

Obstacles Towards the Use of ICT Tools in Teaching and Learning of Information Systems in Malaysian Universities

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Abstract: This paper examines the obstacles towards the use of Information and Communication Technology (ICT) tools in teaching Information System (IS) at Malaysian universities. The findings of a survey identify that the most significant obstacles are: ICT tools are changing too fast to keep current, extra time and effort needed after integrating ICT tools in teaching, the management did not provide any incentive for lecturers to integrate ICT tools in their teaching, the network connectivity was poor, the management did not have any evaluation in integration of ICT tools in teaching. Factor analysis was performed to determine if there were any underlying factors within the data. Six factors were emerged from the data.

Keywords: ICT tools, higher education, e-learning, information systems, obstacles.

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1. Introduction

1.1. Definitions

Integration of Information and Communication Technology (ICT) tools in teaching has been at the forefront of the education sector in recent years. There are many definitions of ICT. The definition of ICT from whatis.com is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning [15]. Another definition of ICT is given as: "ICT are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." [1]. A simpler definition of ICT from Free On-Line Dictionary of Computing is given as: "the study of the technology used to handle information and aid communication" [5].

For the definition of Information System (IS), IS2002 Model Curriculum and Guidelines for Undergraduate Programs in Information Systems [6] documented Information Systems as a field of academic study encompasses the concepts, principles, and processes for two broad areas of activity within organization:

1. Acquisition, deployment, and management of information technology resources and services.
2. Development, operation, and evolution of infrastructure and systems for use in organizational processes. e-commerce, system analysis and design,

database, information system management are examples of subject categorized under IS.

1.2. Studies Involving Obstacles to Integrate ICT in Education

There is a significant body of research relating to the obstacles of ICT integration in teaching in the developed countries such as US and UK. There are a few publications on obstacles to the integration of ICT tools in teaching at higher education as reported in [2, 7, 11, 17]. Such publications are valuable information sources for countries which would like to improve and make a success on ICT tools integration in teaching. Lessons learned can serve as useful guidelines for others. There is little literature on barriers of ICT tools integration in the developing countries. Among the factors that affect the technology use in these developed countries are summarised as: availability of equipment, sufficient equipment, up-to-date equipment, maintenance of the equipment, infrastructure, staff training and development, technical staff support, vision and incentives, time factor, and other relevant support.

Studies have shown that lack of equipment, out-of-date equipment, poorly maintained equipment, and poor network infrastructure are the prominent obstacles to the integration of ICT tools in teaching [2, 7, 12, 17]. These studies reflected that it is essential to have sufficient, up-to-date and well maintained equipment, as well as good networking infrastructure to support its use in teaching. We consider equipment to include both hardware and software. A classroom that meets the above criteria enables the educator to concentrate

on teaching and learners learn in a “techno-problemless” environment. The equipment should also be available in educators’ room and students’ computer lab or study area so that they can access to the equipment conveniently. Johnston and McCormack [7] stressed that all basic technology needs must be met and sufficient technical support is provided for educators to feel comfortable using the technology in their daily academic work.

Studies also highlighted that insufficient provisions in training, inadequate and inappropriate training are important obstacles to the implementation of ICT tools in teaching [7, 17]. The ICT is advancing at a very fast pace. A state of the art technology found today can be outdated in just a few months time. It is essential to familiarise educators with the technology. Ongoing training on using ICT tools in teaching is the most important item in educators’ development agenda to ensure educators have the necessary skills and abilities to use the ICT tools. The training must coincide with course goals and be seen as an integral course component [12]. The training should focus on how educators can use the technology effectively in teaching, not just directions on how to use the tools [11].

Poor technical support would make negative impact on educators’ desire to integrate ICT tools in teaching. Support from technical staff is critical to ensure educators can concentrate in preparing and delivering of course content. Educators should not be caught up by the technical requirement to operate the equipment. Technical support should be available at every stage of the ICT tools integration. At the initial stage of ICT tools integration, supports and advises from technical staff are needed for selection and installation of the necessary hardware and software. During the delivery of lesson to students, technical support is urgently needed to troubleshoot and repair any malfunction equipment. For those educators who are interested in developing their own course content, a multi-skilled team of technical support is necessary for the development phase [7].

