

The Potential for Using Mash-Ups at a Higher Education

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Abstract: Mash-ups are Web. 2.0 applications that reuse data and services available on the web and combine them to form new applications, Mash-ups considered as recent phenomenons which are web-based applications for interactive, real-time data visualization. In this paper is the literature of the topic which identify different type of tool used in mash-up development and work done in this field, in addition to that, a comprehensive methodology and framework used in this research is included. Key successes, as well as challenges, relating to the potential and application of mash-up technology in Higher Education (HE) is highlighted as we also brought a typical mash-up architecture which is compromise of three key components. This work is a guide for both researchers and HE users for mash-ups development.

Keywords: Data mash-up, higher education, library, mash-up architecture, mash-up editor, research activities, teaching and learning, web 2.0

INTRODUCTION

Several activities have been taken place during the starting of this work till today. Some of these activities include literature reviews, contact with different personals, interviews and questionnaires, discussion with few individuals, trainings and tutorial and other relevant activities. Before we move into explaining these activities let's spend some time to define some term which found to be important in this study.

First is starting with the backbone which is the Web 2.0 where personalization and flexibility are key features. In order to explore the potential of these features for Higher Education, we took the decision to focus on the technology along the border of Web services and Web 2.0 mash-ups.

A web service define as a programmable software module that is equipped with standard interface descriptions and can be universally accessed through standard network communication protocols Zhang *et al.* (2007). The Web services technology is endowed with a comprehensive set of standards, which involves protocols, languages and frameworks. These facilitate the clear description of the functionality of a Web service, the easy location of a Web service over the Web and the creation of a new Web service from existing ones Zhang *et al.* (2007). A new Web service could, for example, be a mash-up. Many existing Web applications happen to have a Web services capability. By this we mean that the functionality inherent in the website can be used by those wishing to create a new Web service. Such Web applications offer both a traditional interface as well as a Web services interface.

For example, popular weather report websites, such as the one operated by Google, usually provide Web services interfaces. Web service developers may write code to access applications through their Web services interfaces. They can access information directly without having to navigate through Web pages. In addition, Web services developers may create new services by building a workflow comprising of multiple Web services. For example, HousingMaps.com mashes up two Web services: craigslist and Google Maps Housing Maps (2008).

The major contribution of mash-ups is that they are relatively code free, as the developers need few, or no, programming skills. They require little technical skill as compared to the web development of the past. It is sufficient to have a basic level of understanding of Web technologies like HTML, XML and Web services. Additionally, reusability is possible by incorporating web widgets into mash-up applications. Mash-ups empower the non-technical user to come up with a new application, as a solution to their problem, without requiring support from management or IT personnel in the development process Ogrinz (2009). A mash-up is considered to be a simple but useful user application which can be developed by normal Internet users, professional users and also application developers. As stated in Zang *et al.* (2008). Studies on mash-ups are divided into two themes. The first theme is Information Systems (IS). In this category, mash-up applications are developed in response to precise users' needs-usually map synthesis, enterprise information integration, or web service tracking. Identifying the relevant sources and extracting the most useful

information is the main focal point which allows the fulfilment of the IS requirement. The second theme is considered as User Programming (UP). The main goal of UP research is to facilitate “user programmers”. The users range from those who have programming skills and may write code, but are not classified as professional programmers, to those who do not use any programming techniques. Our study of this theme focuses on creating mash-ups where there is no need for coding or programming skills. Instead, users can make use of existing mash-up editors. Mash-ups have become important to HE due to the increasing number of individuals and organizations utilizing the mash-up technology Raza *et al.* (2008) and Michael (2005). There is an urgent need to come up with a development methodology and model for the mash-up process in HE and libraries.

Despite the remarkable amount of interest in mash-ups, there are only a few references proposing a proper development methodology or model for HE mash-ups. This research is therefore seeking to develop a particular methodology and model for HE mash-ups for certain types of mash-up editors (not all) and certain types of mash-up. Later in this study, we will state the type of mash-up editor that is being used.

In this research we consider numerous areas of mash-up application and their potential in HE to the summarize levels. Yet three of these were selected and are drilling down as a main in this research, while other remaining part will remain at the basic description or at summarize version of a potential of mash-up application.

Let us go through the numerous areas of mash-up application in HE one at a time, which are:

Teaching and learning: For this part we considered teaching web 2.0 Architecture student, being there a student which are considered Information Technology oriented student and web 2.0 concept trainee, it is easier to understand the concept in mash-up as it is part of web 2.0 components. We teach the student how to make or develop their own mash-up application that can use and reused data from local and remote location, the teaching is based on tutorial and limited to a well known mash-up tool, which commonly know as yahoo pipes. The student are teach how to understand the pipes environment and its modules and how to use it to produces result.

This section can be applied to any other category of the student in the campus.

Research: For the Postgraduate Students, the mash-up can be applied in a way of exploration, research, discovery, analysis and so on.

Mash-up in collection of data, remixing the data, analyzing it and generating new data from the original data. Postgraduate students can make use of mash-up to get a real time update on their area, use the mash-up for fast collection of data sample and also fast access to the regional world for his research, or easy access to the research materials.

Library: This section consist of resource organization and distribution, mash-up can make a big role here, by becoming a big services in the library and library information system.

Data integration and data organization are the things needed in the standard library, location, locating the item and clear view of the item record is the key function for a user in library, being a library, there must have availability of physical and digital items, yet the accessibility of those both physical and digital items remain the issue. How the information can be discovered by user and how to disseminate the information to the users as well. With the help of mash-up help to make used of the current system and solve all the issue of discovery and dissemination of the information.

Currently we make use of mash-up to resolved the issued faced by the UTP IRC users while searching for an online material like journals, by which the users don't have to go through each of the subscribe data base one at a time, so the user will just have to worried about the topic and make his search, directly the new mash-up application will go through all the subscribe database and result the output.

This study of the new mash-up application stated since the request by the one of the librarian staff, while was addressing the issue, we directly think it is the new era of mash-up in UTP IRC.

Admin: For the admin section, we did not go through as a result that Admin function in higher education plays a supporting function or services to the Higher Education culture not the active function.

Security: The security function is found to be not the basic function for higher education, so for this reason it is left for future work.

Problem statement: The problem that we are attempting to address is how best to make use of mash-ups in Higher Education and address what are the potential of using mash-ups at higher education institute. We need to find out which software tools are best suited for creating mash-ups. Furthermore, we need to decide which applications are appropriate for the HE environment. We need to develop mash-ups, or allow users to develop them by

teaching them or providing the with a guide and later assess their acceptability and effectiveness in disseminating of information.

Main objective: The objective of this study is to go some way towards integrating Web 2.0 mash-up technology into the teaching, learning and research activities undertaken at a university.

