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A new model for assessing the impact of new IT-based services on students' productivity

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ABSTRACT

The dynamic growth of the services sector globally, along with rapid advances in information technology, are creating new opportunities for social empowerment, economic growth, and innovation. This paper has considered the usage of IT-based services in education as a key factor for improving students' productivity. Moreover, a conceptual model was proposed to evaluate this process. For assessing the components of the proposed model, a well-designed questionnaire was used. The SPSS 22 and SMART- PLS 3.2 software package was used for statistical analysis of questionnaire responses. Findings confirmed the validity of the model for assessment of students' productivity. Furthermore, the results showed that four variables (digital technology acceptance, attitudes toward technology, cloud-based services and capacity of IT-based systems) significantly influenced students' productivity.

Keywords: *Information technology, Student, Productivity, Cloud computing, Technology Acceptance.*

INTRODUCTION

The digital revolution and development of the Internet have led to several innovations in the area of electronic learning or e-learning (Hillenburg et al., 2006; Navimipour & Zareie, 2015). E-learning is applied as an efficient tool based on electronic media, to offer vocational education and training (Chrysostomou & Papadopoulos, 2005; Nath, 2012; Pongsiri et al., 2011). E-learning is a modern type of traditional learning, where the learner can access the content anywhere and anytime based on various user-friendly applications (Akhavan, Teimuri, Rajabion, & Philsoophian, 2018; Javidi, Rajabion, & Sheybani, 2017). It is one way of developing knowledge in a population by offering the required training. Also, the students will enjoy learning activities within an autonomous and flexible e-learning system that reduces the time and cost in comparison to other education and training methods (Netwong, 2013). E-learning aids students in overcoming many barriers such as time limitations, geographic location, and physical disabilities. It can also offer some advantages such as convenience and flexibility. New digital technologies allows for required courses to reach a wide range of enthusiasts (Bian, 2009).

On the other hand, the worth of IT is undeniable since it has dominated almost all the areas of business and industry including the management, service, and education sectors (Dehgani & Jafari Navimipour, 2019). One would not be able to make any progress in education, business and industry, without this technology (Ali, Ahmed, Shaikh, & Bukhari, 2011; Rajabion, Wakil, Badfar, Mojtabavi Naeini, & Zareie, 2019). The advance of IT has provided different ways of learning in recent years. E-learning is one of the important applications of IT, which has become a frequent way of learning (Ting, 2004). Using ICT tools has fulfilled delivery and facilitates teaching by teachers and learning by students. This process can make the whole training process more collaborative and fascinating as contrasted with traditional methods of education delivery (Asabere, 2012; Buabeng-Andoh, 2012). The important variables for describing IT-based services are conservation of time, ease of use, convenience, accuracy, privacy, and use of advanced IT and multifunctional capabilities (Zhu, Wymer, & Chen, 2002). To successfully develop customer satisfaction, IT-based services play a critical role and add value in ways determined by customers (Sudan, Ayers, Dongier, Kunigami, & Qiang, 2010). These service systems are estimated to help service providers, develop service quality, increase financial performance, improve customer satisfaction, and enhance total productivity (Dehgani & Jafari Navimipour, 2019). Some examples of IT-based service enhancements are Web-based banking systems, automatic ticketing machines of airlines and e-learning-based training.

IT-based services have been critical to efforts at improving productivity and developing knowledge-intensive products and services - one of the vital aspirations of all countries in the world, as it leads to overall prosperity for countries and regions (Egoeze, Misra, Maskeliūnas, & Damaševičius, 2018). The education sector has been fundamentally transformed by extensive investments in IT infrastructure. Today, e-learning systems are supported as an essential application in schools and universities. The use of these systems is not restricted to universities and schools but they can be extended to government offices and private institutes (Alsabawy, Cater-Steel, & Soar, 2013). However, schools and universities are always facing new challenges to achieving their purposes and taking up opportunities, due to the dynamic environment and continuous alteration of policies. Therefore, in this paper, the use of IT-based services in education is considered as a key factor to improve students' productivity. The main contributions of this paper are as follows:

- Helping to better understand IT-based services as a tool for the teaching-learning process, which can influence students' productivity and performance.
- Providing a framework for assessment of the impact of IT-based services on students' productivity.
- Identifying and determining the impact of digital technology acceptance, attitudes toward technology, cloud-based services and capacity of IT-based systems on students' productivity and performance.

