

Skills, Usage and Perception of ICT and Their Impact on E-Learning in an Open and Distance Learning Institution

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ABSTRACT

Open and distance learning (ODL) institutions have long recognized the need for their learners to participate in education programmes through a flexible delivery of instructions. One of the key elements of a flexible delivery mode is the use of information and communications technology (ICT). However, the potential of ICT will only be fully realized if learners have the ability and capacity to use them, and at the same time possess a positive attitude towards learning with ICT.

This study aims to determine not only learners' skills and use of ICT but also their perception towards the use of ICT in learning and their views on opportunities that can be enhanced by ICT. The research instrument used in the study is a questionnaire adapted from the SPOT-PLUS Project, 2004, conducted by the Directorate General for Education and Culture of the European Commission (ECEC) in 2004 (<http://www.spotplus.odl.org/questionnaire>). A random sample of 482 undergraduate learners was asked to rate themselves in terms of their own ability to use four well-known software applications, followed by how frequent they use three ICT tools. Another section teased out learners' attitudes towards the use of ICT in learning and finally, learners were asked to rate areas where they believed ICT could add value.

The overall results indicate that OUM learners are quite skilful, as shown by the overall (restrictive and permissive) ICT skills index of 3.5 out of 4.0 and a medium usage level of ICT tools. To learners, traditional face-to-face methods are still desirable, even though they prefer the use of ICT in learning. An important result derived from this study was that ICT skills index and perception are two significant factors that have an impact on the odds of using e-learning. Towards this end, OUM

continuously monitors learners' use of ICT and e-learning to ensure that real learning takes place so that its graduates are adequately equipped to compete in today's technology-driven and information-rich work environment.

INTRODUCTION

Today's diverse learners demand that education be delivered in a flexible mode to suit their learning needs. To meet these needs, higher education institutions (HEIs) are turning to information and communication technology (ICT) as an enabling factor to allow for greater flexibility and accessibility to learners, particularly working adults who have multiple commitments. ICT has the potential to provide choices, cater for learner diversity and stimulate and engage learners. In this regard, HEIs are spending huge sums of money on ICT hardware, software and Netware to ensure that learners are provided the best e-learning facilities possible. Despite the best of intentions and efforts and educators' belief about the value of ICT, the issue of learners' perceptions, skills and use of ICT in learning need to be investigated to ensure that HEIs' technology expectations are met. Learners differ in their basic learning styles and individual preferences and this has a significant effect on their willingness to embrace ICT in their learning.

A majority of today's learners are technology savvy but they are not necessarily information savvy. For example, they can text messages and download music but are often at a loss when selecting appropriate websites and creating persuasive digital presentations. To function in an information society, learners need ICT literacy. It includes ability to use technology as a tool to research, evaluate, organize and communicate information. Learners need good ICT literacy skills to succeed in their academic course, when they have to carry out (on their own) tasks such as checking their financial, administrative and academic status. They also need the skills to produce documents with word processors, to present project papers or short talks using a software application such as PowerPoint or through a personal website, to retrieve information from the digital library and Internet, to communicate electronically with staff and peers and to download and upload files. Upon their graduation, the skills have to be a part of them in order to compete in today's technology-driven and information-rich work environment.

On average, Open University Malaysia (OUM) spends 15% of its annual budget (operating as well capital expenditure) on ICT-related departments, namely, ICT Services, Centre for Instructional Design and Technology (CIDT) and Digital or Online Library. These expenditures are intended to provide the highest quality ICT infrastructure to deliver its academic programmes effectively and efficiently. Being an open and distance learning (ODL) institution utilizing a blended mode of delivery, OUM relies heavily on the capability of its ICT infrastructure to effectively provide quality education to its learners at any time and in any place. An excellent ICT infrastructure will most likely enhance learners' interest and motivation to use ICT in their learning.