LITERATURE REVIEW

Mash-ups are Web.20 applications that reuse data and services available on the web and combine them to form new applications. Further, these applications are developed rapidly and in an ad-hoc fashion Peenikal (2009) and Grammel and Storey (2008).

Ogrinz (2009) gives an overview of the mash-up phenomenon and we now describe some of the issues mentioned there. What encourages mash-up development is that it is easy, quick and is regarded as an affordable application development done by reusing applications that have already been developed, tested and paid for. It makes use of the huge amount of data and services that are available over the web. The level of web platform does not really matter here since mash-ups use a basic level of web platform for the universal exchange of data and knowledge. A user can utilize an existing Application Programming Interface (API), the availability of which has facilitated the growth of mash-ups; also, users can design and implement a new API if a suitable one is not available. Mash-ups are a powerful means of accessing the almost unlimited amount of data that is available. Moreover, the growth of the tools used for building mash-up applications is impressive. They have reached a level of usability whereby normal Internet users, i.e. non technical users, can use the tools to create their own mash-up solutions.

Fig. 1 shows enterprise architecture for mash-ups. Mash-ups are capable of combining different sources of data irrespective of whether the data or service is local or remote. Web services, local or remote database files, Really Simple Syndication (RSS) feeds, platform services like Google Maps, flat files and more are the sources of data for mash-ups. Existing Web widgets are also utilized by most of the mash-up developers.

There are three categories of mash-up data source Craig (2002). The categories are as follows:

- Online data resources whose underlying data cannot be controlled by users and where access to the data requires special software available from the resource owner. For example, the data held by Bay, Flickr, Google can be accessed using the appropriate API.

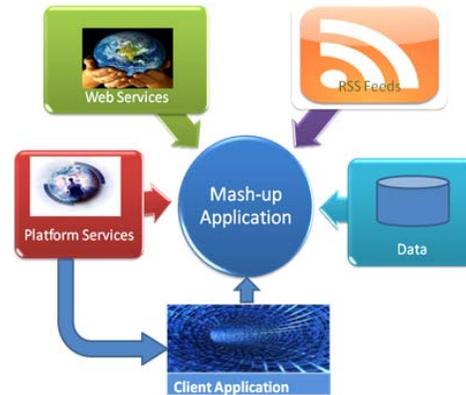


Fig. 1: Mash-ups enterprise architecture: Clarkin and Holmes (2007)

- Local and other files that belong to a user and, therefore can be controlled and accessed by the user.
- Online data resources whose underlying data cannot be controlled by users and where access to the data required is readily available. Websites and RSS feeds are examples of this data category. The data is publicly available.

Some general terms relevant to the discussion of mash-ups are 'combination' (also called 'aggregation') and 'visualization'. We can also model a mash-up as a set of layers: the data layer, the application layer and the presentation layer Craig (2002). A mash-up combines multiple data sources into a single application. The data layer is being referred to here. Visualizing the data with the aid of a User Interface (UI) can be thought of as the presentation layer. Grouping data and manipulating it, with varying functions, usually happens in the application layer which can be done using the powerful aggregation features of mash-ups. Mash-ups are applications that are situational. Mash-ups are used by the 'long tail', a place in which there is a huge amount of unmet demand. In the 'long tail' the traditional IT cost structure for an application is no longer applicable Krill (2007).

Ogrinz (2009) describes the use of mash-ups in the workplace. We summarize some of the issues it deals with. Two of the points made are as follows:

- "IT must learn more about the business associates' goals and create an environment that facilitates the rapid construction of products that they require.
- Members of the business team must participate more directly in the engineering process (either on their own or in partnership with IT), which requires some knowledge about development best practices."

This indicates clearly that mash-ups can support a high end for both sides to accomplish collaborative solutions. Generally, enterprise mash-ups have come up with the solutions for organizations to be different from the traditional system base by performing the following:

- Creating applications that users need, in two separate ways:
 - Developing applications is faster with mash-ups
 - Creating “a set of ‘mashable’ components and gives end users a sand-box environment where they can freely mix and match the pieces together themselves”.
- Organizations can come up with an environment that allows users to create and combine their own mash-ups.

“Mash-up development is a promising End User Development (EUD) application area for several reasons” Michael (2005). Web technology is considered as an essential platform which provides access to the rising number of publicly available services and allows developers to find the sophisticated services, then to develop a User Interface (UI) to which these services are joined together and presented to the user. These processes require a basic level of technical know-how in programming and are supported by tools. Demand guided by rapid, opportunistic development of situated applications, with short lifetimes, intended for small audiences are the basis for the development model. Furthermore, the web is a platform that facilitates community building and mash-up sharing. Too many different explanations of mash-ups have resulted in some confusion regarding the term ‘mash-up’ and its use Ogrinz (2009).

Nevertheless, the commonly used definition of mash-ups classifies them into two divisions: web mash-ups and enterprise mash-ups. The web mash-up comprises of only data and people, while the enterprise mash-up is designed to integrate data and people for use by a business process.

Currently many available mash-up editors are only for business purposes. It is possible to develop an application for HE by using some of the editors available even though the editors are more suitable for web mash-ups as these editors are primarily for users to develop applications and integrate data from different sources, mostly for fun. There is a clear reason for classifying mash-up editors according to their purpose and context. Grammel and Storey (2008). is an investigation of mash-up editors and we now discuss some of the issues it raises. The study classified editors into three groups. First, an editor that retrieves data from one or more data source,

Table 1: Types of mash editors

Information mash-ups	
Microsoft Popfly	http://www.popfly.com
Yahoo! Pipes	http://pipes.yahoo.com
IBM Mash-up center	http://www.ibm.com/software/info/maashup-center/
Google Mashup editor	http://editor.googlemashups.com/editor
Mash-up makers for process mash-ups	
Serena mash-up	composer http://www.serena.com/Mashups/
Mash-up makers for web site customization	
Intel MashMaker	http://mashmaker.intel.com/web/

processes the data and, lastly, publishes the result into a web feed, or widget, is classified as an Information mash-up editor. Second, an editor that automates processes by orchestrating services, forms and other resources in a workflow and often includes data entry, is classified as a Process mash-up editor. Third, a Web Site Customization editor is one that allows a user to mash-up by customizing a web page; this process includes removing elements, adding additional widgets and changing the UIs of websites. Table 1 shows examples of three types of mash-up editor.

In this study the proposed methodology for using information mash-up editors to develop mash-ups for Higher Education and libraries (educational mash-ups) is discussed and introduced.

There are a few things that we consider while working with mash-ups for higher education-things like the commonly available mash-up editors, the community of practices and other related issued. Below are shown the class categories considered during this study detailing some of the many aspects under consideration.

