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**Leveraging on New Technologies and Their Impact
on Teaching and Learning in Higher Education**

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Abstract

In this digital age, there is little that escapes technologies. They influence the way we work and communicate, and are a mainstay for many businesses today. Higher education is similarly affected, as many of the latest teaching and learning innovations are built on the internet and web-based technologies. A well-equipped information and communication technology (ICT) infrastructure is therefore essential for higher education institutions. ICTs provide the resources needed to complement the university's pedagogy and delivery system, and they are important enablers for revitalising higher education and for inculcating a new teaching and learning culture amongst academics and students.

For an open and distance learning (ODL) institution like Open University Malaysia (OUM), technologies are indeed integral and represent the vital link between what is necessary and what is innovative. It is through technologies that OUM has been able to spread its wings in Malaysia and internationally as well.

This paper will illustrate the leverage of new technologies in a higher education institution as exemplified by OUM. A university's ICT infrastructure must be continuously enhanced and improved in order to develop best practices and maximise the benefits of technologies in a holistic and comprehensive manner. Thus, this paper will also describe the way forward for higher education institutions looking to adopt even newer developments in technology.

LEVERAGING ON NEW TECHNOLOGIES AND THEIR IMPACT ON TEACHING AND LEARNING IN HIGHER EDUCATION

1. INTRODUCTION

The information and communication technology (ICT) revolution is perhaps the most prominent and pervasive force in today's world. It has impacted virtually everything we do; from communicating at work and accessing information, from the way we do business to the way we entertain. In higher education, the profound impact of technologies has culminated into dynamic ways of teaching and learning, transforming traditional classroom learning into new combinations of pedagogies, materials and resources that can transpire outside regular notions of time and space.

In higher education, these technologies, combined with growing digital literacy, have created new opportunities for transforming the way we teach and learn. Today's learners are "digital natives" (The Economist, 2008; Magaña & Frenkel, 2009) – having grown up in an era where technological tools are universal and ubiquitous. Where previous generations would have come to class with books and pens, today's learners are armed with mobile telephones, laptop computers and iPods. For many higher education institutions, particularly those operating in open and distance learning (ODL), this new trend opens the door for numerous opportunities. New technologies can enable higher education institutions to explore multimodal teaching, transform curricula, invent rich forms of content to suit different learning styles and create prospects for collaboration. Through their various guises, applications and capabilities, technologies may hold the key to mould how we teach, learn, acquire knowledge, and thus, reshape the very core of our society.

Many institutions today recognise that technologies can be the catalyst for revolutionising teaching and learning and have, in varying degrees, adopted different technologies in their day-to-day operations. While this bodes well for educational technologies, it is also important for institutions to maintain a respectable level of quality, especially in the eyes of their stakeholders. The provision of quality education extends to a rewarding teaching and learning experience to learners as well as faculty members.

For an ODL institution like Open University Malaysia (OUM), technologies have been the mainstay of our educational provision. In the past nine years of operations, OUM has cumulatively enrolled over 90,000 learners in academic programmes delivered through a blended pedagogy designed using various technologies to complement teaching, learning and campus administration as well. As at June 2010, over 20,000 learners have successfully graduated; a testimony not only to the viability of ODL, but also to the effectiveness of technologies in a higher education environment.

This paper will explore the use of technologies in higher education, as well as look at how technologies can shape teaching and learning processes in an ODL institution like OUM. By leveraging on technologies to improve teaching and learning, OUM has had significant accomplishments in Malaysian ODL within the last decade. However, we believe that there is always room for improvement, both in the kind of technologies institutions can choose to adopt as well as how to maximise their use in higher education. With this in mind, this paper will also discuss how universities and colleges can learn to cope with future technological developments that will continue to have an influence on higher education.

2. TECHNOLOGIES AND THEIR IMPACT ON TEACHING AND LEARNING

Today's higher education scene has been greatly impacted by technologies, and this is especially true for ODL institutions. The very nature of ODL demands for flexibility that can truly benefit from smart adoption of the appropriate technologies. In recent years, this can be seen in such developments as learning and content management systems, multimedia-rich course materials, virtual libraries and the use of collaborative tools like the Wiki. These innovations have enormous implications on teaching and learning processes, by facilitating different learning styles, fostering creativity and encouraging co-operation between academics, learners and their peers. Even traditional universities have been embracing technologies in their teaching and learning – however, this is probably more pronounced in highly technical disciplines such as medicine, engineering and computer science. Technologies in this sense of the word usually encompass tools as learning aids, e.g. simulation programmes, videotaped lectures, and the like.