The previous research, related work, IT-based services factors influencing students' productivity, the conceptual framework, and the study hypotheses are discussed below.

LITERATURE REVIEW

In the age of information bang, the information system can effectively decrease educational training costs and becomes a powerful tool that facilitates learning in the new era (Bagarukayo & Weide, 2012). Thus, with the low-cost, suitability, flexibility, and accessibility of e-learning, schools can access more learning opportunities and engage in initiatives (Jimmy & Noel, 2008). ICT can be used to ensure that e-learning becomes an innovative education style. One of the great advantages of using such technology is that it can enhance flexibility, through resources that facilitate learning, anytime and anywhere (Liaw, 2008).

IT-based services, students' productivity and their performance

E-learning is defined as a tool that affects the delivery of learning instructions to learners via high-speed network technology such as the Internet, intranets, and extranets (Abdullah & Ward, 2016). A current tendency in education uses e-learning systems to provide online access to learning content by learners (Park, 2009b). E-learning is becoming a progressively widespread method worldwide. Many traditional universities are preparing themselves with e-learning systems to provide not only a common platform for course delivery, but also a common space for presenting and sharing processes that are required by a learning community (Persico, Manca, & Pozzi, 2014).

In the present information society, people need to access knowledge through IT to keep pace with the latest developments in their desired fields. By applying IT-based services, the possibility of learning without time limitations would be achieved to meet the requirements of the learners. These possibilities for learning share many features of technology-based education and propose new learning methods in which the student plays an active role (Talebian et al., 2014). The teaching and learning process moves from teacher-centered and content centered forms to competency-based and student-centered forms (Häyrinen-Alestalo & Peltola, 2006; Talebian et al., 2014).

IT and students' productivity

Bankole (2019), investigated the relative efficiency and productivity of ICT infrastructure utilization in education. The research employed the Data Envelopment Analysis (DEA) and Malmquist Index (MI) non-parametric research methodology. The results show a relatively efficient utilization and steady increase in productivity for the regions, but with only Europe and the Arab States currently operating in a state of positive growth in productivity.

Nugroho and Santosa (2018), identified factors of IT management flexibility for higher education by adopting the supply chain flexibility concept. The results indicate that communication, IT leadership, human resource, and regulation are crucial factors in increasing IT management flexibility in higher education.

Furthermore, Salam, Yang, Shaheen, Movahedipour, and Zeng (2017), examined the impact of using ICT on students' performance. Their model was evaluated using a sample of 150 public and private school students in Peshawar, Pakistan. The results showed that the use of ICT improves the quality of education and the performance of students. Further, Cerretani, Iturrioz, and Garay (2016), explored the effects of using ICT tools on students' academic activities, their performance, and their psychosocial adjustment. The results indicated that younger students are more disposed to the use of ICT tools. In addition, using ICT is associated with academic performance and psychological beliefs.

Islam and Fouji (2010), evaluated the relationship between ICT and student performance at the undergraduate level. The results showed that many students are not aware of the potential role of ICT in their academic life. Furthermore, if ICT access was not provided to the students it cannot be applied to improve academic performance. Also, Ben Youssef and Dahmani (2008) studied the relationship between the use of ICT and students' performance in higher education. The results show that a student's performance is mostly described by their characteristics, educational environment, and teachers' characteristics. ICT was found to have an influence on these factors.

Finally, some researchers have identified success factors in use of an e-learning policy. These factors include flexibility in time management for training; active contribution by instructors; creating quality content; increase in use of interactive elements among trainers and students; use of standardized and developed technologies and gradual implementation, progress in the use of e-learning and, the creative response to technology changes (Gascó, Llopis, & Reyes González, 2004; Hillenburg et al., 2006).

