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A Campus Portal Development Methodology to match Stakeholder Activity

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Abstract

Although introduced less than seven years ago, a Campus Portal (CP) can be considered as an emerging technological innovation within higher education institutions. A large number have already adopted the concept and are currently implementing some type of portal to extend the services of their Web site and information systems to support the activities of institutional stakeholders, especially students. There is some literature recommending sets of characteristics and functionality for successful CPs, in particular personalisation and customisation. However there is a lack of evidence on which aspects of core attributes lead to the failure of a portal to satisfy user requirements in regard to their personalisation and customisation functionality. This paper reports the findings of a CP study and discusses the importance of personalisation and customisation as part of the core set of portal functionalities. These should therefore be considered in the process of CP design and development and be included in any proposed CP Development Methodology (CPDM).

Keywords

Campus Portal, Development Methodology, Personalisation, Customisation

INTRODUCTION

There is an imperative to determine an effective methodology for CP development within higher educational institutions. Case studies of higher education institutions that have already developed and implemented a portal, indicate that an appropriate approach is to have either partial or complete in-house development e.g. (Bajec 2005; Cabacungan et al. 2002; Frazee et al. 2003; Thomas 2003). The lack of an established methodology for CP development has necessitated the need for each institution to formulate its own unique technique for portal creation . The different situation at each institution means that the set of CP characteristics and functionality varies depending upon the problems and requirements, which are unique to each institution (Thomas 2003).

In the search for a suitable methodology for CP development, this paper endeavours to focus on stakeholder activity to reveal a core set of portal characteristics and functionality aligned with user requirements. It begins with a study of academic and practitioner literatures to determine three aspects of portals:

- The general characteristics of portals and what distinguishes them from other similar artefacts such as campus web sites, intranets, etc
- The various classifications of portals and stages of portal sophistication
- Methodologies for portal development

The paper will begin with a summary of this literature followed by the findings of a case study undertaken of user activity on a university campus-wide web-based information systems that has the characteristics of second generation of a portal. A survey of students was undertaken to gather data on the use of the system as well as perception of the students of current and possible future aspects of the system. Data was also collected in the forms of interviews and documents of other stakeholders including academic, IT and administrative staff. In addition, CPs from other universities were also investigated. The results of the study are then used to investigate the position of personalisation and customisation functionality in a CP and it implication for a portal development methodology.

BACKGROUND AND LITERATURE REVIEW

This section of the paper provides a summary of the answers to four questions generally deemed important in the study of CPs:

- What is the definition and scope of a Campus Portal in this study?
- What types of portals are there and how have they matured?
- What is a definitive set of characteristics and functionalities of CPs?
- What are suitable methodologies for in-house CP development?

The idea of a portal has evolved from concepts based on Web technologies principally the Internet, Intranets and Extranets. In fact, a conceptual framework of a portal emanated from My Yahoo™ which was introduced in 1998. The term Corporate/Enterprise portal was originally introduced by two researchers from Merril Lynch, New York in 1998 (Shilakes et al. 1998). The idea of a Campus portal was initially introduced by UCLA in 1999 followed by the University of Washington and the University of Buffalo (Moskowitz 2001).

Clarification of portal terminology

For the purpose this study, this section first defines and then scopes the concept of portal to provide a standard definition of CP for this paper. The concept of *Enterprise Information Portal* (EIP) was introduced by Shilakes et al. (1998) followed by the terms *Business Portal*, *Knowledge Portal*, *Internet Portal*, *Corporate Portal*, *Enterprise Portal*, and *Information Portal* commonly used, often interchangeably with EIP (Dias 2001; Finkelstein et al. 2000). Firestone (1999; 2003) observed that theses are often defined in accord with the political or commercial interests of IT managers or vendors

In the early stage of their evolution a web portal was recognised as a search engine whose main purpose was to facilitate access to unstructured information available throughout the Internet (Dias 2001; Reynolds et al. 1999). Recognising the advantages of using a web portal as a search engine, (Shilakes et al. 1998) introduced the idea of implementing a web portal within a business environment as *Enterprise Information Systems* define as:

> *"...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 et al. 1998)".*

White (1999) agreed with this saying that a portal offers business users a simple and personalised Web interface to any information of an enterprise regardless of the location of the source. Eckerson (1999c) has a similar idea but called it a *Business Portal*. Murray (1999) extends the original definition of (Shilakes et al. (1998) into a collaborative space arguing that a portal should not only be a gateway to connect people to information, but should also provide a connection between information, people, and tools in a desktop environment. Reynolds et al. (1999) broadened the definition to give a user-centric focus

Positioning a Campus Portal

A current trend of technology adoption within an organisation is to implement a portal or prioritised it on top of the list (Kastel 2003). Higher education institutions are among the most active organisations toadopt new technologies into their educational and management systems. Most higher education institutions who already have a sophisticated traditional information system are converting to 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. However, most have misgivings concerning an adoption of a portal and the choice of its development methodology.