In ODL, access, flexibility and independence are the cornerstones in its delivery system. Oftentimes, ODL learners study in their own time, attending classes or interacting with their tutors and lecturers only on an occasional basis. Because many of them are working adults who juggle multiple responsibilities, these learners must catch up on reading material and assignments, do quizzes or prepare for examinations in their own time. Technologies, particularly web-based innovations, are an important mainstay – as these learners expect to have easy access to their study materials, tutors and the university at all times without constantly having to be on campus.

For higher education to be a truly rewarding experience for both tutors and learners, the teaching and learning strategy should provide some room for pedagogical innovation – a feat that can certainly be assisted by using the right technologies. In any academic programme, several important features will need to be present, for instance, materials and resources that are easily accessible and usable; stable networks and infrastructure to facilitate asynchronous communication (e.g. e-mail service, online forums); as well as creative applications to support different learning styles, foster reflective thinking, revamp curricula, allow for self and peer evaluation and create a platform for interactive and attractive teaching techniques. With these features properly put in place, a higher education institution can really ensure of the quality of its education provision.

It is said that technologies have a direct impact on the main processes involved in teaching and learning, i.e. what is learned; when and where learning takes place; how learning occurs; who teaches and who learns (Oliver, 2002). In today's scene, awareness of this new approach is indeed growing. The conventional method of teaching that entails lecturers planning lessons and instructing learners in a series of lectures has evolved into a contemporary approach whereby learning can take place through constructivism. Today's learners are encouraged to have active and interpretative involvement in their own learning; the lecturer or tutor playing a "guide on the side", rather than a "sage on the stage", role (Rogers, 2000). In an environment like ODL, technologies are inherently linked to this new approach. ODL tutors must now assume a more facilitative, rather than instructive, role – they must help learners to construct their own thoughts and opinions from the information provided. In essence, the learner becomes the centre of the educational process.

This learner-centred approach is, in fact, also a central concept in ODL. It resonates with the entire ODL philosophy – from delivery to teaching, learning and the technologies that make all of them possible. The idea of quality education with a learner-centred approach means prioritising learner needs by creating learner-friendly programme design, learning materials and support services. All of these aspects encompass the efforts to ensure a rewarding teaching and learning experience for everyone involved.

3. TEACHING, LEARNING AND TECHNOLOGY AT OUM

ODL is at the centre of both technological innovations. By utilising state-of-the-art technologies, ODL has been able to deliver academic programmes with higher impact and efficiency, in a cost-effective manner. The convergence of pedagogies and digital technologies is evident in the ODL mode of delivery, blending face-to-face interaction with virtual interfaces, combining stand-alone multimedia applications with networked environments, Web 2.0 applications like Wikis, blogs, online social networking and open educational resources (OER). At OUM, we try to adopt these innovations and applications into the appropriate channels in creating a teaching and learning environment suitable for both learners and faculty members.

OUM was established in August 2000 as a response to the Government's call for the democratisation of education. It is thus the mission of the university to make higher education accessible, affordable and available for anyone who seeks it. Although having been set up under a consortium of 11 public universities, OUM operates as a private university that leverages on other public institutions and the industry to lend their academic expertise in managing and delivering OUM's programmes.

Today, nine years on, OUM's cumulative intake has reached over 94,000 learners while the number of graduates has surpassed 20,000. Over 8,500 individuals from public and private educational institutions are appointed as tutors, and they conduct face-to-face tutorial sessions on a fortnightly basis at 61 learning centres situated in major locations nationwide. In its mission to educate the masses, OUM relies on information technology (IT) to provide the means to deliver its programmes. With flexible entry requirements, a learner-friendly academic system and a blended learning pedagogy, OUM focuses on

lifelong learning opportunities for working adults who may have missed out on the chance to pursue higher education earlier in their lives. The blended learning pedagogy combines self-managed learning using print modules and other learning materials with face-to-face sessions to complement the e-learning component. Thus, while e-learning is the core of OUM's delivery method, the university has also focused on its accompanying elements as well – this is certainly deemed important to provide a comprehensive and enriching educational experience for the learners.

Technologies have been integral to achieve and implement all the above targets, while the main objective remains to enrich teaching and learning and maintain the university's learner-centred approach. For OUM personally, the foray into technologies began with the development of an in-house learning management system (LMS) and today includes various other innovations that are designed to influence teaching and learning processes. OUM also continuously seeks to ensure the relevance and suitability of its teaching and learning framework so as to reach out to all its learners and allow them to develop their own individual capacities as workers and citizens.

3.1 The e-Learning Model
The e-learning model employed by OUM encompasses one of the three components of the blended pedagogy. The most important element in this model is the university's LMS, today known as myVLE (my Virtual Learning Environment). Because learners will do most of their studying independently, the e-learning model must be able to provide the necessary support and guidance to help make this process an interesting, engaging and enriching experience.

