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Web Interactive Multimedia Technology Implementation: A University Context

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Abstract

Illuminate a web interactive multimedia technology (WIMT), was introduced in a large metropolitan university. The system incorporates several interactive and multimedia features. Those features when used in teaching and learning activities are categorised into five affordances: text, audio, video, image and screen-board. This system provides real time collaboration when used in a university teaching and learning environment as it enables immediate feedback between participants across physical space. This provides opportunities for interactivity and relationship building between academics and students, a vital component of learning. However, there are also several constraints in using WIMT. This paper discusses the findings from a case study conducted using a design science research approach. Semi-structured interviews were employed to gather the implementer's and adopter's perspective on their use of WIMT. The findings demonstrate the benefits and challenges in using WIMT for teaching and learning activities. The practical description of experienced implementer and adopter can be used as a guide for others.

Keywords: *Web interactive multimedia technology, Design science research, System Implementation, Implementer's perspective, Adopter's perspective, Blended learning environment.*

1.0 Introduction

Web interactive multimedia technology (WIMT), an information and communication system is used in many fields, such as, business and university environments. It continues to shape public and professional interactions. With the emergence of Web 2.0 affordances, the platform for collaboration, sharing and innovation is influencing the way people communicate on the web, individually and in groups. The Internet-based World Wide Web has had an enormous impact on web applications and society due to affordances that provide a means for collaborative learning, open access to information and social networking.

The web interactive multimedia technologies available have expands rapidly in recent time. Universities have begun to adopt WIMT applications in order to prepare future graduates for work as well as providing a platform for a global interaction. Blended learning approaches where web technology is used in the teaching and learning activities enriches the learning experience for all students irrespective of age

and nurtures life-long learning. Blended learning incorporates learners' interactions with lecturers, online learning via interactive multimedia systems and self-study.

This paper reports the findings from a case study at a large metropolitan university with several campuses in Southeast Asia that have trialled Elluminate, a web interactive multimedia technology (WIMT). The paper elicits insights to the implementation of WIMT affordances in university's teaching and learning activities. The findings that are extrapolated from the analysis of two different stakeholder group, an implementer and an adopter, are classified using a conceptual framework based on design science research.

The paper presents a literature review, followed by a description of research methodology. The paper continues with an analysis and findings from the two stakeholder group perspectives. These are described within a design science research framework: solution technology invention, naturalistic evaluation and theory building. The findings include a description of the practical approach used by practitioners and the benefits and challenges of implementing WIMT affordances. This paper calls for further research on the evaluation of WIMT affordances in the university environments.

2.0 Literature Review

There are few research studies being done on the implementation of web systems which look at best practice. The study reported here examines a case study of effective use of WIMT particularly for university learning and teaching. It is posited that the use of interactive multimedia programs can provide a richer teaching and learning environment and enable collaborative work using the web 2.0 affordances that enable collaboration and open access to information would not otherwise be possible. Baharun and Porter (2009), Boulay, Anderson, Parisky and Campbell (2009), Craig, Wozniak, Hyde and Burn (2009), and Cody (2009) describe cases where a website has augmented the teaching of statistics; online material has been developed to teach molecular biology; web based lecture technologies have been used to teach medical students and an online database has improved the teaching of dance respectively.

Iivari, Isomaki and Pekkola (2010) mentioned that there are signs of the Information Systems (IS) research community broadening its focus to include

investigation of user-oriented design. There are calls for researchers to enter the web and blended learning research community (Arbaugh, 2009). According to Ivory and Megraw (2005), the pattern for web research started with a back-end approach (the database and infrastructure) and then shifted towards a front-end approach (interface and users). The focus is now more realistic as it is shifting towards user-oriented methods (Iivari, Isomäki and Pekkola, 2010). Furthermore, there is a need to do this research as the quality, extent and impact on learning of ICT use in blended and online learning environments remains an under-researched area (Krause and McEwen, 2009).

Web interactive multimedia technologies (WIMT) can be considered as part of Web 2.0 component as they enable and broadens user's communication capabilities and options (Yoo and Huang, 2011). WIMT also enables virtual classrooms that facilitate access to resources, experts, broader learning networks and for academic staff greater access to professional learning opportunities (State Government Victoria, 2010). WIMT is used to support meetings, trainings, lectures and presentations, the features include audio and video communication, screen-board (for shared applications) and polls.

