteristics of the participants, most International students are studying a Postgraduate degree, whereas most Domestic students are currently studying a Bachelor degree. By considering the overall information from the students combined with the observation of the researcher, there are several issues that might be related to the differences.

Firstly, most International students spend their time reading their national news on their languages. Foreign language contents in Australian paper-based newspapers are not commonly available throughout most local newsagents. As a result, International students prefer to read online newspapers rather than buying Australian newspapers.

Secondly, reading online newspapers is low cost when compared to the paper-based version. For most International students, especially Asian students, a price of paper-based newspaper is considered as expensive when compared to their paper-based newspapers in their countries. This could drive the popularity of digital newspapers among International students.

7.4.1.6 Entertainment

Human life styles have been affected and changed since the popularisation of the Internet has reached in a mature stage. Everyone needs at least one kind of entertainment in their everyday life or another.

However, this study will not cover all the areas of entertainment, but will only focus on any kind of entertainment activity that may involve using the Internet, such as listening to online music stations, watching online video clips, watching on-demand videos, watching music video, playing online games, and so forth.

- Based on the Gender perspective, there is a significant difference in the usage pattern regarding the Gender perspective. More male students spend their time on the online entertainment when compared to females. In detail, 66.7% of male students spend time for entertainment activities when they are online. In addition, 23.5% spend less than 10 minutes and 19.6% spend more than one hour. In contrast, less than half of female students (43.1%) use the Internet for their entertainment. Among female participants who spend time on the Internet for entertainment, 23.6% spend up to half an hour on this activity, while 11.8% spend time for more than one hour.
- In reference to the result from the Student Category perspective, there is somewhat of a difference when compared with focusing on the Student Category perspective. Domestic students spend longer time than International students on this online activity. In detail, about half of Domestic students (50.9%) do not use the Internet for their entertainment. In fact, there are two major groups who spend a short period of time up to half an hour (25.4%), and a longer period of time for more than one hour for entertainment (18.2%). Comparable to International students, more than half of International students (59.6%) use the Internet for their entertainment. Regarding the detail of the result in this section, 31.9% spend less than half an hour on this activity, while 14.9% use the Internet for their entertainment between 30 minutes and one hour. Moreover, 12.8% spend more than one hour on this activity.
- According to the Educational Level perspective, there is a significant difference in the usage pattern between each group of this perspective. Almost half of Undergraduate students (42.2%) do not use the Internet for their entertainment.

Oppositely, 28.2% spend up to 30 minutes daily on this activity, while 18.8% spend more than one hour a day. The majority of the Postgraduate students by Coursework (30.8%) spend only less than 10 minutes a day for this activity. In addition, 46.2% do not access the Internet for entertainment. In addition, 41.7% of Postgraduate students by Research spend time on this activity: 16.6% spend up to half an hour, while 8.3% spend between half an hour and 45 minutes. Moreover, 16.7% spend more than one hour on this activity.

In conclusion, a significant difference on the usage pattern of this activity can be found within two perspectives: Gender and Educational Level. However, approximately half of overall students spend their time on this kind of activity.

7.4.1.7 Downloading and Evaluating New Software

Recently, there is a very large collection of software available for downloading from various sites on the Internet. Some of them are: freeware, which is freely available to anyone to download and use without charge; shareware, which the user can try before buying on the basis of limited time and/or functionalities; and demo, which demonstrates some or full functionalities of the software but might be limited in saving capability, and so forth. This study will investigate the usage pattern of the students regarding to this kind of activity.

- Based on the Gender perspective, over half of male students (56.0%) usually download and evaluate new software. 21.6% of male students spend more than one hour for this activity, while 23.5% spend only a short period of time in less than half an hour. Compared to male students, many of females (66.7%) do not download new softwares for evaluating purposes. In fact, 21.6% of this group do this activity for up to 30 minutes, and only 3.9% of females are involved in downloading for more than one hour.
- Focusing on the Student Category, not many Domestic students (27.3%) download and evaluate softwares from the Internet; 12.7% spend more than one hour for this activity, and 10.9% download for up to 30 minutes. Meanwhile, two thirds of International students (66%) download and evaluate softwares from the Internet; 12.8% download for more than one hour. Whereas 36.2% spend less than half an hour and 17.1% download software between 30 minutes to one hour.

- More than half of Undergraduate students (64.1%) do not download softwares from the Internet. By considering a group of Undergraduate students who spend some time on this activity, it can be found that 23.4% of Undergraduate students spend no more than one hour, while 12.5% spend time for more than one hour, and 20.3% spend no more than half an hour. For Postgraduate by Coursework, 57.7% have downloaded software for evaluation from the Internet; 11.5% spend a quick period of time less than 10 minutes, while 15.4% spend between 11 and 30 minutes a day on this activity. Additionally, 11.5% of Postgraduate students by Coursework spend more than one hour on this activity. In further comparison to Postgraduate students by Research, 66.7% of them usually download software from the Internet; 25% spend up to 30 minutes, another 25% spend a further up to an hour, while 16.7% spend more than one hour for this activity.

In conclusion, the result clearly shows that there is a significant difference in every perspective.

7.4.1.8 Online Shopping

A traditional-based shopping store has completely merged itself into the world of digital. In fact, E-Commerce can be viewed as an extension of traditional business. Some online businesses, however, may only exist in the digital world. Amazon.com is a very good example of an E-Commerce business that started from an online store without any actual storefront. As a result, it has become a good practice for an uncounted number of today's online stores.

Not only a tangible product can be sold in the online shops on the Internet, but also intangible products such as services; these are widely available. EBay is another successor example that changed the way of the traditional auction forever. Millions of people buy and sell something using its online auction tools via EBay Web sites around the world.

On the other hand, not everyone can buy a product and service from the online store. Credit card, including some debit cards, are a major accepted financial payment over the Internet, which can be applied when purchasing products from the Internet. In fact, security on this matter is another important issue that may slow down the popularity of online shopping.

- From the Gender perspective, many male students (66.7%) do not prefer to buy things online, while the majority of the remaining spend up to half an hour doing online shopping. On a view of female students, most of them (80.4%) do not shop on the Internet, while most of the remaining female students spend a short period of time visiting or buy things online. In addition, a very small participants of this group spend more than one hour this activity.
- Based on the Student Category perspective, most Domestic students (76.4%) do not do online shopping, while most Domestic students who go online shopping spend less than 30 minutes for this activity. For International students, most International students (70.2%) do not go online for shopping. In contrast, a majority of the remaining group of International students (19.1%) spend only up to 10 minutes for this kind of activity.
- Based on Educational Level, the majority group of Undergraduate students (78.1%) do not do online shopping, while 15.6% spend a short period of time less than 30 minutes on this activity. Additionally, 61.5% of Postgraduate students by Coursework do not participant in this activity. The majority of online shoppers among Postgraduate students by Coursework (30.8%) spend less than 10 minutes in this activity. Moreover, 75% of Postgraduate students by Research do not buy things online at all.

In summary of this activity, the Internet shopping usage pattern is very similar; most of students who do online shopping spend a short period of time visiting the online shopping site. However, the large majority group of students do not do online shopping. In overall, approximately only one forth of students do this activity.

7.4.1.9 Job Searching

Breaking through the traditional job searching procedures, a job searching site is considered as a major Internet application and service that allows online users to search for a vacancy position in various areas of professions on the Internet.

Instead of the classifying section in newspapers, a job searching site extends beyond a limitation of the paper-based by integrating the capability of a search engine, which allows a user to be able to specify a job criteria and respond back with a set of results

that relevant to the defined criteria. In fact, millions of vacancy positions are listed on job searching sites each year.

- Based on the Gender perspective, more than half of male students (56.9%) do not search for their jobs online, while 37.3% spend up to half an hour on this activity. For female students, two thirds of them (66.7%) do not search for a job on the Internet. Additionally, 27.5% of female students search for a vacant position on the Internet for a short period of time, normally less than 30 minutes.
- Based on the Student Category perspective, this activity is not popular among Domestic students. Based on the result, 70.9% of Domestic students do not participate in this activity. In addition, most Domestic students who search for a job online spend a short period of time visiting as quick as 10 minutes. While half of International students (51.1%) do not search a vacancy job on the Internet, 44.7’% spend up to half an hour for this activity.
- Based on the Educational Level perspective, most Undergraduate students (71.9%) do not search for a job online while 12.5% spend a short time for their daily visit less as 10 minutes. In contrast to Postgraduate students by Coursework, 65.4% have regularly searched a job online. However, most of them spend less than half an hour for this activity. On the side of Postgraduate students by Research, two thirds of them do not use this kind of activity, 25% of Postgraduate by Research, however, spend less than 10 minutes on this activity.

In conclusion, it is clearly evident that there are differences in two major perspectives: Student Category and Educational Level.

However, these perspectives are tightly related to each other. Most international students are studying the Postgraduate by Coursework or by Research. Therefore, it can be seen in the result that more International Users and Postgraduate students by Coursework utilise this activity. Based on my observation, a group of Postgraduate students by Research who generally are International students already have a job in the origin countries; most of them are higher education institution lecturers. Therefore, they would not need to search for any job.

7.4.1.10 Internet Banking

Internet banking has become a vital role in today's banking and financial businesses. Most Australian banks have already implemented Internet banking and made it available to their customers. However, the security issues of using Internet banking and online fraud are always an issue that slow down new Internet banking customers, as well as their computer literacy.

- Based on the Gender perspective, although most major banks in Australia offers Internet banking service, over half of male students (56.9%), however, do not use this kind of service at all. In fact, most males who are online banking customers spend no more than 10 minutes a day on this activity. For to female students, almost half of female students (47.1%) do not use an Internet banking service while the rest of the remaining majority (49%) spend up to 10 minutes.
- It is very similar when focusing on the Student Category perspective: over half of Domestic students (56.4%) do not access their bank on the Internet, while the majority of Domestic students spend as little time as 10 minutes to do the financial transaction. In the mean time, 46.8% of International students do not connect to their account via Internet banking. Nevertheless, the majority of the International students (34.0%) who access the Internet banking spend up to 10 minutes on this activity.
- Based on the Educational Level perspective, more than half of Undergraduate students (57.8%) do not access online banking, while most students who access the Internet banking service spend less than 10 minutes a day. Similarly, over half of both Postgraduate by Coursework (57.7%) and Postgraduate by Research (58.3%) spend some time to do Internet banking; a majority of them indeed spend a short period of time on this kind of activity.

In conclusion of this activity, there is a slightly difference in every study perspective. More female students participate using online banking when compared to males. In addition, more International students use Internet banking when compared to Domestic students. On the Educational Level perspective, most group participation is Postgraduate students by Research, Postgraduate students by Coursework, and Undergraduate students, respectively.

7.4.2 Usage Pattern of Online Activities for Academic Purposes

The purpose of this section is to discovery the usage pattern of the activities that are related to academic purposes. Normally, the Case University provides broad range of online services for students.

The activities listed in this section were taken from the actual online services available for students within the University's Web site, Student Online Services, and WebCT. Although there are many kinds of activities regarding the academic purposes available from the University, most of them are not a compulsory activities that all students need to do.

7.4.2.1 Viewing Course/Subject Description and Outline

In a general practice of the Case University, every subject needs to provide students a course/subject outline including its description. In addition, an online version is often available. This study will focus on the usage pattern of the online activity on viewing the course/subject description and outline to reveal how students spend on it.

- Based on the Gender perspective, a usage pattern of the activity between males and females is comparable in terms of time of usage. It can be found that one third of male students (33.3%) view their course/subject description and outline a few times per session. Another one third of males (31.4%) spend up to half an hour a day doing this kind of online activity. Similar to a group of male student, half of female students (51.0%) spend time viewing the course/subject description and outline for a couple times per session. In addition, 27.5% spend up to half an hour for this activity.
- Based on the Student Category perspective, approximately half of Domestic students spend a couple times per session to doing this activity, while 27.3% spend no more than half an hour a day. International students have also interacted with this activity in the similar way to other groups: 36.2% spend a few times per session and 31.9% spend less than half an hour a day.
- Based on the Educational Level, almost half of Undergraduate students (43.8%) spend only view the course/subject description and outline a few times per session whereas 31.3% spend less than half an hour a day to do this activity.

Similarly, half of Postgraduate students by Coursework (53.8%) spend a few times per session on this activity, while 23.1% spend up to 30 minutes. Conversely, 41.7% of Postgraduate students by Research are not involved with this activity at all. Only 8.3% view the course/subject description a few times to while 33.3% spend no more than 30 minutes.

The significant difference in a usage pattern regarding this activity can be found within the Educational Level perspective. Furthermore, the Research student is the group who engages least with this kind of activity. The reason is that most Postgraduate students do not require studying coursework subjects. Therefore, this activity is not applicable to this group of students.

7.4.2.2 Viewing Marks and Grades for Each Subject

Every student is normally able to access online services for checking the exam and assignment results. In fact, the results of assignments may be released in a parallel approach to the online release. Based on my observation, it was found that many lecturers still posted the result on their noticeboard in front of their room although a digital form was also released.

Based on the results, it can be summarised as following.

- According to the Gender perspective, it was very surprising that 21.6% of male students and 17.6% of female students who responded noted that this activity was not applicable in their situation. However, approximately half of males (47.1%) spent a couple times a session doing this activity, and 27.5% spend up to half an hour a day. For female students, 62.7% spend a couple times per session and 15.7% spend up to 30 minutes a day viewing the result of each subject.
- Regarding the Student Category perspective, it was found that 65.5% of Domestic students viewed their educational result a couple of times per session, while 21.8% spend up to 30 minutes. In addition, nearly one third of International students are not involved in this activity, while 42.6% do it a few times per session. However, 21.3% spend up to half an hour checking their academic results.

- Based on the Educational Level perspective, most Undergraduate students (89.1%) view the results online: 57.8% check only a couple times per session compared to 28.1% who usually spend up to half an hour doing this activity. Quite a similar pattern can be found within a group of Postgraduate students by Coursework: 61.5% check it several times per session and 11.5% spend up to 30 minutes. On the other hand, the result within a group of Postgraduate students by Research is totally different from other groups in the Educational Level perspective. In detail, 66.7% of the Postgraduate students by Research do not perform this kind of activity, and 25.0% spend a couple times per session on this.

It can be summarised that the major significant difference can be found when considering in the Educational Level perspective. Once again, this kind of activity seems to be out of sync with the nature of Postgraduate students by Research.

7.4.2.3 Viewing Course Materials

In the past, most subjects available within the Case University helped students by placing major teaching materials within the Reserve Division in the library; many subject's off-line materials are still maintained. Since the online learning service, WebCT, has been introduced within the Case University, the traditional procedure of studying has entirely changed. Most subjects currently offer students with online and offline materials, such as lecture notes, previous exam papers, and so forth.

Based on the results, it can be summarised as following.

- Based on the Gender perspective, the usage pattern between males and females is quite comparable that 31.4% of male students do this activity a couple times per session while nearly half of males (45.1%) often access to the online service to view the course materials for up to 30 minutes. Furthermore, 9.8% spend between half an hour and one hour. For the female students, although 13.7% do not perform this kind of activity, approximately half of females (45.1%) spend a few times per session viewing the online course materials, and 10.7% spend between 30 minutes and one hour.
- Based on the Student Category perspective, there is no significant difference in the usage pattern of this activity between Domestic and International students.

The majority of Domestic students (43.6%) spend up to 30 minutes a day, while 34.5% spend a few times per session for doing this activity. Moreover, 10.9% spend between 30 minutes and one hour, while 3.6% spend more than one hour to view their course materials online. Similarly, the majority of International students (46.8%) spend up to half an hour for viewing the course materials, while 25.5% spend a couple times per session. In fact, 14.9% of International students do not access their online materials. In addition, 10.7% spend between half an hour to one hour, and only 2.1% spend time on this activity for more than one hour a day.

- When compared to the Educational Level perspective, a significant difference within this group can be found. Most patterns regarding the Undergraduate and Postgraduate students by Coursework is considered comparable, however it cannot be compared to the pattern of Postgraduate students by Research. Regarding the Undergraduate students, the majority of students spend time for this activity up to half an hour, whereas 35.9% spend only a few times per session. Furthermore, 10.9% spend between 30 minutes and one hour, while 3.1% spend more than one hour on this activity. For the Postgraduate students by Coursework, the majority of students (46.9%) spend up to 30 minutes, which is the same pattern for Undergraduate students. Moreover, 35.9% spend a few times per session, while 15.4% spend between 30 minutes and one hour. Lastly, 3.8% spend more than one hour on this activity. In contrast to the Postgraduate students by Research, this kind of activity is not applicable to half of this group of students (50.0%). In addition, 16.7% spend only a few times per session, while 33.3% spend up to half an hour. Noticeably, no one spent more than half an hour.

Once again, it can be found that this kind of activity was not relevant to the group of Postgraduate students, where no coursework subjects were required. In fact, the usage pattern regarding this activity is generally very similar in all perspectives except in the Educational Level perspective.

7.4.2.4 Using Online Communication Tools for Discussion with Classmates and Academic staff

This activity is an alternative approach based on an adoption of modern technologies which enables students with the digital channels to be able to communicate to their friends and academic instructors. Based on my observation and experience as a tutor for three years, the University provides students with these kinds of tools excluding email. This section investigated any kind of communication tools which allowed students to be able to communicate for studying purposes.

- Based on the Gender perspective, almost half of males (47.1%) and female (41.2%) students do not occupy this kind of activity. Moreover, 27.4% of male students spend only a few times per session and 17.6% spend up to half an hour for communicating with their friends and academic staff. Additionally, only 5.9% spend time on this activity between half an hour and 45 minutes, whereas 2% spend more than one hour. Similarly, it can be found that 41.2% of female students use a couple time per session, whereas 15.7% spend up to half an hour doing this activity. In addition, there are no female students who spend more than one hour.
- Regarding the Student Category perspective, approximately half of Domestic students (50.9%) do not perform this activity while 34.5% use a few times per session. In addition, 9.1% spend up to 30 minutes and 3.6% spend between 30 minutes and 45 minutes for communicating purposes. In terms of International students, the number of students (36.2%) who are not involved in this activity is less when compared with the Domestic students. In detail, 34.0% of International students spend a few times a session discussing with classmates and academic staff, whereas 25.5% spend up to 30 minutes. Furthermore, there is only 4.3% spending time on this activity for more than 30, minutes but less than 45 minutes. In fact, no one spent more than 45 minutes.
- According to the Educational Level perspective, 43.8% of Undergraduate students do not spend time on this kind of activity, while the majority of the remaining (39.1%) check it a couple times per session, and 4.7% spend between 30 minutes and 45 minutes. Compared to the Postgraduate students by Coursework, 38.5% do not use the online discussion with friends and academic

staff for academic purposes, whereas 26.9% spend only a few times per session. Furthermore, 30.8% spend up to half an hour on this activity for and 3.8% spend between 30 and 45 minutes. For Postgraduate students by Research, more than half of them (58.3%) do not discuss with friends and academic staff via online channel, whereas 25.0% use it a few times per session, and 16.7% spend up to half an hour a day.

In brief, there is no significant difference in every perspective. However, it can be noticed that a group of Postgraduate students by Coursework and International students that are tightly related are the most active group in this activity.

7.4.2.5 Submitting Assignments and Papers

In fact, there are many subjects that required students to submit their assignment online rather than hand in a hard-copy version. Indeed, some faculties such as the Faculty of Commerce developed software for submission, which enables a lecturer to control on criteria regarding the assignments. In the mean time, a student can also track the status of their submission and verify the submission process to make sure that the assignments were submitted correctly.

The study in this section focused on the usage pattern on any submission approach with any tool available for students to be able to submit their assignments and papers via the Internet and/or Intranet of the Case University.

- Based on the Gender perspective, 72.5% of male students perform this activity, while only 49% of female students do. Among males, 35.3% spend a few times per session submitting their assignments and papers using online submission, whereas 27.5% spend up to half an hour for this activity. In addition, 5.9% spend between 30 minutes and one hour, while 3.9% spend more than one hour. For female students, 31.4% spend a few times per session, while 13.7% spend up to half an hour a day on this activity. In addition, 3.9% spend between 30 and 45 minutes on this activity.
- Based on the Student Category perspective, 52.7% of Domestic students do not perform this activity compared to 23.4% of International students. However, the majority of students (29.1%) who submit their assignments via online services spend a couple times per session, and 16.4% spend up to half an hour doing this

activity. Similar to International students, the majority of students (38.3%) involved in this activity spend only a few times per session, whereas 25.5% spend up to half an hour. In addition, 8.5% spend between 30 minutes and one hour.

- Based on the Educational Level perspective, 43% of Undergraduate students do not submit any assignments via online services, while 39.1% spend only a few times per session on this activity. In addition, 10.9% spend up to 30 minutes, whereas 4.7% spend from half an hour to 45 minutes on this activity. For a group of Postgraduate students by Coursework, only 15.4% are not involved in this activity, while 26.9% spend a few times per session. Moreover, 38.5% spend up to half an hour a day submitting their assignments. In addition, 7.7% of this group spend more than one hour to do this activity. Within a group of Postgraduate students by Research, more than half of this group (58.3%) do not submit their assignments via online services, while 25% spend only a few times per session. Furthermore, there are 16.7% who spend no more than half an hour on this activity.

In conclusion, there is somewhat of a significant difference in the number of students who spend their time on this activity. It can be found the more number of male (Gender perspective), International (Student Category perspective), and Postgraduate by Coursework (Educational Level perspective) students spend submitting their assignments online.

