EUROPEAN JOURNAL OF EDUCATIONAL RESEARCH Vol. 2, No. 3, 139-149

Flexible Delivery Approach in Architecture and Construction Management Course

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The millennial generation is facing challenges in their career path and they believe that tertiary education can help them to equip better to tackle against. However, some students find it difficult to rush back to classroom due to work commitment. Fortunately, flexible education developed these years allows students to capture knowledge anytime and anywhere easier. In order to deliver courses in line with students' need, many universities have considered offering alternative studying modes, such as flexible method, to enrich the course delivery. Using a case study, this paper investigates the delivery approach adopted by a school of a well-known university in Australia. This School offers architecture and construction management courses and has successfully adopted the flexible approach, with the aid of various online teaching and learning tools: the Cloud, Elluminate Live!, EchoSystem, Mediawiki and ePortfolio, in delivering subjects. It is welcomed by various cohorts of students. Not only the student numbers have been increased, but the School is also the first preference when students opting architecture and construction management studies. Statistics also indicate students' satisfaction and course experience are improved. The success of this School proves itself to be an exemplar for other educators planning for flexible delivery.

Keywords: flexible teaching and learning, architecture and construction management education, Australian tertiary education

Introduction

Collis, Moonen et al. (1997) identify five categories of flexible education related to time, content, entry requirements, pedagogy and delivery logistics. Along the line, Tucker and Morris (2011) argue that the research on flexibility for architecture and construction management education falls into two main broad groups: 1.meta-analyses identifying aspects of flexibility; 2.individual case studies detailing how aspects of flexibility are implemented. In Australian tertiary education, Bigum and Rowan (2004) reveal the term "flexible" is a commonplace in the discourses of higher education and claim that "flexibility" is found in combination with terms of "delivery", "teaching" and "learning" literally which means pliant, tractable or characterized by a ready capability to adapt to new, different, or changing requirements. When it is used to describe teaching or learning in higher education settings, it typically means either other than, or in addition to, lectures, workshops or tutorials to teach a course. That means it is worth to study flexibility for architecture and construction management education in Australian university from the delivery perceptive.

Many research studies discuss and agree that electronic supported learning (E-Learning) is an integral part of flexible education; and electronic, web-based and online teaching and learning tools

ISSN 2165-8714

http://www.eu-jer.com DOI: 10.12973/eu-jer.2.3.139

assist to enable flexible delivery (Clarke & Hermens, 2001; Eklund, Kay & Lynch 2003; Hoppe, 2003; Marjanovic & Orlowska, 2000; Svensson, Ellström & Åberg, 2004). Obviously, there is a trend of adopting technology in flexible delivery. Therefore, in applying flexible education, the focus of this study is for using e-learning tools in flexible delivery from teaching and learning perspectives. The aims of this paper, via a case study, are to 1.investigate how a well-known university in Australia using online tools to enrich flexible delivery; 2.demonstrate this practice is an exemplar and guide for other educators planning for flexible learning approach.

Literature Review: Flexibilty and E-Learning Tools

For the key aims and purposes of flexible education, Schellekens, Paas et al. (2010) conclude that the flexible educational model offers a valid representation of higher professional education institutes in the Netherlands and can contribute to the flexibility and innovation of educational programmes. King and Kenworthy (1999) also contend with flexible approaches to a changing learning environment in Australia and many of the attributes and characteristics of successful distance education programs are well suited to the demands being placed upon higher education institutions. The authors suggest institutions engaging with the applications of new technologies to teaching and learning, whereas there is a push to utilize the production facilities and expertise to support this shift to more flexible teaching and learning arrangements.

As far as effective tools in flexible education is concerned, (Kirkpatrick, 2001)'s paper suggests flexible learning with technology can offer opportunities for improving the quality of students' learning experiences and for meeting the needs of students in more appropriate ways. According to Collis and Wende (2002), institutions should not only look to integrating their various information and management systems in order to support more flexibility, but also move to plan for stretching-the-mould flexibility through technical systems that facilitate easy tailoring of course resources for different types of students.