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), and support officers (IT, security etc).. A web-based information system for a higher education institution usually provides services to two major stakeholders: students who can be classified as the customer and primary target of organisational service, and staff who can be considered as internal users of organisational systems. By considering this viewpoint, web-based information systems that have been implemented in higher education institutions can be regarded as a type of Extranet for students and Intranet for Staff. Consequently, a Campus Portal in a higher education institution is like an Enterprise Portal in a business. A Campus Portal can therefore be defined as *a user-centric campus-wide web-based information system that incorporates all types of enterprise and third-party information, activities, and services providing its stakeholders with a secured personalised and customised single point of access regardless of location by using a standard Web browser.*

Although CP can be recognised as a type of Enterprise Portal, our study and observations show that the context of a Campus Portal can nevertheless be significant difference from an Enterprise Portal. In fact, both Enterprise and Corporate Portals are more focused on facilitating business work for the staff in an organisation. External entities such as customers are an extension of the system in the Enterprise Portal. In contrast to these types of portael, higher education institutions give priority to the customer (student) as the primary stakeholder of their organisation and attempt to provide to best service possible to this group. A CP project therefore will commence with students requirements before considering those of the remaining stakeholders within the institution.

Characteristics and Functionalities of Campus Portal

A CP offers a broad-range of applications and services (Collins 2003) that assist all stakeholders of an academic institution. A portal can play an important role in linking applications and services to meet user requirements and solve business problems. This section of the paper lists some commonly agreed characteristics that can be attributed to a portal and that distinguish a portal from a general Web site Internet or Intranet (Aneja et al. 2000). The following list is not intended to be a complete list of all possible CP characteristics as this is an area undergoing such rapid change that any definitive list would be impossible. However it results from an extensive review of the literature. (see e.g. Aneja et al. 2000; Boettcher et al. 2000; Brosche 2002; Collins 2001; Dias 2001; Eckerson 1999a; 1999c; Firestone 1999; Frazee et al. 2003; Hazra 2002; ICT_EMU 2003; Jafari 2003; Kim et al. 2002; NEC 2004; Nielsen 2003; Ramos 2002; Plumtree 2002; Raol et al. 2002Reynolds et al. 1999; Sawyer et al. 2001; Terra et al. 2003; White 1999, 2000; Wojtkowski et al. 2005)

Personalisation: According to Aneja et al. (2000), "the goal of personalisation is to deliver content relevant to an individual user or group of users based on their roles and preferences." Personalisation focuses on each individual user's needs as well as an organisation's interest. A CP should reflect the user's roles, rights, interests and specification in the organisation.

Customisation: From the software implementation viewpoint, "customization is a socio-technical activity of modifying the properties of packaged software, so that the resulting information system converges with the requirements of the target organization ((Nordheim et al. 2004), p2)." Adapting this to the user perspective, customisation is a socio-technical activity of modifying the properties of content and services, so that the resulting portal converges with the requirements of the user. In CP, customisation serves personal interests. Because everyone has different needs, each individual user should be able to select a preferred set of contents and a personal look-and-feel interface.. The classical example of customisation is a Yahoo web portal found at http://my.yahoo.com

User Centric: Most traditional Web sites have been designed from the perspective of the provider. A portal should be designed to support the user's activities and roles. However, it is unnecessary to be 100% user-based. Some information that the provider wants to inform users can also be released to the interface via push channels.

Easy to Use: A portal should be easy to use with minimal training by users with minimal experience. An overload of information or access to services on the screen is the critical matter for novice users or even experienced users as in an inconsistent interface..

Categorisation: Because of the enormous volume of information available on a portal, documents should be organised and indexed into categories and sub-categories.

Single Point Authentication and Access: A portal should allow users to have a single secure sign-on. Once users sign on their personal contents and specification should be retrieved and the system should securely pass the user name and password to other pages throughout the portal without asking for access permission again. Content, information, and functionalities that relate to a user should available on the first page of the site.

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.