The most significant difference in the usage pattern can be found within the Educational Level perspective, where Postgraduate students by Coursework is the group which most participative in this activity.

7.4.2.6 Taking Quizzes and Exams

Quiz and exams are something unavoidable for all students. By enhancing Web and Internet technologies, online quizzes and exams are possible to be offered online. Based on my observation, many subjects proposed this online service to the students. Many groups of students were asked to use the provided online service to take a quiz subject to their available time. In addition, some subjects also request the students to take an exam using an online service. However, students were often asked to do the exam within their tutorial time, such as in a computer lab rather than at a flexible time.

- Based on the Gender perspective, there is no significant difference between males and females. Approximately half of male students (52.9%) spend time taking quizzes and exams via online systems. From the details, 21.6% spend a couple times per session doing this activity, while there are 17.6% spending no more than half an hour. Furthermore, 7.8% spend between 30 and 45 minutes. Similarly, when compared to a group of female students, 41.2% of this group participate in this activity. In fact, the majority of the females who take online quizzes and exams spend only a couple times per session while 9.8% spend up to half an hour.
- Based on the Student Category perspective, the usage pattern on this activity between Domestic and International students is comparable. According to the result, 50.9% of Domestic students spend some time taking quizzes and exams using online services. In details, 25.5% spend amount of time only a couple times per session, while 14.5% spend up to half an hour. In addition, 9.1% usually spend more than half an hour on this activity, but less than 45 minutes. For International students, 42.6% spend some time taking quizzes and exams via the online system. In detail, 19.1% spend a few times per session doing this activity, while 12.8% usually spend up to half an hour. Moreover, 6.4% spend between half an hour and 45 minutes taking quizzes and exams, while only 4.3% spend more than one hour.
- Based on the Educational Level perspective, a significant difference can be found within the perspective. According to the results on Undergraduate students, 48.4% participate in this kind of activity. In fact, 23.4% spend only a couple times per session for doing this activity, while 12.5% spend up to half an hour. Moreover, 9.4% spend between 30 minutes and 45 minutes. For the group of Postgraduate students by Coursework, approximately half of the students in this group (53.8%) spend some time doing this activity. In detail, 23.1% spend a few times per session taking some quizzes and exams, whereas 19.2% spend up to 30 minutes. In addition, 7.7% spend between half an hour and 45 minutes, while only 3.8% spend more than one hour on this activity. For Postgraduate students by Research, the majority of students (75%) do not participate in this kind of activity, while 16.7% spend only a few times per session.

In summary, a significant difference in the usage pattern of this activity can only be found when focusing on the Educational Level perspective. Most Postgraduate students by Research do not have any quizzes or exams throughout their studying. However, some Master degree by Research students, in particular, may be required to take some coursework as a part of their course. Therefore, it can be found that only 25% of Postgraduate students by Research spend some time doing this kind of activity.

7.4.2.7 Accessing Full-text Articles and Online Databases

A decade ago within the Case University, full-text articles were available in a form of hard-copy and CD-ROM, where now there are now numerous volumes of online journals available for students and staff members to be able to access from anywhere in the world via an Internet connection. In every subject offered by the University, students are able to search relevant online articles that suit to their assignments.

Therefore, this section investigates the usage pattern regarding one of the most active activities among students of the Case University.

- Based on the Gender perspective, most male students (92.2%) have accessed full-text articles and online databases for their studying purposes. Within this group, 25.5% spend only a couple times per session, while 23.5% spend up to half an hour a day doing this. Moreover, 27.4% spend between 30 minutes and one hour, whereas 15.7% spend more than one hour a day on this activity. A very similar pattern can be found within a group of female students where 23.5% spend a few times per session and 29.4% spend up to 30 minutes accessing online databases and articles. Furthermore, 23.5% of females spend between half an hour and one hour for this activity, while 13.7% spend more than one hour.
- Based on the Student Category perspective, there is a significant difference between Domestic and International students. Most Domestic students (92.7%) spend some time on this activity. As a fact, 30.9% spend time a couple times per session on this activity, whereas 23.6% spend up to half an hour. Moreover, 27.3% spend between 30 minutes and one hour, and 10.9% spend more than one hour to access online databases and articles. For International students, 17% spend time accessing full-text articles and online databases a couple times per session. In fact, a majority group of International students (29.8%) spend up to

half an hour for this activity while 23.4% spend between 30 minutes and one hour. Moreover, 19.1% spend more than one hour on this activity.

- Based on the Educational Level perspective, there is a significant difference between each group in this perspective. For Undergraduate students, almost everyone (93.7%) spend various times doing this activity. In detail, 31.3% spend a couple times per session while 21.9% spend up to half an hour a day for accessing full-text articles and online databases. Furthermore, 28.1% spend from half an hour to one hour a day doing this activity, 7.8% spend more than one hour. When compared to the Postgraduate students by Coursework, a majority of students (34.6%) spend up to 30 minutes daily followed by 19.2% spend a few times per session doing this. It also was found that 19.3% spent between half an hour and one hour a day, while 11.5% spend more than one hour on this activity. In contrast, when considered the usage pattern of Postgraduate students by Research, one third of them (33.3%) spend more than one hour on this activity while the other one third (33.3%) do this only a few times per session. However, it can be found that 25% spend between 30 and 45 minutes on this activity.

In conclusion, a significant difference in the usage pattern regarding this activity can be found within two perspectives: the Student Category and Educational Level. As it was mentioned, these two perspectives contain a close relationship: most International students are Postgraduate students. According to the perspective from the Education Level, the usage patterns of all groups of students are different. Postgraduate students by Research spend more time accessing online databases when compared to others.

7.4.2.8 Accessing the Library Catalogue

According to the information from the library home page of the Case University, there are “half a million books, over 22,000 journal titles, 200,000 journal volumes, 250 databases (online collections of journal articles) and 3,000 e-books, with many resources available regardless of location, 24x7”. In fact, the library catalogue is one of the busiest online systems within the Case University.

The library provides its members with a huge number of computers within the library for accessing the online catalogue. However, the members can also search the catalogue at home via their personal computer. In addition, members can additionally search the

catalogue of the University by using a keyword within Endnote software (reference citation management software).

Moreover, it is often found that the online catalogues based on other academic institutions were also available for public access. This study investigated this activity regardless to the sources and tools that students used.

- Based on the Gender perspective, there is no significant difference between males and females. In fact, 27.5% of male students do this activity a few times per session, while 27.5% spend up to half an hour. Furthermore, 19.6% spend between half an hour and one hour, while 11.8% spend more than one hour accessing the library catalogue. For female students, 25.5% do this activity a few times per session, while 33.3% spend up to half an hour a day. In addition, 25.5% spend between half an hour and one hour accessing the library catalogue, whereas 7.8% spend more than one hour.
- Based on the Student Category perspective, there is no significant difference in this perspective. However, there are more International students spending longer periods, more than 45 minutes, when compared to Domestic students. In detail, approximately one third of Domestic students (30.9%) spend a few times per session accessing the library catalogue, while another one third (32.7%) spend up to 30 minutes. Moreover, 18.2% access to the online catalogue from 30 minutes to 45 minutes, whereas 1.8% spend from 45 minutes to one hour, and 5.5% spend more than one hour. For International students, 21.3% spend only a few times per session, while 27.7% spend no more than 30 minutes accessing the online catalogue. Moreover, 14.9% access the online catalogue from 30 minutes to one hour, whereas 10.6% spend between 45 minutes to one hour, and 14.9% spend more than one hour on this activity. In contrast to other groups, one third of Postgraduate students by Research (33.3%) spend more than one hour on this kind of activity, while nearly half of this group (41.7%) spend between 30 minutes and one hour. Furthermore, only 16.7% access it a couple times per session, and 8.3% spend no more than half an hour on this activity.

In conclusion, it was clearly shown that there is a significant difference when comparing within the Educational Level perspective, the Postgraduate students by

Research is the most active group of students, who spend a lot of time accessing the library catalogue.

7.4.2.9 Holding books in the Library

Please see print copy for Table 7-11

Table 7-11 loan information (source: the Case's library home page)

At the Case University, members of the library can hold a book in various levels of maximum holds if a preferred book was borrowed by other members (see Table 7-11 for more information).

Doctorate students, for example, can loan up to 30 books for one whole period of the session. However, anyone can also place a hold on any loaned book, and the system will automatically change a new due date, which is normally reduced to a length of two weeks.

This section aims to investigate a usage pattern on this activity regardless of how many books students place a request for holding books; this section will focus on how regularly they participant in this activity.

- Based on the Gender perspective, there is no significant difference when comparing between males and females. It can be found that over half of male students (58.8%) spend some time holding a book from library. In more detail, 43.1% do this activity a few times per session, whereas 11.8% spend no more than half an hour. Within a group of females, 68.6% spend time on this activity; half of females (49%) do it a couple times per session and 15.7% spend more time but no more than 30 minutes.

- Based on the Student Category perspective, half of Domestic students (56.4%) participate in this kind of activity. In more detail, half of them (50.9%) spend only a few times per session, whereas 5.5% spend only a short period no more than half an hour for this activity. For International students, a very similar pattern was also found in with Domestic students. However, more International students spend time on this kind of activity than Domestic students. In detail, 72.3% of International students spend time holding some books from the library via online service provided by the library. In fact, 40.4% do this a few times per session and 23.4% spend up to half an hour doing this activity. Moreover, 6.4% spend between 30 and 45 minutes, and only 2.1% spend more than one hour on this activity.
- Based on the Educational Perspective, it can be found that there is a significant difference in this perspective. Most active groups of students are Postgraduate students by Research, Postgraduate students by Coursework, and Undergraduate students, respectively. Among a group of Undergraduate students, 45.3% hold some books only a couple times per session, whereas 9.4% spend no more than 30 minutes. However, 43.8% do not participant in this activity. For a group of Postgraduate students by Coursework, it can be found that 73.1% involve in this kind of activity. Approximately half of Postgraduate students (46.2%) hold some books from the library a couple times per session while 19.2% spend up to half an hour. In addition, only 3.8% spend time for more than one hour. Within a group of Postgraduate students by Research, 83.3% spend some time for this activity. It can be found that half of this group (50%) spend a couple times per session for holding books using online services, whereas 25% spend a couple times per session. Moreover, 8.3% spend from half an hour to 45 minutes.

In conclusion, a significant difference in the usage pattern of this activity can be found in a perspective from the Educational Level. Similar to many previous activities, somewhat of a difference can also be found when compared to the Student Category perspective.

7.4.2.10 Using Email to Contact Classmates and Academic staff

Within the Case University, email is a common tool that is instantly provided when one becomes a student or staff member. POP3, an email protocol that allow users to be able to use their preferred email client software such as Microsoft Outlook and Mozilla Thunderbird, and Web-based email are available for users.

From my observation from the course and subject outlines, it can be found that the preferred contact method apart from the face-to-face meeting, which is an interaction between students and staff members, is email. Based on this observation, this section inspected the usage pattern of email activity regardless of the application and type of email clients.

According to the result, it can be found that most students (more than 80% in all perspectives) involved in this activity as following.

- Based on the Gender perspective, there is no significant difference in the usage pattern within these groups of students. In fact, 82.4% of male students are involved in this activity. In more detail, 25.5% do this activity a couple times per session, while the majority of male students (49%) spend up to half an hour. In addition, 7.8% spend between 30 and 45 minutes. Similar to males students, 88.2% of female students participate in the activity with the majority of 37.3% and 31.4% spending up to half an hour, and a couple times per session, respectively, on this activity. Moreover, 15.7% spend between 30 and 45 minutes, and 3.9% spend more than one hour to use email for contacting their classmates and academic staff.
- Based on the Student Category perspective, there is no significant difference in the usage pattern between Domestic and International students. In fact, 82.6% of Domestic students spend some time to use email to contact their classmates and academic staff. In detail, 29.1% spend a couple times per session on this activity, while 36.4% spend up to 30 minutes daily. Moreover, 14.5% spend more than half an hour but no more than 45 minutes on this activity; only 3.6% spend more than one hour. For International students, 27.7% of this group of students spend a couple times per session on this activity, while half of the International students (51.1%) spend up to half an hour a day. Furthermore,

8.5% spend from 30 to 45 minutes and no one spends more than 45 minutes for this activity.

- Based on the Educational Level perspective, somewhat of a difference in the usage pattern between groups can be found. According to Undergraduate students, 85.9% use email to contact their classmates and academic staff. In fact, 31.3% spend only a few times per session on this activity while 35.9% spend up to 30 minutes. Moreover, 15.6% spend between 30 and 45 minutes on this activity, and only 3.1% spend more than one hour. Among Postgraduate students by Coursework, 80.8% participant in this kind of activity. In more detail, 26.9% spend a couple times per session whereas half of Postgraduate students by Coursework (53.8%) spend up to half an hour for contacting their classmates and academic staff. For Postgraduate students by Research, 91.7% are involved in this activity. In detail, 16.7% spend a couple times per session while another 16.7% spend between 30 and 45 minutes on this activity. However, the majority of this group (58.3%) spend up to half an hour using email to contact their friends and academic staff

In conclusion, the overall majority of students spend their time on this activity either a couple times per session, or a short period of time (less than 30 minutes a day). Although there is somewhat of a difference in the usage pattern when considered in the Educational Level perspective, it could be said that a pattern in every perspective is quite similar when compared within or overall groups of students.

7.4.2.11 Viewing Examination Timetable

An examination timetable is always available from the University's Student Online Services (SOLS). In practice, students need to log-on to their account in order to see the personalised examination timetable.

Based on a result, it can be summarised as following.

- Based on the Gender perspective, there is no significant difference between males and females. 82.4% of male students spend some time on this activity. In fact, the majority of males spend a couple times per session viewing their examination timetable, whereas 19.6% spend no more than 19.6% a day for this activity. A similar pattern can be found in female students. A majority group of

females spend a couple times per session on this activity, while 11.8% spend no more than 30 minutes a day.

- Based on the Student Category perspective, there is no significant difference between Domestic and International students. For Domestic students, 80% of this group view the examination timetable online. Actually, the major group (67.3%) spend only a couple times per session performing on this activity, while 10.9% spend time daily, but no more than 30 minutes. For International students, a very similar usage pattern to Domestic students can be found within this group. In fact, 72.3% participate in this activity. In the actual figure, 46.8% spend a couple times per session, while 21.3% spend only up to half an hour a day for this activity.
- Based on the Educational Level perspective, there is a significant difference between groups in this perspective. The result showed that Postgraduate students by Research are the least participative group when compared to other groups of students. For Undergraduate students, 82.8% are involved in this activity. In more detail, the majority of Undergraduate students (67.3%) spend only a few times per session for this activity, while 15.6% spend no more than half an hour a day. A similar pattern can be found in a group of Postgraduate students by Coursework, where 80.8% of students are involved in this activity. In detail, the majority group of students (57.7%) spend only a few times per session on this activity, whereas 15.4% spend no more than half an hour. Conversely, the majority of Postgraduate students by Research are not involved in this activity, while 16.7% spend only a couple times per session. Moreover, another 16.7% usually spend up to 30 minutes on this activity.

It can be summarised that the significant difference can be found when considered from the Educational Level perspective. However, it was found that this kind of activity is not applicable to a group of Postgraduate students by Research.

7.4.3 Usage Pattern of Online Activities for Administrative Purposes

The purpose of this section is to discovery the usage pattern of the activities related to administrative purposes where some of them, such as online registration and enrolment, are compulsory for every student. However, Doctorate students are not required to do

the re-enrolment process by themselves because the Research Office normally do the process for all Doctorate students once the Annual Progress Reports has been approved.

However, the activities listed in this section were taken from the actual Student Online Services (SOLS) regardless of any specific activities that may be appropriate to any specific group of students. Randomly selecting regardless of any particular group of student actually can strongly confirm the usage pattern, which leads to understanding of the personalisation and customisation of the Campus Portal.

7.4.3.1 Viewing and/or Updating Personal Information

In the past, students needed to go to the administrative office, fill in a form and submit it in order to change the address or other information, whereas now, all students can view and change their personal information, such as a contact address, via the University's student online services.

In general, the contact address will be used when the University wants to send official letters to the students. Therefore, the University always encourages students to change their address when they have moved to a new location.

- Based on the Gender perspective, there is no difference in the usage pattern between males and females. However, there is somewhat of a difference in terms of percentage of participative students where more male students are involved. For male students, 82.4% have updated their address online. The majority of males (62.7%) do this activity a couple times per session, on this activity while 17.6% spend up to 30 minutes. For female students, 64.5% spend time on this activity. In the fact, the majority of females (52.9%) spend only a couple times per session, whereas 11.8% spend up to half an hour a day to view and/or update personal information.
- Based on the Student Category perspective, no significant difference can be found when comparing between Domestic and International students. Although the usage pattern when considering on the time block is quite similar, the number of participants in this activity is significantly difference. For Domestic students, 65.5% of this group spends time on this activity. In more detail, almost everyone (61.8%) involved in this activity spends only a couple times per session, whereas 3.7% spend no more than half an hour a day. Regarding

International students, 83% spend some time viewing and updating their personal information via online services. In fact, the majority of International students (53.2%) spend a couple times per session doing this activity while 27.7% spend up to 30 minutes.

- Based on the Educational Level perspective, the usage pattern when considered on the time block of the scale is very similar. However, there is somewhat of a difference when focusing on the number of students involved in this activity. For Undergraduate students, 70.3% spend time viewing and updating their personal information using online services. In more detail, the majority of students (56.43%) spend a few times per session on this activity, whereas 14.1% spend up to half an hour. For Postgraduate students by Coursework, 76.9% spend time on this activity. In fact, the majority (61.5%) spend a couple times per session doing this activity while 11.5% do the activity up to 30 minutes daily. In addition, 3.8% spend longer time, but no more than 45 minutes. For Postgraduate students by Research, it can be found that 83.3% of this group spend some time to view and update their personal information via online services. In detail, the majority group (58.3%) spend only a few times per session on this activity, while 25% spend no more than half an hour a day.

In conclusion, there is no significant difference in the usage pattern in any perspective. However, the difference can be found in the percentage between groups in every perspective. It means that some groups such as ‘Males’, which refers to the Gender perspective, ‘International’, which refers to the Student Category perspective, and ‘Postgraduate by Research’, which refers to the Educational Level perspective have more students involved in this activity when compared with other groups within their perspective, respectively.

7.4.3.2 Enrolling and/or Withdrawing Subjects

The Case University has changed the process of enrolment which previously relied on a paper-based approach. All students need to go the administrative office to hand-in the enrolment application. Recently, all of that process has been transformed into a paperless application which requires students to use an online enrolment service for these kinds of purposes. However, continuing Doctorate students do not need to comply with this activity because the research office will do this process for the students.

The result in this section shows the usage pattern of the students from various perspectives which is reflected in the previously mentioned activity.

- Based on the Gender perspective, there is no significant difference in the usage pattern between male and female. In detail, 66.7% of males spend a couple times per session on this activity, whereas 13.7% spend up to 30 minutes, and 5.9% spend between 30 and 45 minutes. Within a group of female students, 60.8% spend a couple times per session, 15.7% spend no more than half an hour, and 2% spend between half an hour and 45 minutes.
- Based on the Student Category perspective, there is a significant difference between Domestic and International students. For Domestic students, 74.5% spend a couple times per session on this activity, 5.5% spend up to half an hour and 1.8% spend a longer time, but less than 45 minutes. For International students, 51.1% spend a couple times per session, whereas 25.5% spend more time, but no more than 30 minutes.
- Based on the Educational Level perspective, there is a significant difference in the usage pattern when comparing between each group. For Undergraduate students, the majority of students (71.9%) spend a couple times per session for this activity, while 9.4% and 6.3% spend no more than half an hour, and between half an hour and 45 minutes, respectively. For the Postgraduate students by Coursework, the majority of the group (61.5%) spend a few times per session doing this activity, while 30.8% spend up to half an hour. For the Postgraduate students by Research, the majority of this group do not participate in this activity. However, 25% spend a couple times per session, and 8.3% spend no more than half an hour a day.

In conclusion, it can be confirmed by my observation that a majority of the group of Postgraduate students by Research are not involved in this activity because the research office always processes this for the research students. However, all research students need to do this activity when they are in their first year of study. As a result, a significant difference when considering in the Educational Level perspective.

7.4.3.3 Viewing Financial Issues

In every session, the University always publishes a tuition fee statement on the system that can be viewed by using the online service (SOLS). At the same time, an official letter is also sent to the postal address of the students to inform the instruction with provided a payment slip that students can go to the bank for making the payment. In addition, the information on the Higher Education Contribution Scheme (HECS) and Postgraduate Education Loans Scheme (PELS) are also available within SOLS.

This section was designed to reveal a usage pattern which relates to these financial statements. According to the result, it can be summarised as following.

