



Page from 222-240

## IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON TEACHING AND LEARNING PRACTICES: (UPM AS A CASE STUDY)

**Ibrahim Ghanim Abdulwahab**

Department of Mechanical and Manufacturing Engineering, Universiti Putra  
Malaysia  
gs51656@student.upm.edu.my

**Siti Ujila Masuri**

Department of Mechanical and Manufacturing Engineering,  
Universiti Putra Malaysia  
ujila@upm.edu.my

**Rawa Muayad Mahmood**

Department of Electrical, Faculty of Engineering, Tikrit University  
rawa.muayad@tu.edu.iq

Received 02/09/2020 - Accepted 13/10/2020 - Available online 15/01/2021

### Abstract

ICT (Information, Communication, and Technology)'s rapid global technological advancement and growth has put education in a more demanding position where lecturers need to replace traditional teaching methods with technology-based teaching and learning resources and facilities. This is because ICT incorporation improves the learning success of the students in terms of critical thinking, problem solving and concentrating the lesson by online resource surfing. In Malaysia, ICT has been included as one of the main elements of the transform shift in the latest Malaysian Education Blueprint (2013-2025) as the national education focusing on quality education for future development. This paper focuses mainly on identifying the impact of ICT integration on teaching and learning practices in University Putra Malaysia. A survey questionnaire was randomly distributed to a total of 240 lecturers from 8 departments at University Putra Malaysia, Malaysia's Faculty of Engineering. Overall findings show that ICT adoption affects both lecturers and students greatly. Results indicate that lecturers should always be trained and well-equipped to improve their learning performance in terms of ICT competencies and a positive attitude to provide students with better educational opportunities. In future studies, certain aspects of ICT integration need to be addressed, in particular from a management perspective of strategic planning and policy making.

**Keywords:** ICT integration, Technology impact, Teaching Learning, Malaysia.

## Introduction

The word "technology" is a significant issue in many fields like education in this 21st century. This is because technology has become the highway for the transfer of knowledge to all humans. Nowadays, most people of all age groups know at least how to use a basic form of technology (Collins & Halverson, 2018; Ertmer & Ottenbreit-Leftwich, 2010; Peeraer & Van Petegem, 2012). Technology tools and equipment have become the main medium of connectivity worldwide and we are keen and inclined to connect online (Meyer & Xu, 2009) (Meyer & Xu, 2009). Throughout education, ICT incorporation refers to the use of computer-based communication that is integrated into the everyday instructional process in the classroom. ICT integration aims to improve and enhance the quality, accessibility and cost-effectiveness of education delivery while taking advantage of the benefits of networking learning communities together to equip them to meet the challenges of global competition (Kakroo, 2007; Sherblom, 2010; Ziden, Ismail, Spian, & Kumutha, 2011).

It regularly contained computer hardware and software application to fully support teaching and learning tools as well as knowledge. The ICT adoption process is not a single step but is a continuous and ongoing process (Fattah, 2020; Ghaznavi, Keikha, & Yaghoubi, 2011; Moore, 2005; Owena, ATARERE, & ROTUA, 2015; Peeraer & Van Petegem, 2012; Pegu, 2014; Yusuf, 2005). When we move into 21st century education, the use of ICT more directly in the classroom at the university is essential because students are familiar with this technology and will learn better in this setting (Jamieson-Proctor, Watson, Finger, Grimbeek, & Burnett, 2007; Kyei-BLanKson, Keengwe, & Blankson, 2009; Lim, Lee, & Hung, 2008). Integration of ICT into education generally means a technology-based teaching and learning cycle closely linked to the use of digital technologies in universities (Bhattacharya & Sharma, 2007).

This is due to the outcome of ICT adoption in enhancing the teaching and learning cycle effectiveness. In addition, the use of technology in education contributes considerably to the pedagogical aspects where the application of ICT will lead to effective learning with the help and support of ICT elements and components (Chan, 2002; Noor-Ul-Amin, 2013). It is correct to say that most subject areas can be learned more effectively from mathematics, science, languages, arts and humanistic and other major fields via technology-based tools and equipment.

In addition, ICT provides support and supplementary support for teaching and learning for both lecturers and students where successful learning to serve the purpose of learning aids is involved with the help of computers (Pegu, 2014; Ziden et al., 2011). Computers and technology do not act as substitutes for tools but are considered as an add-on to lecturers in which it is the supplement necessary for better teaching and learning.

The need for ICT integration in education is crucial because ICT technology can be used in millions of ways to help both lecturers and students learn about their respective subject area at university (Chan, 2002). A technology-based teaching and learning offers a variety of interesting ways, including educational videos, stimulation, data storage, database use, mind mapping, guided discovery, brainstorming, music, the worldwide web (www) and making the learning process more comprehensive and meaningful (Ghaznavi et al., 2011; Mitić, Nikolić, Jankov, Vukonjanski, & Terek, 2017; Owena et al., 2015).

At the other side, students will benefit from ICT incorporation where they are not tied to the restricted curriculum and resources, instead they will be able to stimulate their comprehension of the lesson by interactive experiences in the lesson tailored for them. It often enables lecturer's layout lesson plans in an effective, creative, and interesting strategy

that would lead to active learning for the students. The use of ICT in teaching will surely improve the learning process and optimize the capacity of the students to learn effectively. Eventually, when the ICT is used to aid and support the learning of the student, a complementary approach is. This approach enables students to be more organized and efficient in obtaining notes from a computer, submitting their work by email from home if they meet the deadline and searching for information from different online sources to fulfill their task (Hermans, Tondeur, Van Braak, & Valcke, 2008).

## **Method**

### **Research Design:**

A quantitative approach has been used in this study to collect and analyze the data collected from all the respondents. The researcher designed and completed the questionnaire, before being distributed to the targeted group of respondents. The questionnaire was explicitly designed to address research goals regarding the impact of ICT in teaching and learning for lecturers who use ICT in their UPM teaching. The split into three main targets:

1. To determine the impact of ICT on teaching in terms of (quality, efficiency, and easiness).
2. To determine the impact of ICT on learning in terms of (students' behavior, knowledge quality, and creativity).
3. To determine ICT effective elements in UPM in terms of university support.