In higher education, educators are encouraged to actively involve in research activities and are rewarded based on research publication. There are a few institutions that have ICT vision, incentives system and recognition for educators who successfully integrated ICT tools in teaching. Educators would be more likely to use ICT tools when clear vision and incentives system are established for using it. It will affect how the educators perceive the value of integrating ICT tools in their teaching, and subsequently affect the amount of effort and time spent on using it. It will also affect the willingness of the educators in exploring new ICT tools and trying to integrate them in teaching [11]. Without the ICT vision, incentives system and recognition, Spotts [11] has pointed out that is one of

the reasons for the slow adoption of ICT tools in teaching.

Johnston and McCormack [7] reported that educators commented scarcity of time available to commit to the time-consuming nature of developing technology-based material. Butler and Sellbom [2] stated their finding was the time it takes to learn to use new technologies was the second biggest concern of faculty. Spotts [11] reported that in addition to time for training, an educator needs time to experiment with new technologies and to develop material using technologies. There is no provision of time for educators to do so other than to do it on their own time. Dawes [4] stressed the importance of good time management because the Internet can seemingly absorb infinities of time for communication purpose.

It is common perception among researchers that peers support and positive feedback from students would motivate educator to initiate or continuously use ICT tools in teaching. In addition, management support and involvement is critical to the successful integration of ICT tools in teaching [2, 3].

1.3. Research Statement

Educators need to be able to use ICT tools in the classroom in order to prepare students for the 21st century. Malaysia is categorized under the intermediate stage for ICT tools integration in teaching by UNESCO Asia and Pacific Regional Bureau for Education. Under this category, it is documented that the country have national ICT policies and master plans, and is in the stage of applying and testing various strategies, but have not fully integrated ICT within education system. This raises the question of what were the obstacles to the use of ICT tools in teaching for countries under intermediate stage such as Malaysia. The literature review that was carried out could not trace any study that has been done in Malaysia to answer this question.

2. Methodology of the Study

To study the use of ICT tools and factors affecting its use in teaching at higher education, a questionnaire consisting of 98 questions was designed and submitted for review to a panel of advisor consisting of the Head of Information System, and 7 Senior lecturers who taught IS subjects. The constructs were compiled from the literature [2, 7, 12, 17], and authors’ experience as educator. After the panel’s suggestions were incorporated, the questionnaire and cover letter were sent to IS lecturers in all universities. Data collection through a questionnaire survey was chosen because it allows a larger sample, as well as a wider geographical distribution of the sample, and the collection of a large amount of data in a relatively short time [16].

The objectives of the survey were:

- To gauge the use of ICT tools in teaching IS.
- To seek information on how ICT tools have boosted teaching, the obstacles to their use, and the factors that contribute to their successful usage in teaching.

The questionnaire consisted of five parts. The first part of the questionnaire gathered the respondent's background such as, their age group, gender, their highest educational attainment, teaching experience and IS subjects that they have taught. The second part of the questionnaire was dedicated to collect data on the use of ICT tools in teaching. The third part of the survey was focused on how ICT tools have boosted teaching in IS. The fourth part of the survey was designed to identify the obstacles to ICT tools integration in teaching. The fifth part was dedicated to collect data on success factors towards the ICT tools integration in teaching. Lastly, the respondents were asked about their views of ICT tools integration in teaching IS. Respondents provided information through both closed-ended and open-ended questions on these topics.

Questionnaires were distributed to 19 local public and private universities in Malaysia. These universities were listed in [8]. The universities are located in east and west Malaysia. These universities were chosen because they offer IS subjects to their students. These universities were considered as the representative of the IS teaching community in Malaysia. The name list of full time faculty members was provided by the respective universities. Two email reminders were sent to the faculty members who did not return the questionnaire after the deadline. A total of 273 questionnaires were distributed and 151 usable set were returned. Thus, a response rate of 55.3% was achieved.

This article will present the findings related to the obstacles encountered towards the use of ICT tools in teaching IS. The degree of agreement on the item as an obstacle to the use of ICT tools in support teaching were rated using a Likert scale, starting from NO COMMENT (if respondent never encountered the situation mentioned), STRONGLY DISAGREE, DISAGREE, SLIGHTLY DISAGREE, SLIGHTLY AGREE, AGREE and STRONGLY AGREE. We used two data analysis methods in this study. The first data analysis was identifying the obstacle by grouping the same category scale. To get a clearer picture of the degree of agreement on an item as a obstacle, the number of respondents whose response is slightly agree, agree or strongly agree for an item were added together to form single agree category. The number of respondents whose response is slightly disagree, disagree or strongly disagree for an item were added together to form a disagree category. The percentage for each category against the total number of responses is calculated. The second data analysis method was a

factor analysis to determine if there were any underlying relationships between the items. The results of the data analyses are presented in the following section.