- Based on the Gender perspective, it can be considered that the usage pattern between males and females is comparable. According to male students, approximate half of males (56.9%) spend time on this activity. In detail, 49% of males spend a couple times per session and 7.8% spend up to half an hour viewing their financial statements and related issues. For a group of female students, 41.2% contribute to this activity, while the majority (35.3%) spend a few times per session. Moreover, 3.9% spend up to half an hour a day, whereas 2.0% spend time between half an hour and 45 minutes for this activity.
- Based on the Student Category perspective, there is no significant difference in the usage pattern between Domestic and International students. For Domestic students, more than half of them (56.4%) are not involved in this activity. In addition, 43.6% spend a few times per session viewing their financial issues and statements. For International students, 44.7% do not view their financial statements online. However, 40.4% spend a couple times per session on this activity, while 12.8% spend up to half an hour and 2.1% spend between 31 minutes and 45 minutes.
- Based on the Educational Level perspective, there is no significant difference in the usage pattern regarding the se groups of students. For Undergraduate students, approximately half of students (48.4%) spend some time on this activity. In fact, 46.9% spend a couple times per session, while only 1.6% spend up to half an hour a day to view their financial issues. For Postgraduate students by Coursework, approximately half of them (57.7%) view their financial statements and issues via student online services. In detail, 38.5% spend a

couple times per session and 15.4% spend no more than 30 minutes. Furthermore, 3.8% spend between 30 and 45 minutes for this activity. For Postgraduate students by Research, 66.7% are not involved to this activity, while 25% spend only a couple times per session and 8.3% spend up to 30 minutes.

In conclusion, there is no significant difference in the usage pattern regarding this activity from any perspective. Overall, about half of students do not view their financial issues via the online service, however, another half of students spend only a couple times per session.

7.5 Summary

This Chapter provides the results based on the case study contained in the questionnaire survey. Once again, the major purpose of this study is to understand the current usage pattern on the various online activities, which are commonly available in the modern educational environments such as within the Case University.

The results provided in this chapter will be discussed again to generate the finding with the supportive evidence based on interviews with the academic staff. Most importantly, the results regarding the development team provided in previous chapter need to be integrated in order to fully understand the situation that leads the appropriate development of a Campus Portal.

Chapter 8
Finding and Discussion of the Case Study

8.1 Overview

The objective of this chapter is to present the findings from the case study of a Campus Portal and to discuss the results. This study was conducted on two groups: the development team and the major stakeholders (mainly students with supportive evidence from the academic staff). The chapter addresses the following major question:

> **RQ2:** What are the essential factors of current practices that appear to enable or obstruct the development of a Campus Portal? How could the development of Campus Portals be improved in light of an improved understanding of these factors?

This question will be answered through an interpretation of the results of case study in conjunction with relevant literature. This will initially be done from a research perspective for further understanding of the areas surrounding these questions. The finding of this study should also be useful in order in guiding practitioners through the development of the Campus Portal. Finally, the finding will be used to guide the determination of a formal development methodology for Campus Portals. This will be discussed in next Chapter.

8.2 Summary of Research Findings

The results of the case from the study of the development team and major stakeholders are of significant value to the future development of Campus Portals. On the one hand, the usage pattern of student's online activities presents a clear picture of the design, development, and implementation issues of the personalisation and customisation functionality of a Campus Portal. On the other hand, some conflicts between the vision of the development team and the usage pattern of the students were detected which may lead to the misunderstandings on the major concepts of the Campus Portal development.

In order to explore these details, this section will be separated into two sub-sections which summarise the finding from both perspective, firstly the end-users (stakeholders)

who will be a future user of the Campus Portal and secondly the development team who appear to be the most influential group of people that give the direction and development to the Campus Portal.

8.3 Usage Pattern of Online Activities

This section aims to answer the following sub-question:

> **RQ2.1:** What factors appear to have the most influence on the usage pattern of the online activities of the students?

In the design of the empirical study, there are three confounding variables (Gender, Student Category, and Educational Level) that could influence the usage pattern of the student's online activities when using the survey questionnaire as an instrument. Additionally, the online activities listed in the questionnaire were categorised into three major groups: online activities for general purposes, online activities for academic purposes, and online activities for administrative purposes.

In the analysis process, all information gathered from the survey was processed with SPSS to generate both a frequency and a percentage of the data on online activities. Comparable results were combined together from each perspective to build a usage pattern on each online activity. The full results of the usage pattern of the online activities were presented in previous chapter. Some interesting trend in contested areas are now presented.

This study confirms the results of similar research by Li and Kirkup (2002) that there is no differences in the computer ownership between young adults at the university level age group between those students from developed countries and those from developing countries. However, the results of this study and that of Li and Kirkup (2002) conflict with previous research (i.e. Kirkup 1995, Comber et al. 1997, Kirkpatrick and Cuban 1998) which was conducted earlier in 1990s. This may indicate a significant trend in global parity.

According to Morahan-Martin (1999), female students spend less time online and used the Internet for fewer purposes than men. In contrast the results of this study, showed no significant difference between males and females usage patterns or between the activities that they undertook online apart from one small difference in entertainment related activities.

Nowadays, the gap between male and female experience and literacy on computers and the Internet seems to be substantially reduced. The results of this study contradict the statement that "the computer culture is uncomfortable for girls and women (Frankel 1990 p.38)". On the contrary they support the findings of a previous study of the University which studied the academic achievement of the female students and stated that "contrary to popular belief that women do not embrace IT, these figures show that in fact girls are good at science and they do excel in computing disciplines" (UOW 1990s).

Before discussing in the overall finding of the usage pattern, a general summary of each group of online activities which were investigated in this case study is provided in the following section.

8.3.1 General Purpose Activities

Activity	**Gender**	**Student Category**	**Educational Level**
Email	✗	✗	✓
Instant Messaging Service	✗	✗	✓
Discussion Group	✗	✗	✓
Search Engine	✗	✗	✓
Online Newspaper	✗	✓	✓
Entertainment	✓	✗	✓
Downloading and Evaluating New Software	✓	✓	✓
Online Shopping	✗	✗	✗
Job Searching	✗	✓	✓
Internet Banking	✗	✗	✗

Table 8-1 A significant difference based on online activities for general purposes

According to Gefen and Straub (1997), there is a significant difference between males and females in the perception and use of email. However, it seems that this is the least

important factor that affects the pattern of the online activities within the case university.

As displayed in Table 8-1, the most significant difference in the usage pattern of online activities as appears to relate to the Educational Level perspective. However it is probable that this is interrelated with other factors, in particular Student Category.

As mentioned in the previous chapter, the majority of International students (within Student Category) are also members of the group of the Postgraduate students (within Educational Level). As a result, while a significant difference in the usage pattern was detected on some kinds of online activities other perspectives showed the similar usage patterns.

Significant differences in usage pattern in the online newspaper, for example, can be found in both the Student Category and Educational Level categories. The results showed that more International students (70.2%) read online newspaper than Domestic students (43.6%). In fact, more than half of International students (55.3%) are Postgraduate students by Coursework and 19.1% are Postgraduate students by Research. This also influence is seen in the results from the Educational Level perspective.

Moreover, some activities such as entertainment, and downloading and evaluating new softwares showed some differences from the perspective of Gender. According to Hofstede (1980), gender differences are one aspect of the overall cultural differences that are present in human beings. Therefore, the reason behind these results may be inherent in the nature of each gender.

The usage pattern on online shopping and Internet banking showed little variation on the confounding factors. These could be considered as independent activities which are optional to any student in order to facilitate their studying and daily living.

For other online activities that facilitate the student’s academic and daily living such as email, instant messaging service, web board, search engine, online newspaper, online entertainment, and job searching, there is a significant difference in the pattern of these online activities from the perspective of Educational Level.

8.3.2 Academic Purpose Activities

Activity	Gender	Student Category	Educational Level
To view course/subject description and outlines	✗	✗	✓
To view marks and grades for each subject	✗	✗	✓
To view course materials	✗	✗	✓
To use online communication tools to discuss with classmates and academic staff	✗	✗	✗
To submit assignments and papers	✗	✗	✓
To take quiz and exams	✗	✗	✓
To access full-text articles and online database	✗	✓	✓
To access to the library catalogue	✗	✗	✓
To hold books in library	✗	✗	✓
To use email to contact classmates and academic staff	✗	✗	✗
To view examination timetable	✗	✗	✓

Table 8-2 A significant difference based on online activities for academic purposes

According to the Table 8-2, the most significant difference in the usage pattern of online activities for academic purposes are found by viewing the Educational Perspective. Although countless online activities are offered to students and staff to facilitate their activity while studying and working at the University, these online activities can be categorised into two types: ongoing and one-time activities.

- **An Ongoing Activity**
  is an activity that is a continuous process throughout their education, i.e. to access full-text articles and online database, to access to the library catalogue, to hold books in library, and so forth. It can be found that this kind of activity is repeated by students many times during their studying.

- **A One-time Activity**
  is an activity that is required to be done only once, or a couple times per session, i.e. to view marks and grades for each subject, to view examination timetable, to take quizzes and exams and so forth.

Many kinds of online activities, both ongoing and one-time, which are available from the official University's Web site and Student Online Services (SOLS) are not generally applicable to all groups of students.. For example, 'To take a quiz or exam' and 'to view marks and grades for each subjects' are not applicable to the group: Postgraduate students by Research. Therefore, a significant difference in the usage pattern of these activities is only seen from the Educational Level perspective.

It does not make sense to compare the usage patterns of ongoing activities and one-time activities for academic purposes by only distinguishing between them on time spent. Differences are more likely to be related to whether the online activities may not applicable to the some specific group of students. This could explain the reason why significant differences on the usage pattern of online activities are mostly found within the perspective of Educational Level.

8.3.3 Administrative Purpose Activities

Activity	**Gender**	**Student Category**	**Educational Level**
To view and/or update personal information	✗	✗	✗
To enrol and/or withdraw subjects	✗	✗	✓
To view financial issues	✗	✗	✗

Table 8-3 A significant difference based on online activities for administrative purposes

There are not many administrative activities available for students to handle and do by themselves; however some most active online activities are listed as displayed in Table 8-3.

Table 8-3 shows the significant difference in the usage pattern of the online activities for administrative purposes. It was expected that most online activities for administrative purposes would not show significant differences from any perspective.

In fact, there is a significant difference in the activity 'to enrol and/or withdraw subjects'. When inspecting the details of the results, they showed a similar pattern to those discussed earlier. The cause of the different is probably because this activity is usually not applicable to the group of doctorate students who are considered as 'Postgraduate students by Research'.

In general, most students do not spend much time on these kinds of activities. Some activities such as 'to view and/or update personal information' may be not accessed by some students for the whole time of their studying at the University. Domestic students, for example, may not move house since they started at the University. On the other hand, some International students may change their address many times throughout their study.

Therefore, this kind of online activity can viewed as one-time activity which may not occur many times during studying period. Consequently, it can be found that one-time activity may result in no significant difference ins the usage pattern. However, if the activity is not applicable to one specific group of students such as Postgraduate students by Research, a significant difference in the usage pattern may result.

8.3.4 Supportive Findings from the Academic Staff

This section aims to answer the following sub-question:

> **RQ2.2:** In what kind of online activities are academic staff involved? Are there any problems, and if so, what are they**?**

The stakeholder group of academic staff is one of major target user groups for the Campus Portal development. The results of the study based on interviews shows a similar computer and Internet usage pattern to that of the students from the academic staff members. Although the quantitative usage pattern of online activities cannot be determined from the three interviews, the data clearly shows feedback to support the results and findings from the survey of the students. The academic staff also commented on the current version of the Web site and online services as will be discussed below.

It was evident that the computer and the Internet have become important tools for all academic staff to fulfill their needs and help them with the jobs within their sphere of responsibilities. In fact, all academic staff who participated in this study had long experience and confidence to use a computer and the Internet to help them to perform their research and teaching. Three academic staff participated to the interview and are referred to as L1, L2, and L3.

8.3.4.1 Kinds of Online Activities

Based on an analysis of the interviews, it was found that there are many Internet and Intranet activities in which the academic staff are currently involve. However these can be categorised into three major groupings based on their purpose: personal purposes, research and teaching purposes, and administrative purposes. Some examples of the online activities can be seen in the following list.

- **For Personal Purposes**
  i.e. online banking, online shopping, and so forth
- **For Research and Teaching Purposes**
  i.e. email, search engine, access to online articles in the library, access to the online catalogue, creating content for WebCT, and so forth.
- **For Administrative Purposes**
  i.e. access to the Student Management Package (SMP)

All participants spend a lot of their time with online activities, mostly for research, teaching, and administrative purposes. Every participant mentioned SMP which is compulsory for every academic staff to manage their classes in each subject. In addition, email and search engine were the activities mentioned most by the participants.

It is noticeable that these three kinds of online activities are very similar to those found in the student’s list of online activities. However, the roles and responsibilities of academic staff are shared with students for some kinds of activity and some are quite different. The activities of academic staff and students on email, search engines and accessing online articles are normally comparable, whereas there is a marked difference in the use of WebCT where the content is created by academic staff and used by students.

8.3.4.2 Problems on the Current Online Services

In the current version of the Web site of the case university, there is a large collection of links to the information and online services that are available at the university. It seems to provide a large amount of information needed by students, academic staff, other stakeholders and visitors. However when the participants were encouraged to talk about the information and services which are available and the design of the current implementation, it turned out that all participants identify very similar issues.

> ***According to L3, she mentioned that*** *"the way it is organised at the moment I found is better than in the past, but what I tend to do is.…I tend to organise my browser …I use Safari and it has a toolbar. I've got a bookmark set on the top and I've got things like Jannisen, WebCT, SMP, the library, the things that I use all thing time that I want to go straight to I put them in my toolbar. I've guess I've customised my browser in order to have those access functions I use all the time because otherwise I have to go to the staff page and find them on there.*
>
> *Some of the things I find frustrating to get to. So, if I've looked up some thing on IT services I have to go into the staff pages. Then, I have to look for the site … it's not anywhere I can see in the front page which is quite frustrating….*
>
> *I've hardly ever used the search because I found it's not particularly useful to find things. So, occasionally I do want to find things …I can't think of something right now I wanted to find… but I only use it as a last chosen and it's only 50% successful."*
>
> ***L1 echoed the words of L3in that*** *"I want to choose, of course, to give me my faculty, my department immediately on the home page…. every time …not to click on the faculty or search all those things. And then, another one the good one is calendar….the university's calendar, the important date should be one the first page rather than going down and such and such in the different level."*

> ***Moreover, L2 mentioned that*** *"If I can customise it. I will get rid of some of the various things … I don't think the information for new staff should be made for more than one line here……*
>
> *It's generic…you know….too much. I don't know why people need finance and insurance or the marketing....they might be better as a title….I would like to be able to ….let's say…just…if I can pick this one…pick this one…and pick that one….that's what I would like to do hide this one……hide this one…and hid that one…that's what I would like to do…..."*

It is deduced that all participants who have confidence and experience in using a computer and the Internet prefer to take over the control of the online sites and adapt the interface from the one which currently implemented. A Campus Portal should provide a solution to overcome these flexibility problems that these experienced users are facing. However, without an efficient and effective design of the Campus Portal to support appropriate levels of personalisation and customisation, the Campus Portal will only act as another new look-and-feel of the Web site which currently implemented. This could lead to more serious frustration of all stakeholders and be detrimental to the organisation as a whole.

As shown in the findings from the literature review and exploratory stages of the research, personalisation and customisation functionality appear to be critical factors which uniquely distinguish a mature Campus Portal from those of earlier generations of Portals. Personalisation is the functionality that allows Campus Portal managers to give specific groups of users access to the appropriate information and online services. Customisation is the functionality that enables users to tailor the Portal interface to their own likes and ways of working.

8.3.5 Discussion of Patterns of Online Activities

By viewing the results of the case study from the students' perspective, it can be concluded that the most significant difference in the usage pattern of overall online activities of students can be found when viewed at the Educational Level. However, the Educational Level perspective does not adequately reflect the usage pattern as related to the Social Class Level concept (see Hofstede 1994) used in the design section of the

survey questionnaire described in Chapter 5. On the contrary, it reflects the job functions and nature of study in the courses of each student group.

Because of the differences in the job functions and nature of study course, students in different Educational Level groups will perform differently on each kind of online activity. Indeed, some online activities may not available to some specific groups of students so that there will be entirely different usage pattern on those activities.

The findings of this study provide evidence to support the need to acknowledge, and create an understanding of, the real differences in usage patterns of online activities of the students who form the majority of the stakeholders. Moreover, the academic staff confirmed the need for flexible of control over the online services and functionalities and that this is a critical issue in the design of a Campus Portal. This indicates that the implementation of the personalisation and customisation functionality should be included as a critical aspect of the design and development of a Campus Portal.

As was revealed in the findings of the preliminary study, many institutions implemented only a minimal set of personalisation and customisation functionalities. The findings of this case study indicate that it is quite dangerous for prospective developers not to understand the need for, and to design in, an appropriate level of personalisation and customisation as part of the development of the system. Furthermore, the developers who already developed and implemented the Campus Portal should reconsider this issue and readjust the appropriate level of their current personalisation and customisation functionality.

8.4 The Development Team

This section aims to answer the sub-question:

> **RQ2.3:** What are the current vision, opinion, and practices of the development team? If there are any conflicting requirements for the Campus Portal, how should they be resolved?

Once again, the development team in this study is considered as a representative group typical of any prospective Campus Portal development team. Having created a second generation Campus Portal, they are now in the process of implementing an embryonic more advanced one. By understand the views and opinions of these prospective

adopters, some recommendations can be made on the factors that might affect the development of Campus Portal systems as well as barrier that might prevent this.

This section will present the findings from the interviews with members of the development team. It reflects their vision and opinions as well as interpreting the facts of the current situation and future direction of their online services development including a Campus Portal. Finally, the summary of the findings will be discussed.

8.4.1 Philosophy of the Development

According to Norman (1998 p.185), "human-centered product development requires developers who understand people and the tasks they wish to achieve". Based on the results of the case study regarding to the development team, the philosophy of the development of online services is interpreted as following.

> As mentioned by DT1, "*The whole philosophy went from let's not focus on how to automate our administrative functions, let's look at what's the best outcome for our customers which is students and staff and then work backward from there.*"
>
> Furthermore, "*…We're rolling out weekly as needs are identified. We meet our users about once a fortnight, I think it is, the academic registrar division is the owner all of this software. ITS, we build it, we manage it, but we don't make a decision on the priority of what's get worked on next.*"

According to the development philosophy of current development, the statement "*our customers which are students and staff*" show a strong commitment of the development team to focus on the customers' requirements. In fact, their concerns with the daily online activities of staff and students may be a hidden indication of the system requirements which lie behind the interests of the development team and reflects some real involvement of the stakeholders.

As it was shown in the findings from the study of the stakeholders, the usage pattern show most variability when viewed from the Educational Level perspective. Moreover, some online activities may only applicable to a specific group of stakeholders at these levels. This is a strong indication that sooner or later, the personalisation and customisation will soon need to be developed and implemented.

It was clear however that, although their current approach was quite adequate for the development of online services, it would not be sufficient to develop a mature Campus Portal in which personalisation and customisation would be the major characteristics. Importantly, the findings from the study of students show that the usage pattern of their online activity is quite variable and needs a greater degree of flexibility.

Moreover, the findings from the study of academic staff show that they preferred to have more flexibility and greater control over their online activities and that this should be available every time of use on the first screen of the default page. Therefore, the personalisation and customisation functionalities will become an issue not only in the processes of the developing and implementation stages, but also they need to be well incorporated into at the design stage of the Campus Portal.

This supports the general philosophical view that if the development team have made a decision to proceed with a Campus Portal development, the personalisation and customisation functions will become very important components of the Campus Portal. These need to be considered in the design stage of the development to make sure that all of personalisation and customisation issues will not be overlook and meet the real requirement of the online activities of the users.

8.4.2 Inconsistency of the Current Development

From the interviews, an inconsistency was clearly noticed in the development team between the vision of online service development, the perceived benefits of the Campus Portal, and the usage pattern of the students whom they viewed as their major customers.

Initially, interviewees DT1 and DT2 described the process and vision of the development of online services and Web site as following.

> ***DT1 said that*** *"We've designed and we want functionality over looking pretty. We want to roll out the functionality quickly and accurately, and so the actual coming back and making it look pretty and that's sort of things, it's pretty low in our agenda."*
>
> ***DT2 confirmed by the statement that*** *"But as far as the university goes, it's not a priority. If it became easy to do, something we've done and it fits nicely. Yes, want to do it. I think the Intranet of the staff might be*

> *interesting because it's more about function rather than flashy nice things."*

However, the University and development team invested heavily in the development of Web site and the online services as DT2 mentioned that

> *"The university started to realise the important of having a corporate control of the web site, probably around 1996. And I think they hired a graphic design company in 1997 to come up with a new university design. It turned out it to be a shock with its sort of roll out and the sort of marketing. At that time I was working about template. And it didn't last long that one. 1998 or 1999….or 2000 we come up with the new design which is all done in-house. We put various designs together which student could see which ones they like the best."*

According to Vidgen (2002) and Vidgen et al (2002), user interface design is an essential part of Web development and should be placed at a designing stage. As, online services are developed and implemented under Web development platform, they will invariably have similar development characteristics and philosophy in the design and development of user elements. It would be better to incorporate these rather than separate them from the Portal development theme.

In fact, functionalities of Web-based services are normally developed to facilitate users to their performing their activities. However the user interface is usually designed and developed to be attractive and enticing for users while they are using the system. Moreover, the user interface design is not only about the look-and-feel aspect of the design, but it also includes the usability aspects which particularly focus on the human aspects of systems.

Therefore, functionality and the user interface should combine together to make sure that everyone uses an effective and enjoyable online system. For a Campus Portal, in particular, the user interface design as well as core characteristics of the Campus Portal such as personalisation and customisation should be seriously considered at the designing stage to make sure that all the functionality and the look-and-feel are integrated and reasonably applicable to the right group of users.