Poon, Royston et al. (2010) then identifies the critical factors involved in the development of a successful learning and teaching method for built environment courses. These factors include a suitable and well-thought out design, dedicated and sufficient resources (including IT and human resources), provision of skills-training for facilitators and students, and support from senior managers. From the teaching perspectives, when consider and effective delivery tools in flexible education for construction management courses, Tingerthal (2011) points out that educator will take advantage of technological advances in the classroom with a plethora of options ranging from interactive whiteboards to clickers. Students agree that 'Tablet PC' is very effective and give them a chance to listen and participate rather than worrying about missing notes the whole time. Syed-Khuzzan, Goulding et al. (2008) also agree that personalized learning environments are the core development issues for construction management education. The authors introduce the concepts and issues surrounding the development of the personalized learning environments. Their research findings reveal several important factors that need to be considered for further developing and enhancing personalized learning environments which include learner motivation, learner platforms, pedagogical approaches and instructional design methodologies, standardization of learning objects, and creation of generic and specific learner profiles. For pedagogical developments, pedagogic underpinning in e-learning (a type of information technology) must be well considered.

From the learning perspectives, Sinha and Chaudhary (2004) explain the relationships between online behaviors and learning styles, and suggest that the adaption will be based on the learning style and cognitive state of the learner. The adaptable system must allow user to change certain system parameters as per need of the user, and the web and multimedia technologies have to provide for adaption based on learning style, motivation strategies, current level of domain competence, and feedback methodologies. Cavus and Al-Momani (2011) add that the mobile-learning comes to existence as a learn-

ing method that uses the mobile devices like digital cell phone, personal digital assistants and laptops. Improving the mobile-learning systems, in particular provide the requested knowledge to the learners, with less constraint in terms of devices, locations and networks in use, can improve performance of flexible education.

Therefore, flexible delivery is hinged on effective use of information communication technologies and academic staff should sight to familiarize with such technologies and strive to appropriate use of those technologies in teaching. As far as matching students' need is concerned, this is a matter or adaption system (such as suitable information technologies), and mobility (by communication technologies). All these must be well considered in pedagogical developments.

Strategies for Flexibility & E-Learning Tool

According to Wyn (2004), the millennial generation grows up today facing the various challenges under high social, political and economic pressure in their career path. For example, future prospects and employment opportunities for the millennial youth have been worsened due to world finance tsunami in 2008 and then the Euro crisis during these years. In order to compete in the fierce market environment and cope with demanding working requirement, young people realize that tertiary education and a "diploma" make them better qualified in the battlefield. Some non-completion of secondary school education school leavers continue to correlate with disadvantage in employment outcomes, and secondary school graduates find it extremely difficult to secure a position. It therefore becomes a trend that young people tends either returning to school for full time study or combining study and work. In satisfying these students cohort, there is a need to provide flexible educations.

In fact, education providers have adopted various strategies in providing flexibility. For example, a report by the Deakin University in 2010[1] indicated that flexible education is the strategy to provide an enhanced student-centered approach to learning. Therefore, this University's teaching and learning agenda dictates the approach to the integration of traditional classroom teaching, distance education and online education in ways most appropriate to the needs of its diverse student cohorts and the changing student environment. In summary, the Deakin's Strategic Plan states that flexible education provides students' choice where appropriate in:

- the time at which study occurs
- the pace at which learning proceeds
- the place in which study is conducted
- the learning style adopted by the learner
- the content that is studied
- the forms of assessment employed
- the option to learn collaboratively or independently
- how teaching is staffed
- the mix of these elements in particular courses or subjects