This paper aims to create a substantial baseline of data about ICT skills, usage and attitudes of learners at OUM. This data and the instrument used were intended to provide a basis for benchmarking between HEIs and track changes over a period of time. This paper also seeks to determine the factors influencing the use of e-learning at

OUM. An understanding of these factors will enable OUM to identify the necessary initiatives to enhance learners' skills and use of ICT in learning.

OBJECTIVES OF STUDY

The study was carried out to achieve the following objectives:

- (1) To obtain a baseline assessment of learners' abilities and frequency in using ICT;
- (2) To determine learners' perception towards the use of ICT vis-à-vis the use of traditional methods in learning;
- (3) To obtain learners' views on the opportunities that can be enhanced by ICT, particularly its role in learning and education; and
- (4) To identify the significant factors influencing the use of e-learning.

The above objectives are translated into the following research questions:

- (1) Are OUM learners equipped with skills of using software applications (word processing, e-mail, PowerPoint presentation and Digital Library) to help them in their study?
- (2) Are there any differences in learners' skills of using the above software applications among new and established learners?
- (3) Are the three ICT tools (website, online forum and academic support via e-mail) fully utilized by learners?
- (4) Are there any differences in the usage of the above ICT tools among new and established learners?
- (5) Do learners have a stronger preference for the use of ICT or traditional methods in learning?
- (6) Do ICT skills, perception and demographic variables influence the use of e-learning?

LITERATURE REVIEW

ICT as a key enabler in learning and teaching is generally accepted worldwide. This has prompted many studies on learners' readiness in terms of their ICT skills level as well as their attitude in terms of frequency of use of ICT tools and applications in teaching and learning. The European Union, in particular, has an active concern for the state of development of ICT skills of their population, especially their learners (European Commission, 2002). A more recent study on the ICT skills and attitudes among students across Europe found that European students generally had adequate ICT skills and displayed a positive attitude towards the use of ICT to enable them to cope with the demands of university studies as well as graduate employment (Haywood, et. al., 2004). However, the extent to which these skills will remain sufficient for future developments in the use of ICT such as mobile learning or e-learning remains unanswered and needs to be further researched.

Another study found that the majority of medical students in Denmark had access to computers at home as well as used e-mail and the Internet regularly. Only a few students preferred not to use computers at home. Interestingly, the study found that

students believed the use of ICTs was merely a supplement to and could not replace traditional teaching activities (Dorup, 2004).

Siritongthaworn, et. al. (2006) examined the e-learning technology implementation of universities in Thailand. They found that three main factors and one key barrier influence the degree to which e-learning implementation was successful. The three factors are: (a) characteristics of the organization with regard to its policy towards e-learning and the organization of e-learning itself, which is the most important, (b) the instructor and (c) the Internet environment. The key barrier was found to be student preference for instructor-led learning. The students were used to instruction in the conventional structured format in the traditional mode of education delivery. The study recommended that students and instructors in Thai universities use ICT effectively and integrate it in the learning and teaching procedures accordingly.

A number of studies examined the differences in ICT skills and attitude among male and female learners (Schumacher and Morahan Martin, 2001; Lily Shashaani and Ashmad Khalili, 2001; Morahan Martin, 1999; and Ford and Miller, 1996). In general, females were found to be less experienced, less interested in Internet use and more likely to report significantly greater levels of disorientation and disenchantment in relation to the Internet, compared to males.

Another issue that was examined regarding ICT usage among students was its effect on learner performance. Kulik's (1994) meta-analysis study revealed that on average, students who used computer-based instruction scored higher compared to students without computers. The students also learned more in less time and they liked their classes more when computer-based instruction was included.

Another aspect in the use of ICT that is gaining greater interest among researchers is the integration of ICT in teaching and learning by teachers, lecturers and instructors. Anouk Janssens-Bevernage, *et.al.*, (2005) conducted a study in Kenya and found that after going through three phases of how to integrate ICT in their teaching, namely, awareness, guided integration and realization, the instructors seemed to acquire considerable drive and motivation to use ICT in their daily work including teaching. More importantly, the study also found that the ICT training provided to lecturers enhanced the learning environment of their learners. As a result, they became more independent learners, enjoyed learning, enjoyed the democratization process in their learning, saved a considerable amount of time in running around libraries to look for information when given an assignment, were better able to assess educational practices and policies and could relate with and assist others in undertaking research activities.