### **Population and Sampling:**

A total of 147 lecturers from the Faculty of Engineering, Universiti Putra Malaysia, in Malaysia, were the respondents for this study. The questionnaire was randomly distributed with a teaching background to the respondents regardless of gender, teaching experience and the highest teaching experience. The researcher does not set any priorities so long as the respondents come with a background in teaching. Therefore, the distributed questionnaires are not equal in numbers.

### **Instrument:**

In this study, a survey questionnaire containing a total of 42 items was used as the main instrument to analyze the impact of ICT integration in teaching and learning at Universiti Putra Malaysia. A total of 200 questionnaires were distributed in which all respondents were asked to read the statements given and select their answers based on the 5-Likert scale ranging from 1= Strongly Disagree, 2= Disagreement, 3= Neutral, 4= Agreement and 5= Strong Agree. The questionnaire is composed of four parts. Section A deals with the respondents' demographic history, consisting of 7 items that include gender, age, teaching experience, form of department, teaching style preference, highest academic qualification and teaching ICT handling skill. The other 3 parts of the questionnaire concentrate more on the experience of teachers and the elements of ICT adoption success within UPM. Section B includes 15 items examining the teacher's perception of ICT in teaching, section C consists of 10 items examining the effectiveness of ICT integration for students in learning while section D provides 10 items examining the effective elements of ICT integration in teaching at UPM. The questionnaire used for this quantitative study was adopted and modified from Gulbahar's original questionnaire, and Guven<sup>14</sup> considered appropriate for this research. Some of the items are designed and developed accordingly by the researcher with the title chosen so that the items produced can provide the answers necessary for both research questions.

### **Data Collection Procedure:**

Before it is completed, the researcher updated the questionnaire and circulated it to the target group of respondents, which gave out a total of 200 questionnaires to all respondents. The data were collected by random distribution within 2 months, and some of the questionnaires were sent to email from the respondents. The respondents were given 3-5 days to complete the questionnaire and return it to the data analytics researcher. After 2 months, all full filled-up questionnaires were collected and analyzed by the researcher to get the results and findings for the study for further data analysis.

#### **Data Analysis Process:**

All data collected from the respondents were collected for analysis using version 25 of the Statistical Package for the Social Sciences (SPSS). The analysis includes a descriptive as well as an inferential analysis. The study used systematic methods to analyze the frequency and percentage of demographic history of the overall population. It is also used to determine the mean, standard deviation, frequency and percentage for identifying the effectiveness of ICT integration in learning for students as well as the effective elements of ICT integration in UPM teaching.

#### **Findings:**

The results of this research will give the researcher the output needed to answer the research questions. The findings are made according to the sections of the questionnaire and some inferential analysis which includes testing for reliability. Testing of Mann-Whitney U is also carried out towards the general results.

#### **Demographic Background:**

The analysis includes both the descriptive and the inferential analyses. In the demographic context the authors used a descriptive approach to analyze the frequency and proportion of the total population. It is also used to measure the mean, standard deviation, frequency and percentage for determining the effectiveness of ICT integration in student learning as well as the active elements of ICT integration in teaching at the University of Putra Malaysia's Faculty of Engineering.

The results of this research would give the researcher the production needed to answer the questions of the study. The conclusions were drawn on the basis of the parts of the questionnaire and some inferential analysis which included precision tests. There is also tracking of the Mann-Whitney U towards the overall data.

**Table (1): Demographic Background of Respondents**

Factors	Frequency	Percentage (%)
Gender		
Female	70	47.6%
Male	77	52.4%
Age		
25-30	3	2.0%
31-40	74	50.3%
41-55	65	44.2%
56-75	5	3.4%
Teaching Experience		
<1 year	5	3.4%
1-5 years	37	25.2%
6-10 ears	53	36.1%

>10 years	52	35.4%
Department		
Department of Aerospace Engineering.	16	10.9%
Department of Civil Engineering.	16	10.9%
Department of Biological & Agricultural Engineering.	26	17.7%
Department of Electrical & Electronic Engineering.	17	11.6%
Department of Chemical & Environmental Engineering.	18	12.2%
Department of Computer and Communication Systems Engineering.	16	10.9%
Department of Process and Food Engineering.	18	12.2%
Department of Mechanical and Manufacturing Engineering.	20	13.6%
Preference of Teaching Style		
Conventional/Traditional	49	33.3%
Modern/Contemporary (Use of ICT)	98	66.7%
Highest Academic Qualification		
Diploma.	0	0%
Master.	4	2.7%
PHD.	143	97.3%
The Ability of Handling ICT in Teaching		
High	45	30.6%
Medium	96	65.3%
Low	6	4.1%

There are 70 female respondents from the total sex population (n=147) with a 47.6 percent ratio compared with 52.4 percent of 77 male respondents. The highest rate of respondents from the general age-based population is 31-40 years, with a total of 74 (50.3%) followed by 41-55 years with 65 (44.2%), then 56-75 years with 5 (3.4%) and 25-30 years with 3 (2.0%). Most respondents have 6-10 years of teaching experience with 53 (36.1%) followed by a few discrepancies > 10 years of teaching experience with 52 (35.4%), then 1-5 years of teaching experience with 37 (25.2%) and 5 respondents with < 1 year of teaching experience with (3.4%). From the department-based overall population, there are 16 respondents (10.9%) from the Department of Aerospace Engineering, followed by the same proportion of 16 respondents from the Department of Civil Engineering (10.9%), followed by the Department of Biological & Agricultural Engineering with the highest percentage of 26 respondents (17.7%).