The first four issues above are related to time, pace, place and style and the best approach then may be to utilize a variety of methods and variety of formats to enable "flexibility" is using flexible delivery method. Thus, if university can offer courses which cater for an individual's preference of time and space, it is true flexibility, whereas students are able to take advantage of the information available to them at the time and place of their choosing; they are not required to attend lectures or tutorials at a set place and time. Collis, Moonen et al. (1997) define the meaning of "flexible in delivery", namely time and place for interactions, technology supporting collaboration, learner support mechanisms and

communication channels, and Collis and Moonen (2002) further elaborate flexibility related to delivery and logistics and express that:

- Time and place where contact with instructor and other students occur
- Methods, technology for obtaining support and making contact
- Types of help, communication available, and technology required
- Location, technology for participating in various aspects of the course
- Delivery channels for course information, content, communication

All these should be considered when universities thinking of flexible delivery.

Adaptation of Flexible Education

If adaptation of flexible education is the way to go, in doing so, the concepts of flexibity should provide:

- access to learning resources via contemporary technologies (e.g. using online teaching and learning management system and internet technologies)
- flexible delivery of learning experiences and assessment, (e.g. lecture recordings, podcasting, online portfolios)
- collaborative and interactive activities (e.g. via social software and online 2-way real time communication tools)

In fact, committed to providing education for all, not only universities have to offer suitable courses in line with, but also allowing appropriate studying modes including on compass and virtual class. However, the main point still relies on adequate support by the teachers. As far as appropriate studying modes are concerned, university should use the online teaching and learning tool. Using web-based tools, study material is delivered via the internet including audio or video files, media in the form of text, image, animation etc. Tutorials and presentation can also be conducted online. Students can also enjoy a free access to the virtual classroom, post their comments, questions and queries there in such technological format. Not only students need not rush back to "real" classroom, but also suits those adults who required a "diploma" in the progression of their career. Therefore, various flexibility education delivery online tools should be used, and ideally features and functions must include:

- On-line teaching and learning platform: This is the primary application to deliver web-based course material and assessment tasks, and facilitates communication and collaboration between staff and students. The platform should also feature with a range of integrated web-based tools for:
    - Assessment: quizzes, self-assessments, surveys, assignment drop box, rubrics
    - Communication: news, email, discussion, chat, updates
    - Site management: calendar, grades, view student progress, release conditions
    - Providing learning materials: create, upload and deliver content
- Electronic Portfolio: This should be a personal portfolio tool for storing, organising, reflecting on and sharing items that represent student's learning. They may create and include documents, graphics, audio files, videos, presentations, assessment, etc. that demonstrate their development or mastery in a certain area. This tool should also feature that student can decide what items he/she wants to include in the portfolio, how students want to organise them, and who he/she want to share them with.

- Virtual classroom: The function of this kind of online tools should aim to enhance both on- and off-campus teaching and learning. This tool should be able to facilitate instant communication and collaboration between staff and students. Therefore, the virtual classroom should enable the delivery and facilitation of online learning, training, coaching, mentoring and meetings in real time.
- Lecture recordings: Recorders must be installed into lecture theatres and are able to capture video and audio sources controlled by the lectern AV control panel, e.g. PC, document camera, DVD, VCR, room cameras and microphones. The process of having a lecture recorded should include scheduling lecture times into the recording system, which automatically records the lecture, compresses the recording into various formats.
- Electronic Networking: The aims of this online tool should be able to provide a web space where students can share information and create documents collaboratively. Therefore students can upload text, links, images and media files, and then edit each other's work and add comments. Ideally, multiple users can work on a page at the same time, and they can view the page history to see who added which components.