All of OUM's courses are complemented with rich, web-based content, including downloadable modules (in PDF), topic-specific forums, frequently-asked questions and resources such as learning objects and links to collections in the digital library. Modules are also available in Hyper Text Markup Language (HTML) format; allowing learners to have actual interaction with the module content. There are also other useful resources, e.g. YouTube videos, audio files and web links. A designated e-tutor is also appointed to facilitate each forum, with whom all registered learners in a particular course can interact with in a virtual environment. All assignments are submitted online via myVLE

as well; and they are automatically run through a Similarity Checker System to ensure originality and check for plagiarism.

3.2 My Virtual Learning Environment (myVLE)

The core element in OUM's e-learning model is myVLE. First developed to support online discussion forums, provide a link to the university's digital library collection and other learning resources, myVLE today allows learners and tutors to access multimedia learning materials, interact with one another, try out quizzes and even check on their own profiles, schedules and payments. All of these services, including the digital library, can be accessed as long as the learner or tutor is connected to the Internet.

3.3 Learning Materials

The learning materials that have been developed and are accessible through myVLE include: CD-based multimedia courseware, iBooks, iTutorials, iLectures, iRadio learning segments, audiobooks as well as digital modules in PDF and HTML formats. The HTML modules are the latest development to be incorporated into the myVLE. By leveraging on web-based technologies, OUM has been able to transform print modules into interactive web pages that incorporate useful links, hover-boxes to reveal definitions of specific terminology and even self-assessment quizzes for learners to try out.

3.4 OUM's Internet Radio (iRadio)

One of OUM's proudest technological applications is the iRadio, which broadcasts infotainment academic segments that are based on print modules to enhance the teaching and learning experience. These are accompanied by live interviews with subject-matter-experts from time to time. iRadio also produces audio learning materials for visually impaired learners. With features such as downloadable podcasts via the iCast website, these segments can all be downloaded into any computer or handheld device. Learners can opt to be automatically informed on the availability of latest content by subscribing to the iCast Really Simple Syndication (RSS) feed. Concerning Web 2.0, social networking tools such as Facebook and Twitter have also been incorporated into iRadio.

OUM has also collaborated with the Ministry of Education, the Maldives, to bring iRadio Maldives on air. With support from the Commonwealth Educational Media Centre for

Asia (CEMCA), OUM has been able to provide knowledge and technical support to the Maldivian team, including training their members on the necessary know-how's in broadcasting technologies, applications and software; as well as developing programmes, segments and scripts for the implementation of their version of the internet radio. iRadio Maldives was successfully launched in December 2009.

The Central Institute of Educational Technology (CIET) in New Delhi, also with support from CEMCA and the Commonwealth of Learning (COL), became the latest institution to launch its own version of iRadio known as "Umang on www". "Umang" is the collective name for audio programmes broadcasted by CIET and through this venture, all of these programmes will now be available over the Internet. Similar to the iRadio Maldives project, the OUM team also provided knowledge, expertise and technological support to CIET. Umang on www was successfully launched on 4 June 2010.

3.5 Mobile Learning (m-Learning)

Mobile learning, or m-learning, is also one of the newer technologies that have been included in OUM's teaching and learning framework. The m-learning initiative was piloted in May 2009 for one of OUM's core courses, i.e. "Learning Skills for Open and Distance Learners". There were about 2,000 learners enrolled for that particular semester. m-Learning was integrated to provide more learning opportunities and to benefit from the proliferation of mobile telephones amongst its learners (Anuwar Ali, 2009). Each learner with a registered telephone number received two to three short text messages per week during the entire semester. The messages were usually in the form of small 'chunks' of content, reminders and motivational phrases. Learners appeared very receptive to this new technology, and by the end of 2009, OUM also began implementing m-learning for two more courses i.e. "Company Law" and "Renal Nursing".

3.6 Mathematics Resource Centre (MRC) and Electronic Gateway to English Resources (e-GATE)

In an effort to help learners deal with the intricacies of Mathematics, OUM also launched the Mathematics Resource Centre (MRC) in September 2009. The MRC serves an online centre that provides a variety of resources, including supplemental notes, practice problems, interactive tutorials and links to other Mathematics sites. It also provides a round-the-clock free online tutoring service. The MRC is the first of its kind for OUM;

and has garnered over 50,000 visits since its launch. It has been able to simultaneously engage learners, tutors and faculty members who are on the lookout for useful resources for teaching Mathematics and has become part of the university's retention initiative.

Early in 2010, a similar website was developed for another subject matter, i.e. the English language. Known as the Electronic Gateway to English Resources (e-GATE), it provides various useful links for learners in search of help in grammar, reading, speaking, listening and writing. As means of promoting e-GATE to more visitors, not only the OUM community, the website also has complementary Facebook and Twitter pages as well.