Unified Presentation of Information: A portal should provide seamless integration of the enterprise information sources, both unstructured and structured information, and support document formats that currently available and in the future. However, the presentation of that information should have identical look, feel and access regardless of the original source.

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 work to like-minded groups.

Security: Security is the issue of most concern among users who log into a portal. To protect privacy, the portal should provide security to make sure that only the right user can access the account and information.

Extensibility: The development of CP is an ongoing process in which new modules can be appended into a system after implementation. Additionally, the development team are always finding new technologies which may offer a great improvement to the existing system. A portal therefore should be flexible to allow future extension of the system.

Generations of Campus Portals

Many writers recognise four generations of portal as shown in Table 1(Dias 2001; Hawking et al. 2003; Stein et al. 2005, Eckerson 1999b). Development in the first generation emphasised building portal content. A user-centric viewpoint was added in the second generation which allows users to customise their contents. In the third generation, collaborative functions are the major focus of the development. In the fourth generation, all web-based applications are completely integrated into the portal system with a role-based personalisation capable.

These general recommended generations of the portal translate into a specific CP development. Because each higher education institution are confronted with different problems and situations, each generation and its features needs to be appropriately adjusted to meet local requirements.

Table 1 Generations of Portal (Eckerson 1999b) in (Stein et al. 2005)

Generation	Descriptor	Features
First	Referential	Generic Focus Hierarchical Catalogue of Pages Pull Flow Decision Support
Second	Personalised	Personalised Focus Push and Pull Flow Customised Distribution
Third	Interactive	Application Focussed Collaborative Flow
Fourth	Specialised	Role Focussed Corporate Applications Integrated Work Flow

Campus Portal Development

There is currently no standard practice of web and portal development in most institutions. In general, a portal is a large-scale project that addresses problems within large organisations (Stein et al. 2005, Cabacungan et al. 2002, Collins 2001; Collins 2003). With any organisational IT project there are decisions to be made on whether to buy an off-the-shelf product or develop an application from scratch, and then whether to do this internally or outsource some, or all, of the development. For higher educational institutions, the budget is a very important issue in any development of a new system. CP is a large and complex system that may not presents tangible benefits to an organisation, but will return intangible benefits as a whole once it has been implemented. Moreover, most higher education institutions have already developed and implemented their traditional and web-based information systems in-house so that buying an off-the–shelf portal product is not likely to be a good solution for a higher education institution. Freeware portal development packages such as uPortal (www.uportal.org) is a possible alternative for many institutions, however there is a lack of a suitable methodology. Additionally, as the context of aCampus Portal can be significantly different from the Enterprise Portal, the methodology that might taken from an Enterprise Portal such a development package therefore might not fully be adaptable and appropriate to the context of a higher education institution.

"Software development methodologies (SDM) have been developed to assist software developers build systems that meet their clients' needs" (Gregor et al. 1999 p4). There is a debate as to whether a portal project on should be considered as a web development requiring an authoring approach or rather as an application developing process as with other organisational information systems (Ginige et al. 2001). As Vidgen (2002) states "many of the approaches to Web development have focused on the user interface and in particular the look and feel of a Web site, but have failed to address the wider aspects of Web-based information systems". Avison et al. (2003) concur with the observation that traditional IS methodologies have struggled to accommodate web-specific aspects into their methods and work practices. Vidgen (2002) goes on to say that "although web sites are characterised historically as graphically intense hypermedia systems, they have now evolved from cyber-brochures into database-driven information systems that must integrate with existing systems, such as back office applications". Portals can thus be seen as organisation systems (albeit web-based) and therefore require a mix of Web site development techniques together with traditional IS development competencies in database and program design. Figure 1 show a schematic by the authors of how an establish information systems approach, Multiview, adapted for the web through WISDM, may direct Portal development.
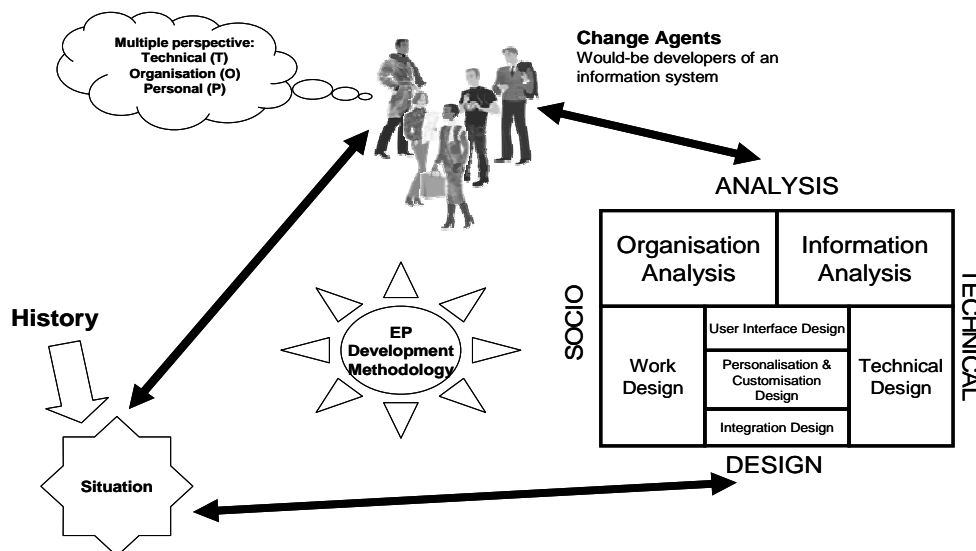
Figure 1 Campus Portal Development Methodology (CPDM) Adapted from Multiview Methodology (Avison et al. 2003; Avison et al. 1990; Avison et al. 1998) and WISDM (Vidgen 2002; Vidgen et al. 2002)