Flexibility in the Case Studied School

The case studied school offering architecture and construction management education and has a great team of academics. In summary, this School offers various undergraduate and postgraduate courses:

- Architecture
- Architectural Technology
- Construction Management
- Facilities Management
- Planning
- Urban Design
- Landscape Architecture

As a result of the millennial youth demands a “diploma, there is a growing trend of students demanding flexible approach to pursue the degree in this School. In order to meet this requirement, the School does offer most of the subjects for postgraduate courses in flexible mode. Students can study from home, in their own time, using flexible “online classrooms”. Amongst various online tools for flexible delivery within the University, this School uses the following tools:

Online Teaching and Learning Platform: The “Cloud” Suite is Used

The “Cloud” is a tightly integrated suite of products that provide a seamless experience for creation, delivery and management of courses, allowing users to collaborate and connect around content and activities. From simple to sophisticated, the “Cloud” supports a variety of learning environments and is the home page which leads students to their subject sites. With the aid of the “Cloud” suite, users can build and deliver engaging learning experiences, create and share personalized portfolios, gain real-time knowledge with sophisticated analytics, capture and distribute presentations worldwide. The online site includes the subject guide, electronic version of the readings, lecture notes, discussion forum, noticeboard, assignment drop box with the plagiarism detecting, quizzes, grade book, chatting area, group area and other resources deem fit. Students can access the “Cloud” platform from smartphone or tablet to view various content materials and involve in discussion with other users.

Virtual Classroom: The Elluminate Live (E-Live) is Used

The "E-Live" is a web conferencing communication program integrating together those tools of voice over and teleconferencing, public and private chat, quizzing and polling, emoticons and web-cam. This "E-Live" also includes useful visual tools: whiteboard, application sharing, file transfer (video and images) and web tour. The software also equips with audio and video recording features which allows the moderator to record the class for others to watch later as well as a graphing tool, breakout rooms for group work, and timer. The whiteboard also supports the uploading of power-point and images presentations for viewing on the whiteboard for class or meeting. This "E-Live" allows teacher and student to talking over the internet; chat via text online; share applications, videos and presentations and stream multimedia files. In addition, it further allows virtual meeting with third party from the industry when invited.

Lecture Recordings: The "EchoSystem" is Used

The "EchoSystem" service is a lecture capture and online delivery system. It is a valuable teaching and learning service for many staff and students, providing audio and video recordings via streamed files, downloads and podcasts. The "EchoSystem" allows audio and visuals from live events, such as face-to-face lectures, to be automatically recorded and processed into a variety of streaming media formats.

Electronic Networking: The "MediaWiki" is Used

The "MediaWiki" is a free web-based wiki software application. This electronic networking software is optimized to correctly and efficiently handle terabytes of content and hundreds of thousands of hits per second. Therefore, it is suitable for group works. In fact, many architecture and construction management subjects involve students to complete group assignment tasks. Using the "MediaWiki", teacher can know the sizes of the classes, and set up groups. This also provides a web tool for students to share ideas for group work collaboratively. In a group assignment, students upload text, links, images and media files to the "MediaWiki", and then edit each other's work and add comments. Students can also work on a same page at the same time, and they can view the page history to see who added which components. Individual contribution from each group members can be identified using the history page of the "MediaWiki". It helps to reduce group disputes as everyone is accountable for their work.

Electronic Portfolio: The "ePortfolio" is Used

The electronic portfolio used also known as "ePortfolio" which is a collection of electronic evidence assembled and managed by a user on the web. This "ePortfolio" is a personal portfolio tool for storing, organising, reflecting on and sharing items that represent students' learning. Users may create and include documents, graphics, audio files, videos, and presentations etc. that demonstrate individual development or mastery in a certain area. In addition, the completed "ePortfolio" will become individual student's testimonial to their potential employers.