8.4.3 Viewpoints on the Development of a Portal

On the specific viewpoint of a Campus Portal development, DT1 mentioned that

> *"The customisation function is certainly what we are looking toward now. You could only see the thing that your are interested in, you can hide some if you want to, you can add some if you want to, and yeah It will become more customised to the user."*

It is clearly the vision of the DT1 who is the leader of the development team that a full Campus Portal should be developed and implemented in the future. However, when he was asked the direction of the development whether there will be a single Campus Portal that support to every group of stakeholders, DT1 commented that:

> *"I don't think that will never happen. Not because of wouldn't be nice, but for a few reason.*
>
> *The student portal….because of three separate functions here…..the student portal and staff portal, I think is one division where it is gonna be separate now. What the students want and what the staff want…the system will be difference.*
>
> *The staff's view of the world as far as the university concern, I think should be quite separate from the student see.*
>
> *There is a lot of information in our web page, even before the student sign-on to their portal that I don't need to see. It would beneficial to us to be able to say "Welcome to the University of ……" and then presents the information that they want, not just customised stuff like enrolment record and things, but also the university links that relevant to current students that at the moment they have to click on "current students". We should know them they are current students and then give them some information.*
>
> *…… I think the division between students and staff will always be two separate portals."*

From these statements, it was realised that there is no universally accepted direction for Campus Portal development and that there are different understandings on the best approach to the development of a Campus Portal. However, there is a definite signal

that the development team, especially the leader, has a clear vision on how they should improve online service by developing and implementing a Campus Portal at the university.

The general philosophy and practice of Campus Portals would indicate a preference for having one single interface for both students and academic staff.. However here the message of the following statement was typical:

> *"The staff's view of the world as far as the university concern, I think should be quite separate from what the student see……what the students want and what the staff want the system will be difference"*

In order to enhance the communication channel though which the University can send information out to a specific group of users, there should be some personalisation functionality within the Campus Portal. Moreover, targeting those online activities which should available only to a specified group of users can also managed by using some personalisation functionality. On the other hand, where users should be allowed to freely select a particular information channel, add to their own links, and so forth, this is implemented by using customisation functionality.

> Mr. Sam, for example, is a Ph.D. students as well as a lecturer of Information Systems. If the statements of DT1 were enacted, Mr. Sam would be provided with two different portals. By applying the general practice of the Campus Portal, Mr. Sam would have only one single portal with the capability to access to both students and staff information, link, and online services.
>
> Once Mr. Sam successfully logged on the Campus Portal, all information, messages, activities which related to Mr. Sam regarding to two roles (academic staff and Ph.D. students) should be instantly organised and displayed for him. On the other hand, Mr. Sam may subscribe to new channels to receive more information.

Therefore, the statement "*I think the division between students and staff will always be two separate portals*" may need to reconsidered in order to develop a Campus Portal.

8.5 Clarification of the Personalisation and Customisation Characteristics and Roles

Bringing together the literature reviews and the findings of the preliminary study and the case study, the characteristics of personalisation and customisation can be clarified as follows (see also Figure 8-1).

- **Personalisation**
  is the function that allows users to personally receive the information, contents and online services, specific to their needs and roles through the Campus Portal. The information, contents and online services will be pre-defined and assigned the appropriate level of priority by the authorising university division, i.e. the academic registrar, faculty, lecturer and so forth. This personalised information, with content and online services, normally relate to standard or compulsory activities.

- **Customisation**
  is the function that allows users to select their preferred information, contents and online services as well as mode of interaction. The customised information, content and online services will normally be classified as optional activities.

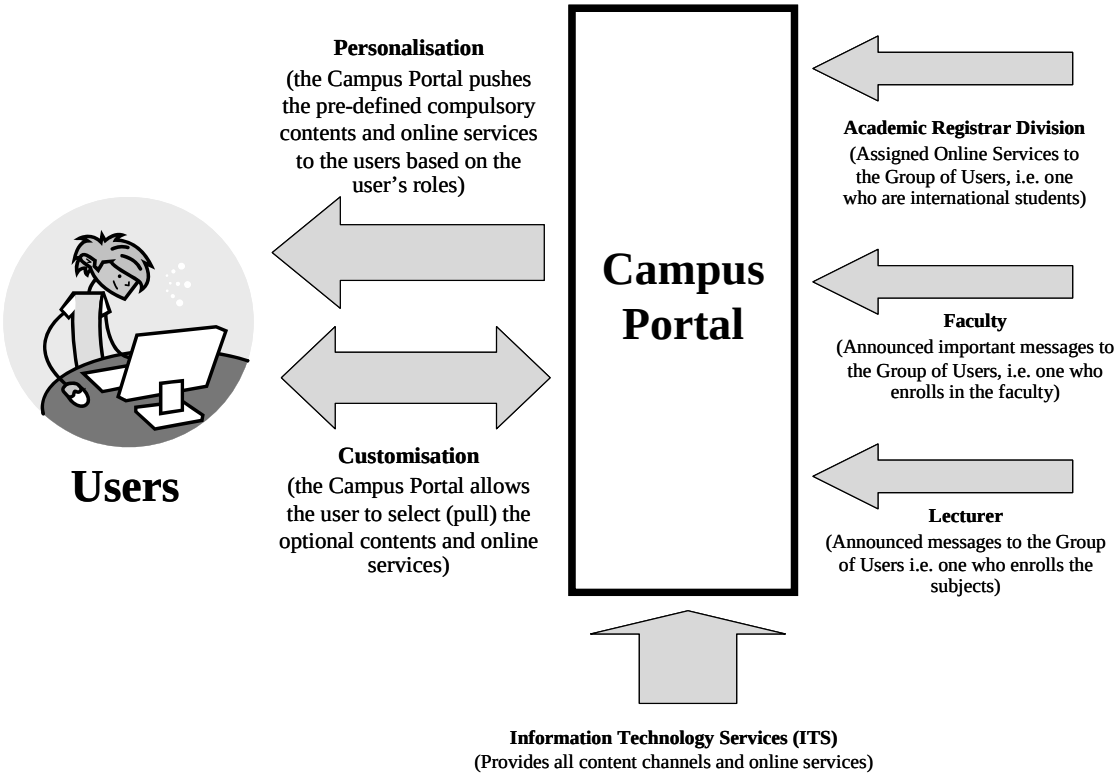

Figure 8-1 Personalisation (push) and Customisation (pull)

Additionally, the personalisation and customisation functionality can be viewed from another perspective when the development team need to design and manage these functionalities on the Campus Portal (see also Figure 8-1).

- Personalisation can be viewed and designed as a push system, which enables the faculty, institution and authorised groups to communicate directly to the users.
- Conversely, customisation can be viewed and designed as a pull system that enables the users to be able to select their favourite types of channels, contents and online services as well as adding their own links.

8.6 A Breakdown of the Organisation's Levels

According to the clarification of personalisation and customisation above, it is understood that each piece of information, content and online service needs to be attached to at least a group level, i.e. at educational level (eg undergraduate, postgraduate by coursework, postgraduate by research) at school or faculty level, by individual course or subject, etc. In order to design and manage personalisation and customisation, the level of the information, which is attached to each person, should be divided into smaller units based on these organisational or group levels.

In the study, the influencing factors on online activities that were investigated were the Gender, Students Category, and Educational perspectives. Each of these perspectives was designed for different purposes (see Chapter 7 for more details).

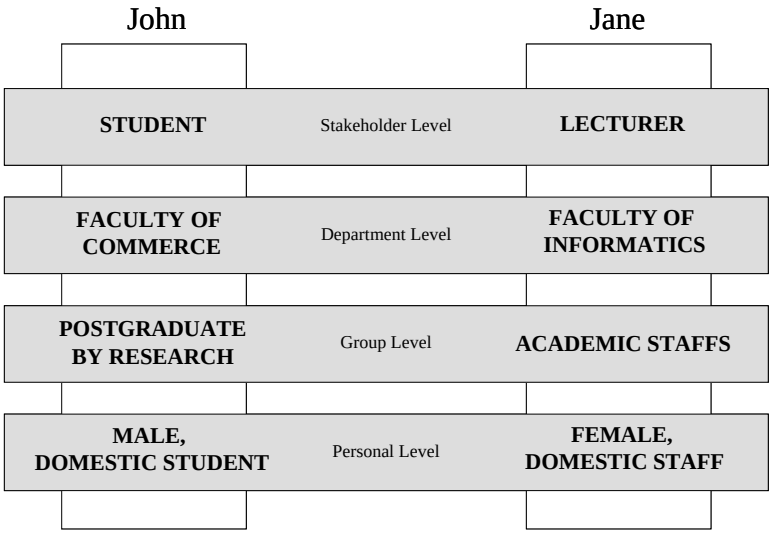

Figure 8-2 a breakdown of a person into organisation's level

As illustrated in Figure 8-2, each person within an institution has a responsibility at many different organisational levels.

- John, for example, is a Postgraduate student by Research who is Australian and studying in the Faculty of Commerce. The status of John can be broken into four levels, which are the stakeholder level (student), the department level (Commerce), the group level (Postgraduate by Research), and the personal level (male and domestic student).
- Jane, another example, is a Lecturer who working in a Faculty of Informatics. The status of Jane can be broken into four levels which are the stakeholder level (lecturer), the department level (Informatics), the group level (academic staff), and the personal level (female and domestic staff).

A breakdown of the features of each of these levels is displayed in Figure 8-3 in respect of personalisation and customisation

- ***Personalisation:*** Once log-on, all information and contents that are displayed on the user interface should be based on the user's role(s) at every level that relates to the user.
- ***Customisation:*** Users are able to select how information and contents is presented to them within the range to which they have been granted access. The exception is that some information and contents at the higher organisational level cannot be changed.

In order to satisfy all stakeholders within the University, both aspects of this functionality need to be implemented, i.e. content needs to be personalised to the role of the user as part of the portal design and the functionality to customise the interface for ongoing activities needs to be available to users. Therefore, a balance of content and information is necessary.

From another perspective, the balance of the content and information between personalisation and customisation can also be recognised as 'Push' and 'Pull'.

- ***The Push Approach (Push the Personalised Information to the Users):***
  Here, the information displayed is controlled at a higher organisation level who may want to inform a user of a particular role(s) or at a particular level. Once a

user has logged-on to the system, all the information and contents that relate to the user will be appeared on the user's interface.

- ***The Pull Approach (Allow the Users to Customise the Contents):***
  The information is not controlled by any organisation level but is available to those who have rights to it. Users can then choose when and if they access it.

Privilege	**Levels**	**Examples**		**Balance between Push & Pull**	
				Personalisation (Push)	***Customisation (Pull)***
High	Stakeholder Level	- Student	- Staff	High	Low
	Department Level	- Referred Faculty	- Referred Faculty		
	Group Level	- Undergraduate - Postgraduate by Coursework - Postgraduate by Research	- Academic - Administrative - Others		
Low	Personal Level	- Male, Female - Domestic Student - International Student	- Male, Female - Domestic Staff - International Staff	Low	High

Figure 8-3 Organisation levels of Campus Portal

This indicates that online services should be developed with the consideration of a balance of the 'Push' and 'Pull' approach. This doesn't mean that every single online application needs to have both characteristics at the same time. In fact, in balancing of the personalisation (push) and customisation (pull) of the Campus Portal as a whole user satisfaction needs be considered as well as the needs of the faculty and University in order to preserve enough channels which can inform and communicate to the right user groups.

The situated activity of students in the real world also needs to be considered. For example there are a great many social activities among students i.e. messaging tools, entertainment news, online music, online gaming, and so forth. From the point of view of management and developers, these kinds of activities are considered as irrelevant and should not be included in the Campus Portal.

However, it is a fact that many students spend a great deal of time on these kinds of activities when they are online and if the Campus Portal does not at least provide a customised link to the relevant sites for these activities, the stakeholders, especially students, may leave the Campus Portal and go there directly.

The philosophy of any type of portal is to encourage its users to stay on it as long as possible so all desired allowed functions should be accessible through the portal. Students have more independence than any other type of stakeholder because they are the customers who use the system to facilitate all their activities while they are studying at the university and from a service point of view, customers are undoubtedly gods.

8.7 Summary of the Findings

The implications of the findings of the study in light of the literature are summarised here. A Campus Portal can be considered a technology product which was developed to serve people and help them on their activities. Therefore, the Campus Portal should be developed in criteria that meet the user requirement regarding to the users' characteristics as shown in the usage pattern of their online activities.

Norman (1998) Model proposed a technology adoption life cycle which originated from Moore (1991) and was adapted to show the changes in customers as a technology matures. This is displayed in Figure 8-4.

Please see print copy for Figure 8-4

Figure 8-4 The change in customers as a technology matures, (Norman 1998 p.33)

Norman (1998 p.33) explained that "In the early days, the innovators and technology enthusiasts drive the market; they demand technology. In the later days, the pragmatists and conservations dominate; they want solutions and convenience."

As it can be found that all students and academic staff in this study have very long experience in both computer and the Internet, the technology innovation therefore should support from the existing level of their experience to improve the performance on their daily activities as these people require solutions and convenience.

Although the usage of the Campus Portal which ideally offers the personalisation and customisation functions may require extra competency to manage their preferred channels, activities, and so forth, I believe that these groups of people have already had enough knowledge and ability to handle these major characteristics and functionality of the Campus Portal.

Therefore, it is quite necessary for the development team to adjust their attitude and vision on the development of the Campus Portal and distinct its development from the general Web development projects because they are in different characteristics. Moreover, it can be understood that there are always some limitations and problems in order to develop the Campus Portal or any project. However, the designing of the appropriate level of personalisation and customisation to the Educational Level perspective is the most important task that needs to be completed prior to the actual development.

According to Eckerson (1999b) and Dias (2001) as mentioned in Chapter 2, Eckerson (1999b) proposed generation of the portal as displayed in Table 8-4. In fact, users do not understand on the side of the development team that the Campus Portal should be developed as recommended generation of the Campus Portal as proposed by Eckerson (1999b), but they expect to see the distinction of the Campus Portal and general Web site.

Based on the finding that shows the significant difference in usage pattern on their online activities as well as adapting with Norman (1998)’s Model , it would be possibly to argue that the personalisation and customisation should be designed as “role focused” on the first time of the development because the users now have enough experience in computer and the Internet and expect to gain a benefit of personalisation and customisation to deliver the relevant information and services when the first use of the Campus Portal.

Please see print copy for Table 8-4

Table 8-4 Generation of Portal
(Eckerson 1999b in Stein and Hawking 2005 p.173)

At least, the information which currently available on the current Web site should be reorganised into a category of the information based on level and group of the users in order to deliver them properly to the right group of users via the Campus Portal. This approach is to basically give the opportunity to the users to receive their personalised information and possibility to customise their interested information channels. Other online services may gradually be appended into the Campus Portal.

8.8 Conclusion

A number of research questions have been answered in this chapter according to the major question as follows:

> **RQ2:** What are the essential factors of current practices that appear to enable or obstruct the development of a Campus Portal? How could the development of Campus Portals be improved in light of an improved understanding of these factors?

It can be summarised that the essential factors which affect and obstruct the development of the Campus Portal are misunderstandings where the actual and living requirement of the stakeholders which are reflected through the usage pattern of the online activities, are overlooked.

According to the results and findings, it can be concluded that Educational Level is the most influence perspective that shows a significant difference on the usage pattern of the online activities of the students. By breaking down the level which existing and embedded into each stakeholder of the University, it can be found that there are four major organisation's levels which can contribute to the understanding of design, development, implementation, and management of the 'push' and 'pull' approach

which directly related to understand the balance between personalisation and customisation of the Campus Portal.

The findings suggest that, to improve the development of the Campus Portal, the development team should understand the usage pattern of the stakeholders' online activities and try to balance between the push and pull contents. Moreover, the attitude of the development team on Campus Portal is a big barrier that obstructs the appropriate development of the Campus Portal. Finally, the best functionalities should go along with good look-and-feel as the Campus Portal is a part of Web development which the user interface and usability design are the major issues in the area.

In order to prevent a misunderstanding on the development of Campus Portal, a personalisation and customisation should be introduced in the designing stage rather than implementation stage. By adoption of at least a formal development methodology with the introducing of personalisation and customisation as a designing stage, it should help to prevent this kind of misunderstanding in the development of the Campus Portal.

Next Chapter, the selection of the formal development methodology will also be discussed to preliminary help the development team who wish to develop a Campus Portal to be able to adapt the methodology for their Campus Portal projects.

Chapter 9
A Development Methodology for Campus Portals

9.1 Overview

This chapter concerns the final phase of this research, namely, the presentation of a development methodology for Campus Portals. The proposed methodology is based on the findings from the preceding phases of the research: the literature reviews, the preliminary study and the case study. These were all completed in order to clarify and identify the important issues regarding Campus Portal use as well as accumulate an understanding of current practices in the development of Campus Portals.

In this final phase of the research, the findings from the previous phases will be applied to select the most appropriate development methodology for Campus Portal projects. The issues identified through the research will be integrated with other criteria to form the basis of the proposed methodology. The traditional Information Systems and Web development methodologies, which were described in the literature review (Chapter 3), will be further investigated for their suitability in order to form a basis for a new methodology for Campus Portal development. Some modifications will be made to the selected methodology to adjust the model to suit the criteria and characteristics of Campus Portals. Finally, the modified development methodology will be proposed as the Campus Portal Development Methodology (CPDM).

9.2 Identification of the Critical Characteristics of Campus Portals

One of the early outcomes of this research was the realisation that a campus portal was a very different concept from a campus Web site with a number of distinctive and unique characteristics. Because a Campus Portal is based on Web technology, an overlap of characteristics between campus Web site and Campus Portal is unavoidable. However as Boettcher and Stauss (2000) mention, no matter how fancy the homepage is, it is not quite a portal.

The portal characteristics, which were described in Chapter 2, can be placed at various levels of priority in order to develop a Campus Portal. This means that it is unnecessary to implement all the characteristics of the Campus Portal at once. Some characteristics are critical to the development of a Campus Portal, but some are not. The stages of development need to be planned, and then the portal can be continuously developed over time.

The original report of an Enterprise Information Portal by Shilakes and Tylman (1998), together with literature from pioneer contributors, i.e. Eckerson 1999a, Eckerson 1999b, Eckerson 1999c, Firestone 1999, Murray 1999, Roberts-Witt 1999, White 1999b, Aneja, Rowan and Brooksy 2000, Boettcher and Stauss 2000, Finkelstein and Perkins 2000, Morrison 2000, White 2000, Collins 2001, Dias 2001, Kotorov and Hsu 2001, Moskowitz 2001a, Katz 2002, Strauss 2002, and the most current literature (Firestone 2003a, Frazee, Frazee and Sharpe 2003, Jafari 2003, Thomas 2003a, Walsh 2003, NEC 2004b, Smith 2004, Sharma and Gupta 2005, 2005a, Wojtkowski and Major 2005), confirm unequivocally that personalisation and customisation are the most critical characteristics of a campus portal and therefore must be taken into account in any methodology for portal development.

Indeed, this research is based on the principle that these characteristics are significant in distinguishing the Campus Portal from the Campus Web site. For a Web site, including any Web applications and services, personalisation and customisation are optional characteristics; conversely they are compulsory characteristics of a Campus portal.

It is interesting to note that Rossi, Shewabe, and Guimaraes (2001), the original authors of the well-established OOHDM (see Chapter 3 for the detail), recommend having personalised Web applications using this methodology. Rossi, Shewabe, and Guimaraes (2001 p.1) additionally state that, “since personalization is a critical aspect in many popular domains such as e-commerce, it important enough that it should be dealt with through a design view, rather than only an implementation view.”

Although I agree with the statement by Rossi, Shewabe, and Guimaraes (2001) there was no empirical evidence at the time to suggest that the mere popularity of personalisation is a good-enough reason for the shifting it from the implementation view to the design view. The finding of this research does provide the required

supportive evidence and, indeed, extends it to the issue of customisation. Moreover, this research clearly distinguishes the terms and roles of personalisation and customisation, as was described in the previous chapter.

Based on these findings, it can be concluded that the inclusion of the explicit personalisation and customisation functionality as a separate design stage in the development methodology could be invaluable for practitioners in the process of development, and help eliminate misunderstanding on these critical aspects of a Campus Portal project.

In addition, user interface issues are also related to this, and are extremely important because they form an essential part of a Web-based Information Systems (Vidgen 2002, Vidgen et al. 2002). Therefore, this research will also consider user interface issues as additional critical characteristics of Campus Portals.

9.3 The Traditional Development Methodologies VS. Agile Development Methodologies

According to the findings from the case study, the development team of The Case University did not adopt any development methodology for the development of their online services projects. Although the development team adopted the approach which they believed was best practice, it may, in fact, not have been the most appropriate approach for a new project, which could be considered as an emerging technological innovation.

Although the development team generally had expertise in various areas of Information Systems and Web development, their limited knowledge and even misunderstandings in the area of emerging technological innovation was not unexpected. As was described in the previous chapter, there was an inconsistency in the understanding of the Campus Portal development found among the development team's viewpoints that are no doubt common to many such teams. This indicates that a formal development methodology should be introduced to guide the process of the development of the Campus Portal so that it will provide the major characteristics of the Campus Portal, and meet the user requirements and goals of the organisation.

According to Nerur, Mahapatra and Mangalaraj (2005), the software development community can now be divided into groups, namely, traditionalists and agilists. As

explained by Nerur, Mahapatra and Mangalaraj (2005), the traditionalists are a group of people who adopt the traditional development methodologies for their development project, whereas the agilists are a group of people who adopt the agile methodologies to help them develop systems. However, both kinds of methodologies have their own strengths (Highsmith 2002, Boehm and Turner 2004).