The Department of Electrical & Electronic Engineering's number of respondents was also 17 (11.6 per cent). And (12.2 per cent) with respondents from the Department of Chemical & Environmental Engineering (18). While the percentages were for the Department of Computer and Communication Systems Engineering, Process and Food Engineering, and Department of Mechanical and Manufacturing Engineering 16 (10.9%), 18 (12.2%), respectively. (20.6%), and 20 (13.6%), respectively. More respondents favored 98 (66.7 percent) modern/ contemporary teaching style from the overall population-based teaching style choice compared to respondents who preferred 49 (33.3 percent) conventional / traditional teaching methods. Most respondents earn Ph.D. with 143 (97.3 %) from the overall population based on the highest educational credential, followed by M.D. At 4 (2.7 %), then at 0 (0 %) and M.D. 9 (8.91 %). Most respondents believe they have a medium

capacity of 96 (65.3 percent) followed by a high capacity of 45 (30.6 percent) in ICT handling and a low capacity of 6 (4.1 percent) from the overall population based on the ability to handle ICT in teaching.

### Lecturers' Perceptions:

It is shown from the details in Table 2 below on the teacher's understanding of ICT in teaching that most lecturers are aware of ICT's goodness and usefulness in teaching.

Most lecturers find that using ICT allows lecturers to enhance their teaching with more up-to-date materials that display the 4.06 mean. In order to develop a more interesting and attractive lesson for students, it is clear that the teaching resources and materials provided online are more up-to-date and that the lecturers may relate to.

**Table (2): Lecturers' Perceptions of ICT Integration in Teaching**

No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	MEAN	S. D
		Frequency and Percentage (%)						
1.	I feel confident about learning new computer skills.	2	2	21	79	43	4.08	0.78
		1.4%	1.4%	14.3%	53.7%	29.3%		
2.	I find it easier to teach by using ICT	0	5	30	67	45	4.03	0.80
		0%	3.4%	20.4%	45.6%	30.6%		
3.	I am aware of the great opportunities that ICT offers for effective teaching.	1	3	19	76	48	4.13	0.76
		0.7%	2.0%	12.9%	51.7%	32.6%		
4.	I think that ICT supported teaching makes learning more effective.	0	2	30	77	38	4.02	0.72
		0	1.4%	20.4%	52.4%	25.9%		
5.	The use of ICT helps lecturers to improve teaching with more updated materials.	0	0	29	79	39	4.06	0.67
		0	0	19.7%	53.7%	26.5%		
6.	I think the use of ICT improves the quality of teaching.	0	5	33	78	31	3.91	0.75
		0%	3.4%	22.4%	53.1%	21.1%		
7.	I think the use of ICT helps to prepare teaching resources and materials.	1	3	19	84	40	4.08	0.73
		0.7%	2.0%	12.9%	57.1%	27.2%		
8.	The use of ICT enables the students to be more active and engaging in the lesson.	0	4	38	72	33	3.91	0.76
		0%	2.7%	25.9%	49%	22.4%		
9.	I have more time to cater	1	6	52	61	27	3.72	0.83



	to students needs if ICT is used in teaching.	0.7%	4.1%	35.4%	41.5%	18.4%		
10	I can still have an effective teaching without the use of ICT.	2	35	52	42	16	3.23	0.98
		1.4%	23.8%	35.4%	28.6%	10.9%		
11	I think the use of ICT in teaching is a waste of time.	22	79	37	7	2	2.23	0.81
		15%	53.7%	25.2%	4.8%	1.4%		
12	I am confident that my students learn best without the help of ICT.	22	66	49	7	3	2.34	0.86
		15%	44.9%	33.3%	4.8%	2.0%		
13	Classroom management is out of control if ICT is used in teaching.	30	73	36	7	1	2.15	0.82
		20.4%	49.7%	24.5%	4.8%	0.7%		
14	Students pay less attention when ICT is used in teaching.	19	60	43	25	2	2.51	0.95
		12.9%	40.8%	29.3%	15.6%	1.4%		
15	Students make no effort for their lesson if ICT is used in teaching.	24	48	51	17	7	2.55	1.04
		16.3%	32.7%	34.7%	11.6%	4.8%		

Furthermore, most lecturers agreed that using ICT would provide plenty of opportunities for effective teaching as well as ICT-supported teaching with the 4.13 sharing average would make learning more efficient. This situation shows that lecturers view the use of ICT in the teaching and learning system as beneficial where ICT is the help that lecturers need to guarantee the efficacy of teaching and learning processes.

First, it also demonstrates from the data obtained that the use of ICT in teaching enables students to participate more and to participate in the lesson prepared by lecturers with an average score of 3.91. This is because the students are familiar with ICT, finding it easier to learn about ICT and inspiring them to become more interested in the curriculum. Also, the familiarity and skill of lecturers in ICT handling was gained from the data where the average of 4.08 shows that most lecturers feel confident about learning new computer skills and can use ICT to find teaching materials and resources. In this context, this demonstrates that lecturers are open to using ICT in teaching, are not resistant, and feel comfortable learning new stuff. Other than that, lecturers accept that using ICT with a mean score of 4.03 is easier to teach, but at the same time some still believe in the conventional way of teaching where lecturers are the center of learning and say they can still have effective teaching without using ICT with a recorded mean of 3.23.

On the other hand, most lecturers dispute that the use of ICT helps them to meet students' needs with an average score of 3.72 due to clerical work and other activities that need to be performed other than teaching responsibilities. Using ICT only simplifies their teaching, but other things remain the same at school. Most lecturers agree the use of ICT helps teaching and learning in various ways and ICT adoption is not a waste of time with an overall average of 2.23. Nevertheless, there is also a positive part of ICT integration where the outcome shows that classroom management is under control when ICT is used in teaching with an average of 2.15 followed by students with an average score of 2.55 and most lecturers do not

assume that using ICT in teaching just leads students to pay less attention with an average score.

### Effectiveness of ICT Integration for Students Learning:

The results obtained from the data as shown in table 3 below, which would like to address the efficacy of ICT implementation in learning for students, suggest that the use of ICT promotes active and engaging lessons for students with a mean score of 3.76 recorded for best learning experience. Previously, most lecturers agreed that using ICT would allow students to interact more and participate in the lesson.