In a study conducted in Greece, Stavropoulos and Moschona (2007) found that self-study (learning by doing) and informal assistance from colleagues and friends seemed to be the most important factors for acquiring IT skills. For young individuals and those with a high education level, they found that the main way of obtaining IT skills was through educational institutions.

One common consensus among researchers in the above studies is that they unanimously agree that academicians and course instructors need to incorporate ICT into their course curricula. The role of higher education institutions in this regard is to provide the impetus for teachers and learners to use ICT in their daily teaching and learning activities.

METHODOLOGY

Sample

The sample selected for the study consists of 482 learners from the states of Pahang, Kelantan and Sabah. They were from different programmes and semesters of study.

The Research Instrument/ Questionnaire

The research instrument used in the study is a questionnaire adapted from the SPOT-PLUS Project, 2004, conducted by the Directorate General for Education and Culture of the European Commission (ECEC) in 2004 (<http://www.spotplus.odl.org/questionnaire>). The questionnaire is divided into five sections. The first section collects information on learners' demographic variables, such as gender, race, programme, CGPA, etc.

The second section measures learners' ability in using four standard software applications. The four software applications are word processor, e-mail programme, presentation manager and Digital Library. The skill of using the software applications is measured in terms of 3-point scale, that is, *1: I can do this by myself; 2: I would need some help to do this and 3: I have never done this type of task.*

To achieve maximum standardization, learners were given examples of using the software to guide them to the level of skills they have acquired. These examples are: to create a formatted CV with a word processor, to send an attached document or image with an e-mail, to create a short talk with slides using a presentation manager and to search for a specific publication using the Digital Library.

The third section measures learners' experience in three different ICT tools. These tools are interactive website, online discussion forum and academic support via e-mails, using a four-point scale, that is, *1: Several times; 2: Once; 3: Never; and 4: Never heard of this.* For the purpose of analysis, these codes were reversed, that is, *4: Several times; 3: Once; 2: Never, and 1: Never heard of this.*

The fourth section contains 20 questions which are used to tease out learners' attitudes towards the use of ICT in learning. The 20 questions are divided into two factors: "positive perception of use of ICT in education" and "positive perception of use of traditional method." Learners are asked to answer based on four levels of agreement – *1: I totally agree; 2: I mostly agree; 3: I mostly disagree; and 4: I totally disagree.* One additional scale, *5: I do not know*, was also provided. For the purpose of analysis, these codes were reversed: *4: I totally agree; 3: I mostly agree; 2: I mostly disagree; and 1: I totally disagree.*

The fifth and final section of the questionnaire contains 17 questions, offering a list of opportunities that might be enhanced by ICT. The respondents were asked to indicate how important in their opinion each item was on a scale from *1 (not important at all) to 4 (very important).* An additional scale of *5 (I do not know)* was also provided. The questions were grouped into three factors. The first factor was labelled "Facilitating contact and information exchange," the second factor, "Promoting access to higher education" and the third factor, "Changing the learning process and learning outcomes."

Data Collection

The printed questionnaires were distributed to the learning centres of the three selected states after their tutorial sessions and were collected immediately after the learners had completed them.