3. Results of the Study

3.1. Percentage Calculated for Each Item

The reliability of the constructs was assessed using Cronbach's alpha and the value is 0.912. The calculated percentage value for each item is ordered by the highest value of agree category as shown in Table 1.

Two open-ended questions were asked to gain an understanding of other barriers that experienced by respondents but were not included in the question. However, their responses were generally congruent with those to the closed-ended questions.

3.2. Factor Analysis

We conducted a factor analysis of the obstacles of all 151 participants to determine if there were any underlying factors within the data. The factor analysis was conducted using the principle component method of extraction and varimax rotation. We decided that for an item to load on a factor, it must have a minimum absolute value of 0.45 and must not have loaded on another factor at an absolute value of 0.45 or greater. The 23 items reduced to six factors, which accounted for 67.9% of the variance. The results of the factor analysis are shown in Table 2. A detailed discussion of each factor is provided in the following section.

4. Discussion

4.1. Percentage Calculated for Each Item

Table 1 shows that there are many obstacles identified from the survey. The five most important obstacles will be elaborated in the order of significance. These items are: the ICT tools are changing too fast to keep current (57%), extra time and effort needed after integrating ICT tools in teaching (41.7%), the management did not provide any incentive for lecturers to integrate ICT tools in their teaching (38.5%), the network connectivity was poor (38.4%), the management did not have any evaluation on integration of ICT tools in teaching (37%). A follow up telephone interview with 10 percents of the respondents reveals the following explanations.

4.1.1. ICT Tools are Changing Too Fast to Keep Current

It is well known that technology is one of the fastest changing fields as compared to other field. Every year, new model of hardware with higher processing power and with new enhanced features is unveiled. The same happens to the software when new version of operating

systems or new software application is released with enhanced features.

Table 1. Obstacles encountered towards the use of ICT tools in teaching.

Items	Agree Category (%)	Disagree Category (%)	No Comment (%)
ICT tools are changing too fast to keep current.	57.0	38.4	4.6
I had to spend extra time and effort in teaching after integrating ICT tools in teaching.	41.7	56.3	2.0
The management did not provide any incentive for lecturers to integrate ICT tools in their teaching.	38.5	48.9	12.6
The network connectivity was poor.	38.4	59.0	2.6
The management did not have any evaluation on integration of ICT tools in teaching.	37.0	52.4	10.6
The ICT tools were not always reliable	36.5	58.9	4.6
I have had problem getting quality training program.	31.2	56.9	11.9
There is no long term staff development to support the integration of technology into instruction.	29.8	58.3	11.9
Some of my peers have failed to integrate ICT tools in their teaching.	27.7	55.7	16
I have had difficulty getting support from technical staff.	27.2	67.5	5.3
The hardware available was not sufficient to accommodate ICT supported teaching.	27.2	66.8	6.0
The software available was not sufficient to accommodate ICT supported teaching.	26.5	64.2	9.3
Certain software was difficult to learn and use.	25.1	53.7	21.2
The management did not provide any clear instruction on how to integrate ICT tools in my teaching.	24.7	64.0	11.3
The hardware available had already outdated to accommodate ICT supported teaching.	21.3	73.4	5.3
The management did not initiate any program (such as seminar and workshop) to encourage ICT supported teaching.	20.6	72.1	7.3
Students were lack of ICT skills.	20.5	78.8	0.7
The software available had already outdated to accommodate ICT supported teaching.	17.2	72.2	10.6
The management did not have any vision on integration of ICT tools in teaching.	15.2	73.5	11.3
My peers have been giving negative comments about using ICT tools.	13.9	74.2	11.9
Students had negative attitude towards ICT supported teaching.	11.9	83.5	4.6
Students gave negative feedback on ICT supported teaching.	11.3	84.1	4.6
I found myself difficult to change from my current teaching practice to integrate ICT tools in teaching.	10.6	83.4	6.0

The respondents that were involved in the telephone interview pointed out that it depends on the subject; it is true especially for the IS subject incorporate programming languages or CASE tool. Programming

language or CASE tool used in teaching and learning are in par with the business or industry needs. Some respondents revealed that it has been frustrating to deal with different version of software package. Newer version means educators need to know and learn the new features and gauge the possibility of incorporating it to fulfil the existing learning objectives so that the students are well equipped with the latest software development. Completely new software would mean educators need more time to familiarize and master it. One of the respondents mentioned that to encourage more educators to use the software, the institution has engaged with the same software. To be knowledgeable and sustainable in this field, educators have to keep abreast with the latest development of the hardware and software available in the market. This poses a great challenge to educators to manage their time among teaching, administration, research and acquiring new knowledge. The same issue was shared by Office of Technology Assessment (OTA) [10]. OTA reported that it is difficult to keep up with the rapid rate of technology development and changing messages of best use.