To evaluate WIMT in the blended learning environment, teaching resources are first evaluated against constructive alignment approach in the curriculum design described in Biggs (1996, 2007). The first part of the analysis in this research validates the teaching resources used by the adopter as in Biggs (1996, 2007). Learning objectives, teaching and learning activities and assessment are aligned in an effective subject design. These three main concepts need to be aligned in order to get the desired learning outcome. When the teaching and learning activities are aligned with the learning objectives, this is an indicator of learning outcome being delivered.

In order to achieve a holistic view in evaluating WIMT affordances in learning and teaching activities, a design science research approach is undertaken. DSR focuses on evaluation and following the DSR framework provided by Iivari and Venable (2009), three main aspects are being investigated in this research: solution technology invention, naturalistic evaluation and theory building. This approach provides a holistic view in analysing the data as it not only focuses on the technology nor just the users' perspectives, but it also links back to the theory, in this case Biggs's theory (1996, 2007), that becomes the backbone of the research itself. The

DSR offers a sound theoretical foundation and starting point for the analyses of WIMT implementation in blended learning environment.

3.0 Methodology

The research methodology employed was a qualitative method that aims to explore WIMT implementation and adoption, in context, to understand the practice and to elicit lessons for others. Furthermore, this study will be driven by the interpretive paradigm as this research attempts to understand a phenomenon through accessing the meanings that participants assign to them (Yin, 2009; Myers, 2009).

A case study was conducted at a large metropolitan university that has conducted a pilot study of Elluminate. An implementer (a key person from the pilot project committee) and an adopter (a coordinator of a graduate program) were interviewed about the affordances of Elluminate and how this impacted on their pedagogy and scheduled learning activities. This enabled two points of view to be collected, from the implementer and the adopter perspectives. Both stakeholder groups used the technology to complete their work. Ethics approval was obtained to record the interviews and use transcripts and written notes for this research. The one-on-one interviews took approximately 30-40 minutes. The comments from the implementer related to WIMT implementation issues in the large metropolitan university and the adopter's perspective were collected. This paper represents a subset of the data collected in the research as the interview from one implementer and one adopter is described.

Analysis was completed using a design science research approach. A model was used to evaluate the effectiveness of WIMT in the university especially in the teaching and learning environment which is one of the main activities in a university. It is adapted from design science research framework (Iivari and Venable, 2009). It consists of three aspects: Solution Technology Invention, Naturalistic Environment and Theory Building.

Solution Technology Invention covers the WIMT affordances referring to the features of web interactive multimedia technology used in the delivery approach for learning. Naturalistic Evaluation covers the stakeholders' opinion using case study method to evaluate the use of WIMT affordances in teaching and learning activities.

Theory building is the backbone of this research which refers to Biggs's theory (1996, 2007).

4.0 Findings

The findings of this research are structured according to the research conceptual model consisting of solution technology invention, naturalistic evaluation and theory building. When appropriate, direct quotes from those interviewed are presented to illustrate the findings.

4.1 The Implementer's Perspective

The implementer in this case is a key person in the pilot committee that is in charge of trialling Elluminate in one faculty in the university.

4.1.1 Solution Technology Invention

The technology being evaluated is Elluminate, a web interactive multimedia technology. Elluminate was piloted and implemented in the university after three types of software had been evaluated. Initially there were some technical issues for end-users of Elluminate caused by the ICT infrastructure. However, as the software and infrastructure have matured, the university has decided to implement Elluminate to practically realize and reap the benefits of WIMT:

“The university have been waiting for a software and the technology (including bandwidth, reliability of the technical aspect) to come closer together to make it possible for the idea of all things you can do in Elluminate being useful for people. You can use it for distance learning, tutorial, professional development and software training”.

4.1.2 Naturalistic Evaluation

This section provides a focus on the people perspectives associated with successful implementation. As the pilot committee was satisfied with the pilot study, Elluminate was to be implemented to university wide which involved three faculties. So the next step was to create a “good communication strategy” to support the implementation. To support uptake of the recommended WIMT, successful examples of WIMT implemented in learning and teaching activities included “how the application was used and what benefits were obtained from using it”. Information was needed to

inform the roll-out of Elluminate across the university. Articulation of the users' satisfaction and experiences helped the university develop training and helped staff make the adoption choice. The examples were intended to support staff in extending their learning and teaching approach beyond the traditional boundaries. A guideline for using the systems was published. However, the guidelines focus on how to use the available affordances without a description of the advantages and pitfalls in a specific context, or advice on how to implement Elluminate affordances in teaching and learning activities.