Outcomes of Flexibility

The contribution of the online teaching and learning tools which have been used by the School can be summarized as follows:

- When using the "Cloud" suite, teacher can link various tools together:
- Design and implement subjects and courses including assessment items using tools such as online quizzes created in the learning platform
- Store, classify, access and share teaching and learning materials from a central location
- Manage virtual classrooms (using "E-Live")

- Record and post audio and video in a lecture theatre (using "EchoSystem")
- Create and manage blogs (using "MediaWiki")
- Have students curate and present their learning achievements (using the "ePortfolio")
- When using the "E-Live" in teaching, teacher can:
- run tutorials for students on other campuses, or for off-campus students
- encourage students to participate, e.g. negotiate outcomes, methods, contribute opinions, mentor each other
- present lectures and have students ask them questions
- run role plays and debates
- engage learners in auditory and visual presentations
- record sessions for students to revise or for those who miss sessions
- brief students on assignment requirements
- run online meetings with other industrial parties

When using the "EchoSystem", it allows audio and visuals from live lectures to be automatically recorded and processed into a variety of streaming media formats. If students miss the lecture or want to review the lectures, they can easily download the recordings via "EchoSystem" from the "Cloud".

When using MediaWiki, students can share information and create documents collaboratively. The "MediaWiki" system has also been used in the facilitation of tutorial work and for student interaction outside of classes. Tutors set up discussion groups in the MediaWiki for each of their classes, and use these groups to coordinate their students' emerging group projects. Through the discussion groups, students nominate topics of interest to them and thus find like-minded collaborators, and student teams can flesh out their project ideas (while at the same time providing the tutor with a permanent record of their project ideas and overall participation in class).

Architecture and construction management courses always require students to consolidate all of their artefacts, reflections, presentations, and collections into a single view, enabling teacher and reader to view, search, and manage all of their content from one location. Using the "ePortfolio", teachers can incorporate assessment in portfolio format because it can enable students to express their "learning and showcase" in gathering and contemplating aspects of their work to assist them to learn over the period of their lifetimes, as well as from which to draw examples for potential employers.

Although the ultimate quantitative benefits cannot be measured directly, the student numbers have been increased in the last five years as shown in Figure 1. In addition, from the informal statistics of 2011-2013, though the attendance rates in classroom dropped, passing rates still maintained in a good shape. On the other hand, in one of the recent surveys for "Students Satisfaction of Teaching Subjects" in 2012, this School achieved an almost 8% increase in relation to the response for question about "This subject was well taught" for international students from first trimester to second trimester during 2012. The surveys also indicated a 3.6% increase in relation to the response for the same question for on campus students from first trimester to second trimester in 2012, and off campus results also increased 2.8%.

In addition, as shown in Figure 2, data reflects an improvement in "Course Experience Questionnaire" outcome since 2008 in all of its indicators: good teaching scale, generic skills scale, overall satisfaction index, intellectual motivation scale, student support scale, graduate qualities scale, learning resources scale. Furthermore, there is an increase in choosing the courses offered by this School as the first preferences in 2013.

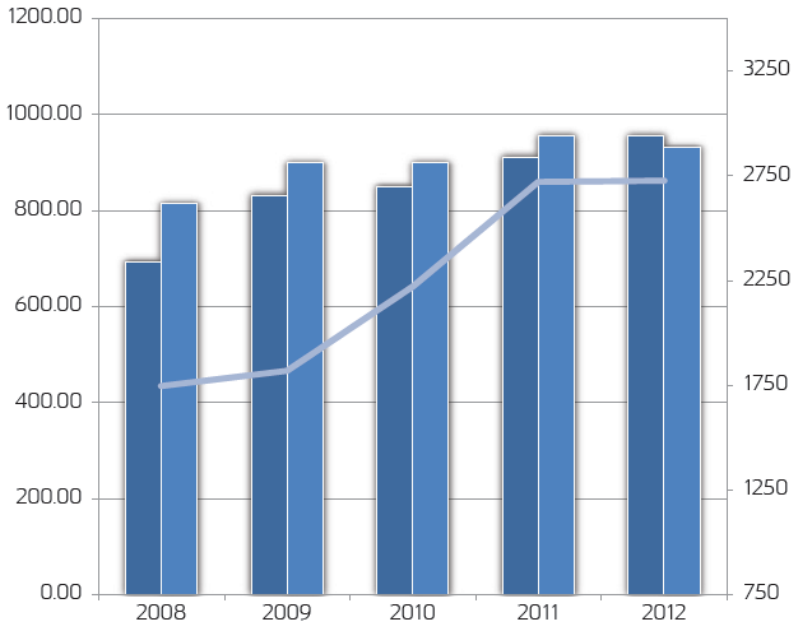

Figure 1. Student Number (2008-2012)