It cannot be denied that agile development methodologies have recently become a very popular approach to the development of software, Information Systems and Web applications. However, this research will emphasise on the traditional system development methodologies rather than the agile development methodologies for the following reasons.

- At the time this research commenced, no systematic reviews had yet been made of agile techniques, and no procedures were available for developers to determine the appropriate method that would offer the best benefit in given situations (Abrahamsson et al. 2002, Abrahamsson et al. 2003). In addition, "agile software development methods, without rationalization, cover certain/different phases of the software development life-cycle and most of them do not offer adequate support for project management" (Abrahamsson et al. 2003 p.244).
- Nerur, Mahapatra and Mangalaraj (2005 p.74) observe that for "organizations steeped in the traditional systems development methodologies, adoption of agile methodologies will likely pose several challenges, since the two software development methodologies are grounded in opposing concepts."
- Because the agile methodologies are still not as stable as the traditional system development methodologies and the some development teams, i.e. The Case University's development team, were found to have misunderstood the emerging concept of the Campus Portal, it is extremely risky to introduce two new major issues, the agile development methodologies and the Campus Portal, at the same time.
- Finally, the traditional system development methodologies have been taught in most Information Systems related courses within universities around the world.

Most developers already have some knowledge and experiences in traditional development methodologies.

As a result, this research will mainly focus on traditional system development including the Web development methodologies derived from the traditional development concepts (see chapter 3), to search for the most appropriate development methodology for the Campus Portal. It will then recommend modification and adaptations that may be needed to make sure that the methodology for the development of Campus Portals is appropriate to the portal unique characteristics. However, a possible agile development methodology for Campus Portal development can be investigated in future research.

9.4 The Build or Buy Debate

In general, each organisation has a different mission, vision, and objectives, surrounded by different resources, which may serve relatively different requirements (Thomas 2003a). This causes different organisations to face different problem situations. To overcome these problems, the development of a Campus Portal has to rely on a specialised but flexible development strategy able to meet the particular requirements of each organisation. This research aims to address this demand and increase the understanding of how an appropriate strategy for Campus Portal development suitable to each institution can be selected.

It is always very difficult to reach a verdict on whether to build or buy (Fleischman 2001) an Information Systems application. The fact that a Campus Portal project is considered which involves a large integrated system makes it particularly hard to decide whether to ‘build’ or ‘buy’. In fact, many institutions consider it preferable to compromise so that they both ‘build and buy’ rather than select a single course of action (Katz 2002). However, this issue should be considered on a case-by-case basis (Thomas 2003a).

It is true that many Campus Portal development strategies, such as in-house development, outsourcing, purchasing a complete or partial commercial package and so forth, may suit the particular situation of the institution. Also, there are many factors affecting the decision concerning the selection of the development strategy.

With this in mind, it should be understood that this research places strong emphasis on a methodology for Campus Portal based on an in-house development solution. The

findings of the case study suggest that education institutions normally that have a competent development team, together with specialised needs for each situation, support this emphasis. Consequently, the factors and decision issues on the selection of a strategy, although of interest, are beyond the scope of this research.

9.5 The Need for a Comprehensive Methodology for Campus Portal Development

Building a Campus Portal is one of the most important strategic endeavours in many academic institutions. However, many institutional managers do not see a reason for a Campus Portal for their institutions and it is more likely that they will want one simple because other institutions have already implemented one (Thomas 2003a). Although many of them may not really understand what a Campus Portal is, they do, however, go ahead and build one without consideration of the appropriate approach to the development process.

The literature review in Phase One of this research revealed that, although there are some Enterprise and Campus Portals development methodologies for practitioners; they are not available in the public domain. In fact, most existing development methodologies are embedded within commercial software packages. This research will not investigate these kinds of development methodologies further because they depend upon the software, which is only provided by the vendors.

Because of the unavailability of the development methodologies within the knowledge of the public domain, many early Campus Portal developers had no alternative but to develop their own development methodologies to handle and solve their problems regarding their situation and requirements (see Bishop 2003, Frazee, Frazee and Sharpe 2003, Thomas 2003a). This kind of practice could be the source of problems in higher education institutions when developing a Campus Portal. In fact, misunderstandings of Campus Portal concepts and development issues are among the most serious problems, which lead to no development methodology being applied or the selection of an inappropriate approach to developing a Campus Portal.

The research findings show that the development team of the Case University is a knowledgeable group of people that have experience in both traditional and Web development projects including the early generation of a Campus Portal. It is interpreted that this is typical of the situation in many such institutions. Unfortunately,

the requirements of the end-users, which is reflected in the usage pattern of their online activities, have grown to reflect those of a more advanced generation of portal where a certain level of personalisation and customisation is considered important. However, there were obvious misunderstandings on the part of the development team on this aspect of Campus Portals; where there was a notable discrepancy between the literature and this research finding. In fact, users currently want the personalisation and customisation to enhance their activity and performance rather than the expectation of having a colourful user-interface.

Therefore, there is a clear indication of the need for the adoption of the formal development methodology to help development teams construct mature Campus Portals in efficient and effective ways. The introduction at the design stage of personalisation and customisation functionality should be prominent in the flexible environment of the development methodology.

It is also clear that, while a distinctive development methodology for Campus Portal projects is essential for a successful Campus Portal project, a development team should be aware that the project also needs to meet the goals of the organisation and other user requirements specific to that organisation.

To explain further the reasons why a comprehensive methodology for the Campus Portal development is needed, this section is divided into three subsections. These provide details of reported situations that occur in the implementation of Web-based systems.

9.5.1 A Change in the Development Environment

According to Wynekoop and Russo (1993 cited in Hirschheim, Iivari and Klein 1997), the finding of their research, which studied the adoption of the traditional system development methodologies, shows that 65% of the respondents in 100 organisations had constructed their own in-house development methodology; 89% believed that the formal development methodologies, which are available, should be adapted on a project-by-project basis. Additionally, Hardy, Thompson and Edwards (1995 cited in Hirschheim, Iivari, and Klein 1997) found that 38% of the methodology used were in-house developed, whereas 88% of them customised other methodology in order to fit to specific projects.

According to Avison and Fitzgerald (2002, 2003a, 2003b), the decline in the adoption of development methodologies is caused by some factors, i.e. not contingent on local factors, a one-dimensional approach, inflexibility, and so forth. Moreover, the transformation of the development platform, which has shifted from the traditional environment to a Web-based environment since the mid 1990s, may be a possible factor regarding the perceived risk of failure in development and implementation.

Recently, the Web has become a development platform in itself, which allows developers to build their Information Systems project completely in the Web-based environment. In fact, most large organisations have transformed their organisational Information Systems applications in to a Web-based platform.

The possibility of failure, which has always been present in traditional Information Systems with the acceptance and adoption of any development methodology, will likely become a serious problem for Web development. This is in part due to the need for a shorter development cycle with the Web platform and environment (Baskerville and Pries-Heje 2001).

Certainly, the problems may occur through the adoption of methodologies for Campus Portal development if those methodologies cannot fulfill the requirements and oversee the real problems regarding the development platforms of Campus Portals. From my point of view, any methodology for Campus Portals should not be concentrated either solely among the traditional system development methodologies, or the Web development methodologies. In fact, it should integrate both aspects of those two kinds of methodologies in order to complement the nature of the Campus Portal, as previous described in Chapter 3.

9.5.2 A Web Development Crisis

The Web development crisis may be caused by two major factors as described in the following points.

- **Misunderstandings of the Web Development Concept**
  Many Web sites are created without planning or analysis (Goedefroy, Meersman and De Troyer 1998). In fact, most Web developers are not interested in adopting any standard development technique and methodology. More importantly, the Web system development often relies heavily on an

individual or a small group of developers (Ginige and Murugesan 2001b).

According to Ginige and Murugesan (2001b), although the Web development has an important artistic side, it should follow the same discipline as in science and engineering. Moreover, a study of Barry and Lang (2001) shows that there were only a small number of respondents who implemented a methodology for hypermedia development when they developed the system.

- **Incorrect Selection of the Development Methodology**
  Vidgen et al (2002 p.178) mentions that "although the design of the human computer interface (HCI) has long been a fundamental activity in the system development process, the area of graphic design for the Internet represents a significant departure for the traditional Information Systems developer."

  Many traditional Information Systems development methodologies are based on outdated concepts that go back to the 1990s (Fitzgerald 1997 cited in Howcroft and Carroll 2000). Although these methodologies have been utilised to develop Web sites, the scope and capability of these methodologies are very limited because they are not designed with this kind of purpose in mind (Powell, Jones, and Cutts (1998) in Howcroft and Carroll (2000)). Because the characteristics of the traditional and Web-based systems are different, it is necessary to carefully select an appropriate development methodology that is suitable to a Web development project.

These factors should definitely be taken into consideration when developing a Campus Portal. However, this does not mean this research has already prejudged and rejected traditional development methodologies for Campus Portal development projects. Conversely, it is believed that traditional development methodologies can provide some benefits to the development of a Campus Portal if the developers understand and adapt them in an appropriate way. Likewise, fully adopting a Web development methodology for a Campus Portal without careful consideration could also be unsuccessful.

9.5.3 An Awareness of the Campus Portal Development Crisis

The crisis regarding the Campus Portal is somewhat similar to that in Web-based development in general because of the lack of a clear understanding of the requirements and behaviours of Campus Portals. As a result, some developers may apply none or the wrong type of methodology to Campus Portal development.

In fact, the Campus Portal integrates broad ranges of content and many online services across the campus into a single complex project. Very often, the Campus Portal is viewed more as a user interface application by some developers (as was proved in this research in the interviews with the development team of the case study).

The findings of the case study in this research, described in the Chapter 8, revealed that the various usage patterns of the online activities among students could be clearly noticed only when viewed from the Educational Level perspective. In fact, each group of students (Undergraduate, Postgraduate students by Coursework and Postgraduate students by Research) require and perform differently in the online activities. While this may not be the same in detail in every institution, the principle is there. Developers need to understand this concept and its importance to Campus Portal development, otherwise this could lead to serious problems in the design, development, implementation and maintenance of the Campus Portal, which needs to support the online activities of the end-users of the system.

Therefore, the Campus Portal is more than a user interface application. It is really a Web-based Information Systems, which needs to be integrated with many other views such as organisation, stakeholders and technology, in order to develop the system effectively. Moreover, the Campus Portal development methodology, therefore, should be balanced between Information Systems and general Web development perspectives.

9.6 A Selection of the Development Methodology for a Campus Portal

This research places its emphasis on the methodology for in-house development of a Campus Portal. The research approach will start by analysing the available Information Systems and Web development methodologies, which were described in the review

Chapter 3, to find those existing development methodologies that are appropriate to the development of the Campus Portal.

The research will then investigate the details in the selected existing methodologies to discover the necessary aspects to enhance them to match the major characteristics and demands of Campus Portals. As a result, new critical components from the selected development methodology may need to be proposed in order to develop a suitable and comprehensive methodology for Campus Portal projects.

In order to select the appropriate development methodology to develop a Campus Portal, this section will provide an overview of the nature of Campus Portals, some selection criteria, a comparison between the traditional and Web development methodologies and a filtering process to match the criteria to the characteristics of the Campus Portal.

9.6.1 Criteria for the Selection

Murugesan et al (1999) and Ginige and Murugesan (2001a) state that disciplined approaches and new methods and tools for Web development are extremely necessary in order to avoid a perceived Web crisis and achieve success in the development of complex Web-based systems. Murugesan et al (1999) also mention that there are a number of criteria, such as the unique features of the new medium, the operational environments, scenarios and multiplicity of user profiles, and the skills and knowledge of people building Web-based systems, that need to be considered in order to successfully develop and implement Web-based systems.

Adapting the criteria of Murugesan et al (1999) to the Campus Portal development, the selection of the development methodology therefore should match the following criteria, taking into account the special characteristics of Campus Portals.

- **Multi-dimensionality**

  Previous research shows that factors influential in major failures of development project are: lack of commitment in top management and inadequate user involvement (Keil et al. 1998, Wallace and Keil 2004). To satisfy user needs, a system must be developed accordingly and fulfill the requirement of the users (Standing 2002). Campus Portal users are composed of many groups of stakeholders that require different needs and may have a direct

or indirect relationship to each others (Pressman 2005). Each group also performs different activities to facilitate and achieve their objectives. The development methodology therefore should consider the development of a Campus Portal with a user focus from the multiple views of stakeholders.

- **Flexibility**

  Inflexibility in the development methodology inevitably leads to problems (Avison and Fitzgerald 2002, Avison and Fitzgerald 2003a). A Campus Portal is a complex project, integrated with many Web-based Information Systems and other online services. Consequently, the development methodology should be flexible enough to allow the developers to adjust methods, tools, and techniques as well as the process of the development to suit the local situation.

- **Supporting Critical Characteristics of the Campus Portal**

  As shown in the earlier phases of this research, the development methodology has to support the functions of personalisation and customisation, which have been mentioned previously as critical characteristics that define a third or fourth generation of Campus Portal. In the field of Human-Computer Interaction (HCI), however, good usability is widely accepted as a critical component for Web sites and Web applications (Vidgen 2002, Vidgen et al. 2002). The development methodology for a Campus Portal should also considered usability as an additional critical characteristic.

9.6.2 Comparison of Existing Development Methodologies

Avison and Fitzgerald (2003a p.555-572) provides a framework for comparing methodologies in the final chapter of their book. They mentioned that “comparing methodologies is a very difficult task, and the results of any such work are likely to be criticised on many counts. There are as many views as there are writers on methodologies. The views of analysts do not necessarily coincide with users, and those views are often at variance with those of the methodology authors” Avison and Fitzgerald (2003a p.555-572).

They also mentioned that a number of additional elements might be appended to the framework in order to compare methodologies for a particular purpose. As most traditional Information Systems methodologies have been referred to by Avison and Fitzgerald (2003a), this research will also adopt their approach in order to explain the traditional development methodologies. This will be extended to Web development methodologies in this research.

Because of the wide range of differences between the traditional Information Systems development methodologies and Web-based development methodologies, (2003a), this research will customise and use only some elements of their framework for comparing development methodologies against the Campus Portal's criteria as described in the previous section. This comparison will concentrate on positive aspects, rather than on the disadvantages or pitfalls of all possible development methodologies in order to select and justify the most appropriate development methodology for the Campus Portal based on the defined criteria.

9.6.2.1 Philosophy

The general philosophy of all Information Systems and Web development methodologies is to improve the areas of development in each respective world. An in-depth philosophy of each development methodology, however, varies and depends on many factors such as paradigm, objectives, domains and targets (Avison and Fitzgerald 2003a).

- **Paradigm**

  A paradigm is "the most fundamental set of assumptions adopted by professional community that allows its members to share similar perception and engage in commonly shared practices" (Hirschheim and Klein 1989 p.1201). Avison and Fitzgerald (2003a) identify two major sets of paradigms: a science paradigm, which focuses in hard scientific development or physical world (Hirschheim and Klein 1989), and a system paradigm, which is characterised by holistic approach or social world (Hirschheim and Klein 1989).

  Among the traditional Information Systems development methodologies, SSM, ETHICS and Multiview2 are categorised into system paradigm and that SDLC, SSADM and JSD belong to the science paradigm. The reason is that SSM,

ETHICS and Multiview2 provide a perspective for both technical and social perspectives, whereas the others emphasis on the technical perspective of the Information Systems development.

Although Multiview2 is claimed as a framework by the authors of the development methodology (Avison et al. 1998, Avison and Fitzgerald 2003a), there are much confusions to specifying the exact type of Multiview2, because it can be referred to as an approach, a methodology, a framework, or metaphor (Zhu 2002). This research views Multiview2 comparable as a development methodology for developing an Information Systems.

Among Web-based system development methodologies, only WISDM and ICDM can be categorised into a system paradigm, whereas RMM, OOHDM, WSDM, Lowe-Hall's Approach, Takahashi-Liang's method, Howcroft-Carroll's methodology, and IDM belong to the science paradigm.

- **Objective**

It is very difficult to identify all categories of the objective. Each development methodology in fact has different aims and objectives to improve the development in a particular area. Regarding to the objective of this research, the comparison of the development methodology objective will be categorised into two major areas: building the system, or improving the system.

Building the system means that the development methodology provides methods, approaches, framework, guidelines and/or procedures in order to develop a new system. Improving the system means that the development methodology provides methods, approaches, and/or procedures in order to enhance the process and/or procedure of the system, or recommend a guideline or framework to handle the detected problems.

Among the traditional Information Systems development methodologies, SDLC, SSADM, JSD, and Multiview2 can be categorised as the development methodology for building the system. However, there is not a clear and distinct answer regarding whether or not SSM and ETHICS can be viewed as improving the system because the processes which recommended in the development methodologies also can be considered as a category for building the system,

which was proposed in different approach. Multiview2 framework and JSD, however, does not cover all stages as found in SDLC and SSADM. More information on the scope of the development methodology will be further discussed in a later section.

Among Web-based system development methodologies, all development methodologies, i.e., RMM, OOHDM, WSDM, Lowe-Hall's Approach, Takahashi-Liang's method, Howcroft-Carroll's methodology, IDM, WISDM, and ICDM, are considered as building the system category.

- **Domain**

Avison and Fitzgerald (2003a) separate the domain of philosophy by regarding the particular interest: seeking to identify the business or organisational need of the Information Systems, addressing general planning, organisation, and strategy of information and systems in the organisation, and solving a specific, pre-identified problem.

Among the traditional Information Systems development methodologies, SSM is more unique than other methodologies. Regarding to the comments by Avison and Fitzgerald (2003a), SSM, can be categorised as the methodology for planning, organisation, and strategy type, where as SDLC, SSADM, JSD and ETHICS can be classified as specific problem-solving methodologies because they specify a particular problem. In addition to the methodology for planning, organisation, and strategy, Mutiview2 framework can also be identified in this group because it focuses on wider aspect of problem-solving in both the technical issue and organisation.

Among Web-based system development methodologies, RMM, OOHDM, WSDM, Lowe-Hall's Approach, Takahashi-Liang's method, Howcroft-Carroll's methodology, and IDM are categorised as specific problem-solving methodologies. In contrast, WISDM and ICDM are more than problem-solving methodologies because they provide a planning procedure from both organisation and technical perspectives. However, ICDM pays little attention to explaining the details of the user interface design although they are concerned that it is a very important part of the development of a Web-based system;

whereas WISDM identify the user interface (human-computer interface) as a designing stage.

- **Target**

  It is very difficult task to identify the various targets of the development methodology since most methodologies claim to be used for a general purpose (Avison and Fitzgerald 2003a). Avison and Fitzgerald (2003a) mentioned that the size of an organisation, which methodology addresses is an important aspect for comparison. This research will additionally focus on the size of the project to increase the dimension of the comparison of the methodologies.

  Among the traditional Information Systems development methodologies, most methodologies can handle from small to large sized of projects because they are designed to support large organisations that have a capability to afford the development and implementation cost of an Information Systems a in booming period of computer-based Information Systems. Multiview2 is a framework that was just being introduced to the Information Systems area in the late 1990s which the size of most organisations where Information Systems development is still being active are small and medium enterprises. This makes Multiview2 to be designed to support small organisations (Avison and Fitzgerald 2003a).

  Previously, most hypermedia development methodologies, i.e., RMM and OOHDM, could be adopted for supporting small to medium sized Web projects. Recently, the authors of these methodologies claim that they can support the large and complex projects since the methodologies have been enhanced. Additionally, WISDM and ICDM can be adopted to use in medium and large projects regardless of the multiple perspectives that allow developers to understand the situation of the project, people, and organisation. However, the approach to the WISDM and ICDM view is quite different when compare to the majority of the development methodologies, which only focuses on system building.

9.6.2.2 Scope

In the framework of Avison and Fitzgerald (2003a), there are a number of stages which taken from the conventional set of development life cycle. There are strategy,

feasibility, analysis, logical design, physical design, programming, testing, implementation, evaluation, and maintenance.

Avison and Fitzgerald (2003a) explained briefly about the definition of each stage as follows. Strategy addresses wider aspect of the system development by including an organisation wide context, overall Information Systems methodology, and planning. There are feasibility concerns about the economic, social, and technical evaluation of the system. Analysis involves user requirements analysis. Logical design describes the processes and functions of overall system. Physical design described how the process works and which tools will be operated. Programming explains the physical development of the system. Testing involves planning and testing the systems, program and procedures. Implementation includes planning and implementation of technical, social, and organisational aspects. Evaluation and review focuses on measuring and evaluating the implemented system. Finally, there are maintenance concerns about improvement of the methodology.

Please see print copy for Table 9-1

Table 9-1 Adapted from Avison and Fitzgerald (2003a p.568)
(* these methodologies are summarised by Avison and Fitzgerald (2003a))

By describing with this approach, it is uncomplicated to understand because most current developers are already familiar with the steps of the life cycle approach. In

contrast, it may misrepresent some methodologies which are not designed to follow the traditional structure of the life cycle system (Avison and Fitzgerald 2003a).

Although each methodology has different aims and objectives for the system development, most of them can be placed into some section of the life-cycle. These can be summarised as displayed in Table 9-1.

The purpose of displaying Table 9-1 is to overview the focus area of the methodologies. Dark grey represents the main emphasis area of the methodology, and light grey represents the attempting area, which was mentioned in the methodology but somehow may not be fully explained. In fact, Table 9-1 only presents the particular view which is not intended to answer which one is the best methodology. Analysis on the methodology to the particular situation and criteria is needed in order to select the appropriate methodology.