4.1.3 Theory Building

Integration of the learning and teaching activities and the use of the complex-based WIMT (Md Ali and Richardson, 2011) for messaging, audio and video conferencing, audience response tools, screen-board and application sharing enable an evaluation of the impact of Elluminate on functionality, in context. A pilot study was conducted to test the technical capacity of the WIMT rather than the actual learning and teaching aspects, the core activity of a university: "The pilot study look more at the technical side of things. It should have also addressed the learning and teaching aspect". There is a need to use WIMT to meet the learning objectives which is in line with Biggs's theory (1996, 2007).

4.2 The Adopter's Perspective

During the pilot study, the university staff members were asked to volunteer. However, the adopter interviewed was not directly involved in trialling the technology in the pilot study. The adopter in this case is a graduate coordinator, a lecturer, who came across Elluminate when designing a graduate neurology subject for distance education students.

4.2.1 Solution Technology Invention

This section focuses on the web interactive multimedia technology (WIMT) implementation. WIMT affordances are categorised into text, audio, video, image and screen-board.

Text affordance

A textbox is available for the lecturer and students to send messages either publicly, like chat room or privately which mimics instant messaging. The textbox affordance is also used when the student is not able to ask a question or give comments in audio. If the students have an audio problem, they could easily use the textbox feature that is also available in Elluminate to ask questions and provide feedback: “Some of the students have problems with sound and things so we use textbox”.

Audio affordance

Elluminate also enables audio conferencing and up to six simultaneous speakers. In the neurology course, the lecturer allowed the maximum number of audio and video participants: “I had maximum simultaneous talkers and maximum visual. I had all the pictures (video) of the students every week”.

Video affordance

Video enables the lecturer and students to see each other. The lecturer can know when a student is not sitting in front of the monitor. In this case, the adopter had a positive experience with the use of a smooth video and encouraged her students to use the affordance during the web session. The efficiency whilst using video was due to the small size. Less than ten students were available in each web session.

Image affordance

There are more than just text-based interactions in Elluminate as graphics can be shared which is important to learning. In the graduate course, the students have only a 2-hour session each week and they have to do a lot of self study in their own time. The Elluminate session time was used to update, discuss, raise any issues that they did not understand or required additional clarification from the lecturer: “I use a lot of graphics to overview the course content to make sure the students have not got any queries and that they are happy with the week learning that they have to do.” This is crucial in a neurology course that looks at neurological processes through different scanning mechanisms using CT scan and IMR: “...looking at different neurological processes through different scanning mechanisms is very crucial”. The discussion on the neurological processes was made clearer by showing actual CT scanned images

and IMR graphics: "...able to do that in Elluminate by uploading CTS, IMR and those sort of things are very helpful".

Screen-board affordance

The screen-board affordance enables the use of power point slides, a hand pointer, highlighter and pen. Elluminate in this case does not support animation in a power point presentation slide as the animation effect on the slide will be flattened on the screen-board. The pointer and highlighter motion could be considered as animation as the focus is shifted around the screen by the lecturer using these affordances. Elluminate also has several whiteboard interaction tools including a pointer and a highlighter for the virtual whiteboard. Items can be circled or coloured: "I use a pointer to actually point to different things as I go through because as I was going through a CT scan for example, I use a pointer to point at the hotspot or the area that was significant".

4.2.2 Naturalistic Evaluation

This section focuses on the adopter's perspective on reasons for using WIMT affordances in the teaching and learning activities, such as, ease of use (Davis, 1989).

Towards effective learning approach

The adopter did not go to the formal university training sessions but managed to explore Elluminate and acquire skills and knowledge experientially: "Although I missed out on the (formal) training, it was quite intuitive (to use it)". When a certain task to accomplish a planned activity was a bit of a challenge, she contacted the university. The Elluminate support team in the teaching and learning unit requested that she join a network of users involved in the pilot university. This group who were exploring the affordances of Elluminate in real time effectively became a community of practice.

"The ability to talk is an advantage because virtual classroom (previous software), you could not talk, you could only text with typos and quick typing".

With Elluminate, a complex-based web interactive multimedia technology, she could talk, interact with the students on the whiteboard: "I have them draw on the whiteboard" and "we do discussion verbally through microphone".

However, for the real time Elluminate session, the expectation was that the students have already done their weekly reading and learning and come to the 2-hours session for further discussion and clarification. The session provided opportunities for students to gain further understanding and achieve the learning outcome intended for that week:

“The expectation is probably more self-directed learning because I got less time with them (web interactive multimedia technology students)”.