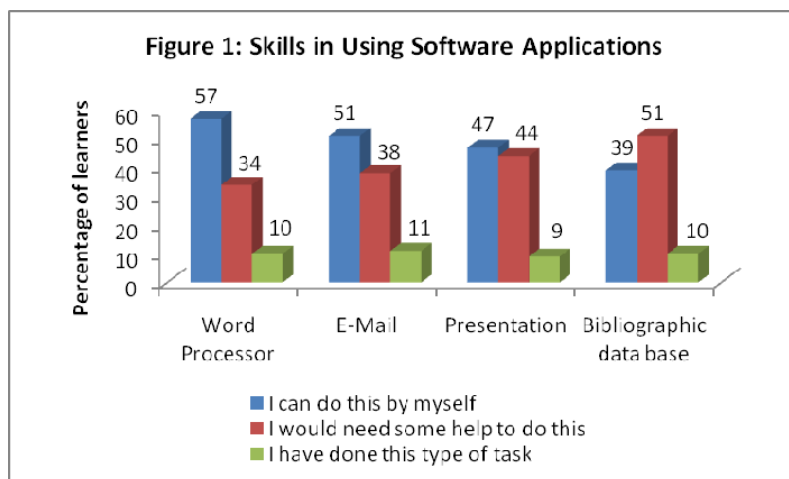
RESULTS

Demographic profile of respondents

The majority of the learners in the sample was females (70%), above 26 years old (62%), and married (88%). In terms of entry qualifications, slightly less than half of the learners (44%) had the equivalent of SPM-level qualification while the rest had the equivalent of STPM-level qualification or diploma certificates.

Skills in using software applications

The study found that most learners could use word processing (57%) by themselves, followed by e-mail (51%), presentation (47%) and bibliographic database (39%) as can be seen from Figure 1 below. However, when some help is available, most learners could use bibliographic database (51%), followed by presentation (44%), e-mail (38%) and word processing (34%). The survey revealed another interesting finding: a small proportion (9-11%) of the learners had never used any of the four software applications.



ICT Skills index

Table 1 shows an ICT Skills Index for two categories of users, that is, *restrictive* and *permissive users* by different groups of learners, *new* and *established*. The restrictive skills index refers to the number of ICT applications which learners could use without help. Permissive skills index refers to the number of ICT applications which learners could use with some help. The overall restrictive skills index was 1.9, while the overall permissive skills index was slightly lower, at 1.6, giving a combined skills index of 3.5 out of 4 ICT applications. These figures indicate that ICT skills level among learners in OUM is medium to high, albeit with help for some learners. The results also show that the combined skills index of established learners is marginally higher than that of new learners. There is also a marked improvement in the restrictive skills index of the new

(1.6) and established learners (2.0); this implies that learners have acquired substantial ICT skills, such that they are able to use the four software applications on their own during their course of study.

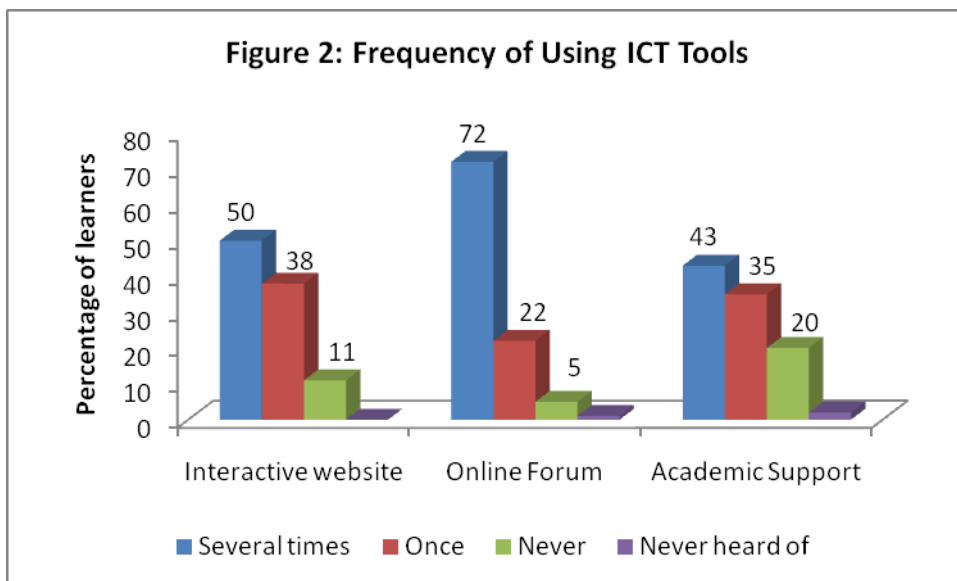
Table 1: ICT Skills Index

Current Semester	n	Skills index*		
		Restrictive user (can do by myself)	Permissive user (need some help)	Combined users
Semesters 1, 2 & 3 (new learners)	254	1.6	1.7	3.3
Semester 4 & above (established learners)	228	2.0	1.6	3.6
Overall	482	1.9	1.6	3.5