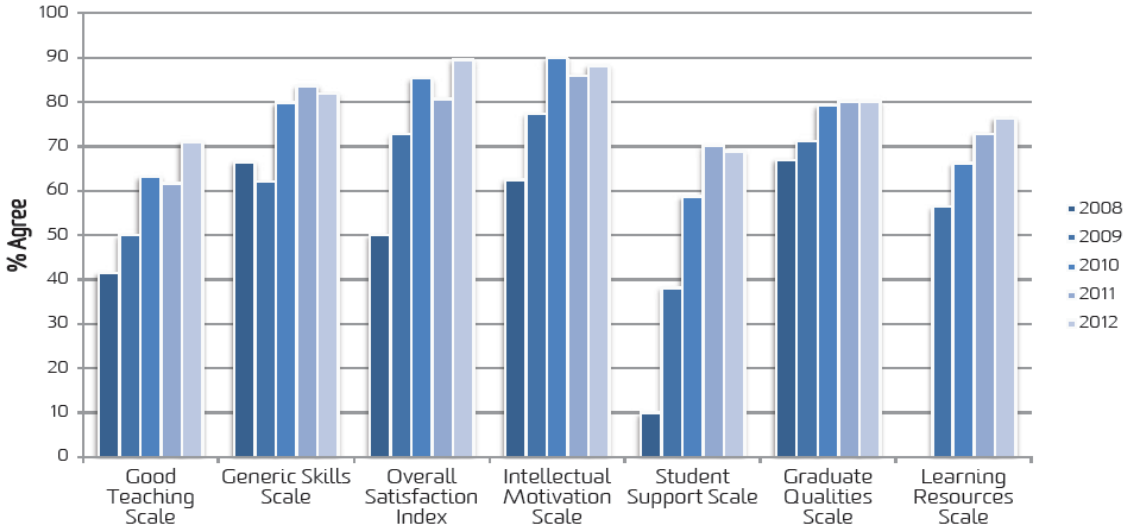

Figure 2. Summary of Course Experience Questionnaire (2008-2012)

All these indicators represent positive outcomes of "flexibility" and prove that flexible education does not compromise the quality but indicate the School's attractiveness as a built environment education provider.

Discussion: Example of Flexible Delivery Approach

The case studied university's academic calendar is for three trimesters, i.e. autumn (Trimester 1), winter/spring (Trimester 2) and summer (Trimester 3), which provides students with greater flexibility to plan their study around work or life commitments. The recent student's enrolment shows that the demand of summer trimester is increasing. In line with the trimester system, the School offers numbers of units for the Bachelor of Construction Management programme in summer. Table 1 compares the delivery modes of those units offered in three trimesters. It is worth to note that some units in autumn and winter/spring trimesters are offered as on campus or online, but all the units in Trimester 3 are delivered flexibly online by using various available e-learning tools. This also proves that e-learning tools are very helpful in flexible delivery approach.