The technology increased the opportunity for lecturers to interactively align the objectives, activities and assessment (Biggs, 1996, 2007). The number of students that the lecturer managed through the technology was small and it enabled the smooth operation of affordances in a real time session on the web. For implementing the WIMT affordances to achieve the learning objectives, the teaching and learning support team was crucial.

Easy to use

The university informed her that the previous virtual learning environment system was no longer available and the university was currently adopting and piloting Elluminate: “I needed to have a virtual classroom connected (for my distance education students) and they said we are using Elluminate now.” She straight away installed Elluminate and found it was user friendly and easy to use.

Be positive thinking

She managed to surmount the obstacles and use the web interactive multimedia technology (WIMT). Elluminate, was useful for the neurology graduate subject coordinator and students that lived in different suburbs and were scattered across different states and countries.

Advance emergent technology

The previous virtual learning environment was just text-based. The lecturer and students had to communicate using the written word without any sound or pictures and images to discuss and present: “Elluminate is light years ahead because the virtual learning environment (the previous software) was only text-based”.

Elluminate also enabled real-time interaction with students. This was more than mere text exchange as the facilitator could communicate verbally, point to graphics

and get polling and audio feedback from the students: “It is fantastic! I think it is a fabulous technology”.

Technology is not perfect

As with other technology implementation, there are pros and cons, the obstacles that had to go through before getting to launch it, the silver lining behind grey clouds. In Elluminate, the students that participate in a real time session drop out and in again: “people/computer dropping out”. In the neurology course case, the coordinator ran into a major problem in the initial stages. She was not able to login into the system. When she called Information Technology Support (ITS) staff, the support staff took a long time to solve the problem. The ITS staff member was not a participant of the pilot study or community of practice and had no idea about Elluminate: “Initially I run into major problems in the beginning of the semester...the first call to ITS they had no more idea about Elluminate than I did (because they were not informed or included in the pilot study)”. The ITS staff and support staff from the teaching and learning unit were very helpful in trying to solve the problems and obstacles faced by the graduate course coordinator: “...(support) people have been very supportive”. She managed to get Elluminate running and has been using it ever since:

Example of solutions taken by university IT services to tackle the Elluminate problems was to create user groups to experience and understand the technological infrastructure problems and support each other challenges. The university proactively organized training and a user group to enable sharing of practices among staff. However, some staff learnt to use the application on their own because it was relatively simple. In a pilot study, front line technical support staff should be included and be introduced to the web interactive multimedia technology piloted and prior to implementation by the university.

4.2.3 Theory Building

Designing the subject

The lecturer had already prepared the materials for the on-campus students that came to traditional face-to-face classes. Although the mode was different, the lecturer managed to use the same material for the online real time sessions: “I am prepared for

the course for the on campus student. So now I am going (to use the materials) on Elluminate, They (the students) would have done the reading, it sort of just a bit different mechanism really. So I do not have to prepare anything other than what I would normally do”. Using the same resources, Elluminate provided advantages in adding interaction and functionality for building academic and student relationships with the students.

The subject guide describes objectives, activities and assessment which adhere to the constructive alignment principle (Biggs, 1996, 2007) as in Figure 2.

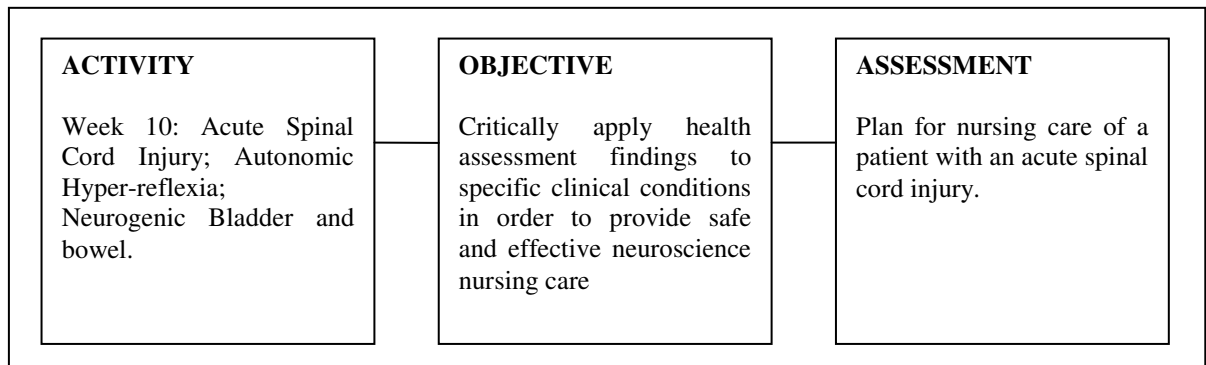


Figure 2. An example of designing the subject according to constructive alignment (Biggs 1996, 2007) principle.