It indicates that both lecturers and students agree that the use of ICT offers students the opportunity to become involved and to take on more sections or tasks for their best learning experience. Using ICT also helps to extend students' information spectrum with an average score of 3.80 where students can integrate their previous knowledge into the new learning systems as well as interact with lecturers and classmates and share opinions. ICT aims to provide the new and emerging issues that students can easily gain from and integrate into their learning process.

**Table (3): Effectiveness of ICT Integration for Students Learning**

No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	MEAN	S. D
		Frequency and Percentage (%)						
1.	ICT allows students to be more creative and imaginative.	1	2	18	106	20	3.96	0.61
		0.7%	1.4%	12.2%	72.1%	13.6%		
2.	The use of ICT helps students to find related knowledge and information for learning.	1	6	21	84	35	3.99	0.78
		0.7%	4.1%	14.3%	57.1%	23.8%		
3.	The use of ICT encourages students to communicate more with their classmates.	0	8	34	76	29	3.85	0.79
		0%	5.4%	23.1%	51.7%	19.7%		
4.	The use of ICT increases student's confidence to participate actively in the class.	5	39	77	26	5	3.84	0.74
		3.4%	26.5%	52.4%	17.7%	3.4%		
5.	I think students learn more effectively with the use of ICT.	0	10	55	56	26	3.66	0.84
		0%	6.8%	37.4%	38.1%	17.7%		
6.	I think the use of ICT helps to broaden students' knowledge paradigm.	0	10	34	77	26	3.80	0.80
		0%	6.8%	23.1%	52.4%	17.7%		
7.	I think the use of ICT helps to improve students' ability specifically in reading, writing.	3	24	50	52	18	3.39	0.96
		2.0%	16.3%	34%	35.4%	12.2%		
8.	The students are more	4	29	71	30	13	3.12	0.92



	behaved and under control with the use of ICT.	2.7%	19.7%	48.3%	20.4%	8.8%		
9.	The use of ICT enables students to express their ideas and thoughts better.	0	16	41	68	22	3.65	0.86
		0%	10.9%	27.9%	46.3%	15%		
10	The use of ICT promotes active and engaging lesson for student's best learning experience.	0	8	40	77	22	3.76	0.76
		0%	5.4%	27.2%	52.4%	15%		

Moreover, with an average score of 3.66, ICT helps students learn more effectively, as well as helping students find similar knowledge and information for shared mean 3.99. The software also acts as a tool for learners to find knowledge and information related to their learning. It's better when students are able to gather information, apply it back to what they've learned and have an exchange of knowledge with lecturers and their peers to see what's new and what the current issues they need to catch up for effective learning.

Apart from that, online students were provided with a lot of educational videos that helped enhance students' ability to learn skills such as reading, writing, listening and speaking with a total mean of 3.39. Watching videos and learning from it is good for students so they can gain the confidence they need when it comes to classroom arguments where they can have clear insight and interpretation on some subjects. The use of ICT also allows students to be more creative and imaginative, with an average score of 3.96 followed by their ability to express their thoughts and ideas further with an average of 3.65. This shows that using ICT improves students' creativity and helps them to think out of the box and make the best possible use of their learning process.

The result shows that the effectiveness of ICT in student education is that it allows students to interact more with their peers and also increases the student's morale of participating actively in the class with a collective mean of 3.85 and 3.84 respectively. It is effective in the sense that students have sufficient knowledge to enable them to be more confident in sharing and exchanging their views with their classmates. Finally, it indicates that students are more handled and regulated with the use of ICT in learning, but is also considered less appropriate by lecturers as the mean 3.12 ranking. This could give teachers the ideas that the learning process does not rely on students being somewhat out of reach when using ICT in teaching as teachers.

#### **Effective Elements in ICT Integration in Teaching and Learning in UPM:**

From the data obtained as shown in table 4 it shows that teaching time is not enough for lecturers to use ICT for teaching and learning purposes with a score mean of 2.87. It means that lecturers have an unhurried time to use ICT at least for effective teaching and teacher learning processes.

Ideally if lecturers have more time to teach then ICT implementation can be a teaching success. Many lecturers accept that a total of 2.85 will waste most of the ICT resources given to their university because the lecturers do not have the skills and knowledge to use it. Sometimes ICT facilities are offered absolutely but little access to ICT prevents lecturers from using it in teaching, the lecturers' opinion was negative with a mean score of 3.05.

Most lecturers feel the urge and motivation to use ICT in teaching, but there is a lack of university top management support that prohibits and discourages them from using ICT at an

average of 2.92. The university's top management will allow lecturers to use ICT in teaching and convince them that ICT will support the process of teaching and learning.

**Table (4): Effective Elements in ICT Integration in Teaching and Learning in UPM**

No	Statement	Strongl y	Disagre e	Neutral	Agree	Strongl y Agree	MEAN	S. D
		Frequency and Percentage (%)						
1.	The ICT facilities at my university are well-functioning and can be used.	6	28	46	58	9	3.24	0.96
		4.1%	19%	31.3%	39.5%	6.1%		
2.	The technical supports are provided if lecturers or students are faced with difficulties.	4	18	48	65	12	3.42	0.90
		2.7%	12.2%	32.7%	44.2%	8.2%		
3.	Little access to ICT prevents me from using it in teaching or learning.	7	33	56	47	4	3.05	0.91
		4.8%	22.4%	38.1%	32%	2.7%		
4.	Lack of supports from the university top management discourage me from using ICT.	5	44	59	35	4	2.92	0.88
		3.4%	29.9%	40.1%	23.8%	2.7%		
5.	class time is not enough for me to use ICT for teaching and learning purposes.	6	52	46	41	2	2.87	0.91
		4.1%	35.4%	31.3%	27.9%	1.4%		
6.	There are enough training and professional development provided for lecturers or students about ICT use in teaching and learning.	1	24	52	64	6	3.34	0.82
		0.7%	16.3%	35.4%	43.5%	4.1%		
7.	All ICT tools in my university go to waste and less used by lecturers or students.	9	49	49	35	5	2.85	0.96
		6.1%	33.3%	33.3%	23.8%	3.9%		
8.	lecturers or students are given more time to learn and be comfortable with the use of ICT in teaching and learning.	2	19	58	63	5	3.34	0.79
		1.4%	12.9%	39.5%	42.9%	3.4%		
9.	There are enough ICT tools within the classroom to be used in teaching and learning.	2	30	50	58	7	3.25	0.88
		1.4%	20.4%	34%	39.5%	4.8%		
10.	I prefer to use external ICT tools and applications, such as (WhatsApp, Facebook or Kahoot...etc) rather than (PutraBLAST) that create by my university.	2	17	45	61	22	3.57	0.92
		1.4%	11.6%	30.6%	41.5%	15%		