Yahoo pipes:

According to the Wikipedia definition of Wikipedia : Yahoo! Pipes is a web application from Yahoo! that provides a graphical user interface for building data mash-ups that aggregate web feeds, web pages and other services, creating Web-based apps from various sources and publishing those apps. The application works by enabling users "pipe" information from different sources and then set up rules for how that content should be modified (for example, filtering).

Open university: Tony (2009) writes: “OUseful.info is a blog in part about... things that I think may be useful in an higher education context, one day...” In this blog there are several examples of how to make mash-ups in Google or Yahoo! using pipes; one mash-up allows a user to retrieve information concerning his/her studies, another mash-up allows a user to map the school location.

Library lookup: The Library Lookup project started, in December 2002, as five lists of bookmarklets for libraries using these catalog systems: Innovative, Voyager, iPac, DRA and Talis. The system allows a user to create a link using a bookmarklets generator. (There are some links already available in the system.) The user can drag and drop links. Udell (2009).

Using web 2.0 mash-ups for learning in the community: This describes the use of a range of Web 2.0 mash-up technologies to support the development of a community for a newly formed Land Trust on the Isle of Lewis, in NW Scotland. The application of social networking tools in text, audio and video has several purposes: informal learning about the area to increase tourism, community interaction, 'ownership' of the Trust's website and pride in the local landscape. The content also provides background theory related to informal learning and Web 2.0 mash-up technologies and describes an innovative application of them to a sparsely populated rural community. Mason and Rennie (2007).

The community acquiring ownership of the Galson Estate coincides with the popularization of a number of social networking tools which are ideal for developing a sense of community, e.g., You Tube, podcasting, Flickr and Internet broadcasting. In this project, the aim is to 'mash-up' these applications for the purpose of presenting the community to visitors and tourists. Finally, the project builds on the fact that broadband is now available throughout the area.

Table 1 Category of Mash-up

There are three main aspects of the project:

- The initial set-up, customization and inter-linking of the new technology applications that provide the platform (the network ecology) to enable the local community to interact with visitors and tourists both past and future.
- Training of members of the local community (tourism micro-businesses, local societies involved in heritage and music etc, school children and local volunteer enthusiasts) to manipulate and input data relevant to their own subject areas. A number of 'learning-by-doing' workshops will also be run.
- Embedding the management of the various Internet applications in the community structures of Galson Estate Trust who then become responsible and capable of adding to, maintaining and interacting with the contents of the sites.

There are three development areas that the work focuses on:

- Promoting informal learning throughout the Galson Trust Estate area by utilising a combination of new technology applications to allow visitors and the local community to interact flexibly with heritage resources.
- Providing a platform for the co-ordination and display of text, audio and visual information relating to the unique heritage of the area and making these more accessible to a worldwide audience.
- Creating a high-tech, low-cost and low-maintenance ecology of proven Web 2.0 applications to enable community participation in the creation of local heritage and tourism resources that benefit consumers (potential tourists) and promote distinctive niche marketing for the area.

Description of online learning community using web 2.0:

Information and communication technology has been increasingly applied in education and driven educational institutes to improve their teaching and learning strategies in order to fit the new learning style of students. The constructivist learning theory, as one of the attempts to improve student learning outcomes, focuses on the learning environment and the learning activity. The constructivist learning theory underlines that students need to be active and gain experience from a significant learning environment. The emergence of Web 2.0 mash-ups has exposed the change in behavior of the online user. Currently, online users are likely to share their knowledge and gain acknowledgement. Wangpipatwong and Piamsakkamol (2008) focuses on studying the key characteristics of Web 2.0 and constructivist learning theory. In this work, 329 websites were examined. Based on examining the results it was shown that the Web 2.0 learning community consists of three main components which are Content Sharing, Communication and Socialization. Wangpipatwong and Piamsakkamol (2008) comments that learning theory is an abstraction whose concrete realization is the improvement of student learning outcomes; similarly Web 2.0 is an abstraction whose concrete realization for learning needs to be realized.

As we have stated, the emergence of Web 2.0 has changed online user behavior.

The development of Web 2.0 sites, such as Face book, Myspace, Wiki and other social networking sites (SNS), rapidly increased the number of virtual communities, in which online users may communicate, participate and share content Wangpipatwong and Piamsakkamol (2008) and Udell (2009).

Web 2.0 has created a revolution in the way that users not only read the content from the web pages, but

also interact with the websites and other users Wangpipatwong and Piamsakkamol (2008).

Web usage has changed from viewing content to sharing content, from reading the web to reading/writing the web. The revolution of Web 2.0 has also made an impact on education. It has been found that Web 2.0 plays an important role in any academic or pedagogical activity Wangpipatwong and Piamsakkamol (2008) and Tijerino *et al.* (2006). Ullrich *et al.* (2008) calls for a study of how to make best use of Web 2.0 in education.

METHODOLOGY

The methodology for this work is still in progress and the work is progressing. Currently we are working towards merging all the three part of methodology were each of this are based on several activities, we engaged on this during our studies. Together these are convert to form one comprehensive and complete process.

Mean while we are using Descriptive research studies that deal with collecting data and testing hypotheses or answering questions concerning the current status of the study.

Why considering the use of Hawthorne Effect?

There many advantage we consider for the selection of hawthome effect, as part of these advantage some are as follows:

- It is commonly positive or beneficial, because knowing those participants are being observed encourages people to behave or perform at a higher level of efficiency than they might otherwise.
- It helps to get the real pact on the subject matters
- It frees participant from being nervous or feeling interrogated
- It avoids over confidence for those waned to be so professional in action.

In this progress we identify five areas of HE with potential of applying mash-up application, some of these are to a summary levels, while the selected 3 are currently drilling and remain the main focus of this work.

These are three areas we are focusing on out of five which we already identify, teaching and learning, the library and research. We have identified categories of application which are suited to mash-up applications. We also developed a framework for mash-up applications for each of the three selected areas based on our scope.

Let us describe our work on the teaching and learning area. In the Information Technology programme at our university, one of the courses involves students studying

Web 2.0 architecture. Mash-ups are a Web 2.0 architectural pattern. Teaching mash-ups to the students enrolled on the Web2.0 architecture course was one of our plans, as an initial step in investigating the use of mash-ups in teaching and learning. Due to the fact that the students were majoring in IT and were studying a course on Web 2.0 architecture we expected that they would be able to easily master the production of mash-ups. That is, the students are a special case as they are IT savvy.