CONCEPTUAL FRAMEWORK AND HYPOTHESES

The use of ICT is important to provide online student support based on new learning styles (Ariwa, 2002; Muianga, Männikkö Barbutiu, Hansson, & Muimucuio, 2019). The education process for the future must take technology into account by understanding how the educational use of computers affects the patterns of thinking, and hence contributes to changes in the symbolic basis of the culture, which should be considered a vital aspect of computer literacy (Rhodes, 2001). Therefore, digital technology acceptance, attitudes toward technology, cloud-based services and capacity of IT-based systems are factors considered to be effective in determining student productivity. Moreover, productivity refers to the amount of work that is accomplished in a unit of time using the environmental factors of production, human resources, and technology (Shakeabubakor, Sundararajan, & Hamdan, 2015; Sutinen & Vanhalakka-Ruoho, 2014). In other words, productivity can reflect the degree of efficiency of the learning processes in the course of which learning resources must be offered (Bitzer & Söllner, 2013).

The aim of this study is to develop a new model for assessing the impact of IT-based services on students' productivity. Table 1 shows the variables used in the proposed and related models.

Table 1: *Identifying variables in the study*

Reference	Variables				
	Digital technology acceptance	Attitudes toward technology	Cloud-based services	The capacity of IT-based systems	Students' productivity
Massy and Zemsky (1995)				*	*
Park (2009a)	*				*
Macharia and Nyakwende (2010)	*				*
Adewole-Odeshi (2014)	*	*			*
Shakeabubakor et al. (2015)			*		*
Makori and Mauti (2016)	*				*
Prior, Mazanov, Meacheam, Heaslip, and Hanson (2016)		*			*
Siddiqui, Alam, Khan, and Gupta (2019)			*		*
Botelho et al. (2019)			*		*
The proposed model	*	*	*	*	*

In this study, twelve sub-indicators within four variables are considered, where these variables are *digital technology acceptance, attitudes toward technology, cloud-based services and capacity of IT-based systems.* The sub-indicators in the digital technology acceptance variable were: perceived usefulness, perceived ease of use and knowledge use of the system. The sub-indicators in the attitudes toward technology variable were: Internet use skills, personal experience, and self-confidence, while flexible storage capacity, scalability and elasticity, encryption and cloud security were sub-indicators of the cloud-based services variable. Finally, efficiency, cost, and digital infrastructure were identified as the sub-indicators in the capacity of IT-based systems variable.

The framework is shown in Figure 1 below.