To the surprise of many, the number of successful portal projects is not large. To counter this trend we suggest from our research a broad-based approach using in-house technical development, as portal type systems are very context dependent. There are suites of tools that can assist this process as were used in the case under study. One specific aim of our study was to assess the merit of different development approaches and thereby develop a well-grounded methodology specific to campus portal development. By looking at the Intranet development model and Web-based Information Systems Development Model (WISDM), we believe the models need to be enhanced, utilised, and redesigned to be appropriate to the portal characteristics.

Although CP technology can be considered as an extension of the Internet and Intranet (Web-based information systems within an organisation), the development methodology and research in the area of the portal should be classified separately because there are a number of different issues and unique characteristics that need to be discussed.

THE CASE STUDY

Background to the Case

This study was undertaken in 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.

With reference to the discussion above the site can be considered as at an early stage of second-generation campus portal development. The IT infrastructure and services to support stakeholders activities is well organised. All computers have been wired and connected to the Internet and Intranet of the institution. Wireless technology is accessible from every building including outdoor areas of the main campus. In short its current IT infrastructure, stage of portal development and long history of its IT development, makes it suitable possible for this research on developing a new methodology for portal development. Most stakeholders have already had experience in using the Internet and the current second-generation portal for a period of time. However initial observation and a pilot study have revealed some problems regarding the hybrid approach between the student portal and general information portal deployed in last three years.

Research Methods

As mentioned previously, the primary aim of the research project was to develop and propose a framework for CP development and, in order to pursue this aim, a case study approach was chosen for the research. By identifying and reflecting on problems and user activities on an existing site, the researcher can obtain a greater understanding of a core set of portal characteristics in order to develop and propose a recommended methodology for CP development. Because CP has a wide-scale perspective of an organisation, this research will focus on a group of key stakeholders within the university.

A variety of methods mainly surveys and interviews were used to collect primary data from various stakeholders: students, teachers, management, and portal developers. Secondary data was collected from both academic and practitioner literature sources as well as a detailed inspection of the characteristics of existing campus portals accessed through the web. In this paper, we present a brief overview of the study results to allow space for the particular analysis of two core portal characteristics: personalisation and customisation. These characteristics will be proposed as particularly important within the proposed framework for CP development.

As there is a large population of students, a survey method was deemed appropriate. An instrument was developed to collect demographic data, patterns of use of the current university student system and some indication of what was thought to be the deficiencies of the current system which we categorised as a second generation portal. The questionnaire was distributed among 115 domestic and international students randomly selected to ensure a balance of gender, education background, current level of study, nationality, and computer and Internet literacy. Of the 102 valid returns there were: 50% males and 50% females. Among the male participants, there were 51% domestic and 49% international students while there were 56.9% domestic female students and 43.1% international female students. All international students were full-time students, whereas 7.3% of domestic students were part-time student. Table 2 shows the breakdown of students by course level.