A Chi-square test found that the permissive ICT skills index is strongly and negatively associated with the restrictive ICT skills index at 0.01% significance level. This result suggests that the skills of permissive ICT users could be easily upgraded with the necessary support, training and motivation provided to become restrictive ICT users.

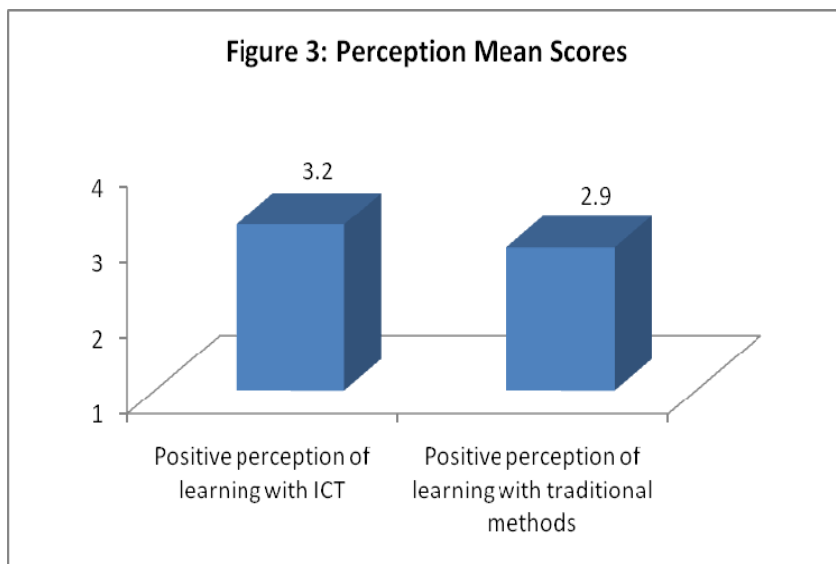
Frequency of using ICT tools

The survey found that 72% of the learners had used online forums, 50% interactive website and 43% academic support via e-mails several times (Fig 2). The survey also revealed that some learners had not used or heard of the three e-learning tools, with the worst two situations reported for academic support (22%) and interactive websites (11%).



Positive perceptions towards the use of ICT and traditional methods in learning

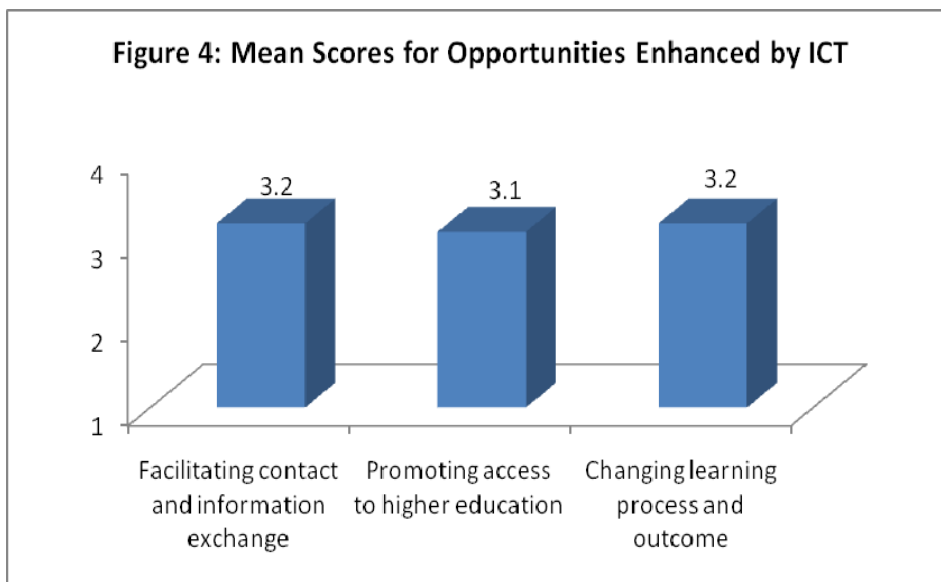
Figure 3 reveals that the learners scored an average of 3.2 out of 4 for “positive perception towards learning with ICT methods” as compared with a lower score of 2.9 points for “positive perception towards learning with traditional methods.” A closer examination of the individual answers to the items in the “positive perception towards learning with ICT methods” dimension reveals that learners were especially interested in using ICT for improving learning and sharing information and ideas with people having similar interests. On the other hand, positive perception towards traditional methods of learning was due to their belief that face-to-face contacts provide better access to a tutor and their strong preference for learning from printed text.