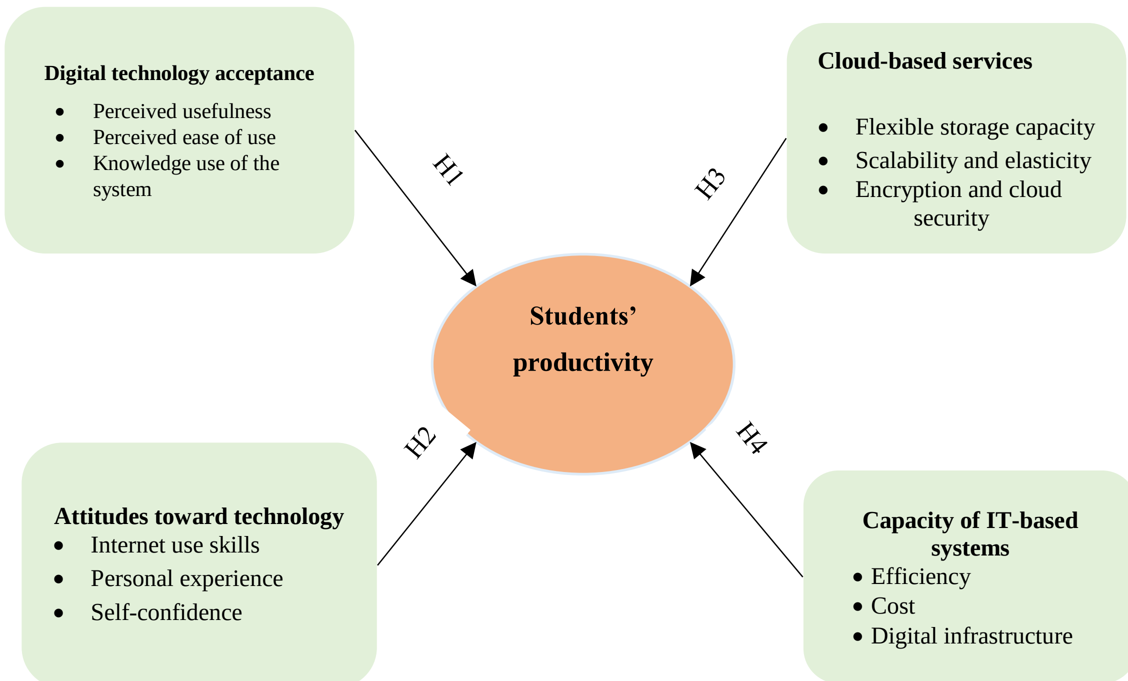

Figure 1: The conceptual model for evaluating the effect of IT-based services on students' productivity.

This conceptual framework positions the four variables shown in Figure 1 above, as important factors in students' productivity. These have informed the hypotheses shown below.

- Hypothesis 1: Digital technology acceptance has a significant impact on students' productivity.
- Hypothesis 2: Attitudes toward technology has a significant impact on students' productivity.
- Hypothesis 3: Cloud-based services have a significant impact on students' productivity.
- Hypothesis 4: Capacity of IT-based systems has a significant impact on students' productivity.

Methodology

Using appropriate IT services can improve the operational and environmental efficiencies of the training process, and it helps to enhance some functional aspects such as inventory control, allocation of resources, fiscal management, communications, employee productivity, student/personnel services, and student records (Krishnaveni & Meenakumari, 2010; Roblyer, 2005). Structural Equation Modelling (SEM) appears in the marketing literature in the early 1980s, but in the past few years, its application has become quite widespread. There are two types of models in SEM: the measurement model, which is employed to measure the relationships between the observed data and the latent variables, and the structural model, which is employed to assess the relationships between the latent variables (Javid, Khalili-Damghani, Makui, & Abdi, 2018). We utilized second-generation multivariate statistical tools, namely PLS-SEM to evaluate the model which could test the entire complex model by correlating the latent variable and measurement items together (Hooi, Abu, & Rahim, 2018). The adopted methodology involved the participants, measurements and measurement model.

Participants

The target group of this study are students at the nongovernmental School in Tehran. A total of 240 students were targeted and 216 students completed the questionnaires showing a response rate of 90%. Amongst them, 18 of the questionnaires were considered invalid due to having missing data or unengaged responses. The remaining 198 completed questionnaires were included for analysis.

Measurements

The core of the questionnaire was a set of items concerning issues proposed to affect students' productivity, presented in the literature review. All of the items were rated on a five-point Likert-type scale, ranging from "strongly disagree" to "strongly agree." Before the final study, we conducted a pretest with over 20 participants to assess the content quality, sequence, format, and layout of the questionnaire. The researcher used the SPSS2 22 and SMART-PLS 3.2 software package for statistical analysis of the questionnaire responses.

Measurement model

This study verified statistical analysis and hypotheses using the Structural Equation Modelling (SEM) by Partial Least Squares (PLS) method. Smart PLS software, Version 3.2 was used to conduct the analysis. PLS procedures were performed to determine the significance levels of the loadings, weights, and path coefficients, followed by the bootstrapping technique. According to the procedure suggested by Anderson and Gerbing (1988), before testing the structural relationships outlined in the structural model, the validity of the measurement model was estimated (Ali, Hussain, Konar, & Jeon, 2017).

FINDINGS

In this section we discuss the findings on the effect of IT-based services on students' productivity, reliability and validity, validation of the structural model, the Goodness of Fit and the results of hypotheses testing.