Table 2 Educational levels of Respondents

	Current Educational Level			Total
	Undergraduate N = 64	PG- Coursework N = 26	PG – Research N= 12	
18 to 22	82.8%	7.7%	8.3%	54.9%
23 to 27	12.5%	57.7%	25.0%	25.5%
28 to 32	4.7%	23.1%	33.3%	12.7%
32 and above	.0%	11.5%	33.3%	6.9%

The survey focuses on the online activities of the students in three major areas:
- online activities for general purposes
- online activities for academic purposes
- online activities for administrative purposes

Each area of activities will be analysed from different perspectives within group and individual levels. Adapted from Nordheim et al. (2004), the university can be categorised into four levels that are
- stakeholder level (student, staff, faculty, etc)
- department level (discipline area)
- group level represented by educational level (undergraduate, postgraduate etc)
- individual level represented by gender, and student category (domestic and international students)

However, the scope of the study is such that it focussed on educational level, gender, and student category only. Academic and administrative staff were more difficult to involve in large numbers therefore a survey method was rejected in favour of semi-structured interviews with a small representative sample.

Research Results

The results of the student survey show a significant difference in the time spent on the online activities of students when focusing on the group level (the educational level perspective). Additionally, there is a slightly difference when making this comparison on individual level (student category and gender perspectives). This is shown in Tables 3-5.

Table 3 Email Usage

		N/A	Up to 10 Minutes	11 to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Gender	Male	.0%	37.3%	41.2%	19.6%	.0%	2.0%	100.0%
	Female	.0%	29.4%	43.1%	21.6%	.0%	5.9%	100.0%
Category	Domestic	.0%	36.4%	43.6%	16.4%	.0%	3.6%	100.0%
	International	.0%	29.8%	40.4%	25.5%	.0%	4.3%	100.0%
Educational Level	Undergraduate	.0%	39.1%	40.6%	17.2%	.0%	3.1%	100.0%
	PGCoursework	.0%	30.8%	42.3%	26.9%	.0%	.0%	100.0%
	PG Research	.0%	8.3%	50.0%	25.0%	.0%	16.7%	100.0%

Table 4 Search Engine Usage

		N/A	Up to 10 Minutes	11 to 30 Minutes	31 to 45 Minutes	46 Minutes to 1 Hour	More than 1 hour	Total
Gender	**Male**	5.9%	**33.3%**	**27.5%**	11.8%	11.8%	9.8%	100.0%
	Female	5.9%	**25.5%**	**27.5%**	**25.5%**	3.9%	11.8%	100.0%
Category	**Domestic**	9.1%	**36.4%**	**29.1%**	14.5%	7.3%	3.6%	100.0%
	International	2.1%	**21.3%**	**25.5%**	**23.4%**	8.5%	**19.1%**	100.0%
Educational Level	**Undergraduate**	6.3%	**34.4%**	**31.3%**	**17.2%**	7.8%	3.1%	100.0%
	PG Coursework	3.8%	**26.9%**	**26.9%**	**23.1%**	3.8%	15.4%	100.0%
	PGe Research	8.3%	8.3%	8.3%	**16.7%**	**16.7%**	**41.7%**	100.0%

Table 5 Usage of online databases and journals

		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
Gender	**Male**	7.8%	**25.5%**	**23.5%**	**23.5%**	3.9%	15.7%	100.0%
	Female	9.8%	**23.5%**	**29.4%**	13.7%	9.8%	13.7%	100.0%
Category	**Domestic**	7.3%	**30.9%**	**23.6%**	**20.0%**	7.3%	10.9%	100.0%
	International	10.6%	17.0%	**29.8%**	**17.0%**	6.4%	**19.1%**	100.0%
Educational Level	**Undergraduate**	6.3%	**31.3%**	**21.9%**	**20.3%**	7.8%	12.5%	100.0%
	PG Coursework	**15.4%**	**19.2%**	**34.6%**	**15.4%**	3.8%	11.5%	100.0%
	PG Research	8.3%	.0%	**33.3%**	**16.7%**	8.3%	**33.3%**	100.0%

Based on the semi-structured interview, all academic staff felt very confident in using the computer and Internet related technologies. Most of them had been using the Internet since it was introduced in early stage of the technology. Moreover, web-based educational systems such as WebCT and the Student Management Package (SMP – a web-based in-house developed application) are compulsory in order to facilitate and manage their teaching. The academic staff commented that, although many systems can effectively facilitate and help them to do the teaching work, most of systems are not linked together even when there is an obvious relationship between them. In fact, there is a double log-in needed in order to work in both WebCT and SMP.

A problem on a current version of the university web site was also mentioned. All experience lecturers explained that the user interface of the web site is really nice, having a good layout and colour, however it does not serve the needs of their daily activities. Some of them had to use search engine to find a particular page that they want and bookmark the URL on the Web browser.. Furthermore, the information and topic of the most of the hyperlinks were not relevant to their current position.