We spent time thinking of a way to apply mash-ups in this HE teaching and learning setting and we formulated an appropriate strategy to carry it out. Part of our strategy was to design and conduct a sequence of mash-up tutorials to this class of students. The content of the tutorials had to be decided upon. We intended to teach the students the basic and most common ways of creating mash-up applications. We planned to teach the students how to construct mash-ups by using and reusing data that is stored either locally or remotely. The sessions were to take place in the computer lab and to made use of a well-known mash-up editor, Yahoo! Pipes. Initially, the students were to be given a lecture on Yahoo! Pipes in order to convey an understanding of the Yahoo! Pipes editor environment and the modules in it; the intention was to make sure that the students became familiar with the editor environment. We planned to demonstrate to the students how to create a simple mash-up application, using the Yahoo! Pipes editor, one that produced results. In subsequent sessions they were to work their way through a list of exercises at their own pace. These involved the students being asked to make a Web search for five educational mash-ups that might be useful in an educational setting and later, to develop five mash-ups of their own. Each of the mash-ups to be developed was to have specific features. We planned to have the students work individually, this was to ensure that each student participated and was creative.

The second application area is the library. A library is a huge repository of physical and electronic resources. The integration of data and the organization of data are the key activities of a library. Metadata, such as the location of an item and details about the item are key requirements for library users. A library consists of both physical and digital items, yet the accessibility of these different types of item remains an issue in our library today. Library users need to be able to speedily locate a resource; the information describing the resource on a computer screen needs to be appropriate and the users need to be able to speedily access the resource. These aspects are concerned with resource discovery. However, there is another aspect, that of disseminating information to users, such as notifying users of the arrival of a new

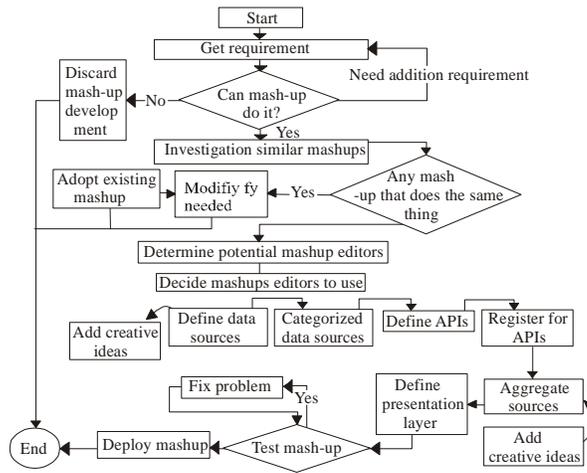


Fig. 2: Mash-up development model for HE- in library

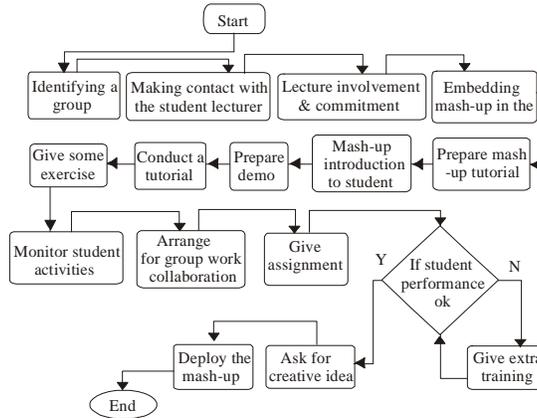


Fig. 3: Mash-up development model for HE.-in teaching & learning

book. Mash-ups have a big role to play in the library. There is considerable scope for using mash-ups to organize, distribute and integrate information on its resources. There is the possibility for mash-ups to become widespread throughout the library. We designed a simple model of how information can be discovered by the users and how information can be disseminated to users.

We planned to make use of mash-ups to resolve some of the issues faced by the Information Resource Centre (IRC) at UTP. We focused on assisting users searching for online material, such as journal papers. Prior to our work, users had to search each subscribed-to database one at a time. We planned to alleviate this problem with the aid of a mash-up that automatically searches multiple databases. Work on this mash-up application started following a request by the one of the librarians.

The third application area is research. Postgraduate students can make use of mash-ups as a way of exploring, researching, discovering, analyzing and so on. Mash-ups

are formed from collections of data. This can be remixed in different ways. Other possibilities include getting real time updates on his/her area of expertise, rapid data sample collection and rapid access to research output/developments taking place throughout the world or easy access to other research materials. Mash-ups can be a good tool for postgraduates to utilize, since he/she can create the desired mash-up application. Postgraduates can tailor-make mash-ups to their own field of research. There are a few issues that we are currently looking into. One of these is the amount of basic training, if any, that needs to be given to the researcher or the postgraduate. In respect to this, we have been focusing on one individual at a time case. The motivation of the student to participate in the experiment is also an issue. In addition there are several other issues related to the effective deployment of mash-ups.

Figure 2 is presenting the Mash-up Development model for HE-in library, Fig. 3 is presenting the Mash-up

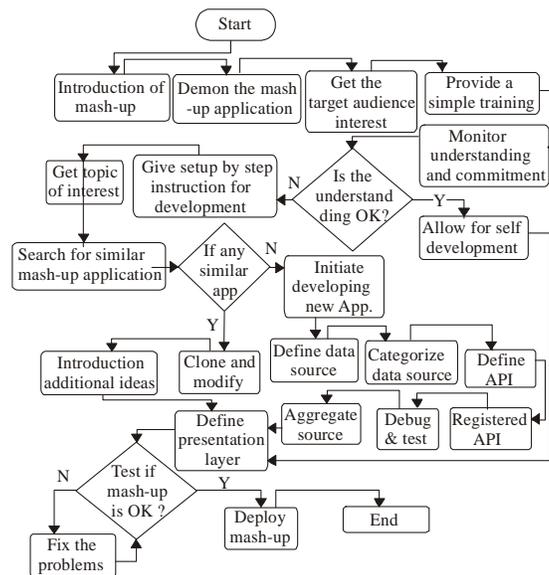


Fig. 4: Mash-up development model for HE. - in research activities

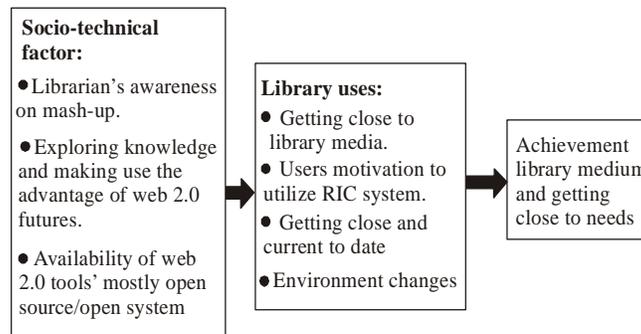


Fig. 5: Mash-up framework for HE - in library

Development model for HE-in Teaching & Learning, while Fig. 4 is presenting the Mash-up Development model for HE-in Research activities which all of these are showing the steps are in the process.