Reliability and validity

In order to assess the properties of the measurement scales, the researcher conducted confirmatory factor analysis (CFA) to measure reliability, convergent validity and discriminant validity (Zareie & Navimipour, 2016a). Initially, the researcher determined the average variance extracted (AVE), Cronbach's alpha (CA) and the Composite scale Reliability (CR) to evaluate the reliability of all the measurement scales. The CA, CR, and AVE of all scales were either equal to or exceeded the 0.70 and 0.50 cut off values respectively (Fornell & Larcker, 1981; Vahdat, Rajabion, Naeini, Hassani, & Charband, 2020). The lowest AVE was 0.54 for the cloud-based services, the lowest CA was 0.74 for the digital technology acceptance, and the lowest CR was 0.80 for the cloud-based services. All values effectively exceeded their respective cut off value (Chin, 1998).

Table 2: *Reliability of measure and the convergent validity*

Variables	AVE	Composite Reliability	Cronbach's Alpha
Digital Technology Acceptance	0.57	0.84	0.74
Attitudes Toward Technology	0.55	0.85	0.80
Cloud-Based Services	0.54	0.80	0.79
Capacity Of IT-Based Systems	0.60	0.86	0.78
Students' Productivity	0.55	0.87	0.82

Moreover, as shown in Table 3 below, the calculated square root of the AVE exceeded the intercorrelations of the construct with other constructs in the model to guarantee discriminant validity (Akter, D'Ambra, & Ray, 2010; Vinzi, Chin, Henseler, & Wang, 2010). Therefore, the measurement model was considered satisfactory with the evidence of adequate reliability, convergent validity, and discriminant validity, before it was used for hypothesis testing and research model validation.

Table 3: *Measurement model's discriminant validity variables*

Variables	Digital Technology Acceptance	Attitudes Toward Technology	Cloud-Based Services	Capacity of IT-Based Systems	Students' Productivity
Digital Technology Acceptance	**0.742**				
Attitudes Toward Technology	0.322	**0.742**			
Cloud-Based Services	0.296	0.415	**0.736**		
Capacity Of IT-Based Systems	0.227	0.275	0.470	**0.779**	
Students' Productivity	0.43	0.52	0.64	0.65	**0.738**

Note: *AVE's square roots are the bold diagonal numbers*.

Validation of the structural model

The primary assessment criteria for the structural model are R^2 values (Hair, Ringle, & Sarstedt, 2011). The R^2 measures the quality of the inner model and is calculated for each endogenous variable based on the latent variables (Stan & Saporta, 2010; Zareie & Navimipour, 2016b). According to the effect sizes which are defined for R^2 by Cohen (1977), the influences classified as $R^2_{small} = 0.02$; $R^2_{medium} = 0.13$; $R^2_{large} = 0.26$ (Wetzels, Odekerken-Schröder, & Van Oppen, 2009). The transformation probability for the selected model was $R^2 = 0.60$ which indicated a perfect fit for the selected independent variables. Four path coefficients are shown in Figure 2 below.