Implementing the affordance to meet the learning objectives

During the web session, the affordances were aligned with the design of the subject. The students were asked to do activities and answer questions to assess their understanding of learning objectives. They were also asking questions that enabled the lecturer to provide further explanation.

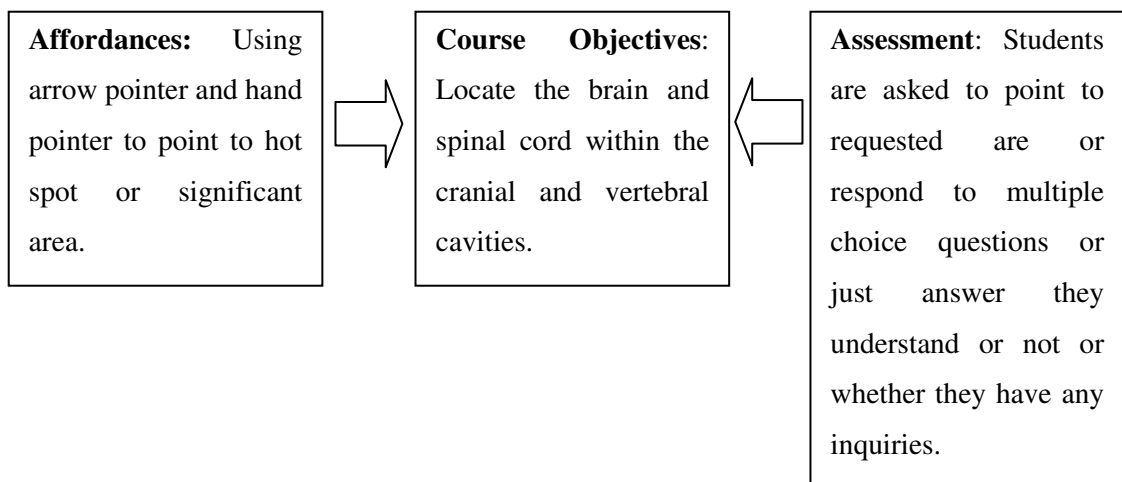


Figure 3. An example of affordances use to meet the explicit learning objectives.

Figure 3 provides an example of web interactive multimedia affordances used in learning and teaching activity in order to meet the explicit learning objectives as designed in the subject guide.

Access to and the ability to effectively use ICTs to obtain information and services are becoming increasingly important to fully participate in the contemporary Australian economic, political and social life (Eklund, Kay and Lynch, 2003). Eklund, et al. (2003) stated that successful learning required quality instructional content as well as an appropriate context includes facilitation and an understanding of the learner during design and delivery of subject materials. The sharing of images and applications enabled in WIMT improves the quality of content and more interaction through pointers and highlighters. However, in this case, the learning is more self-directed. The learner is expected to explore first and then get further clarification and understanding from the real time session with the lecturer.

5.0 Conclusion

This paper provides an overview of web interactive multimedia technology (WIMT) issues and opportunities for adoption in universities. WIMT provides a flexible environment for academics and learners to communicate across physical space. In particular, the potential of using WIMT affordances in a blended learning environment are emphasized. It enables learning beyond the traditional boundaries, and it provides useful alternatives.

Although not all features of web interactive multimedia technology were used by the implementer and the adopter, this study found that the features that were used in the teaching and learning activities are categorised into text, audio, video, image and screenboard affordances. Both the implementer and adopter had a positive attitude towards using the WIMT affordances and it was easy to use although facing some technical challenges as the technology is not perfect and belief of its potential to achieve the desired learning objectives. The WIMT affordances are seen as an enabler of learning when use in alignment with the intended learning objectives.

Therefore future research on development of model to align decision making in relation to appropriate WIMT affordances for teaching and learning activities to support learning outcome in a particular course is essential. It would fast track course

module design for particular context. Other avenues to further detail this research in the context of universities or higher education in Information Systems or other industries are also beneficial.

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