Opportunities offered by use of ICT

Learners were given a list of opportunities that might be enhanced by ICT and they were asked to rate the importance of each of these opportunities using a scale from 1 (*not important at all*) to 4 (*very important*) together with a fifth category of “5: *I don’t know*.” The opportunities items were grouped into three factors: (a) facilitating contact and information exchange, (b) promoting access to higher education, and (c) changing the learning process and learning outcome, in accordance with the groupings provided for by the SPOT+ Survey.

As shown in Figure 4, learners scored an average of 3.2 out of 4 points for both the first and third factors and 3.1 points for the second factor. These suggest that learners believe that ICT is able to enhance communication, change learning and to a lesser degree, promote access to higher education. A detailed analysis of the items in factors 1 and 3 reveals that two items were likely to benefit the most from ICT usage. These two items were opportunities related to student contacts with lecturers/ tutors for advice (50% of learners) and the development of employability skills such as teamwork, problem-solving, self-learning capability and presentation skills (40%). This finding is consistent with the strong show of positive perception towards learning with ICT.



Factors influencing the use of e-learning

In order to determine the factors that influence e-learning, “Using myLMS frequently” is used as the dependent variable in a four-predictor logistic regression model to test the following hypotheses:

- (a) Is there a significant difference in the odds of “using myLMS frequently” by age groups (less than 25 years/ more than 26 years) of learners in OUM?
- (b) Is there a significant difference in the odds of “using myLMS frequently” by gender?
- (c) Is there a significant impact of ICT skills level on the odds of “using myLMS frequently” among learners?
- (d) Is there a significant impact of the perception of use of ICT on the odds of “using myLMS frequently” among learners?

The four-predictor logistic regression model takes the following form:

$$\text{Log of odds of using MyLMS frequently} = \log\left(\frac{P_A}{1 - P_A}\right)$$

$$= \beta_0 + \beta_1 * \text{ICT Skills Index} + \beta_2 * \text{ICT Perception} + \beta_3 * \text{Gender} + \beta_4 * \text{Age Group}$$

where P_A refers to probability of using myLMS several times.

In this model, the following codes were assigned to the indicator variables:

Gender = 0 for male (reference indicator); 1 for female; and age-group = 0 for less than 25 years (reference indicator); 1 for 26 years and over.

As shown in Table 2, the logistic regression coefficients (β) for both gender and age group are not significantly different from zero ($p > .05$). This implies that there is no

significant difference in the likelihood of using myLMS between male and female students, and between the less than 25 years and more than 26 years age groups of learners, respectively.