Conversely, lecturers are expected to use external ICT resources with a cumulative average of 3.57 instead of (PutraBLAST) that is produced by the university due to the complexity of the site. Many lecturers suggest "there is not enough ICT resources inside the classroom to be used in teaching and learning," as the mean score of 3.25 indicates. Technical support is equivalent if lecturers are less accessible to lecturers about the use of ICT in teaching with a mean score of 3.42 and 3.34 respectively when facing challenges as well as learning and professional development. To ensure the successful implementation of ICT in teaching, university top management must find ways to provide sufficient technical support as well as training and professional development for teachers.

Other than that, the ICT facilities installed at the university operate well and in good condition as they are used by lecturers with an average of 3.24 and there is maintenance to ensure that the facilities are taken care of by university administration. Lastly, the finding shows that the use of ICT in teaching at 3.34 does not give the lecturers enough time to learn and be comfortable. Giving lecturers time to learn and be confident with ICT is better to explore their use and make the best use of it. Overall findings show that some of the important elements of ICT incorporation in teaching and learning at UPM are established from the collected data. Nonetheless, the researcher made some suggestions and recommendations for lecturers and top management at the university to address certain problems found in the research being carried out against lecturers.

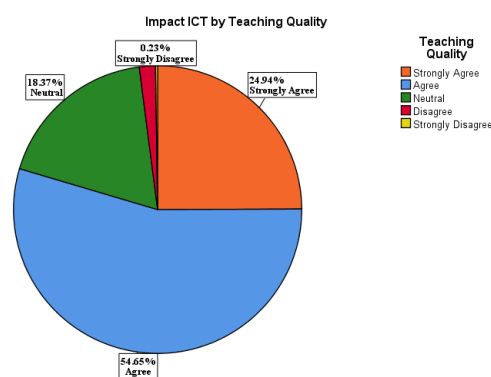
### Impact of ICT on Teaching and Learning

The following results for impact of ICT on teaching and learning come from the Tables 2, 3 and 4 were analyzed in SPSS depend on the objectives of the study.

### Impact of ICT on Teaching

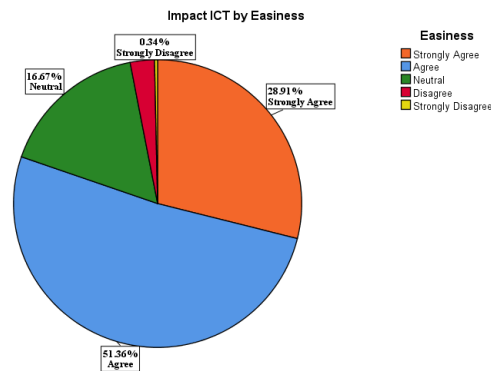
From the results obtained, it is clear to us the effect of information and communication technology on teaching in terms of quality and efficiency and easiness.

Figure 1 shows that the impact of information and communication technology on the quality of teaching, where the largest proportion of respondents presented in blue color which support that ICT increase of the quality of teaching in a rate of 54.65%. The next proportion of those who strongly agree in orange color at a rate of 24.94%. While for the neutrals, they were around 18.37%, which are presented in same figure in green color, then the red color is the ratio of those who disagree with the rate of 1.81%, and finally, those who strongly disagree, which was the lowest rate of 0.23%, indicated in yellow color.



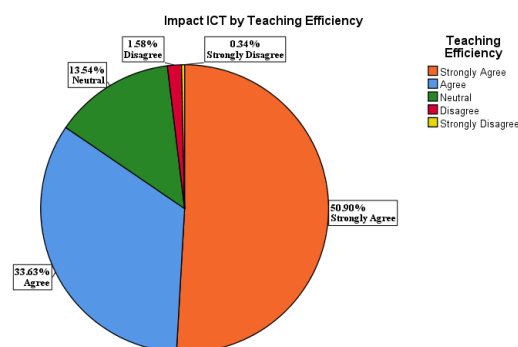
**Figure 1 impact ICT on teaching quality**

Figure 2 shows the impact of information and communications technology on making teaching easier. The results show that the lecturers agree that the ICT making the teaching easier presented in blue color at a rate of 51.36%. While those who disagree were lower proportion at a rate of 2.72% and indicated in red color. The percentage of neutrals was 16.67%, as evidenced by the green color, and the orange color represented a rate of strongly agree, which is 28.91%, and the lowest percentage was a strongly disagree rate of 0.34%, as shown in yellow in the figure below.



**Figure 2 impact ICT for easiness**

As for Figure 3, it indicates to the effect of information and communication technology on the efficiency of teaching. The highest percentages of respondents are agreed that the ICT rise the efficiency of teaching with a proportion of 33.63% represented in blue color while the proportion of who they strongly agree was 50.90% in orange color. While the other ratios are neutral at 13.54% in green color and disagree with 1.88% in red color and finally Strongly disagree at 0.34%, represented in yellow color.