4.1.2. Extra Time and Effort Needed After Integrating ICT Tools in Teaching

With the ever changing ICT environment, educator needs extra time and efforts to learn new tool and to manage existing ICT tools. For instance, to manage an email account, some mentioned that they had spent more time than they expected to reply to students' email or to delete junk mail. The number of email received from students will be double especially before assignment deadline or examination. Most of the respondents do not attempt to use online discussion forum simply because they do not have time to monitor the activities in it. This finding is coherent with other researchers. Morgan [9] reported that time expenditure is a factor that frequently contributed to some faculty's reducing their ICT tools usage. OTA [10] report supported this statement with the following depiction: teacher needs time to experiment with new technologies, share experiences with other teachers, plan and debug lessons using new methods that incorporate technologies as well as attend workshops or training sessions.

4.1.3. The Network Connectivity was Poor

The respondents mentioned that the network connectivity is not reliable and it could be disconnected anytime without prior notices. The reasons for a network being disconnected could be web server maintenance, virus or hacker attack, or cabling problem. This is rather frustrating and de-motivates the respondents. The results from the second part of the same survey revealed that the ICT tools that are used frequently by IS educators are email, search engines,

surfing the Internet and publish materials on the web [14]. These activities need to have consistent network connectivity to make a success for the integration.

Table 2. Coefficient loading of items for factors.

Items	Factor					
	1	2	3	4	5	6
I had to spend extra time and effort in teaching after integrating ICT tools in teaching.	.063	-.054	.077	.094	.092	.832
I found myself difficult to change from my current teaching practice to integrate ICT tools in teaching.	.063	.294	.249	-.173	.188	.667
Certain software (such as Macromedia Flash) was difficult to learn and use.	.284	.080	.084	.127	.731	.196
ICT tools are changing too fast to keep current.	-.050	.329	.136	.075	.654	.080
My peers have been giving negative comments about using ICT tools.	.226	.099	.552	-.022	.371	.073
Some of my peers have failed to integrate ICT tools in their teaching.	.181	-.028	.508	.103	.540	-.090
The management did not have any vision on integration of ICT tools in teaching.	.742	.290	.287	-.161	.115	.070
The management did not provide any clear instruction on how to integrate ICT tools in my teaching.	.723	.194	.275	.077	.256	-.195
The management did not provide any incentive for lecturers to integrate ICT tools in their teaching.	.781	.012	.221	.247	.083	.086
The management did not initiate any program (such as seminar and workshop) to encourage ICT supported teaching.	.791	.165	.166	.080	.153	.092
The management did not have any evaluation on integration of ICT tools in teaching.	.750	.048	.041	.305	.003	.109
Students had negative attitude towards ICT supported teaching.	.234	.113	.819	.016	.098	.059
Students were lack of ICT skills.	.113	.153	.699	.128	.170	.179
Students gave negative feedback on ICT supported teaching.	.161	.101	.780	.254	-.122	.109
I have had problem getting quality training program.	.191	.050	.019	.464	.534	.173
I have had difficulty getting support from technical staff.	.340	.091	.214	.528	.113	.342
There is no long term staff development to support the integration of technology into instruction.	.471	.335	.038	.489	.162	.110
The software available was not sufficient to accommodate ICT supported teaching.	.322	.515	.073	.489	.375	.125
The software available had already outdated to accommodate ICT supported teaching.	.182	.696	.120	.246	.290	.194
The hardware available was not sufficient to accommodate ICT supported teaching.	.117	.880	.098	.188	.049	.056
The hardware available had already outdated to accommodate ICT supported teaching.	.199	.819	.164	.203	.064	-.040
The network connectivity was poor.	.017	.337	.133	.725	.041	-.145

4.1.4. The Management Did Not Have any Evaluation on Integration of ICT Tools in Teaching

Evaluation plays an important role in assessing and providing feedback on job performance. It is often used as one of the important criteria for promotion purpose. In higher education setting, educators are evaluated based on their research activities, administrative work and student evaluation on teaching. There is no detailed evaluation on the educator's usage of ICT tools in teaching and learning. Lack of evaluation activity indicates that the institution does not value the effort put in integrating ICT tools in teaching.