Following are the four categories of application that we have identified.

First category of applications: The first category concerns the importance for a university student to have a relatively stable set of Internet-based services that he/she can use on a daily basis. Let us look at some examples of how students make frequent usage of these services. Today's student accesses his/her email account repeatedly for course-related correspondence which comes from lecturers, instructors, or group project team members. As an example of frequent Internet usage, a student visits every course website for which he/she is enrolled. (Normally one first accesses the university's

website from which there is a hyperlink to the course management system.) A student views the latest information about his/her courses including news, lecture notes, newly published homework and projects and also the 'frequently asked questions' section. A further example of frequent Internet usage is where the student accesses the university Web site to view general university information as well as department specific information. Yet another example of frequent Internet usage is where the student accesses the university library portal to search for books. The last example of frequent Internet usage we give is accessing the Web. This occurs on a daily basis. The types of websites are too numerous to mention. In recent years social networking sites have proved to be one of the most popular.

The existing business model has issues in supporting the above business logic. Every time access is required, the students must launch every one of these websites

independently. There is a lack of a centralized portal here, where students can seamlessly access a variety of information from different sources at one place. This paper aims to highlight a proposed centralized services portal oriented to university students and library users. A main goal is to change from a situation where the services are decentralized to one where they are centralized. Another main goal is to develop a flexible platform for the portal, flexibility in the sense that it allows a user to easily personalize the interface and easily allows a user to create some new information services. A new information service can be created from existing information, but may make use of existing services. Ideally it will be easy for the user to create a new information security purposes; these will capture the admin. building, library, cafeteria and residential college. Framework on service irrespective of where the existing information, or services, resides on the Web, be it local or global.

Second category of applications:

- A web portal maintained by the university which records information that is valuable to the user, including event and related activities, global and local news. This will then be linked to a GPS-enabled system having an interactive map interface, audio, as well as images.
- Creating several Wikis allowing management and users to jointly create and edit a collection of relevant information.
- Repository and central resource will be initiated in which the student is trained to research and create content on items of significance and interest.
- This work will extend the functionality of a previous Higher Education and libraries idea to provide GPS-based information in various layouts, in addition to portable devices at outstanding learning sites in the field.

The third category of applications:

- Podcasts on Lecture topics, rules, guides, announcements, news. They could also be used for knowledge management topics, including storytelling and university songs, music and poetry. The content will include appropriate images and text on the web portal. The podcasts will contain up to date material in addition to the digitization of sound and visual archives that will simultaneously relate to the university and its library.
- Any form of radio system used in the University for reaching the student will be added to a portal and will allow the radio to be accessible from the web portal. This will also allow it to be accessible over the World Wide Web and hence outsiders will have access to it too.

The fourth category of applications:

- Maps. Google Maps will be used to customize overlays to serve as links for a number of different functions. This will be set in a portal for learning and discovery purposes. Also it could be used within the library to locate books.
- Website like Flickr is going to be used for a number of slide shows and still images, made by users and photographers. At the end it will be linked to other applications to provide illustrations in support of text and audio pieces on the web portal.
- A video broadcast site like YouTube will be used for a selected number of relevant short video pieces to highlight some of the key guides, advertisements, teaching and learning content, seminars and conferences, events and also demos. Webcams will be used to establish and run a live-feed from the portal, for knowledge discovery, management and security purposes; these will capture the admin building, library, cafeteria and residential college.

Framework: In this study we come up with the basic framework which contributes to the simplicity of applying Mash-up in the three of five areas of activities with the potential of applying Mash-up at HE as we have identified in Fig. 5

Starting with the Library system at the university which happened to be the first activity we engaged in developing a Mash-up application, here we have the socio-technical factors, library users and the output objective as shown in Fig. 4

The second activity is Teaching and Learning, this activity took the attention of the Undergraduate Student in the campus concerning Mash-up and its application, in this activity we engaged in conducting a tutorial for one group of students in the CIS department. We have seen the commitment of this class of student. With the performance of this group and other active progressive activities happening in this department, we come to the conclusion of generating a bigger idea in supporting Mash-up at HE in Teaching & Learning section. We come out with the following framework based on our knowledge and activities held in this part as presented in Fig. 6.

Figure 7 is presented as the framework for research activity. Research Activities is our third activity in this research, socio-technical factors are considered in this section, it deals with the social and technical activities and behavior that contributed in today's development of Web 2.0 features one of them is Mash-up. As presented in the Fig. 7, awareness of Mash-up supervisor will definitely contribute to this part. The PG students or the researchers will take the advantage of freely used and widely available Web 2.0 tools that will lead them close to their study.

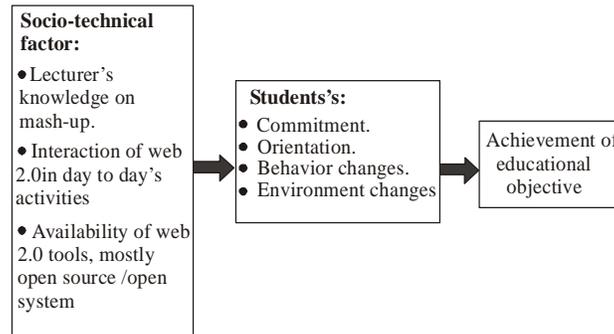


Fig. 6: Mash-up framework for HE - in teaching & learning

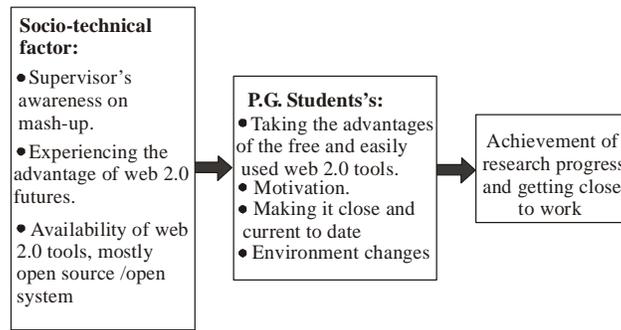


Fig. 7: Mash-up framework for HE - in research activities

RESULTS

This research is progressing to the right path as we are currently seen no contradiction result that effect in CIS department, where many undergraduate students are adopting the term Mash-up for their Final Year Project (FYP).

Some of the student we have contacted and interview them, they explain smoothly that there inspiration for adopting Mash-up is from our tutorial which is design and conducted to the web2.0 architecture class during the last semester.

Other student they are not part of this group, as they did not attend this class, but their responds is almost similar story, because they generate the idea from their friends and some from their lecturer

During the data collection, outcomes is becoming clear to ensure the uses of mash-up in HE, though we are not covering all part of HE but the three out of five which we already identify.