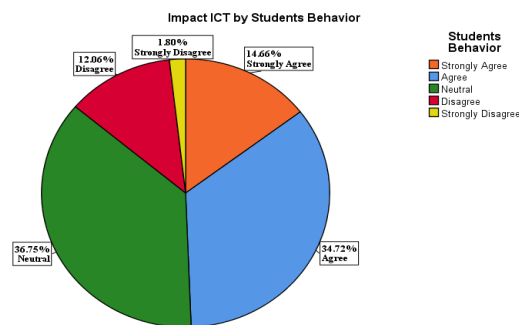
**Figure 3 impact ICT on teaching efficiency**

### Impact of ICT on Learning

Figure 4 shows that the impact of information and communication technology on student's behavior, where the proportion of respondents in blue color and orange color have presented that ICT improves the student's behavior at a rate of 34.72% and 14.66%.

While for the neutrals, they were around 36.75%, which are presented in the same figure in green color, then the red color is the ratio of those who disagree with the rate of 12.06%, and

finally, those who strongly disagree, which was the lowest rate of 1.80%, indicated in yellow color.

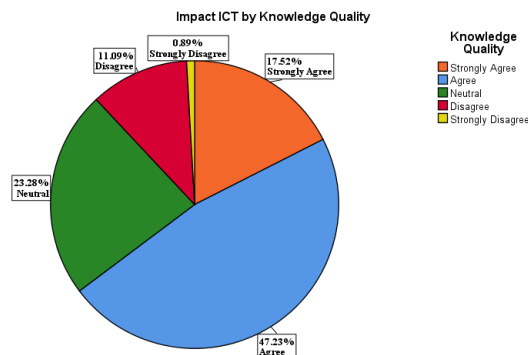


**Figure 4 impact ICT on student's behavior**

Figure 5 shows the impact of information and communications technology on knowledge quality.

The results show that the lecturers agree that ICT increase knowledge quality presented in blue color at a rate of 47.23%. While those who disagree were lower proportion at a rate of 11.09% and indicated in red color.

The percentage of neutrals was 23.28%, as evidenced by the green color, and the orange color represented a rate of strongly agree, which is 17.52%, and the lowest percentage was a strongly disagree rate of 0.89%, as shown in yellow in the figure.

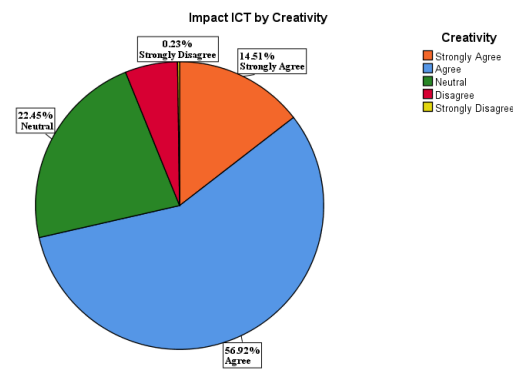


**Figure 5 impact ICT on knowledge quality**

As for Figure 6, it indicates the effect of information and communication technology on creativity.

The highest percentages of respondents are agreed that ICT raises the student creativity in learning with a proportion of 56.92% represented in blue color while the proportion of who they strongly agree was 14.51% in orange color.

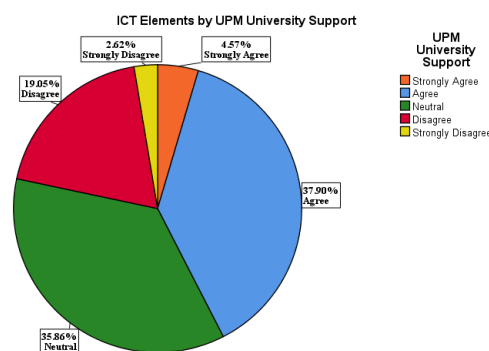
While the other ratios are neutral at 22.45% in green color and disagree with 5.90% in red color and finally Strongly disagree at 0.23%, represented in yellow color.



**Figure 6 impact ICT on creativity**

### ICT Effective Elements in UPM

The last part of the questionnaire determines the extent of the university's support for information and communications technology and the results were as shown in Figure 7. The blue color represents the percentage of who agreed that the university provides support to use the information and communications technology and its elements at a rate of 37.90%. The percentage of neutrals came close to the percentage of those who agreed with the rate of 35.86%, which is represented in green. This indicates that the lecturers are either not aware of the support provided or are not benefiting from the support provided by the university. lastly, the remaining percentages came in a rate of 19.05% disagree that appeared in red and 2.62% for those who strongly disagree, which were represented in the figure in yellow while the last strongly agree with a rate of 4.57%, which is expressed in orange color.



**Figure 7 effective elements in UPM**

### Hypothesis Testing:

The Mann-Whitney U Test is used in this experiment to test the researcher's hypothesis. The experiment is used to compare the deviations from one dependent variable in two independent groups.

The researcher uses the Mann-Whitney U Test as an inferential analysis to test the researcher's null hypothesis. Mann-Whitney U Test is used to compare the effectiveness of two treatments in clinical trials where, when the results are not usually distributed, it often used as an alternative to a t-test.



**H01:** There is no statistically significant difference between the lecturer's perception of ICT in teaching with the type of gender (male and female).

**Ha1:** There is a statistically significant difference between the lecturer's perception of ICT in teaching with the type of gender (male and female).

From the result, it shows that there is no statistically significant difference between the perception of ICT by teachers with the gender type (Mann-Whitney U= 2365, P= 0.196) where males scored median (3.30) and mean rank (69.71) compared to median (3.40) and mean rank (78.71) females. Therefore, it accepts the null hypothesis and rejects the alternative hypothesis.

**H02:** There is no statistically significant difference between the effectiveness of ICT integration for students in learning with teaching style (traditional and modern).

**Ha2:** There is a statistically significant difference between the effectiveness of ICT integration for students in learning with teaching style (traditional and modern).

The result shows that there is a statistically significant difference between the effectiveness of ICT incorporation for students in teaching style (traditional and modern) training (Mann-Whitney U= 1915, P= 0.045) where traditional style is ranked median (3.60) and mean rank (64.08) compared to modern style with higher median (3.70) and mean rank (78.96). Therefore, it rejects the null hypothesis and accepts the alternative hypothesis.