4.2. Factor Analysis

Another main finding of this study is that six factors emerged from the data. Four of the factors had multiple loadings. Items such as some of my peers have failed to integrate ICT tools in their teaching, there is no long term staff development to support the integration of technology into instruction, and the software available was not sufficient to accommodate ICT supported teaching – with loaded above 0.45 on two factors and therefore was not considered to load significantly on any factor. These results indicate that there is an underlying relationship between items. We will describe each of the factors below.

4.2.1. Factor 1: Managed Change

This factor accounted for 16.2% of the explained variance. Individuals who score high on this factor want the deans and heads to play an active role in the change process. They want the deans in the institution to provide direction, clear instruction, proper evaluation and incentives during implementation. However, only those institutions conducting distance learning or online learning education would have ICT vision and better support from the deans and heads. Items that loaded on this factor were the management did not have any vision on integration of ICT tools in teaching (0.743), the management did not provide any clear instruction on how to integrate ICT tools in my teaching (0.723), the management did not provide any incentive for lecturers to integrate ICT tools in their teaching. (0.781), the management did not have any evaluation on integration of ICT tools in teaching (0.750), and the management did not initiate any program (such as seminar and workshop) to encourage ICT supported teaching. (0.791).

4.2.2. Factor 2: Equipment Ready

This factor explained 12.9% of the total variance. Individual scoring high on this factor view equipments as an important variable in the implementation process. Before integrating ICT tools in teaching, educators

want to know if the equipments are in place. Most of the institutions allow educators apply to purchase equipments for teaching and learning with proper justification. Items that loaded on this factor were the software available had already outdated to accommodate ICT supported teaching (0.696), the hardware available was not sufficient to accommodate ICT supported teaching (0.88), the hardware available had already outdated to accommodate ICT supported teaching (0.819).

4.2.3. Factor 3: Peer and Students Influence

This factor contributed 12.2% of the total variance explained. Individuals who score high on this factor concern about peer comments, students' ICT skills, feedback and attitude on ICT tools support teaching. Educator will be more likely to integrate ICT tools in teaching if their students give good feedback on ICT tools integration, have the ICT skills and attitude to learn using ICT tools. They would like to hear positive comments on ICT tools integration from peer as well. Items that loaded on this factor were my peers have been giving negative comments about using ICT tools (0.552), students had negative attitude towards ICT supported teaching (0.819), students were lack of ICT skills (0.699), and students gave negative feedback on ICT supported teaching (0.780).

4.2.4. Factor 4: Reliable Tools and Support from Technical Staff

This factor explained 10.1% of the total variance of the combined factors. Individual who score high on this factor would like to know if there are technical staff support, reliable network connection as well as reliable ICT tools while integrating the ICT tools in teaching. Items that loaded on this factor were I have had difficulty getting support from technical staff (0.528), the network connectivity was poor (0.725), and the ICT tools were not always reliable (0.589).

4.2.5. Factor 5: Easy to Learn and Minimal Change

This factor explained 9.6 of the total variance. Individual scoring high on this factor is concern about the difficulty of learning and the rate of change for ICT tools. They will be more likely to use those ICT tools which are user friendly and the rate of change is low. Items that loaded on this factor were certain software (such as Macromedia Flash) was difficult to learn and use (0.731), ICT tools are changing too fast to keep current (0.654).

4.2.6. Factor 6: Self Enthusiasm

This factor contributed 6.8% of the total variance explained. Individuals with high score on this factor are more likely to use ICT tools in teaching if enough time is allocated for ICT integration and strong

motivation and guidance are given. Items that loaded on this factor were I had to spend extra time and effort in teaching after integrating ICT tools in teaching (0.832), I found myself difficult to change from my current teaching practice to integrate ICT tools in teaching (0.667).

5. Conclusion

The findings of this study have several similarities with other findings on the use of ICT tools in higher education in the developed nation as shown in [7, 11]. The similar factors are: time must be allocated to faculty members, the institution have to provide a proper evaluation and incentive plan on integration of ICT tools in teaching, reliable ICT tools and good network connection for the continuous use of ICT tools in teaching, and quality technical support. The survey result has again verified that these factors are of great importance for faculty members. Barriers for ICT tools integration are very similar for both the developed and developing countries.

In summary, there is an increasing need for institutions of higher learning to be sensitive toward the needs of the faculty members for the ICT tools integration in teaching. The implication of this finding must be taken seriously by management in order to produce an "ICT friendly" environment for faculty members. The successful integration of ICT tools could contribute towards enhancing the teaching and lead to producing quality graduate to meet the priorities of the countries.

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