Table 2: Variables in the equation

Variable	β	S.E.	Wald	Degree of freedom	Sig (p-value)	Exp(β): odds ratio
ICT perception	1.598	.267	35.716	1	.000*	4.943
ICT Skills Index	0.419	.076	30.284	1	.000*	1.520
Gender	-.325	.224	2.109	1	.146	.723
Age group	-.338	.238	2.027	1	.155	.713
Constant	-5.324	.839	40.281	1	.000*	.005

The reduced prediction equation becomes:

$$\text{Log of odds of using myLMS frequently} = -5.324 + 1.598 \cdot \text{ICT perception} + 0.419 \cdot \text{ICT skills index}; R\text{-square} = 26\%$$

Thus, the log of the odds of using myLMS was positively related to perceptions towards the use of ICT ($p < 0.05$) and ICT skills index. This implies that for a given level of ICT skills index, learners with a more positive perception towards the use of ICT would use myLMS more frequently. The results also show that with a given level of perception towards the use of ICT, learners with a higher ICT skills index would use myLMS more frequently. The R-squared of 26% implies there are factors other than the above which influence the odds of using e-learning.

Table 3 provides the magnitude of impact on the likelihood of using myLMS given an increase or decrease in the perception towards the use of ICT. Thus, a one-point increase in the perception would increase the likelihood of learners using myLMS by 4.943 times, given the same ICT skills index. Similarly, a one-point increase in the ICT skills index would result in an increase of the likelihood of learners using myLMS by 1.52 times, given the same level of perception towards the use of ICT.

The probability and the odds of using myLMS frequently are computed by applying the following formulae:

- (1) Probability of using myLMS frequently = e^z
 where: $Z = \beta_0 + \beta_1 \cdot \text{ICT Skills Index} + \beta_2 \cdot \text{ICT Perception}$
- (2) Probability of not using myLMS frequently = 1 - Probability of using myLMS frequently
- (3) Odds of using myLMS = Probability of using myLMS / Probability not using myLMS

Based on the three formulae above, an attempt is made to compute the probability and the odds of using myLMS based on the logistic regression coefficients (Table 2) and a hypothetical set of perception ratings of ICT use and the ICT skills index. The results of the computations are given in Table 3.

Table 3: Probability and odds of using myLMS

Situation	ICT Perception Rating	ICT Skills Index	Probability	Odds	Odds Ratio
A	1	1	0.035	0.037	
B	1	2	0.053	0.056	1.520 *
C	1	3	0.078	0.085	1.520*
D	1	4	0.114	0.129	1.520*
E	2	4	0.389	0.636	4.943**
F	3	4	0.759	3.146	4.943**
G	4	4	0.940	15.549	4.943**

Note: * refers to the odds ratio for a change in ICT skills index, and ** refers to the odds ratio for a change in perception towards use of ICT.

It can be observed from Table 3 that a learner who rates ‘1’ for perception towards the use of ICT and who scores ‘1’ for ICT skills index has a 3.5% probability of using myLMS, and it is not surprising that the odds of using myLMS is only 0.037 time against not using it. If the perception increases to a score of 3 and the ICT skills index improves to 4, then the student would have a 75.9% probability of using myLMS and the odds of using myLMS would increase to 3.1 times against not using it.

These hypothetical figures illustrate the importance of improving ICT perception and ICT skills of students in an effort to increase the use of e-learning. However, the R-squared value of 26% implies there are other factors influencing the use of e-learning.

DISCUSSION OF RESULTS

In general, the study found that 39% to 57% of learners were able to use each of the four software applications without help (*restrictive users*) while 34% to 51% require some help in using the above software applications (*permissive users*). The overall skills index of the learners was 3.5 out of 4 software applications. These indicate that OUM learners’ ICT skills are between medium to high. However, the presence of a large percentage of permissive users suggests that a significant proportion of OUM learners have depended on their peers in getting their assignments ready. This is no surprise because it has been reported that learners acquire ICT skills mainly from their peers, and not through formal training (Stavropoulos, N. and Moschona, T. 2007). To this end, relevant interventions have been put in place to shift the percentage of permissive to restrictive users. In particular, faculties have reviewed some of the curriculum with a view to further integrate the use of software applications in the coursework so as to push learners into using the applications to complete their assignments, self-test, etc. However, the 9-10% of non-users of the software applications is a cause for concern. This is most likely to be attributed to the fact that some learners live in rural areas which have very limited amenities such as electricity and telephone lines.