**Table 5 Mann-Whitney U-test between lecturer's Perception of ICT Integration and Type of Gender**

	Type of Gender	N	Median	Range	Mean Rank	Mann-Whitney U	P
Score_A	Male	77	3.30	2.70-4.60	69.71	2365	0.196* *
	Female	70	3.40	2.90-4.0	78.71		

\*\* Significant P < 0.05

**Table 6 Mann-Whitney U-test between The Effectiveness of ICT Integration for Students in Learning with Teaching Style**

	Teaching Style	N	Median	Range	Mean Rank	Mann-Whitney U	P
Score_B	Traditional	49	3.60	2.70-4.90	64.08	1915	.045**
	Modern	98	3.70	2.70-5.0	78.96		

\*\* Significant P < 0.05

### Discussion and Conclusion:

The results of a previous study (Ghavifekr & Rosdy, 2015). show that technology-based teaching and learning is more effective, and the results show that teachers in Malaysian schools have a positive attitude regarding the use of the Internet in teaching and learning; teachers have some knowledge about using the Internet in teaching and learning; the Internet is not well integrated into teaching Learning to date; teachers' knowledge of ICT and network technology is very limited. On the other hand, the first two points were identical to the results of this research, but at a higher level, where most lecturers believe that the integration of ICT

for students in learning is effective. Since students can build trust, communicate better and articulate their thoughts and ideas; ICT helps students to be more innovative and imaginative as their knowledge model grows and ICT helps students to have all four learning skills when they are able to access the information and knowledge they need. However, this study found that professors at the Faculty of Engineering-University of Putra Malaysia are getting enough time to learn and rest in ICT, as opposed to teachers at Kuala Lumpur Schools, as the results of the previous study bet that teachers at Kuala Lumpur Schools do not have enough time to learn and comfort in ICT.

Compared to the previous study (Ghavifekr & Rosdy, 2015), it has been shown that most pre-service teachers have suggested that they are only interested in simple ICT resources for academic use. This study found that most teachers believe that ICT integration is effective, but ICT tools available at school are not good enough and not in good condition; training and professional development are not adequately provided to teachers; technical support is provided in some way but can be improved from time to time, and computer lab conditions are not very good at school with tools and facilities. While the results of the current study confirm that there is support for lecturers and students in the event of any ICT issues, the lecturers argued that support for the availability of ICT tools in the classroom is still weak and that senior management at the university is working to develop these tools. Lecturers in this study, with the results of the previous study, say that they do not receive enough training and professional development higher than the schools in Kuala Lumpur.

In conclusion, the first stage of ICT implementation must be effective in ensuring that lecturers and students are able to make the most of it. Preparations for technology-based teaching and learning thus start with the proper implementation and support of the university's top management. If the process of integrating technology implementation at the university is carried out properly from the outset and continuous maintenance is adequately given, the introduction of ICTs at the university will lead to great success and benefits for both lecturers and students. The use of ICT in teaching and learning is realistic compared to theory, and that is why lecturers should be allowed time to explore and develop and face the 'trial and error' stage before they are fully comfortable in using it and able to use it for teaching and learning.

Finally, the integration of ICT into the classroom needs serious study to increase the efficiency of the country's education system. This will help to increase the ranking of national education and, in the future, will lead to a better workforce. To promote the use of ICT in classrooms, the government needs to improve and change the convictions of lecturers on ICT integration in classrooms. The role of lecturers is a key role in the effective and successful implementation of any new policies. The change is due to advanced technology and communication devices that should be made available to students wherever they are at college or at home. In addition, the need for lecturers to be literate and to have strong ICT skills and knowledge to develop their teaching methods and strategies is important to promote active learning and to meet the requirements for teaching skills in the 21st century.

This study presented the results of the impact of ICT on teaching and learning practices. the main purpose of this research was to assess and analyze the impact of ICTs on teaching and learning practices at University Putra Malaysia and develop an effective model related to the implementation of ICTs in universities. This model was derived experimentally from the data collected through the College of Engineering from which samples were taken as well as from the practical and theoretical rules of literature. The study is a quantitative method.

From the data obtained about the lecturer's perception of ICT in teaching, it shows that:

1. Most lecturers are aware of the goodness and usefulness of ICT in teaching.
2. Most lecturers realized that the use of ICT helps lecturers to improve teaching with more updated materials showing the lowest mean of 2.15.
3. The effectiveness of ICT integration for students in learning shows that the use of ICT promotes active and engaging lessons for students' best learning experience with recorded the mean score of 3.76.
4. The time is not enough for lecturers to use the ICT for teaching and learning purposes with a score mean of 2.87.
5. It is good if lecturers are given more time to teach so that ICT integration in teaching can be a success.
6. Most lecturers agreed that all ICT tools provided for their university go to not wasted with a mean of 2.85 due to because of the lecturers have the skills and knowledge in using it.
7. Sometimes, ICT facilities are completely provided but little access to ICT prevents lecturers from using it in teaching, the lecturers' opinion was neutral with a score mean of 3.05.
8. ICT allows students to interact more with their peers and increases the student's motivation to engage effectively in the class with a collective mean of 3.85 and 3.84, respectively.
9. The students are more open and under command with the use of ICT in education, but also that less acceptance by lecturers is the lowest of all scorers with 3.12. This might give lecturers the idea that students are a little out of control when ICT is used in teaching as teachers are not the focus of the learning process.