In general, the development cycle of each project is based on many circumstances such as time pressure (Baskerville and Pries-Heje 2001), budget, experience of development teams, and so forth. In Web-based development, the life-cycle of the methodology is often expected to minimise the time of the development and release to the user as quickly as possible.

Among the methodologies which have been adopted for Web development, most have been adapted from hypermedia development methodology. In fact, hypermedia development aims to facilitate the developers to construct multimedia applications. Generally, multimedia is an application type which has minimal connection to business transactions. Therefore, the development of most multimedia applications is processed in a short time life-cycle.

9.6.3 Filtering the Development Methodologies through the Criteria

- **Multi-dimensionality**

  Laudon and Laudon (1998) state that an Information Systems is not only a computer system, but its also composed of an organisation, people, and technology. Accordingly, the Campus Portal is considered as part of a Web-

based Information Systems; the methodology which supports its development should cover the aspects of the organisation, people, and technology.

As it was previously discussed, most traditional Information Systems and Web-based development methodologies view problem as a one dimensional perspective, which attempts to solve the specific problems. On the other hand, SSM, Multiview2, WISDM, and ICDM address not only the technical perspective, but also include some wider aspects on the organisation and people perspective (Linden and Cybulski 2004).

- **Flexibility**

It is a difficult issue to verify and identify the flexibility of the methodology to system development. The flexibility in this research will be focused in the sense that developers should be able to select their familiar tools and adjust some procedures in order to suit the size and limitation of the projects.

Based on the literatures, it can be summarised that most methodologies for both traditional Information Systems and Web-based systems are limited in terms of fixed stages that needs to be followed. This means that most methodologies follow the step-by-step approach of the Waterfall model; this kind of approach is already recognised as a limitation of the Waterfall model.

Although some methodologies, such as IDM and ICDM, provide a feedback loop that allow the developers to go back to the previous stages. It, however, allows to go back to only a certain stage of the development.

Multiview2 and WISDM are different to other methodologies in this term because there are no step-by-step stages to be followed. This makes these methodologies have more flexibility than the others. However, it might not be suitable for inexperienced developers, who may need a procedure of the development, to follow.

In addition to flexibility, Takahashi-Liang's methodology recommends some tools, namely, WebArchitect and PilotBoat which are rarely recognised by developers. This approach drives a methodology to its limits.

- **Supporting Critical Characteristics of the Campus Portal**

In the section 9.2, personalisation and customisation, together with the user interface issue were identified as major critical characteristics of a Campus Portal. The methodology needs to support these characteristics in order to develop effective and efficient Campus Portal.

One critical missing component of most traditional development methodologies is the user interface issue, which is critical to Web-based system development. The literature shows that most methodologies were designed for traditional Information Systems development, which has already been recognised here to be different from that of Web-based systems, particularly in the area of usability. Most traditional development methodologies therefore do not fully support the interactive themes and characteristics of a Web-based system (Powell, Jones, and Cutts (1998) in Howcroft and Carroll (2000)).

On the other hand, the user-interface issue is a major focus of many Web-based development methodologies. Summarised from the literatures, there are three major themes of Web-based development that can be identified: Web site, Web application, and Web Information Systems.

Some methodologies such as RMM and OOHDM originated from hypermedia development, in particular RMM and OOHDM were enhanced to more accurately support the development of a Web-based system (see. Isakowitz, Stohr and Balasubramanian 1995, Isakowitz, Kamis and Koufaris 1998a).

Regarding these themes, it can be summarised that RMM, OOHDM, WSDM, Lowe-Hall's Approach, Takahashi-Liang's Method, Howcroft-Carroll's Methodology, and IDM are more appropriate to Web site development, whereas WISDM and ICDM are more suitable for Web application and Web Information Systems development.

However, there is a chronic lack of support for the personalisation and customisation functionality. The reason is that most traditional Information Systems methodologies were developed in the period of 1970s - 1990s when most business Information Systems and applications were widely accepted as organisational or developer-centred. Although most Web-based development methodologies claim to take a user-centred approach, the information and

content are actually released based on the decision of the providers, using their categorisation of their users and stakeholders.

9.7 Selected Development Methodology for Campus Portal Projects

It can be concluded from the discussion and analysis above that there are no supporting models that clearly focus on personalisation and customisation, which are the most critical and unique characteristics of the Campus Portal. Undoubtedly, most traditional development methodologies were developed before the Internet became popular. However, most Web development methodologies focused on the personalisation and customisation issues, except perhaps OOHDM, which talks about the personalisation issue (see Rossi, Schwabe and Guimaraes 2001).

It is deduced from the analysis here that most traditional Information Systems development methodologies fail to address critical aspect of Web-based system development, especially user interface issues, whereas most Web-based development methodologies, including OOHDM, fail to address the aspects of the organisation and people issues in order to develop effective complex Web applications and Web Information Systems for the organisation. Although the method of OODHM for handling the personalisation issue is deemed useful, OODHM is more appropriate to the development of Web-based applications than Web-based Information Systems that need to integrate the multiple dimensions of the organisation and people issues.

Based on this analysis, it appears that the most appropriate methodologies for the development of a Campus Portal are: Multiview2, WISDM and ICDM. All of these methodologies have the potential to be adapted and adopted for the development of a Campus Portal. However, none of these development methodologies offers the ability for inclusion at the design stage, or the functionality of personalisation and customisation.

In the case of the development in a Campus Portal project, a stage for the design of the personalisation and customisation characteristics needs to be appended into the development methodology. This highlights to all members of the development team that they need to critically consider the issue of personalisation and customisation throughout the development, and include this functionality in the basic design of the portal. Moreover, they need to make sure that at the implemented level the

personalisation and customisation continues to support the current usage pattern of the end-users' online activities throughout the life of the portal.

In summary, a major contribution of this research is the recommendation that a suitable Campus Portal development methodology be based on Multiview2, ICDM and WISDM. An overview of each is as follows:

- Although a Multiview2 framework is a new methodology which offers great flexibility to the Information Systems development, it, however, does not address well the user interface issues that are a critical component of the Web-based Information Systems and Campus Portal.
- ICDM provides multiple perspectives to Web-based development; however, a weak stance on user interface design is found in this methodology. Additionally, its step-by-step approach makes it somewhat inflexible for experienced developers.
- WISDM (see Figure 9-2) presents a clear consideration of user interface issues because the user interface issue under the heading 'human-computer interface' is presented as a major component of the methodology. Additionally, the methodology adopts the Multiview2 style of framework (see Figure 9-1), which does not offer a step-by-step approach to the process of development and so is more flexible than the other methodologies. However, experienced developers are needed in order to manage and develop the Web-based Information Systems using this methodology because of this.

In this important section of the chapter, the result of the selection process for the proposed development methodology particularly suitable for the Campus Portal projects has been presented, discussed and justified. Through the comparison between traditional Information Systems and Web-based system development methodologies and by applying criteria identified as particularly appropriate to the characteristics of Campus Portals, it has been concluded that WISDM is the most appropriate methodology that can be developed into the methodology for the Campus Portal. However a modification of WISDM is needed in order to support the critical criteria of the Campus Portal, as will be shown in the following section.

Please see print copy for Figure 9-1

Figure 9-1 Multiview2 (Avison et al. 1998)

Please see print copy for Figure 9-2

Figure 9-2 WISDM (Vidgen et al. 2002)

9.8 A Proposed Development Methodology for Campus Portal

Using the findings and critical analysis of the research, WISDM was selected as the basic framework, and extended with the concepts of personalisation and customisation, which have been incorporated within the design element of the framework to create the specialised Campus Portal Development Methodology (CPDM) (as shown in Figure 9-3). WISDM created by Vidgen (2002) and Vidgen et al (2002) was itself extended from the Multiview2 framework by Avison et al (1998). Although this may seem to be a minor change to the WISDM framework, it is interpreted and asserted that from the results of this study that consideration of personalisation and customisation issues is critical to the development of a Campus Portal in the same way Human-Computer Interaction is.

Please see print copy for Figure 9-3

Figure 9-3 A Campus Portal Development Methodology (CPDM)
Adapted from Vidgen (2002), Vidgen et al (2002) and Avison et al (1998)

With the CPDM, the development team should be able to develop a Campus Portal that suits the particular concepts and critical characteristics of Campus Portals. As can be noticed from the CPDM shown in Figure 9-3, the Personalisation and Customisation Design element is recommended as separated from that of Human-Computer Interaction, which focuses on the design of the user interface. In addition, the CPDM has changed slightly; the name of this element, from ‘Human-Computer Interface’ to

'Human-Computer Interaction (HCI)', which provides a broader perspective in terms of the users' activities. This is in line with the findings of the case study.

In this approach, the CPDM framework should be able to direct the development team to perform these compulsory design stages. They should thereby be able to eliminate the problems that were revealed in the case study regarding the vision of the development team on the Campus Portal.

While some may consider personalisation and customisation as a component of HCI, this research shows that this is a shallow view of the issues. In fact, only a part of the outcome of the personalisation and customisation designing process needs to be presented on the user interface. Personalisation and customisation functionality must also be considered when designing the level of integration of the information, content, and other links, which may overlap with the HCI design, online services, and so forth. In addition, the design of the personalisation and customisation in links, contents and online services also need to be considered in conjunction with the privilege and access levels.

Privilege	**Levels**	**Examples**		**Balance between Push & Pull**	
				Personalisation (Push)	***Customisation (Pull)***
High	Stakeholder Level	- Student	- Staff	High	Low
	Department Level	- Referred Faculty	- Referred Faculty		
	Group Level	- Undergraduate - Postgraduate by Coursework - Postgraduate by Research	- Academic - Administrative - Others		
Low	Personal Level	- Male, Female - Domestic Student - International Student	- Male, Female - Domestic Staff - International Staff	Low	High

Figure 9-4 Organisation Level of the Campus Portal

The Organisation levels of the Campus Portal (Figure 9-4, see section 8.6 in Chapter 8 for detail), could to be very useful when the developers want to design and organise the different levels of the personalisation and customisation. For example, if the developers

want to design the Campus Portal by starting with role-based personalisation and customisation, there are three selections available: Stakeholder level, Department level and Group level. The developers need to select the group most appropriate to the situation and organisation.

In the case of the Case University, the Group level was preferred with regard to the usage pattern of the online activities. Therefore, the level of personalisation and customisation should be designed by categorising the information, contents and links from the perspective of the Education Level, i.e., Undergraduate, Postgraduate by Coursework and Postgraduate by Research. According to Figure 9-4, the level of personalisation at the Group level should be low (have a minimum number of personalised items), but very high in customisation features (have a maximum number of customised items).

In terms of personalisation, when the end-users are logged-on to the Campus Portal, the personalised information, pre-defined contents, pre-defined links and online services, as determined by their course-coordinator (group level), the faculty (department level) and or the university (stakeholder level); these should be displayed to the users. In terms of customisation, the users should be able to choose their own authorised information channels and online services as they prefer.

As a result, the users will be able to access the most relevant information and online activities according to their need and preferred way of working. When the end-users are satisfied that the Campus Portal can support their daily activities, they will regularly come back to use the Campus Portal. As a result, maximum utilisation of the Campus Portal can be achieved to the benefit of the organisation and all stakeholders.

9.9 Summary

In this chapter, the critical characteristics of the Campus Portal, which are personalisation and customisation as well as usability, were identified and proposed as crucial to the design stage of the development methodology.

Because there are numbers of issues and criteria which influence the decision to select an appropriate methodology for Campus Portal development, this chapter has discussed and described these in addition to establishing the selection criteria in order to filter the

characteristics of the existing methodologies to meet the requirement and characteristics of Campus Portal development.

In addition, the attributes in both traditional and Web-based development methodologies, which were described in the Chapter 3, were investigated and analysed to align them with the critical characteristics of the Campus Portal. As a result, WISDM was selected as the basis of a framework and modified at the design stage of with issues of the personalisation and customisation, in addition to HCI issues. The result has been called the Campus Portal Development Methodology (CPDM).

By adapting the CPDM, the development team should be able to appropriately develop a successful third or fourth generation Campus Portal and enable its users to gain the maximum benefit from the portal to meet their usage pattern of online activities.

Chapter 10
General Discussion and Conclusion

10.1 Overview

This chapter provides a summary and discussion of the key issues associated with the results and findings of the multiple studies detailed in their respective chapters of this thesis. The contribution, limitations and future directions of the research are also presented.

10.2 What Has Been Achieved?

In the literature review conducted in Phase One of the research and presented in Chapters 2 and 3, it was apparent that there was no clear definition of Campus Portals, let alone an accepted methodology for their development. Before being able to propose a development methodology for a Campus Portal, knowledge and understanding of Campus Portal issues and concepts needed to be identified, built up and clarified. This research adopted and modified the model for accumulating knowledge and understanding, which was proposed by Carroll and Swatman (2000), to fit to the theme of this research (see Figure 1-2). By adopting this approach, a series of phased studies were undertaken to help build understanding in the area of Campus Portals.

The main objective of this research, as stated in Chapter 1, was "to compose a comprehensive and thorough development methodology for Campus Portals which will help practitioners to effectively develop a Campus Portal with regard to its critical and unique characteristics in supporting the variety of users' online activities and their preferences". To demonstrate that this has been achieved, the phases of the research are logically summarised below, together with the associated conclusion.

10.2.1 Understanding the Current Practice of the Practitioners

Following the literature reviews, this second phase of the research explored 40 higher education institution's Campus Portal sites, of varying portal generations, in five countries, Australia, New Zealand, the USA, the UK and Canada. This preliminary

study aimed to create an understanding of Campus Portal development based on a broad spectrum of the current situations and practices apparent in these already implemented Campus Portal sites. By understanding these existing situations and practices, the research questions were identified for the major phase of the research, a case study.

The results of the preliminary study indicated no standard pattern or method regarding the design, development, and implementation of the personalisation and customisation functionalities even on the third and forth generation Campus Portal sites studied.

Therefore, the findings of this phase of the study led to the following assumptions regarding two major issues. Firstly, many of the development team of the institutions did not truly understand the full range of concepts and issues of the Campus Portal development. Secondly, even when the development team did understand many of the concepts and issues, they failed to understand the importance of personalisation and customisation in regard to their users' needs in relation to their online activities.

As a result, the in-depth case study was commenced for further investigation in order to build a deeper understanding of Campus Portal issues, especially the appropriate content and methods for the design, development and implementation of a Campus Portal.

10.2.2 An In-Depth Case Study of Campus Portal Developers and End-Users' Online Activities

Guided by the results of the preliminary study, a case study was conducted in Phase Three of the research to extend the understanding on the important issues, especially those related to personalisation and customisation. It was envisaged that an in-depth study of the current practice and vision of a team of developers, together with a record of the usage pattern of end-user online activities, would do this, and could guide the selection of a suitable methodology in which to include appropriate levels of the personalisation and customisation for a Campus Portal project. The selected case for the study was a higher education institution in Australia, at which the major end-users were both Australian and International students in the overall proportions of approximately 75% and 25%, respectively. The case university offers a first-class modern educational environment, which provides students with the information

technologies and services to support their academic and personal activities while they are studying there.

Accordingly this study focused on two groups of stakeholders in the case university: a development team and the end-users. The study of the end-users had the objective to understand and reveal the usage pattern of their online activities, which could lead to an understanding of the appropriate level of personalisation and customisation that should be implemented. Additionally, the study of the development team had the objective to understand their current practice and vision of the future development of the Campus Portal. By merging the two sets of results of the case study, the findings were expanded to give a wider understanding of the issues through which problems were clearly identified.

In the analysis process of the usage patterns of the online activities, a statistical examination was used to create meaningful patterns by focusing on three perspectives: Gender (male and female), Student Category (Domestic and International students) and Educational Level (Undergraduate, Postgraduate by Coursework and Postgraduate by Research). Through an inspection of the results from all perspectives, the most significant difference in the usage pattern of overall online activities was found when viewed at the Educational Level. In fact, this perspective reflected most of the job functions and nature of study course of each student group, and these had the most influence on each person's online activities.

The finding from the development team confirmed those from the literature review that there is no clear direction in the Campus Portal development. However, there was an excellent sign that the development team, especially the leader, had a clear general commitment that they would go further to improve their current early generation portal and the next generation of Campus Portals. However, some conflicts on their vision regarding the development of a Campus Portal were also detected. The development team of the case university viewed customisation as an optional function that would make the Campus Portal look pretty. The facts on this issue based on both literature reviews and the findings from the end-users of the case study were quite different from their view.

The Campus Portal is a central system to an institution that allows the users to carry out their activities more effectively and efficiently. It can greatly enhance the

communication channel, through which the university delivers messages information and services to various sets of users. This activity can be better accomplished by using personalisation functionality. Furthermore, online activities which should only be available to a specific user group can be managed using the personalisation functionality. Because everybody has different needs, users should be able to freely select additional information channels, add their own links and so forth, using customisation functionality. Therefore, it is indicated that personalisation and customisation should be placed as the first priority of Campus Portal development, rather than viewing them as the optional functionalities.

In order to prevent misunderstanding in the concepts and issues of the Campus Portal development, especially the roles of personalisation and customisation, these should be incorporated into the design stage of the development methodology to emphasis their importance to the Campus Portal. More information on this aspect can be obtained from Chapter 8.

10.2.3 Proposing the Campus Portal Development Methodology (CPDM)

Based on the finding from the preliminary and case study, the critical final stage of the research was involved the determination of the composition of a comprehensive development methodology for Campus Portals. In addition, the need to determine an appropriate level of personalisation and customisation was also clarified from the findings of the case's Campus Portal that these should be designed based on the Educational Level perspective. This can be viewed as 'role-based' personalisation and customisation.

This study conducted a broad investigation into development methodologies as described in Chapter 3, and sought to select an existing methodology that would be suitable for Campus Portal development. The remaining study attempted to search for evidence to determine the composition of an appropriate development methodology for Campus Portal projects. According to the criteria and the important issues that were described in Chapter 9, the most appropriate development methodology for Campus Portal projects was chosen to be WISDM, as proposed by Vidgen (see Vidgen 2002, Vidgen et al. 2002). However, the WISDM needed minor modifications in order to

support the specific needs for the development of a Campus Portal, as determined in this research.

By modifying the design stage of WISDM to include personalisation and customisation the Campus Portal Development Methodology (CPDM) was proposed, as described in Chapter 9.

10.3 Contribution of the Research

This research makes a significant contribution to the area of Campus Portal development in both research and practice. After the completion of the entire research, two major direct contributions are highlighted, namely, the implications for the development teams domain in the practical development of a Campus Portal and for the researchers domain in the enhancement of the theory of portals. Additionally, one set of indirect contributions can also be highlighted relative to the implications for the strategic domain of organisations.

10.3.1 Direct Contributions

The direct contribution of this research is derived from the construction of the Campus Portal Development Methodology (CPDM). The process accumulated understanding, and created knowledge for both academic researchers and practitioners. Although the case study focused on only one university in Australia, However, numerous other academic institutions, especially the rest of Australia, New Zealand, the USA, the UK and Canada, where the environments and settings are similar to the case university, should be able to apply CPMD for developing their Campus Portals. The contribution of the research to each group can be summarised as follows.

10.3.1.1 Practitioners

This is the group that benefits most from this research. Because not all institutions have already implemented a full scale Campus Portal, development teams can be categorised into two major groups as following.

- **The Prospective Adopter**

  The prospective adopter is a group of development teams, who are yet to develop or who are currently developing and implementing an early generation of the Campus Portal. This group needs to have a better understanding of the important issues and aspects of the Campus Portal, as well as of the appropriate

direction of Campus Portal development. By following the CPDM, the development team should be able to painlessly develop the Campus Portal that adopts the major Campus Portal characteristics. Moreover, the development team may use an approach similar to that implemented in the case study to investigate the online activities of the students in their institutions to make sure that the Campus Portal and its personalisation and customisation functionalities will support the behaviour and usage pattern of their users.

- **The Current Development Team**
  The current development teams of the higher education institution, who are currently developing and implementing a third or fourth generation Campus Portal (see Chapter 2), can evaluate their current situations and settings of the organisation as to whether the findings of the research is informative to their situations. In addition, the development team may also study their users in order to make sure that the level and style of the personalisation and customisation functionalities are suitable so that their portal supports the usage pattern of their user's online activities. Thereafter, modification to their current Campus Portal can be made to make sure that the Campus Portal will return the benefits to most stakeholders in the organisations.

10.3.1.2 Academic Researchers

Although a number of the papers and articles have addressed the concept of the portal, very limited academic studies have focused on the Campus Portal and its development. Additionally, most available papers were written by the practitioners, who are from the consultant companies or software vendors. Therefore, unavoidable bias could be commonly found, and non-standardisation terms and definition used.

The background literature review revealed that most papers mentioned that the personalisation and customisation of the portal distinguishes the portal from the general Web site. However, the papers failed to address and clarify the approach for designing and implementing the appropriate level and pattern that is needed. This research offers significant contributions to the existing knowledge in the area of the portal, especially the Campus Portal by clarifying and identifying the important issues and aspects within the area of the Campus Portal and its development.

Moreover, the Campus Portal Development Methodology (CPDM) that was designed to help the practitioners to understand and develop the Campus Portal development can also be very helpful for academic researchers, especially those interested in the development of the Campus Portal, in order to extend the knowledge reported here and make the CPDM more flexible and practically useful for the practitioners' community.