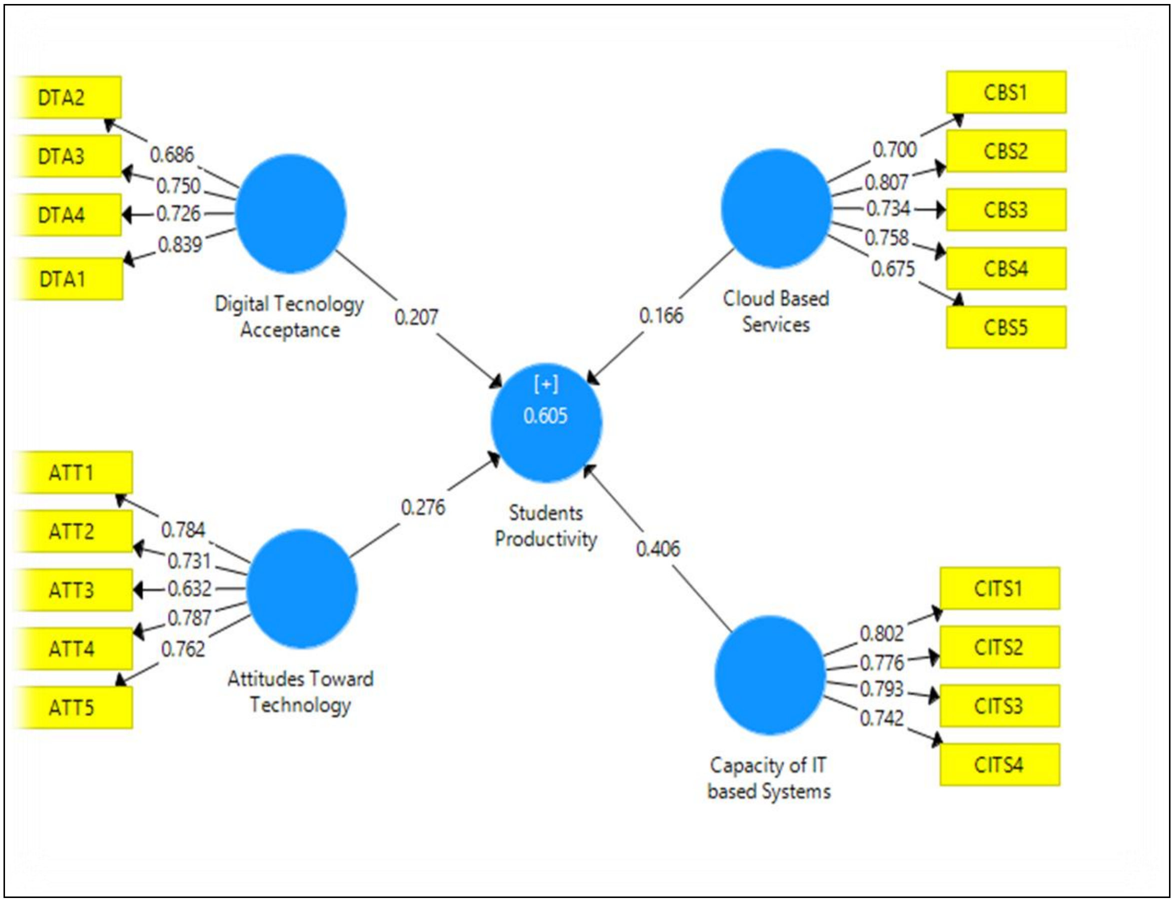

Figure 2: *Path results of the structural model*

Goodness of Fit

A global fit measure for PLS path modeling has been recommended, GoF (0 < GoF < 1). It is defined as the geometric mean of average communality and average R^2. $GoF_{small}=0.1$, $GoF_{medium}=0.25$, and $GoF_{large}=0.36$; these can be expressed as baseline values for confirming the PLS model globally (Wetzels et al., 2009).

The GoF index was calculated by (1):

$$\text{GoF}=\sqrt{\overline{\text{AVE}}\times\overline{\text{R}^2}} \qquad (1)$$

To calculate the AVE average value, Eq. (2) was used:

$$\mu_{\text{AVE}} = \frac{1}{n}\cdot\sum_{i=1}^{n} x_i \qquad (2)$$

$$\mu_{\text{AVE}} = \frac{0.55+0.60+0.54+0.57+0.55}{5}$$

$$\mu_{\text{AVE}} = 0.56$$

The results of the baseline model using an inner model path weighting scheme show a significant R^2 of 0.60 for students' productivity. The R^2 average value was calculated as follows:

$$\mu_{\text{R}^2} = \frac{1}{n}\cdot\sum_{i=1}^{n} x_i \qquad (3)$$

$$\mu_{\text{R}^2} = 0.60$$

The GOF value obtained by substituting (2) and (3) into (1):

$$\text{GOF}=\sqrt{0.56\times0.60}=0.58$$

Results of Hypotheses Testing

Every path shown in Figure 2 correlates with theory. By assessing the statistical significance, size, and sign of path coefficients (β) between the dependent variable and each latent variable, all hypotheses were tested. If the dependent variable is strongly affected by a predictor latent variable, then the path coefficient will be high. The bootstrap procedure was applied to assess the paths' significance (t values) and an iterative set of factor analyses was performed, all done by PLS which for this aim uses ordinary least squares like using its estimation technique (Chin, Marcolin, & Newsted, 2003). The significance of the path coefficients (β1 to β4) was checked through analyzing the significance of the t-value for every path coefficient. For conducting this the Smart PLS 2.0 function of bootstrapping was used. The relating t-values and the path outcomes' synopsis are indicated in the tables below (Table 4 to Table 7).