According to impact ICT on teaching and learning in term of (quality teaching, teaching efficiency, easiness, students' behavior, knowledge quality, and creativity) shows that:

1. The impact of information and communication technology on the quality of teaching, where the largest proportion of respondents which support that ICT increase of the quality of teaching at a rate of 54.65%.
2. The impact of ICT on making teaching easier. The results show that the lecturers agree that ICT making the teaching easier presented at a rate of 51.36%.
3. The effect of ICT on the efficiency of teaching. The highest percentages of respondents are agreed that ICT raise the efficiency of teaching with a proportion of 33.63%.
4. The impact of information and communication technology on student's behavior, where the proportion of respondents has presented that ICT improves the student's behavior at a rate of 34.72% and 14.66%.
5. The results show that the lecturers agree that ICT increases knowledge quality presented at a rate of 47.23%.
6. The effect of information and communication technology on creativity. the highest was the percentage of respondents are agreed that ICT raises the student creativity in learning with a proportion of 56.92%.
7. The last part of the questionnaire determines the extent of the university's support for information and communications technology and the results were shows the percentage of who agreed that the university provides support to use the information and communications technology and its elements at a rate of 37.90%.

According to first hypothesis of the study, it shows that there is no statistically significant difference between lecturers' perception of ICT with the type of gender (Mann-Whitney U= 2365, P= 0.196) where males scored median (3.30) and mean rank (69.71) as compared to females with median (3.40) and mean rank (78.71). Hence, the null hypothesis was accepted, and the alternative hypothesis was rejected. while the second hypothesis which refer to there is a statistically significant difference between the effectiveness of ICT integration for students in learning with teaching style (traditional and modern) (Mann-Whitney U= 1915, P= 0.045) where traditional style was scored median (3.60) and mean rank (64.08) as compared to the modern style with scored higher median (3.70) and mean rank (78.96). Hence, the null hypothesis was rejected, and the alternative hypothesis was accepted.

### Acknowledgements:

I would like to express my deepest appreciation to my supervisor Associate Professor Dr. Siti Ujila Masuri for her valuable advice continuous encouragement, professional support and guidance. My sincere gratitude also goes to Examiner Dr. Razali b. Samin, who offered many useful suggestions during the preparation of this study. Deepest thanks for the staff of engineering management at the Universiti of Putra Malaysia for their academic and scientific supervision throughout my study at the Putra Universiti.

### References

1. Bhattacharya, I., & Sharma, K. (2007). India in the knowledge economy—an electronic paradigm. *International journal of educational management*.
2. Chan, F.-M. (2002). *ICT in Malaysian schools: Policy and strategies*. Paper presented at the a Workshop on the Promotion of ICT in Education to Narrow the Digital Divide.
3. Collins, A., & Halverson, R. (2018). *Rethinking education in the age of technology: The digital revolution and schooling in America*: Teachers College Press.
4. Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*, 42(3), 255-284.
5. Fattah, S. G., A.: Ahmedy, I.: Idris, M. Y. I.: Targio Hashem, I. A. (2020). A Survey on Underwater Wireless Sensor Networks: Requirements, Taxonomy, Recent Advances, and Open Research Challenges. *Sensors (Basel)*, 20(18). doi:10.3390/s20185393
6. Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*, 1(2), 175-191.
7. Ghaznavi, M. R., Keikha, A., & Yaghoubi, N.-M. (2011). The Impact of Information and Communication Technology (ICT) on Educational Improvement. *International Education Studies*, 4(2), 116-125.
8. Hermans, R., Tondeur, J., Van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & education*, 51(4), 1499-1509.
9. Jamieson-Proctor, R., Watson, G., Finger, G., Grimbeek, P., & Burnett, P. C. (2007). Measuring the use of information and communication technologies (ICTs) in the classroom. *Computers in the Schools*, 24(1-2), 167-184.
10. Kakroo, U. (2007). ICT empowering citizens of Malaysia: development with destiny. *Retrieved from*.
11. Kyei-BLanKson, L., Keengwe, J., & Blankson, J. (2009). Faculty use and integration of technology in higher education. *AACE Journal*, 17(3), 199-213.
12. Lim, W. Y., Lee, Y. J., & Hung, D. (2008). "A prophet never accepted by their own town": a teacher's learning trajectory when using technology. *Asia-Pacific Journal of Teacher Education*, 36(3), 215-227.

13. Meyer, K. A., & Xu, Y. J. (2009). A Causal Model of Factors Influencing Faculty Use of Technology. *Journal of Asynchronous Learning Networks*, 13(2), 57-70.
14. Mitić, S., Nikolić, M., Jankov, J., Vukonjanski, J., & Terek, E. (2017). The impact of information technologies on communication satisfaction and organizational learning in companies in Serbia. *Computers in Human Behavior*, 76, 87-101.
15. Moore, C. D. (2005). Is ICT being used to its potential to improve teaching and learning across the curriculum. *Teacherresearch* Available from: [http://www.teacherresearch.net/tr\\_ma\\_4484\\_cdmoores.pdf](http://www.teacherresearch.net/tr_ma_4484_cdmoores.pdf) [Accessed 20 September 2019].
16. Noor-Ul-Amin, S. (2013). An effective use of ICT for education and learning by drawing on worldwide knowledge, research, and experience. *ICT as a Change Agent for Education. India: Department of Education, University of Kashmir*, 1-13.
17. Owena, E., ATARERE, L. O.-I., & ROTUA, A. O. (2015). The Impact Of Information And Communication Technology (ICT) On Learning Habits Of Business Education Students.
18. Peeraer, J., & Van Petegem, P. (2012). Measuring integration of information and communication technology in education: An item response modeling approach. *Computers & education*, 58(4), 1247-1259.
19. Pegu, U. K. (2014). Information and communication technology in higher education in india: Challenges and opportunities. *International Journal of Information and Computation Technology*, 4(5), 513-518.
20. Sherblom, J. C. (2010). The computer-mediated communication (CMC) classroom: A challenge of medium, presence, interaction, identity, and relationship. *Communication Education*, 59(4), 497-523.
21. Yusuf, M. O. (2005). Information and communication technology and education: Analysing the Nigerian national policy for information technology. *International education journal*, 6(3), 316-321.
22. Ziden, A. A., Ismail, I., Spian, R., & Kumutha, K. (2011). The effects of ICT use in teaching and learning on students' achievement in science subject in a primary school in Malaysia. *Malaysia Journal of Distance Education*, 13(2), 19-32.