10.3.2 Indirect Contribution

The results of the case study on the development team included information that the budgets and resources always place limitations on their system development projects. The findings of this research can give significant contributions to the executive members of the institutions who control budgets and resources.

When the development team understands the important issues and needs of the end-users using the result of the case study, which revealed the usage pattern of the user's online activities, they should be able to prove to institutional executives that the development of a Campus Portal should be placed as a high priority that needs to be developed and implemented to support the students' online activity in their educational and personal activities. Therefore, budgets and resources for Campus Portal projects are more likely to be granted.

10.4 Limitations of the Research

Every research has its own weakness and limitation as a perfect and complete research does not really exist (Lin 2002). There are numbers of limitations found in this research, as will now be described.

Firstly, all the stages of the Campus Portal Development Methodology (CPDM) cannot be fully described in this research because there are other important issues related to the development of the Campus Portal that needed to be clarified and identified prior to the actual construction of the development methodology. However, the important issues to the development of the Campus Portal have been identified and clarified. For the next version of the CPDM, the current one should be further evaluated and tested in future research.

Secondly, the elucidation of the user requirements from the usage pattern of online activities differed somewhat from the method recognised by many researchers and practitioners. In general practice, most researchers and practitioners gather the user

requirements using interviews, questionnaires and discussion group methods, and asking users directly what kind of needs they have of the system. The approach in this research was found to be very useful in terms of showing the visual pattern of online activity and making sense of them to determine the appropriate level of personalisation and customisation that should be designed and implemented in Campus Portal projects.

Thirdly, the scale used in the questionnaire, which was modified based on the pilot testing of the questionnaire, did not utilised the standard scale found in most studies. The one used in this research, however, gave a clearer usage pattern of the online activities from which requirements could be drawn.

Fourthly, the proposed CPDM has not been validated in terms of the development of an actual Campus Portal. However, this process should be done in the future.

Fifthly, the major respondents in this research are composed of the multicultural inhabitants. More research studies, adopting the same research approach and procedure, should be done in countries where the major end-users are the same nationality. This will help give the outcomes of the research more generalisation, reliability and validity.

Sixthly, all academic staff interviewed were considered as experience users who have been using a computer and the Internet for a long time. It was very difficult to find an inexperienced person of the academic staff who little computer literacy. However, this may have affected the findings from the academic staff.

Finally, the work and educational background, inexperience in research and personal bias of the researcher may have affected the interpretation of the results in this research. The findings may possibly have been different with another researcher with more experience and a different background.

10.5 Future Research Directions

As previously mentioned in the first chapter, there are many areas related to development methodology research (Nunamaker Jr., Chen and Purdin 1991, Wynekoop and Russo 1997), and so future research on this topic can be extended in many directions. Firstly, the CPDM definitely needs further testing, validating and refinement before it can be of significant benefit to development teams and academic researchers. Action research may be implemented for testing the CPDM in an actual situation as it is commonly used to develop and test development methodologies (see Avison and

Wood-Harper 1986, Avison and Wood-Harper 1990, Avison et al. 1996, Vidgen 2002, Vidgen et al. 2002). Secondly, the study on the other groups of end-users in other countries is suggested in order to validate and make the results more reliable. Thirdly, the end-users' satisfaction and performance after the adoption of the CPDM would also be a very interesting area of study.

It is hoped that the significant contributions of this research to the relevant body of knowledge will benefit other Information Systems and system development researchers and, most importantly, the practitioners.

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Appendix A
Students' Online Activities
Part I: General Online Activity

Email

		N/A	Up to 10 Minutes	11 to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Male	***N***	0	19	21	10	0	1	51
	%	.0%	37.3%	41.2%	19.6%	.0%	2.0%	100.0%
Female	***N***	0	15	22	11	0	3	51
	%	.0%	29.4%	43.1%	21.6%	.0%	5.9%	100.0%
Domestic	***N***	0	20	24	9	0	2	55
	%	.0%	36.4%	43.6%	16.4%	.0%	3.6%	100.0%
International	***N***	0	14	19	12	0	2	47
	%	.0%	29.8%	40.4%	25.5%	.0%	4.3%	100.0%
Undergraduate	***N***	0	25	26	11	0	2	64
	%	.0%	39.1%	40.6%	17.2%	.0%	3.1%	100.0%
Postgraduate – Coursework	***N***	0	8	11	7	0	0	26
	%	.0%	30.8%	42.3%	26.9%	.0%	.0%	100.0%
Postgraduate - Research	***N***	0	1	6	3	0	2	12
	%	.0%	8.3%	50.0%	25.0%	.0%	16.7%	100.0%

Table A-1 Email

Online Messaging Service

		N/A	Up to 10 Minutes	11 to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Male	***N***	20	8	5	6	1	11	51
	%	39.2%	15.7%	9.8%	11.8%	2.0%	21.6%	100.0%
Female	***N***	19	8	7	6	3	8	51
	%	37.3%	15.7%	13.7%	11.8%	5.9%	15.7%	100.0%
Domestic	***N***	26	8	6	1	3	11	55
	%	47.3%	14.5%	10.9%	1.8%	5.5%	20.0%	100.0%
International	***N***	13	8	6	11	1	8	47
	%	27.7%	17.0%	12.8%	23.4%	2.1%	17.0%	100.0%
Undergraduate	***N***	25	7	8	4	4	16	64
	%	39.1%	10.9%	12.5%	6.3%	6.3%	25.0%	100.0%
Postgraduate - Coursework	***N***	10	4	4	6	0	2	26
	%	38.5%	15.4%	15.4%	23.1%	.0%	7.7%	100.0%
Postgraduate - Research	***N***	4	5	0	2	0	1	12
	%	33.3%	41.7%	.0%	16.7%	.0%	8.3%	100.0%

Table A-2 Online Messaging Service

Web Board & Discussion Group

		N/A	***Up to 10 Minutes***	***11 to 30 Minutes***	***31 to 45 Minutes***	***46 Minutes to 1 Hour***	***More than 1 hour***	***Total***
Male	***N***	32	9	5	2	1	2	51
	%	62.7%	17.6%	9.8%	3.9%	2.0%	3.9%	100.0%
Female	***N***	30	11	7	2	0	1	51
	%	58.8%	21.6%	13.7%	3.9%	.0%	2.0%	100.0%
Domestic	***N***	37	9	5	2	0	2	55
	%	67.3%	16.4%	9.1%	3.6%	.0%	3.6%	100.0%
International	***N***	25	11	7	2	1	1	47
	%	53.2%	23.4%	14.9%	4.3%	2.1%	2.1%	100.0%
Undergraduate	***N***	39	11	8	4	0	2	64
	%	60.9%	17.2%	12.5%	6.3%	.0%	3.1%	100.0%
Postgraduate - Coursework	***N***	14	9	2	0	1	0	26
	%	53.8%	34.6%	7.7%	.0%	3.8%	.0%	100.0%
Postgraduate - Research	***N***	9	0	2	0	0	1	12
	%	75.0%	.0%	16.7%	.0%	.0%	8.3%	100.0%

Table A-3 Web Board & Discussion Group

Search Engine

		N/A	***Up to 10 Minutes***	***11 to 30 Minutes***	***31 to 45 Minutes***	***46 Minutes to 1 Hour***	***More than 1 hour***	***Total***
Male	***N***	3	17	14	6	6	5	51
	%	5.9%	33.3%	27.5%	11.8%	11.8%	9.8%	100.0%
Female	***N***	3	13	14	13	2	6	51
	%	5.9%	25.5%	27.5%	25.5%	3.9%	11.8%	100.0%
Domestic	***N***	5	20	16	8	4	2	55
	%	9.1%	36.4%	29.1%	14.5%	7.3%	3.6%	100.0%
International	***N***	1	10	12	11	4	9	47
	%	2.1%	21.3%	25.5%	23.4%	8.5%	19.1%	100.0%
Undergraduate	***N***	4	22	20	11	5	2	64
	%	6.3%	34.4%	31.3%	17.2%	7.8%	3.1%	100.0%
Postgraduate - Coursework	***N***	1	7	7	6	1	4	26
	%	3.8%	26.9%	26.9%	23.1%	3.8%	15.4%	100.0%
Postgraduate - Research	***N***	1	1	1	2	2	5	12
	%	8.3%	8.3%	8.3%	16.7%	16.7%	41.7%	100.0%

Table A-4 Search Engine

Online News

		N/A	*Up to 10 Minutes*	*11 to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	22	9	9	6	2	3	51
	%	43.1%	17.6%	17.6%	11.8%	3.9%	5.9%	100.0%
Female	***N***	23	12	9	4	2	1	51
	%	45.1%	23.5%	17.6%	7.8%	3.9%	2.0%	100.0%
Domestic	***N***	31	9	6	5	2	2	55
	%	56.4%	16.4%	10.9%	9.1%	3.6%	3.6%	100.0%
International	***N***	14	12	12	5	2	2	47
	%	29.8%	25.5%	25.5%	10.6%	4.3%	4.3%	100.0%
Undergraduate	***N***	32	11	11	5	4	1	64
	%	50.0%	17.2%	17.2%	7.8%	6.3%	1.6%	100.0%
Postgraduate - Coursework	***N***	8	9	4	4	0	1	26
	%	30.8%	34.6%	15.4%	15.4%	.0%	3.8%	100.0%
Postgraduate - Research	***N***	5	1	3	1	0	2	12
	%	41.7%	8.3%	25.0%	8.3%	.0%	16.7%	100.0%

Table A-5 Online News

Entertainment

		N/A	*Up to 10 Minutes*	*11 to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	17	12	5	4	3	10	51
	%	33.3%	23.5%	9.8%	7.8%	5.9%	19.6%	100.0%
Female	***N***	29	6	6	3	1	6	51
	%	56.9%	11.8%	11.8%	5.9%	2.0%	11.8%	100.0%
Domestic	***N***	27	8	6	2	2	10	55
	%	49.1%	14.5%	10.9%	3.6%	3.6%	18.2%	100.0%
International	***N***	19	10	5	5	2	6	47
	%	40.4%	21.3%	10.6%	10.6%	4.3%	12.8%	100.0%
Undergraduate	***N***	27	9	9	4	3	12	64
	%	42.2%	14.1%	14.1%	6.3%	4.7%	18.8%	100.0%
Postgraduate - Coursework	***N***	12	8	1	2	1	2	26
	%	46.2%	30.8%	3.8%	7.7%	3.8%	7.7%	100.0%
Postgraduate - Research	***N***	7	1	1	1	0	2	12
	%	58.3%	8.3%	8.3%	8.3%	.0%	16.7%	100.0%

Table A-6 Entertainment

Downloading and Evaluating Softwares

		N/A	***Up to 10 Minutes***	***11 to 30 Minutes***	***31 to 45 Minutes***	***46 Minutes to 1 Hour***	***More than 1 hour***	***Total***
Male	***N***	22	3	9	5	1	11	51
	%	43.1%	5.9%	17.6%	9.8%	2.0%	21.6%	100.0%
Female	***N***	34	6	5	2	2	2	51
	%	66.7%	11.8%	9.8%	3.9%	3.9%	3.9%	100.0%
Domestic	***N***	40	2	4	1	1	7	55
	%	72.7%	3.6%	7.3%	1.8%	1.8%	12.7%	100.0%
International	***N***	16	7	10	6	2	6	47
	%	34.0%	14.9%	21.3%	12.8%	4.3%	12.8%	100.0%
Undergraduate	***N***	41	5	8	2	0	8	64
	%	64.1%	7.8%	12.5%	3.1%	.0%	12.5%	100.0%
Postgraduate - Coursework	***N***	11	3	4	3	2	3	26
	%	42.3%	11.5%	15.4%	11.5%	7.7%	11.5%	100.0%
Postgraduate - Research	***N***	4	1	2	2	1	2	12
	%	33.3%	8.3%	16.7%	16.7%	8.3%	16.7%	100.0%

Table A-7 Downloading and Evaluating Softwares

Online Shopping

		N/A	***Up to 10 Minutes***	***11 to 30 Minutes***	***31 to 45 Minutes***	***46 Minutes to 1 Hour***	***More than 1 hour***	***Total***
Male	***N***	34	8	5	2	1	1	51
	%	66.7%	15.7%	9.8%	3.9%	2.0%	2.0%	100.0%
Female	***N***	41	5	2	2	0	1	51
	%	80.4%	9.8%	3.9%	3.9%	.0%	2.0%	100.0%
Domestic	***N***	42	4	5	2	1	1	55
	%	76.4%	7.3%	9.1%	3.6%	1.8%	1.8%	100.0%
International	***N***	33	9	2	2	0	1	47
	%	70.2%	19.1%	4.3%	4.3%	.0%	2.1%	100.0%
Undergraduate	***N***	50	3	7	2	1	1	64
	%	78.1%	4.7%	10.9%	3.1%	1.6%	1.6%	100.0%
Postgraduate - Coursework	***N***	16	8	0	1	0	1	26
	%	61.5%	30.8%	.0%	3.8%	.0%	3.8%	100.0%
Postgraduate - Research	***N***	9	2	0	1	0	1	12
	%	75.0%	16.7%	.0%	3.8%	.0%	3.8%	100.0%

Table A-8 Online Shopping

Job Searching

		N/A	*Up to 10 Minutes*	*11 to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	29	13	6	1	1	1	51
	%	56.9%	25.5%	11.8%	2.0%	2.0%	2.0%	100.0%
Female	***N***	34	8	6	2	1	0	51
	%	66.7%	15.7%	11.8%	3.9%	2.0%	.0%	100.0%
Domestic	***N***	39	7	5	2	2	0	55
	%	70.9%	12.7%	9.1%	3.6%	3.6%	.0%	100.0%
International	***N***	24	14	7	1	0	1	47
	%	51.1%	29.8%	14.9%	2.1%	.0%	2.1%	100.0%
Undergraduate	***N***	46	8	6	2	2	0	64
	%	71.9%	12.5%	9.4%	3.1%	3.1%	.0%	100.0%
Postgraduate - Coursework	***N***	9	10	5	1	0	1	26
	%	34.6%	38.5%	19.2%	3.8%	.0%	3.8%	100.0%
Postgraduate - Research	***N***	8	3	1	0	0	0	12
	%	66.7%	25.0%	8.3%	.0%	.0%	.0%	100.0%

Table A-9 Job Searching

Internet Banking

		N/A	*Up to 10 Minutes*	*11 to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	29	17	3	2	0	0	51
	%	56.9%	33.3%	5.9%	3.9%	.0%	.0%	100.0%
Female	***N***	24	18	7	2	0	0	51
	%	47.1%	35.3%	13.7%	3.9%	.0%	.0%	100.0%
Domestic	***N***	31	19	4	1	0	0	55
	%	56.4%	34.5%	7.3%	1.8%	.0%	.0%	100.0%
International	***N***	22	16	6	3	0	0	47
	%	46.8%	34.0%	12.8%	6.4%	.0%	.0%	100.0%
Undergraduate	***N***	37	20	4	3	0	0	64
	%	57.8%	31.3%	6.3%	4.7%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	37	9	5	1	0	0	26
	%	42.3%	34.6%	19.2%	2.8%	.0%	.0%	100.0%
Postgraduate - Research	***N***	5	6	1	0	0	0	12
	%	41.7%	50.0%	8.3%	.0%	.0%	.0%	100.0%

Table A-10 Internet Banking

Part II: Online Activity for Academic Purpose

To view course, subject description and outline

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	8	17	16	4	3	3	51
	%	15.7%	33.3%	31.4%	7.8%	7.8%	7.8%	100.0%
Female	***N***	6	26	14	5	0	0	51
	%	11.8%	51.0%	27.5%	9.8%	.0%	.0%	100.0%
Domestic	***N***	9	26	15	4	0	1	55
	%	16.4%	47.3%	27.3%	7.3%	.0%	1.8%	100.0%
International	***N***	5	17	15	5	3	2	47
	%	10.6%	36.2%	31.9%	10.6%	6.4%	4.3%	100.0%
Undergraduate	***N***	8	28	20	6	1	1	64
	%	12.5%	43.8%	31.3%	9.4%	1.6%	1.6%	100.0%
Postgraduate - Coursework	***N***	1	14	6	2	1	2	26
	%	3.8%	53.8%	23.1%	7.7%	3.8%	7.7%	100.0%
Postgraduate - Research	***N***	5	1	4	1	1	0	12
	%	41.7%	8.3%	33.3%	8.3%	8.3%	.0%	100.0%

Table A-11 To view course, subject description and outline

To view marks and grades for each subjects

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Male	***N***	11	24	14	2	0	0	51
	%	21.6%	47.1%	27.5%	3.9%	.0%	.0%	100.0%
Female	***N***	9	32	8	2	0	0	51
	%	17.6%	62.7%	15.7%	3.9%	.0%	.0%	100.0%
Domestic	***N***	7	36	12	0	0	0	55
	%	12.7%	65.5%	21.8%	.0%	.0%	.0%	100.0%
International	***N***	13	20	10	4	0	0	47
	%	27.7%	42.6%	21.3%	8.5%	.0%	.0%	100.0%
Undergraduate	***N***	7	37	18	2	0	0	64
	%	10.9%	57.8%	28.1%	3.1%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	5	16	3	2	0	0	26
	%	19.2%	61.5%	11.5%	7.7%	.0%	.0%	100.0%
Postgraduate - Research	***N***	8	3	1	0	0	0	12
	%	66.7%	25.0%	8.3%	.0%	.0%	.0%	100.0%

Table A-12 To view marks and grades for each subjects

To view course materials

		N/A	A Couple Time per Session	Up to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Male	***N***	4	16	23	3	2	3	51
	%	7.8%	31.4%	45.1%	5.9%	3.9%	5.9%	100.0%
Female	***N***	7	15	23	4	2	0	51
	%	13.7%	29.4%	45.1%	7.8%	3.9%	.0%	100.0%
Domestic	***N***	4	19	24	4	2	2	55
	%	7.3%	34.5%	43.6%	7.3%	3.6%	3.6%	100.0%
International	***N***	7	12	22	3	2	1	47
	%	14.9%	25.5%	46.8%	6.4%	4.3%	2.1%	100.0%
Undergraduate	***N***	2	23	30	5	2	2	64
	%	3.1%	35.9%	46.9%	7.8%	3.1%	3.1%	100.0%
Postgraduate - Coursework	***N***	3	6	12	2	2	1	26
	%	11.5%	23.1%	46.3%	7.7%	7.7%	3.8%	100.0%
Postgraduate - Research	***N***	6	2	4	0	0	0	12
	%	50.0%	16.7%	33.3%	.0%	.0%	.0%	100.0%

Table A-13 To view course materials

To use online communication tools to discuss with classmates, tutors, and lecturers

		N/A	A Couple Time per Session	Up to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Male	***N***	24	14	9	3	0	1	51
	%	47.1%	27.4%	17.6%	5.9%	.0%	2.0%	100.0%
Female	***N***	21	21	8	1	0	0	51
	%	41.2%	41.2%	15.7%	2.0%	.0%	.0%	100.0%
Domestic	***N***	28	19	5	2	0	1	55
	%	50.9%	34.5%	9.1%	3.6%	.0%	1.8%	100.0%
International	***N***	17	16	12	2	0	0	47
	%	36.2%	34.0%	25.5%	4.3%	.0%	.0%	100.0%
Undergraduate	***N***	28	25	7	3	0	1	64
	%	43.8%	39.1%	10.9%	4.7%	.0%	1.6%	100.0%
Postgraduate - Coursework	***N***	10	7	8	1	0	0	26
	%	38.5%	26.9%	30.8%	3.8%	.0%	.0%	100.0%
Postgraduate - Research	***N***	7	3	2	0	0	0	12
	%	58.3%	25.0%	16.7%	.0%	.0%	.0%	100.0%

Table A-14 To discuss with classmates, tutors, and lecturers

To submit assignments and papers

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	14	18	14	2	1	2	51
	%	27.5%	35.3%	27.5%	3.9%	2.0%	3.9%	100.0%
Females	***N***	26	16	7	2	0	0	51
	%	51.0%	31.4%	13.7%	3.9%	.0%	.0%	100.0%
Domestic	***N***	29	16	9	1	0	0	55
	%	52.7%	29.1%	16.4%	1.8%	.0%	.0%	100.0%
International	***N***	11	18	12	3	1	2	47
	%	23.4%	38.3%	25.5%	6.4%	2.1%	4.3%	100.0%
Undergraduate	***N***	28	25	7	3	0	1	64
	%	43.8%	39.1%	10.9%	4.7%	.0%	1.6%	100.0%
Postgraduate - Coursework	***N***	4	7	10	2	1	2	26
	%	15.4%	26.9%	38.5%	7.7%	3.8%	7.7%	100.0%
Postgraduate - Research	***N***	7	3	2	0	0	0	12
	%	58.3%	25.0%	16.7%	.0%	.0%	.0%	100.0%

Table A-15 To submit assignments and papers

To take quiz and exams

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	24	11	9	4	0	3	51
	%	47.1%	21.6%	17.6%	7.8%	.0%	5.9%	100.0%
Female	***N***	30	12	5	4	0	0	51
	%	58.8%	23.5%	9.8%	7.8%	.0%	.0%	100.0%
Domestic	***N***	27	14	8	5	0	1	55
	%	49.1%	25.5%	14.5%	9.1%	.0%	1.8%	100.0%
International	***N***	27	9	6	3	0	2	47
	%	57.4%	19.1%	12.8%	6.4%	.0%	4.3%	100.0%
Undergraduate	***N***	33	15	8	6	0	2	64
	%	51.6%	23.4%	12.5%	9.4%	.0%	3.1%	100.0%
Postgraduate - Coursework	***N***	12	6	5	2	0	1	26
	%	46.2%	23.1%	19.2%	7.7%	.0%	3.8%	100.0%
Postgraduate - Research	***N***	9	2	1	0	0	0	12
	%	75.0%	16.7%	8.3%	.0%	.0%	.0%	100.0%