In terms of usage, 72% of OUM learners used the online forum several times, followed by interactive websites (50%) and academic support by e-mail (40%). These figures are higher than those recorded by European learners in two of the three tools above

(Latifah A.L. *et. al*, 2008). This is not unexpected since OUM learners are in an ODL institution while European learners are in conventional universities. The relatively high usage of the online forum is probably due to the awarding of 5% marks for online participation in the forum. The interactive website provides e-materials of different formats to supplement the print modules. Learners access it to enhance their understanding of the content of the modules. The marginally lower usage of academic support by e-mails is probably due to learners' preference for using the online forum where the online participation marks contribute to the overall grade of the course.

With regard to learners' perceptions on the value of ICT and its potential role in education, they held a fairly positive view of the different advantages that ICT could bring to learning. However, they also showed a relatively strong preference for face-to-face and teacher-based learning. This finding is not unexpected given OUM's blended mode of learning. It reinforces the view that e-learning complements the face-to-face interaction and is consistent with the findings of other similar studies.

On the opportunities offered by ICT usage, learners attached great importance to all the three groups of opportunities – “facilitating contact and information exchange,” “promoting access to higher education” and “changing the learning process and the learning outcomes.” OUM learners scored at least 3.1 out of 4 points for each of the groups of opportunities. A detailed review of the items reveals that almost 50% of learners supported the opportunities offered by ICT in “enabling learners to contact lecturers/ tutors/ staff for advice on academic questions and problems” and about 40% in “developing employability skills such as teamwork, problem-solving, self-learning capability and presentation skills.” Again, this finding is not unexpected as OUM learners are largely working adults and they study on a part-time basis. Thus, they have to rely on the use of ICT for the most part of their learning. As working adults, OUM learners also realize the importance of ICT in enhancing their problem-solving ability, presentation skills and the like so as to perform better at their workplace. Another interesting observation from the study was the high rating for “promoting access to higher education” given by OUM learners, which augurs well for the institution's motto of “Education for All.”

The results of the regression analysis imply that it is vital to provide ICT skills for learners which will likely lead to a more positive perception towards e-learning. In this regard, among the initiatives undertaken by OUM include the offering of a compulsory course on “Learning Skills for Open and Distance Learners” to all new learners. This module introduces learners to the basic ODL skills which include the use of ICT, Internet, e-learning platform, myLMS and Digital Library besides other common skills in learning. Efforts have also been made to integrate the elements of this module in all the courses and also in the face-to-face tutorial sessions.

Another equally important initiative is the heavy investment made by OUM in equipping the learning centres with educational technologies such as computer lab, LCD projector, wireless Internet connections and other computer peripherals like printers and modems to assist teaching and preparations of teaching materials. Having good ICT facilities and infrastructure do not necessarily lead to maximum use of ICT; the usage depends very much on how interested and willing both learners and tutors are in engaging with computers in the teaching and learning processes. As for the learners, they are given appropriate hands-on training before the start of tutorial sessions and for the tutors, they are provided with the relevant ICT training, as and when required, or whenever there is

a new initiative. These institutional efforts are directed towards improving learners' skills and use of ICT and also in ensuring that tutors are well equipped with the knowledge and skills to integrate computer usage in a meaningful learning activity.

CONCLUSION

This study has examined OUM learners' ability, experiences and perceptions of using ICT in their learning. The results showed that ICT skills and usage are medium to high and there is ample room for improvement. Perceptions towards the use of ICT are generally positive and this augurs well for OUM's plans to increase the use of ICT in various aspects of teaching and learning. Traditional face-to-face methods are still desirable even though learners generally acknowledge the advantages of ICT in learning. There is a further need to incorporate e-learning in all courses in order to enhance the frequency of use of e-learning. This is particularly crucial as learners in OUM are empowered to consolidate and reconcile their mastery of the subject matter by integrating their classroom experiences together with the online discussions with tutors and peers. Finally, it is crucial that OUM continuously monitors learners' skills and use of ICT and e-learning to ensure that real learning takes place and that its graduates are adequately equipped to compete in today's technology-driven and information-rich work environment.

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