The administrative staff gave a different response. Although they have been using a computer and Internet for the same time as the academic staff, they only feel confident in using the applications that they have to work on. They gave a very interesting comment that they always use a computer and its application for their works but only for what they have been asked to do. Additionally, they do not need to change anything and will follow what they have trained to do. One administrative staff mentioned about the information on the current web site of the university that "I get used to it now, I can find what I want".

ANALYSIS AND DISCUSSION

The activities of students 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. accessing the online library databases and journals, searching for information by using a search engine, using email, and so forth.
- A one-time activity is an activity that is required to be done only once, or a couple times per session, i.e. online enrolment, online withdrawal from subjects, viewing tuition fees, changing address, and so forth.

A significant difference can be found between the time spent on ongoing activities compared to the one-time activities which are compulsory for every student. However, the services and functionalities on both kinds of

activity are developed and implemented together without regard to the different pattern of use cluttering the interface.. Users are more likely to benefit from customising the functions for the ongoing activities than the one-time compulsory ones.

Each stakeholder within an institution has many organisation levels. For example, John is an undergraduate student 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 (undergraduate), and the personal level (male and domestic student). A breakdown of features of all levels is displayed in Table 5 in respect of personalisation and customisation

- *Personalisation:* :All information and contents that are displayed on the user interface once log-on 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 that to which they have been granted access. The exception is that some information and contents regarding the higher organisational level cannot be changed.

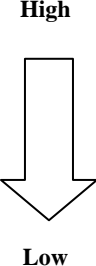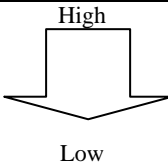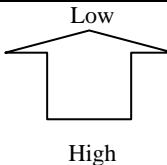**Table 6 Organisation levels of CP**

High ⬇ Low	Levels	Examples		Recommended Features
	Stakeholder Level	- Student	- Staff	Personalisation
	Department Level	- Referred Faculty	- Referred Faculty	Personalisation
	Group Level	- Undergraduate - Postgraduate by coursework - Postgraduate by research	- Academic - Administrative - Others	Personalisation
	Personal Level	- Male, Female - Domestic Student - International Student	- Male, Female - Domestic Staff - International Staff	Customisation

In order to satisfy the stakeholders within the university, both aspects of this functionality need to be implemented, ie 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. Thus the characteristics of personalisation and customisation are prominent in the methodology depicted in Figure 1.

In addition, a balance of content and information is necessary as shown in Table 7. The information and content within an institution need to be balanced between a *push* and *pull* approach (eg Sawyer et al. 2001).

- *The Push Approach:* Here, information displayed is controlled at a higher organisation level who may want to inform a users 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:* The information is not controlled by any organisation level but is available to those who have rights to it.

Table 7 Balance of push and pull approach

High ⬇ Low	Levels	Features	Balance level between push and pull approach	
			Push	**Pull**
	Stakeholder Level	Personalisation	High	Low
	Department Level	Personalisation		
	Group Level	Personalisation		
	Personal Level	Customisation	Low	High

In the real world, there are a great many social activities among students i.e. messaging tools, entertainment news, online music, online gaming, and so forth. From management's and developers' point of view these kinds of activities are considered as irrelevant and should not be included in the CP. However, it is a fact that many students spend time on these kinds of activities when they are online and if the CP does not at least provide a customised link to the relevant sites for these activities, the stakeholders, especially students, will leave the CP 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 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.

CONCLUSION, IMPLICATIONS AND FUTURE RESEARCH

The results of the study indicate that an implementation of personalisation and customisation functionality needs to be done at an early stage of portal development because they play a prominent role in satisfying user needs and facilitating key stakeholders' activities. In order to complete an implementation of the personalisation and customisation, a Content Management System (CMS) also needs to be developed and implemented to achieve the right balance between the push and pull features of the CP.

In conclusion, it is has been demonstrated that personalisation and customisation functionality should be appended as critical elements of the design phase of the CPDM depicted in Figure 1 and which is an object of ongoing research by the authors. The CPDM will provide a framework of CP development based on this research in a higher education institution that has a multicultural stakeholder environment. Although every institution faces different problems and might need different solutions, any higher education institution that has a similar environment should benefit from, and be able to apply, the framework as a guideline for CP development. Future research is needed to confirm the generalisability of the framework of CPDM.

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