For the second part which is the UTP IRC mash-up development, we collected 82 questionnaires, while we are yet to analyze all the result due to awaiting result to be collected, so far from this we see there a lot of progress, yet few part of the result is presented here in this paper. For the research activity we collected so far 24 respond by interview, two of these result are group interview while

the remaining 22 responds are individual person to person interview.

Those interview which conducted as a group, the first is a group of 7 while 3 of the members are the key in the responds.

The second is the group of 6 while the team leader is the key to the all responds. We are working hard to collect more respond from the users as many challenges are associated in collecting a data from busy students.

Following our review of mash-up applications, a small number of mash-ups applications were developed by us. Eleven of these new mash-up applications were tested and in all cases the Yahoo! Pipes mash-up application editor was found to be the editor with the greatest potential for our work. We found it to be well-suited, user-friendly and a tool that we consider one would wish to adopt.

Part of this work is also the construction of a mash-up development model for HE see in Fig. 2. We recommend that development is done using the model.

As the research progresses, the potential for the use of mash-ups in HE is becoming clearer. We are, however, mainly focusing on the core activities of HE: teaching, research and the library. Presently we have drilled down into each of these areas. As regards teaching and learning, we conducted tutorials with 16 students. We found that the result were impressive, with very encouraging

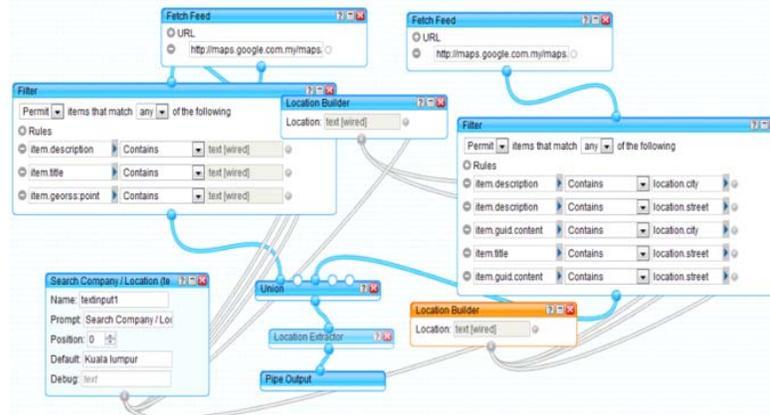


Fig. 8: Mashup engine using yahoo pipes editor

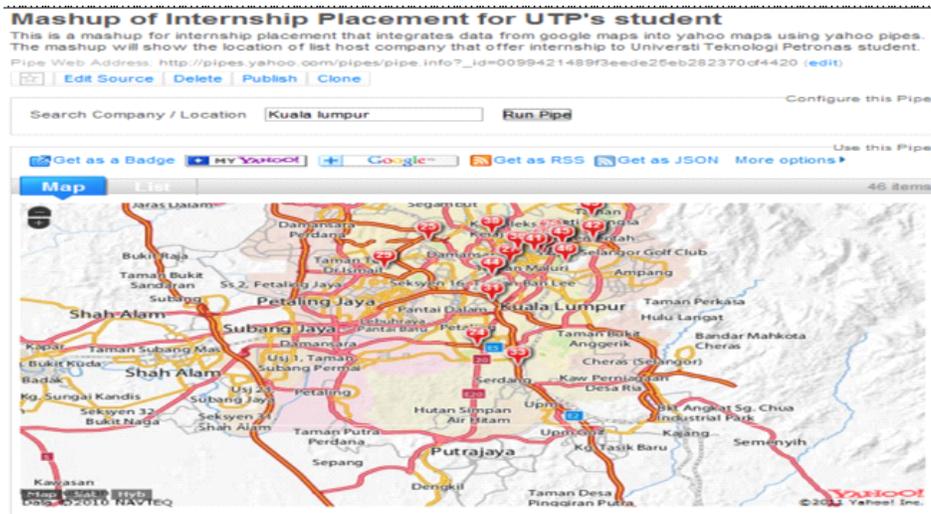


Fig. 9: Mash-up for internship placement map view

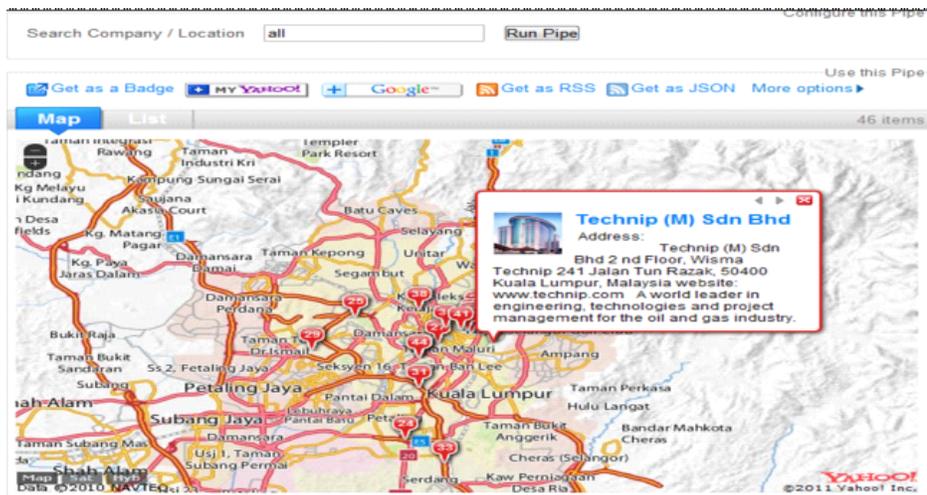


Fig. 10: Mash-up for internship placement map view with popup in the pointer

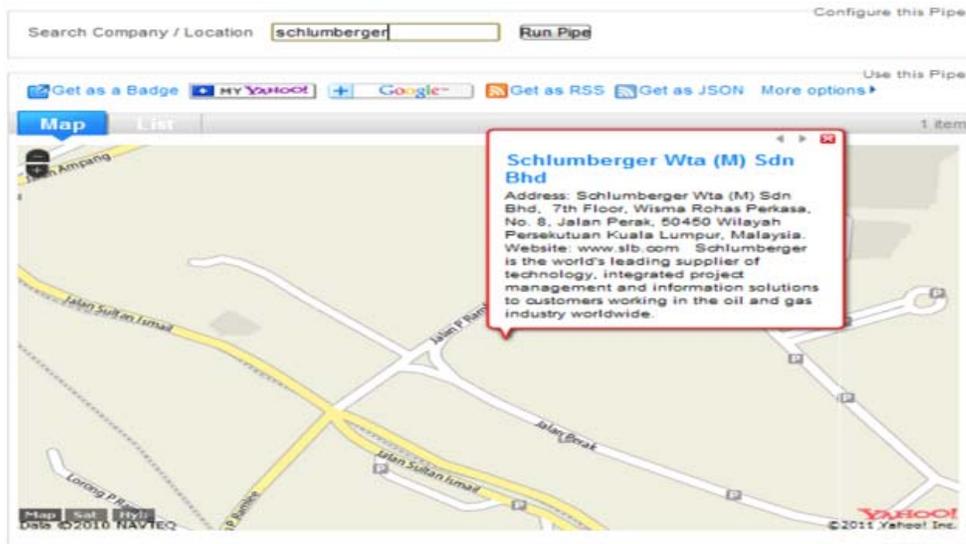


Fig. 11: Mash-up for internship placement map view using search location/title/or name