3.7 Open Educational Resources (OER)

The OUM OER project was initiated by the Institute of Quality, Research and Innovation (IQR) and managed by the Centre for Teaching, Learning and Assessment (CTLA) with the aim of sharing some of OUM's learning resources with the general public. The OER, available via http://oer.oum.edu.my/, is still in its early phase and will generally cover the following areas:

- Mathematics;
- English;
- Learning Skills for Open and Distance Learners;
- Business;
- Information Technology;
- Social Sciences;
- Nursing Science; and
- Education.

OUM's OER are licensed under Creative Commons, but are completely accessible via the Internet. Currently, the website includes learning materials for "Learning Skills for Open and Distance Learners" and Basic Mathematics. In due time, more content will be developed and added to the website.

4. THE WAY FORWARD

Technologies have been identified as the most compelling factor in the development of ODL. With the continued expansion of technologies, the greater acceptance of its use in higher education will improve the quality of teaching and learning. However, there are challenges for higher education institutions seeking to adopt technologies in their daily operations. While it is important to remain abreast with current technological developments, these challenges must be addressed if technologies are to be fully integrated into higher education practices.

Central amongst these is the redefining role of higher education institutions in light of technological influence in our daily lives. With the race towards knowledge societies and globalisation, we must re-consider the impact of education, the roles of teachers and the nature of their training (Loing, 2005). For developing countries like Malaysia, the demand for higher education is bound to grow by leaps and bounds. This demand is expected to come from diverse groups of people, e.g. more working adults, retirees, homemakers and et cetera; and including new types of providers from the private sector. Fulfilling this demand will require technology-based learning; for which the government and higher education institutions will need to invest in the appropriate infra- and infostructures.

The evolution in educational theories, particularly in terms of learning styles and approaches, means that there will be a shift in teacher-learner relations. With technologies taking the stage, lecturers and tutors must discover how to guide learners in their educational experience, utilise the tools to communicate within and outside the classroom, and be adept with devices and innovations that are available. One of the technologies that will potentially make the greatest contribution in enhancing the quality of teaching and learning in this sense is online collaborative tools (The Economist, 2008). Notably, Wikis, instant messaging and social networking platforms have had notable impact on the way learners connect with one another.

In terms of content, there is also great potential to incorporate more web-based technologies to complement available learning materials. For instance, there is vast creative potential in platforms like YouTube and Wikipedia. The University of California Berkeley broke new ground when, in 2006, it introduced its own YouTube channel;

streaming hundreds of videotaped lectures in over 300 hours of free education via the World Wide Web. There are also other cases of web-based technologies used in teaching and learning, e.g. Wikimedia Foundations Wikibooks – which are digital alternatives to traditional textbooks (accessible via http://www.wikibooks.org/) and Wikiversity (http://en.wikiversity.org/) – which is a project that collects learning resources, projects and research across all levels of education; and the Croquet Project (http://www.opencroquet.org/) – that provides open source software for creating collaborative communication tools. Today, there are also many examples of higher education institutions exploring the use of learning objects, simulation software and different multimedia to complement learning.

In this day and age where disparity and the digital divide are still conspicuous, the idea of open sharing is perhaps the most profound amongst these examples. The Internet is an open platform, and many of its tools, are freely available and accessible as well. The idea that knowledge and education can, to a certain degree, be transmitted and shared without restraint, opens great doors for learners who are keen to learn, and higher education institutions that are keen to compete.

These scenarios give us a curious glimpse into the future window of technologies in higher education teaching and learning. These innovations prove that there will be much promise for further development. ODL institutions like OUM, commonly leverage on technologies in our operations. In this sense, ODL institutions can provide the most wholesome environment for growth – in terms of technologies, instructional design and pedagogy. That said, this is an opportunity for knowledge sharing as well. By forging partnerships between institutions, there will be room for collaborative improvement. This will bode well for higher education, educational technologies and higher education institutions as well.

5. CONCLUDING REMARKS

In today's technology-driven world, higher education will be reinvented in the light of digital tools and applications. OUM has proven that it is possible for higher education institutions to leverage on technologies for the advantage of the university and its learners too. The "digital natives", together with open and distance learners and their

needs as stakeholders warrant a new approach towards teaching and learning. The different technologies described in this paper are but a peek into what technologies can truly offer. For higher education, it will be important for institutions to remain in control of their adoption strategies – technologies should complement, enrich and enhance the educational process, but should not be the ultimate driving force *per se*.

That said, the potential for creativity and innovation is indeed great – particularly for higher education institutions that are willing to share and collaborate. The next step in educational technology certainly appears to point in this direction. What will be important is to move forward – in terms of what technologies we explore, how we use them and how we can further enrich the teaching and learning experience for the higher education community. At the end of the day, we all strive for the same thing – to provide quality education to all who seek it.

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