Digital technology acceptance → Students' productivity

According to the three sub-indicators defined for digital technology acceptance (perceived usefulness, perceived ease of use and knowledge use of the system), items DTA1-DTA4 were designed to measure its relevance to the students' productivity. The T-values and path coefficients for digital technology acceptance questions are shown in Table 4. The relationship between digital technology acceptance and students' productivity shows a significant T-value (2.71) and β-value (0.20). The results indicate that the hypothesis was confirmed at a significant level of 99%. Digital technology acceptance positively affects students' productivity.

Table 4: *T-value and path analysis for digital technology acceptance*

Items	Standardized Coefficient	T-value	Significance level
DTA1: I believe that the use of digital technologies in students' productivity is a good idea.	0.83	21.68	0.001
DTA2: If I have problems using digital technologies in my education, I can solve them.	0.68	8.41	0.001
DTA3: The use of digital technologies provides me with a lot of enjoyment.	0.75	12.69	0.001
DTA4: If it becomes available, I would like to use digital technologies.	0.72	12.92	0.001
Digital technology acceptance→ Students' productivity	0.20	2.71	0.01

Attitudes toward technology → Students' productivity

Items ATT1-ATT5 were used to test the impact of attitudes toward technology (Internet use skills, personal experience, and self-confidence) on the students' productivity. The relationship between attitudes toward technology and students' productivity is significant (T-value is 4.59 and β-value is 0.27). The results indicate that the hypothesis was confirmed at a significant level of 99.9%. The T-values and path coefficients for attitudes toward technology questions are shown in Table 5 below.

Table 5: *T-value and path analysis for attitudes toward technology*

Items	Standardized Coefficient	T-value	Significance level
ATT1: I have a positive attitude toward using IT-based services.	0.78	25.89	0.001
ATT2: I believe that sharing information with IT-based services gives me confidence.	0.73	15.37	0.001
ATT3: The use of IT-based services adds to my experiences	0.63	8.96	0.001
ATT4 My motivation to use IT-based services and the Internet is quite personal.	0.78	21.42	0.001
ATT5: Having personal experiences helps to make the best use of IT-based services.	0.76	17.78	0.001
Attitudes toward technology → Students' productivity	0.27	4.59	0.001

Cloud-based services → Students' productivity

The cloud-based services sub-indicators comprises core variables such as flexible storage capacity, scalability and elasticity, encryption and cloud security. In addition, based on the four sub-indicators of cloud-based services, items CBS1-CBS5 were designed to measure its relevance to students' productivity. The relationship between cloud-based services and students' productivity has a significant T-value (2.42) and β-value (0.16). The results indicate that the hypothesis was confirmed at a significant level of 95%. The T-values and path coefficients for cloud-based services questions are shown in Table 6 below.

Table 6: *T-value and path analysis for cloud-based services*

Items	Standardized Coefficient	T-value	Significance level
CBS1: I like to use cloud-based services.	0.70	18.13	0.001
CBS2: The use of cloud-based services would increase my productivity in my coursework.	0.80	25.32	0.001
CBS3: I am concerned that the encryption risk and cloud security of cloud-based services is high.	0.73	15.95	0.001
CBS4: By using cloud-based services, it is expected to increase the scalability of the learning sector.	0.75	17.54	0.001
CBS5: I think cloud-based services have flexible storage capacity.	0.67	9.87	0.001
Cloud-based services → Students' productivity	0.16	2.42	0.05

The capacity of IT-based systems → Students' productivity

According to the sub-indicators defined for the capacity of IT-based systems (efficiency, cost, and digital infrastructure), items CITS1-CITS4 were designed to measure relevance to students' productivity. The relationship between the capacities of IT-based systems and students' productivity shows a significant T-value (5.94) and β-value (0.40). The results indicate that the hypothesis was confirmed at a significant level of 99.9%. The T-values and path coefficients for the capacity of IT-based systems questions are shown in Table 7. The capacity of IT-based systems positively affects students' productivity.