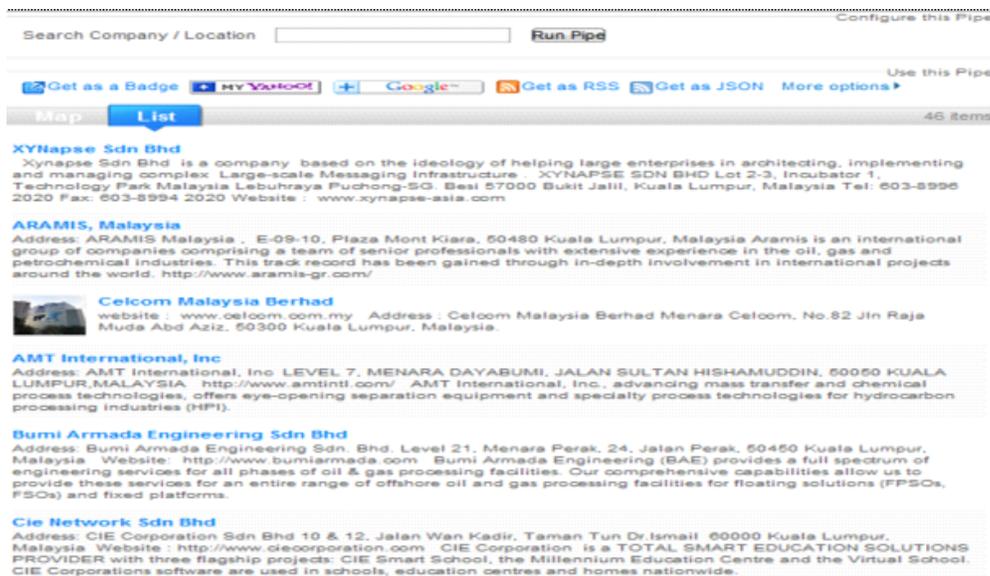


Fig. 12: Mash-up for internship placement list view

performances by the students during the sessions. Among this student we thought few of them accept and adopt the concept of mash-up for their final year project, three of were selected for the Engineering Design Exhibition (EDX), one of the student present the Mash-up for Internship Placement, the creation of this mash-up is with our help and is totally using our lead model which is recommended in our research. The student takes the chance to demonstrate own experience and understanding of the concept of mash-up which we thought during our class. In Fig. 8 shows the Mash-up for Internship Placement source / engine design while the Fig. 9 and 10 present the Mash-up for Internship Placement result to the

user view in map this show the complete result that from between the range of Selangor and Kuala-Lumpur, while Fig. 11 present the search result base on the user input, this input can be the name of the company, location, or the type of placement in the company. Lastly is the Fig. 12 which present the result of this mash-up in a list view, user can select to view the result in map, list, or image in some mash-up applications.

We developed a mash-up application using Yahoo! Pipes to ease accessibility of online material, such as journal papers. Now the UTP IRC users do not have to go through each of the subscribed-to databases one at a time. A screenshot from the library mash-up which we

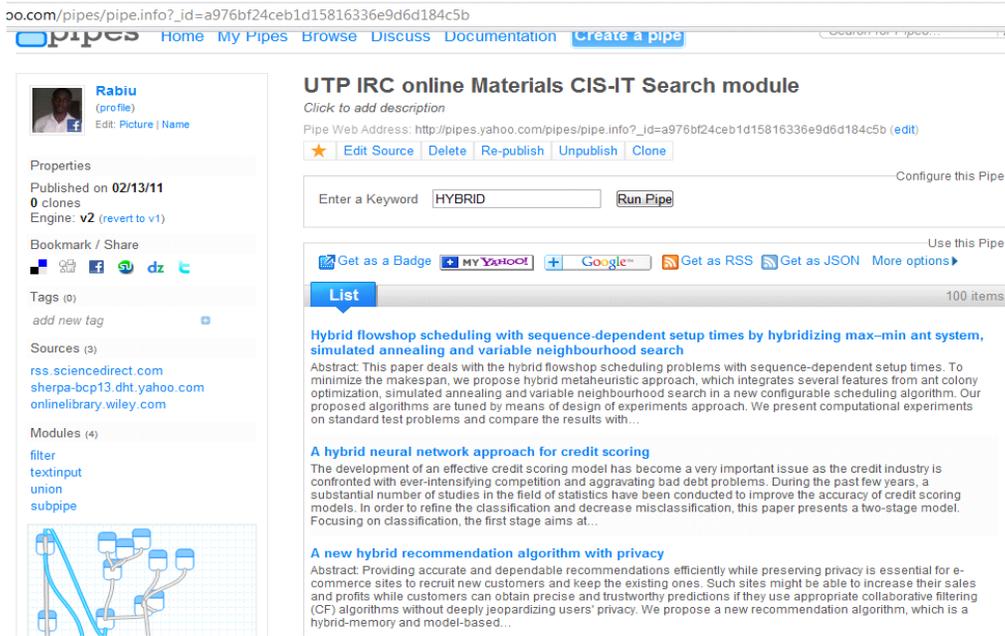


Fig. 13: UTP IRC mash-up interface

Table 2: UTP IRC mash-up section II results

Section II	1	2	3	4	5	Total	Max
The web interface of this application has much that is of interest to	31	43	8	0	0	82	43
It is difficult to move around this web interface.	0	0	2	23	57	82	57
I can quickly find what I want on this web interface.	58	20	4	0	0	82	58
This web interface seems logical to me.	0	0	2	28	52	82	52
This web interface needs more introductory explanations.	0	0	0	30	52	82	52
The pages presented in this interface are very attractive.	44	37	1	0	0	82	44
I feel in control when I'm using this web application.	0	0	1	25	56	82	56
This web application is too slow.	0	13	29	15	25	82	29
This web application helps me find what I am looking for.	46	35	1	0	0	82	46
Learning to find my way around this web application is a problem.	0	0	25	45	12	82	45