Table A-16 To take quiz and exams

To access full-text articles and online databases

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	4	13	12	12	2	8	51
	%	7.8%	25.5%	23.5%	23.5%	3.9%	15.7%	100.0%
Females	***N***	5	12	15	7	5	7	51
	%	9.8%	23.5%	29.4%	13.7%	9.8%	13.7%	100.0%
Domestic	***N***	4	17	13	11	4	6	55
	%	7.3%	30.9%	23.6%	20.0%	7.3%	10.9%	100.0%
International	***N***	5	8	14	8	3	9	47
	%	10.6%	17.0%	29.8%	17.0%	6.4%	19.1%	100.0%
Undergraduate	***N***	4	20	14	13	5	8	64
	%	6.3%	31.3%	21.9%	20.3%	7.8%	12.5%	100.0%
Postgraduate - Coursework	***N***	4	5	9	4	1	3	26
	%	15.4%	19.2%	34.6%	15.4%	3.8%	11.5%	100.0%
Postgraduate - Research	***N***	1	0	4	2	1	4	12
	%	8.3%	.0%	33.3%	16.7%	8.3%	33.3%	100.0%

Table A-17 To access full-text articles and online databases

To access to library catalogue

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	7	14	14	7	3	6	51
	%	13.7%	27.5%	27.5%	13.7%	5.9%	11.8%	100.0%
Females	***N***	4	13	17	10	3	4	51
	%	7.8%	25.5%	33.3%	19.6%	5.9%	7.8%	100.0%
Domestic	***N***	6	17	18	10	1	3	55
	%	10.9%	30.9%	32.7%	18.2%	1.8%	5.5%	100.0%
International	***N***	5	10	13	7	5	7	47
	%	10.6%	21.3%	27.7%	14.9%	10.6%	14.9%	100.0%
Undergraduate	***N***	8	17	22	12	2	3	64
	%	12.5%	26.6%	34.4%	18.8%	3.1%	4.7%	100.0%
Postgraduate - Coursework	***N***	3	8	8	2	2	3	26
	%	11.5%	30.8%	30.8%	7.7%	7.7%	11.5%	100.0%
Postgraduate - Research	***N***	0	2	1	3	2	4	12
	%	.0%	16.7%	8.3%	25.0%	16.7%	33.3%	100.0%

Table A-18 To access to library catalogue

To hold books in library

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	21	22	6	1	0	1	51
	%	41.2%	43.1%	11.8%	2.0%	.0%	2.0%	100.0%
Females	***N***	16	25	8	2	0	0	51
	%	31.4%	49.0%	15.7%	3.9%	.0%	.0%	100.0%
Domestic	***N***	24	28	3	0	0	0	55
	%	43.6%	50.9%	5.5%	.0%	.0%	.0%	100.0%
International	***N***	13	19	11	3	0	1	47
	%	27.7%	40.4%	23.4%	6.4%	.0%	2.1%	100.0%
Undergraduate	***N***	28	29	6	1	0	0	64
	%	43.8%	45.3%	9.4%	1.6%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	7	12	5	1	0	1	26
	%	26.9%	46.2%	19.2%	3.8%	.0%	3.8%	100.0%
Postgraduate - Research	***N***	2	6	3	1	0	0	12
	%	16.7%	50.0%	25.0%	8.3%	.0%	.0%	100.0%

Table A-19 To hold books in library

To use email to contact classmates, tutors, and lecturers

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	9	13	25	4	0	0	51
	%	17.6%	25.5%	49.0%	7.8%	.0%	.0%	100.0%
Females	***N***	6	16	19	8	0	2	51
	%	11.8%	31.4%	37.3%	15.7%	.0%	3.9%	100.0%
Domestic	***N***	9	16	20	8	0	2	55
	%	16.4%	29.1%	36.4%	14.5%	.0%	3.6%	100.0%
International	***N***	6	13	24	4	0	0	47
	%	12.8%	27.7%	51.1%	8.5%	.0%	.0%	100.0%
Undergraduate	***N***	9	20	23	10	0	2	64
	%	14.1%	31.3%	35.9%	15.6%	.0%	3.1%	100.0%
Postgraduate - Coursework	***N***	5	7	14	0	0	0	26
	%	19.2%	26.9%	53.8%	.0%	.0%	.0%	100.0%
Postgraduate - Research	***N***	1	2	7	2	0	0	12
	%	8.3%	16.7%	58.3%	16.7%	.0%	.0%	100.0%

Table A-20 To use email to contact classmates, tutors, and lecturers

To conduct research

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	12	9	6	11	3	10	51
	%	23.5%	17.6%	11.8%	21.6%	5.9%	19.6%	100.0%
Females	***N***	12	8	8	9	4	10	51
	%	23.5%	15.7%	15.7%	17.6%	7.8%	19.6%	100.0%
Domestic	***N***	11	10	9	8	4	13	55
	%	20.0%	18.2%	16.4%	14.5%	7.3%	23.6%	100.0%
International	***N***	13	7	5	12	3	7	47
	%	27.7%	14.9%	10.6%	25.5%	6.4%	14.9%	100.0%
Undergraduate	***N***	13	12	10	10	5	14	64
	%	20.3%	18.8%	15.6%	15.6%	7.8%	21.9%	100.0%
Postgraduate - Coursework	***N***	9	4	2	7	1	3	26
	%	34.6%	15.4%	7.7%	26.9%	3.8%	11.5%	100.0%
Postgraduate - Research	***N***	2	1	2	3	1	3	12
	%	16.7%	8.3%	16.7%	25.0%	8.3%	25.0%	100.0%

Table A-21 To conduct research

To view exam timetable

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	9	31	10	0	1	0	51
	%	17.6%	60.8%	19.6%	.0%	2.0%	.0%	100.0%
Females	***N***	15	28	6	1	0	1	51
	%	29.4%	54.9%	11.8%	2.0%	.0%	2.0%	100.0%
Domestic	***N***	11	37	6	0	0	1	55
	%	20.0%	67.3%	10.9%	.0%	.0%	1.8%	100.0%
International	***N***	13	22	10	1	1	0	47
	%	27.7%	46.8%	21.3%	2.1%	2.1%	.0%	100.0%
Undergraduate	***N***	11	42	10	0	0	1	64
	%	17.2%	65.6%	15.6%	.0%	.0%	1.6%	100.0%
Postgraduate - Coursework	***N***	5	15	4	1	1	0	26
	%	19.2%	57.7%	15.4%	3.8%	3.8%	.0%	100.0%
Postgraduate - Research	***N***	8	2	2	0	0	0	12
	%	66.7%	16.7%	16.7%	.0%	.0%	.0%	100.0%

Table A-22 To view exam timetable

Part III: Online Activity for Administrative Purpose

To view and/or update personal information

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	9	32	9	1	0	0	51
	%	17.6%	62.7%	17.6%	2.0%	.0%	.0%	100.0%
Females	***N***	18	27	6	0	0	0	51
	%	35.3%	52.9%	11.8%	.0%	.0%	.0%	100.0%
Domestic	***N***	19	34	2	0	0	0	55
	%	34.5%	61.8%	3.7%	.0%	.0%	.0%	100.0%
International	***N***	8	25	13	1	0	0	47
	%	17.0%	53.2%	27.7%	2.1%	.0%	.0%	100.0%
Undergraduate	***N***	19	36	9	0	0	0	64
	%	29.7%	56.3%	14.1%	.0%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	6	16	3	1	0	0	26
	%	23.1%	61.5%	11.5%	3.8%	.0%	.0%	100.0%
Postgraduate - Research	***N***	2	7	3	0	0	0	12
	%	16.7%	58.3%	25.0%	.0%	.0%	.0%	100.0%

Table A-23 To view and update personal information

To enroll or withdraw subjects

		N/A	*A Couple Time per Session*	*Up to 30 Minutes*	*31 to 45 Minutes*	*46 Minutes to 1 Hour*	*More than 1 hour*	*Total*
Males	***N***	7	34	7	3	0	0	51
	%	13.7%	66.7%	13.7%	5.9%	.0%	.0%	100.0%
Females	***N***	7	34	7	3	0	0	51
	%	21.6%	60.8%	15.7%	2.0%	.0%	.0%	100.0%
Domestics	***N***	10	41	3	1	0	0	55
	%	18.2%	74.5%	5.5%	1.8%	.0%	.0%	100.0%
International	***N***	8	24	12	3	0	0	47
	%	17.0%	51.1%	25.5%	6.4%	.0%	.0%	100.0%
Undergraduate	***N***	8	45	6	4	0	0	64
	%	12.5%	71.9%	9.4%	6.3%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	2	16	8	0	0	0	26
	%	7.7%	61.5%	30.8%	.0%	.0%	.0%	100.0%
Postgraduate - Research	***N***	8	3	1	0	0	0	12
	%	66.7%	25.0%	8.3%	.0%	.0%	.0%	100.0%

Table A-24 To enroll or withdraw subjects

To view financial issues

		N/A	A Couple Time per Session	Up to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Males	***N***	22	25	4	0	0	0	51
	%	43.1%	49.0%	7.8%	.0%	.0%	.0%	100.0%
Females	***N***	30	18	2	1	0	0	51
	%	58.8%	35.3%	3.9%	2.0%	.0%	.0%	100.0%
Domestic	***N***	31	24	0	0	0	0	55
	%	56.4%	43.6%	.0%	.0%	.0%	.0%	100.0%
International	***N***	21	19	6	1	0	0	47
	%	44.7%	40.4%	12.8%	2.1%	.0%	.0%	100.0%
Undergraduate	***N***	33	30	1	0	0	0	64
	%	51.6%	46.9%	1.6%	.0%	.0%	.0%	100.0%
Postgraduate - Coursework	***N***	11	10	4	1	0	0	26
	%	42.3%	38.5%	15.4%	3.8%	.0%	.0%	100.0%
Postgraduate - Research	***N***	8	3	1	0	0	0	12
	%	66.7%	25.0%	8.3%	.0%	.0%	.0%	100.0%

Table A-25 To view financial issues

Appendix B
Questionnaire

Questionnaire

Please take your time to complete this questionnaire. For most questions there are no right or wrong answers. Your information and activities while using computer and Internet are very important for this study. Please note that all the questionnaires will remain anonymous and all the data collected will be securely kept by the researchers. However, your name and email address will be asked for personal contact if there is incomplete information in essential parts.

Instructions

There are a variety of types of answer, examples shown as below. Please answer every question.

Example 1

What is your undergraduate education background?
……*Commerce*……

Example 2

What is your gender?

1. ☐ Male 2. ☑ Female

Example 3

What kind of computer do you have?
(tick all boxes that apply)

1. ☑ PC / McIntosh
2. ☑ Notebook / iBook
3. ☐ Palm / PocketPC
4. ☑ TabletPC
5. ☐ Other_____

Example 4

How many hours do you spend a day using a computer? (Please circle relevant number)

	1 hour	2 hours	3 hours	4 hours	5 hours or more
At home	1	2	(3)	4	5

Part I: Personal Information

1.1 Family Name…….
1.2 Given Name……..…..……..
1.3 Email Address.....……..
1.4 What is your gender?

1. ☐ Male 2. ☐ Female

1.5 Are you domestic or international student?

1. ☐ A Domestic Student

How can you describe yourself? (√ Tick one choice only)

A. ☐ Australian native. I'm an Australian Citizen by birth and mainly living in Australia since then. *Both of my parents* are native Australian / British / American / Canadian / New Zealander / or other country (Please specify…….) in which English is the official primary language.

B. ☐ Australian native. I'm an Australian Citizen by birth and mainly living in Australia since then. *One of my parents* (☐ father or ☐ mother) is from a country in which English is not the official primary language. Please specify……

C. ☐ Australian native. I'm an Australian Citizen by birth and mainly living in Australia since then. *Both of parents* are from a country in which English is not the official primary language.
Please specify……

D. ☐ I'm an Australian Citizen by applying to Australia's Department of Immigration & Multicultural & Indigenous Affairs.
How long have you been living in Australia? _____Years.
Where are you originally from? ……
What is the language that you mostly use at home? ……
Where are your parents originally from? .....
Are your parents living in Australia?

1. ☐ Yes
2. ☐ No, please specify the country…….

E. ☐ I'm a permanent resident of Australia.
How long have you been living in Australia? ……..Years.
Where are you originally from? ……
What is the language that you mostly use at home? ……
Where are your parents originally from? .....
Are your parents living in Australia?

1. ☐ Yes
2. ☐ No, please specify the country……

2. ☐ International Student

What is your country of residence?
…….. (i.e. Thailand, China, Japan, etc)
How long have you been living in Australia? ……Years.
Are your parents originally from a country other than your country of residence?

1. ☐ Yes, please specify the country……
2. ☐ No

What is the language that you mostly use at home? ……

Do you have an education background in a country where English is the official primary language?

1. ☐ Yes, which level of education?.....
   How long did you take the course? .....
   Which country? …….
2. ☐ No

1.6 How old are you?

1. ☐ Less than 18
2. ☐ 18 – 22
3. ☐ 23 – 27
4. ☐ 28 – 32
5. ☐ More than 32

1.7 What are you studying?

1. ☐ Undergraduate
2. ☐ Postgraduate – Coursework

What is your undergraduate education background?

……

3. ☐ Postgraduate – Research

What is your undergraduate education background?

……

1.8 What is your student status?

1. ☐ Full Time
2. ☐ Part Time

1.9 What year are you in?

1. ☐ 1st Year
2. ☐ 2nd Year
3. ☐ 3rd Year
4. ☐ 4th Year

1.10 In which faculty are you current enrolled?

1. ☐ Art
2. ☐ Commerce
3. ☐ Creative Arts
4. ☐ Education
5. ☐ Engineering
6. ☐ Health & Behavioural Sciences
7. ☐ Informatics
8. ☐ Law
9. ☐ Science

1.11 Do you have work experiences?

1. ☐ Yes, please specify the your job description
……
How long did you work? ……..

2. ☐ No

Part II: Computer and Internet Usage

2.1 How long have you been using a computer?

1. ☐ 1 year or less
2. ☐ 2 years
3. ☐ 3 years
4. ☐ 4 years
5. ☐ 5 years or more

2.2 Do you have a personal computer at home?

1. ☐ Yes

What kind of computer do you have? (Tick all boxes that apply)

1. ☐ PC / McIntosh
2. ☐ Notebook / iBook
3. ☐ Palm / PocketPC
4. ☐ TabletPC
5. ☐ Other_____

What kind of operating system do you mostly use and are familiar with? (Tick all boxes that apply)

1. ☐ Windows Platform
2. ☐ McIntosh Platform
3. ☐ Linux and Unix Platform

2. ☐ No

Do you plan to buy one?

1. ☐ No
2. ☐ Yes. When?
   A. ☐ Within 3 months
   B. ☐ Within 6 months
   C. ☐ Within 9 months
   D. ☐ Within 12 months
   E. ☐ Over 12 months

2.3 How many hours do you spend a day using a computer?
(Circle the number that applies for each topic)

	N/A	1 hour	2 hours	3 hours	4 hours	5 hours or more
At home	0	1	2	3	4	5
At university	0	1	2	3	4	5
At work	0	1	2	3	4	5
At public Internet service places i.e. Internet Café	0	1	2	3	4	5

2.4 On what kind of activities do you spend time when using a computer?
(Circle the number that applies for each topic)

	N/A	1 hour	2 hours	3 hours	4 hours	5 hours or more
Studying (i.e. writing thesis, essay, using the Internet for studying, etc)	0	1	2	3	4	5
Working (i.e. business transactions and functions)	0	1	2	3	4	5
Leisure and accessing to the Internet (i.e. exploring website, reading online news, and chatting with friends, etc)	0	1	2	3	4	5
Entertaining (i.e. playing music, movies, games, etc)	0	1	2	3	4	5
Others if any, please specify …… ……..	0	1	2	3	4	5

2.5 Do you have an Internet connection?

1. ☐ Yes

What kind of connection? (Tick all boxes that apply)

1.☐ Dial-up

Do you have a plan to upgrade to Broadband?

1.____ Yes 2.____ No

2.☐ Broadband (i.e. ADSL, Cable)

Which Internet browser do you often use? (Tick all boxes that apply)

1.☐Microsoft Internet Explorer

2.☐ Netscape

3.☐ Opera

4.☐ Other_____

2. ☐ No

Do you plan to buy one?

1. ☐ No

2. ☐ Yes. When?

A. ☐ Within 3 months

B. ☐ Within 6 months

C. ☐ Within 9 months

D. ☐ Within 12 months

E. ☐ Over 12 months

What kind of connection would you prefer to buy?

1.☐ Dial-up

2.☐ Broadband (i.e. ADSL, Cable)

2.6 How many hours a day do you access the Internet?
(Circle the number that applies for each topic)

	N/A	1 hour	2 hours	3 hours	4 hours	5 hours or more
At home	0	1	2	3	4	5
At university	0	1	2	3	4	5
At office	0	1	2	3	4	5
At public Internet service places i.e. Internet Café	0	1	2	3	4	5

2.7 How long have you been using the Internet?

1. ☐ 1 year or less
2. ☐ 2 years
3. ☐ 3 years
4. ☐ 4 years
5. ☐ 5 years or more

2.8 Is the Internet necessary for your education?
Please comments.

……
……
……
……
……
……
……
……

Part III: Online Activities

3.1 How much time do you spend a day on each of the following activities when using the Internet?
(Circle the number that applies for each topic)

	N/A	Up to 10 minutes	11 to 30 minutes	31 to 45 minutes	46 minutes to 1 hour	More than 1 hour
Email i.e. campus email, public/private emails	0	1	2	3	4	5
Instant Messaging Service i.e. MSN messenger, Yahoo Messenger, ICQ, etc	0	1	2	3	4	5
Discussion Group	0	1	2	3	4	5
Search engines i.e. Yahoo.com, Google.com	0	1	2	3	4	5
Online Newspaper i.e. CNN.com, news.com.au, etc	0	1	2	3	4	5
Entertainment i.e. online games, watch movie trailer, listen to music and radio, etc	0	1	2	3	4	5
Downloading / evaluating new software	0	1	2	3	4	5
Shopping i.e. Amazon.com, eBay.com, etc	0	1	2	3	4	5
Job searching	0	1	2	3	4	5
Internet Banking	0	1	2	3	4	5
Others if any, please specify	0	1	2	3	4	5

…… ……..						

3.2 How much time do you spend a day on each of the following activities when using the ***Online Services*** for ***academic purposes***?
(Circle the number that applies for each topic)

	N/A	A couple time per session	up to 30 minutes	31 to 45 minutes	46 minutes to 1 hour	More than 1 hour
To view course/subject description and outline	0	1	2	3	4	5
To view marks and grades for each subject	0	1	2	3	4	5
To view course materials	0	1	2	3	4	5
To use online communication tools to discuss with classmates, tutors, and lecturers	0	1	2	3	4	5
To submit assignments and papers	0	1	2	3	4	5
To take quizzes and exams	0	1	2	3	4	5
To access full-text articles and online databases	0	1	2	3	4	5
To access to library catalogue	0	1	2	3	4	5
To hold books in library	0	1	2	3	4	5
To use email to contact classmates, tutors, and lecturers	0	1	2	3	4	5
To view exam time table	0	1	2	3	4	5
Others if any, please specify …… ……..	0	1	2	3	4	5

3.3 How much time do you spend a day on each of the following activities when using the ***Online Services*** for ***administration purposes***?
(Circle the number that applies for each topic)

	N/A	A couple time per session	up to 30 minutes	31 to 45 minutes	46 minutes to 1 hour	More than 1 hour
To view and update personal information	0	1	2	3	4	5
To enrol or withdraw subjects	0	1	2	3	4	5
To view financial issues	0	1	2	3	4	5
Others if any, please specify …… ……..	0	1	2	3	4	5

3.4 What new activities would you like to be able to conduct on the campus web site in addition to currently existing ones?

……
……
……
……
…….

Thank you for your participation

Appendix C
Observation Sheet

Institution		**Institution Code**
URL		
Country		
Numbers of Students (Course)	_____ Undergraduate Students	
	_____ Postgraduate Students by Coursework	
	_____ Research Students	
Number of Students (Nationality)	_____ Domestic Students	
	_____ International Students	
Number of Staff	_____ Academic Staff	
	_____ Supporting Staff	
Comment		

Appendix D
Physical Artefacts Study Form

Institution Code	
Any sign of Campus Portal?	○ No ○ Yes, as a normal link ○ Yes, as a link with an image or in a menu zone ○ Yes, as a clear section with login
Generation of the Campus Portal	○ First Generation ○ Second and Third Generation ○ Forth Generation
Supported Users	☐ Students ☐ Staff ☐ Alumni ☐ Other_____
Domain Level of the Campus Portal	○ N/A ○ The Institution's Home Page ○ "my" Subdomain ○ Subdomain ○ Individual Domain Name
Personalisation and Customisation	○ Low Level ○ Medium Level ○ High Level
Comment	

Appendix E
Additional Documents

Due to the limitation of the thesis's length, all data collection instruments and results cannot be attached as additional appendix of the thesis. Therefore, the additional documents can be requested from the author via the following permanent contact details.

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