Table 7: *T-value and path analysis for the capacity of IT-based systems*

Items	Standardized Coefficient	T-value	Significance level
CITS1: Using IT-based systems will help improve my level of efficiency.	0.80	26.77	0.001
CITS2: The use of IT-based services has reduced my costs.	0.77	24.15	0.001
CITS3: Our school has enough digital education facilities.	0.79	28.83	0.001
CITS4: Our school has the necessary infrastructure for using IT-based services in education.	0.74	18.14	0.001
Capacity of IT-based systems → Students' productivity	0.40	5.94	0.001

SUMMARY

The use of IT-based services in education has greatly improved the learning and teaching process. It has provided new chances for learning and accessing educational resources beyond the traditional ways. Furthermore, the use of IT-based services in education makes the information available in a short period of time anywhere in the world**.** Based on the results shown in Table 8, the sample t-test and path coefficient indicate that students' productivity is positively and significantly influenced by digital technology acceptance (β= 0.20, T-value= 2.71), indicating that H1 was supported. The students' attitudes toward technology also proved to be positive and significant (β = 0.27, T-value = 4.59), indicating that H2 was supported. The impact on students' productivity in relation to cloud-based services also proved to be positive and significant (β = 0.16, T-value= 2.49), indicating that H3 was supported. Also, the values of β = 0.40 and T-value= 5.94 indicate support for H4 which proposed that students' productivity and capacity of IT-based systems are positively related to each other. A summary of the results obtained from the hypotheses tests is shown in Table 8 below.

Table 8: *PLS structural model results*

	Paths	Path coefficients	T-value	Confirm or reject the hypothesis
H1	Digital technology acceptance→ Students' productivity	0.20	2.71**	Confirmed
H2	Attitudes toward technology→ Students' productivity	0.27	4.59***	Confirmed
H3	Cloud-based services → Students' productivity	0.16	2.42*	Confirmed
H4	Capacity of IT-based systems →Students' productivity	0.40	5.94***	Confirmed

$^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

CONCLUSION AND FUTURE WORK

Progress in the development of e-learning technologies is creating the basis for a revolution in education, allowing learning to be personalized, improving learners' daily interactions with each other, and transforming the role of the trainers. In the online environment of e-learning, adaptive learning is feasible through the identification of the learner, personalization of content, and individualization of tracking, monitoring, supporting, and evaluating. Adaptive learning provides a great learner-centered experience because it individualizes a unique learning path for every learner that is likely to select his or her specific learning needs and tendencies. In this paper, the main factors related to students' productivity in IT-based services have been studied. A primary contribution of this study is to provide a model and framework for evaluating the effect of IT-based services on students' productivity.

Estimating the impact of IT-based services on students' productivity has been addressed using four research hypotheses. This study found that the impact of digital technology acceptance is important to students' productivity. Digital technology acceptance includes the perceived usefulness, perceived ease of use and knowledge for using the system. Furthermore, the findings showed that the effect of the attitudes toward technology variable on students' productivity is significant and positive. Another important finding is that cloud-based services are very important. The cloud-based services variable includes sub-indicators such as flexible storage capacity, scalability and elasticity, encryption and cloud security. The findings also showed that the capacity of IT-based systems is viewed as an important factor in students' productivity. The capacity of IT-based systems includes some sub-indicators such as efficiency, cost, and digital infrastructure.

Each form of IT-based services has its own advantages in contributing to the total quality of the learning experience. Therefore, it is projected that e-learning with IT-based services will contribute to growth in the higher education sector in the near future. Information delivered via technology can increase a student's awareness of relevant and valid research-based information. The findings suggest that vision, strategy, government, and donor support can be considered as influential for the success of ICT project planning and implementation, while deficiency of funds and poor infrastructure can be considered as considerable challenges. We suggest that the relations among IT features, instructional strategies, and psychological learning processes offers a productive avenue for future studies regarding training in information systems. Also, as e-learning becomes more and more popular with the progress of ICT, its popularity will correspond to the needs of improving educational quality. E-learning also can guarantee good educational opportunities for disabled people. For future studies, analysis of the existing mobile multimedia education systems and the development of more efficient learning tools may be considered.

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