Table 3: UTP IRC mash-up section III results

Section III	1	2	3	4	5	Total	Max
a. I don't like using this web application.	0	0	1	21	60	82	60
b. I can easily generate the result I want to on this web application.	72	9	1	0	0	82	72
c. I feel efficient when I'm using this web application.	0	0	0	18	64	82	64
d. It is difficult to tell if this web application has what I want.	0	0	0	20	62	82	62
e. Using this web application for the first time is easy.	44	38	0	0	0	82	44
f. This web application has some annoying features.	0	0	0	26	56	82	56
g. Remembering where I am on this web application is difficult.	0	0	0	11	71	82	71
h. Using this web application is a waste of time.	0	0	0	12	70	82	70
i. I get what I expect when I click on things on this web application.	0	0	0	13	69	82	69
j. Everything on this web application is easy to understand.	0	0	0	12	70	82	70
Important		0	1	25	56	82	56

developed is shown in Fig. 13. The system has currently been tested by many users in our academic department and so far there are positive results, which help with the progress of our research.

There two different section in the data collection some of which presented in Table 2 and Table 3 as follows:

As regards the research area of application, we are experimenting with a few postgraduates at the moment; this has involved providing training to those participants. Our aim here is to try to assess their acceptance of mash-up applications, the areas of use and how to teach them to develop their own useful mash-ups. This is a win-win situation as the work assists in our research yet, at the

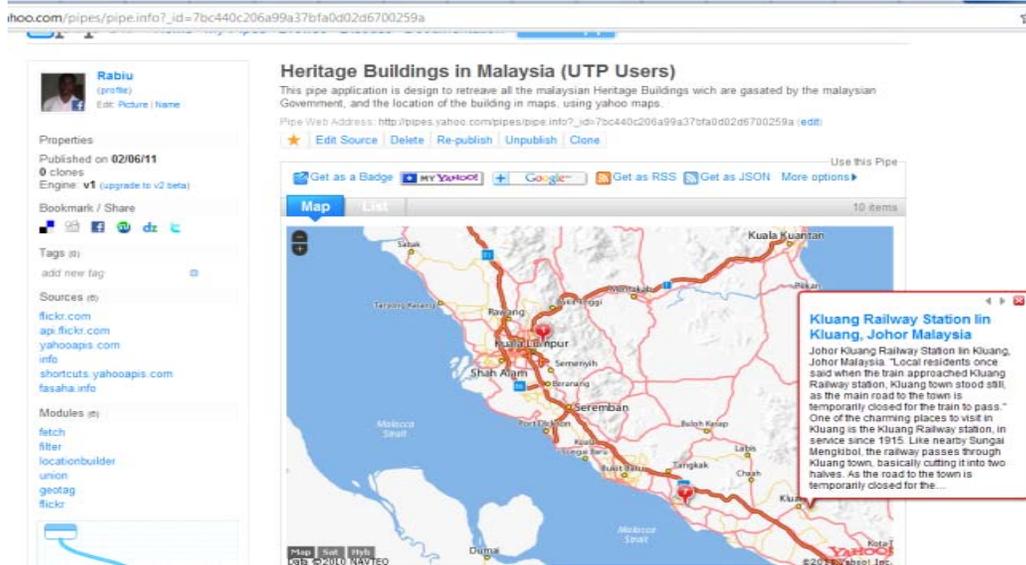


Fig. 14: Heritage building in Malaysia mash-up view

same time, the mash-ups help the researchers in their work. Currently we picked a few students from different departments to assist in carrying our work. These were all students studying different forms of engineering.

Hamid (not his real name) is a postgraduate from the Civil Engineering department currently working in heritage building facility management. He is the first postgraduate to be involved in our work. We took about 25 min to explain to Hamid what a mash-up is and how to develop a mash-up application. He has been able to develop a useful mash-up application. (Figure 14 for a screenshot of the mash-up application developed by this postgraduate.) Some more mash-ups could be explored with other postgraduates in the future.

CONCLUSION

Note that teaching and learning was the first activity that we engaged in; our motivation started from there after obtaining effective and impressive results from the class studying the Web2.0 architecture course. We feel that this training of students on mash-ups could be extended to students of any discipline. An understanding of mash-ups is likely to be of benefit to other students on campus, particularly to those where maps form a part of the curriculum. In addition have few student to adopt our ideology of mash-up for their final year project (FYP) help us to see how effective is mash-up in the HE teaching and learning, at the same time we get impress that our effort to train the student is achieved in this section and it is fantastic.

For the library everything went perfectly. Here the users just benefit and do not contribute to mash-up development. We believe that this is only the beginning for the use of mash-ups in UTP IRC and we think that this is the start of a new era for UTP IRC.

Throughout all of our work we came across so many issues, especially with the research area of application. Nevertheless, we tried our best by making use of the available participants in the work, which has helped in making progress to date.

Following the introduction of Web 2.0, it was noticed that online users began to share information and participate in a socialized community. The culture or behavior of students has now changed and the educational field needs to come up with new or advanced learning strategies.

Mash-ups can be regarded as something similar to a simple Service Oriented Architecture (SOA) application. Both integrate information and this can be either locally produced information or information available on the Web.

In this paper, some work relating to the field of study is described. Examples include the use of mash-ups and Pipes. We are primarily interested in real-time, interactive visual web applications on spatial temporal datasets. With regards to these four aspects (real-time, interactive, spatial and temporal) we have decided to focus on a number of areas. These include temporal data mash-ups that are continuously queried; template driven and materialized mash-up views for providing personalized services; real-time data transmission using Web Service Notification

(WSN); geo-visualization mash-ups for visual synthesis, presentation and analysis.

This study is characterized by several limitations in development methodology. Those mash-up editors that have not been tried may include extra characteristics. Mash-up editors from most companies mainly fall into the commercial product category and thus we have eliminated them for the study, although the editors are likely to be advanced. Whereas in the study we focus on mash-up editors for information mash-ups, process mash-ups and web page customization mash-up editors have not been considered and remain to be investigated. Furthermore, there is no single standard way in using the mash-up editors for development. For example, it is not feasible to create the same mash-up with all editors because of the variation in the maturity of the tools and their functionality. This causes adversity in creating a generalized mash-up development methodology.

Hence, we keep the methodology to the first level of abstraction. Finally, a limitation in this study is that mash-up editors change and improve and it is difficult to develop a methodology that keeps pace with changes. Nevertheless, issues remain for future study. Regardless of the concern mentioned above, the work can be used to guide both researchers and end users in a supportive way in business mash-up development by using information mash-up editors. Any end user study, such as ours, that unveil the complications in using mash-up editors, helps users to be more productive.

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