Table 1. Unit Delivery Approach in Trimester 1, 2 and Trimester 3 during 2012

Unit	Trimester 1	Trimester 2	Trimester 3
Project Management	on campus	n/a	online
Building Economics	on campus	n/a	online
Building Environmental Services	on campus	n/a	online
Measurement and Estimating 3	online	n/a	online
Project Planning and Scheduling	n/a	on campus	online
Project Management 3	n/a	on campus	online
Building Cost Planning	n/a	on campus	online

Conclusion and Limitations

This paper has investigated the case of using online tools in flexible delivery approach. As an academic teaching in the university, everyone should not forget that academics are teachers in essence although nowadays many universities will also "count" them numbers of research as well as "require" hours of community services. A teacher's job is to cause their student understanding various theories, and attain prescribed knowledge of particular field. Indeed, understanding who the students are (whether they are fresh school leavers or return from works), what their expectations are (skill-learning or knowledge-studying) and how their motivations drive (purposeful or accidental), are critically important. Taking into account of the changing world context/environment, together with the variety of the students' background, it is the challenge to teacher to find "the best" or the optimal method to teach them. In fact, more and more students in the university rush back to the lecture room from their works. Flexible delivery is therefore required.

According to the existing literatures, theories show that both flexibility and e-learning tools are inter-related. There is a need to utilize new technologies and take advantage of technological advances in teaching and learning to improve students' learning experiences. Most importantly, pedagogical developments are now underpinned and increasingly supported by technologies. Flexible delivery is hinged on effective use of information communication technologies and academic staff should sight to

familiarize with such technologies and strive to appropriate use of those technologies in teaching. Using online teaching and learning tool does provide students to take advantage of the information available to them at the time and place of their choosing. Using the flexible delivery approach, students can then capture knowledge anytime, anywhere, any place easier. Theories also indicated that strategies for flexibility will affect the choice of e-learning tool, especially relate to time, pace, place and style and the best approach. Therefore, adaptation of e-learning tool in flexible deliver approach must consider: 1.access to learning resources via contemporary technologies; 2.learning experiences and assessment; and 3.inclusion of collaborative and interactive activities. Therefore, variable e-learning tools must include these features and functions: 1.on-line teaching and learning platform; 2.electronic portfolio; 3.virtual classroom; 4.lecture recordings; and 5.electronic networking. In doing so, the case studied school has used the following featured e-learning tools to enable "flexibility": 1."Cloud" suite as online teaching and learning platform; 2. E-Live as the virtual classroom; 3."EchoSystem" providing lecture recording services; 4."MediaWiki" as the basis of electronic networking; 5."ePortfolio" for electronic portfolio.

In fact, the case studied university is working on challenges facing Australian higher education, such as the need for a step-change in flexible delivery to enhance students' accessibility and engagement, and has therefore adopted the trimester academic calendar. Using various e-learning tools is essential. In line with the University's strategies, the School aims to improve its course delivery to meet the students' needs, and has adapted to use various e-learning tools in flexible delivery successfully. For example, all units for Bachelor of Construction Management programme in summer trimester are delivered flexibly by e-learning tools. The success of this School proves itself to be an exemplar and their practice provides useful guidelines for other educators planning flexible learning approach. These allow students' access to learning resources via contemporary technologies and to enjoy flexible delivery of learning experiences and assessment. Most importantly, lecturers/tutors/students are maintained to connect by collaborative and interactive activities.

However, it is worth to note that flexible delivery in learning flexibility is a matter of communication, i.e. delivery and receipt. In order to successfully enjoy the advantages of flexible delivery, updating the technology is an issue. Syed-Khuzzan, Goulding et al. (2008) advise the potential drawback of e-learning is technology dependents. In fact, poor internet infrastructure impact on flexibility. For example, some students responded that they encountered difficult to upload or download learning resources or assignment onto the "Cloud" when they cannot effectively connect to internet. Fortunately, the Australian Government has introduced the National Broadband Network, and it is anticipated that the communication infrastructure will be improved in the near future.

Finally, university must also understand that some students need for some computer literacy and resources to access flexible delivery means. University must think from the user's perspectives. Sometimes, some students are still against computerization. Creation of e-learning infrastructures and culture awareness in using computer in flexible delivery are important and necessary.

Notes

[1] 2010, *Strategic Plan: Delivering Effective Partnerships*, Deakin University.

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