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Investigating Students' Acceptance of Tablet PCs in Rural Areas in Saudi Arabia

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ABSTRACT

The purpose of this study was to examine rural students' acceptance of a prototype tablet PCs, known as IEN bag tablet PCs, that are preloaded with all necessary digital educational resources and do not require Internet access. This study drew on the technology acceptance model (TAM) and took place in the Al-Qunfudhah region of Makkah state in Saudi Arabia. A total of 158 rural students were surveyed for their demographic information, their perceptions of the IEN bag tablet PCs, and their behavioural intentions to use the IEN bag tablet PC. The results of this research confirmed the reliability of TAM model in Saudi Arabia education context, revealing that rural students' perceptions are significantly associated with their intentions to use the IEN bag tablet PC. Furthermore, the perceived ease of use of the IEN bag tablet PC was the strongest determinant of students' attitudes and intentions towards this technology, followed by perceived usefulness. Finally, this study discusses the implications of these results for practice and research.

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Introduction and Rationale

Integrating and using instructional technology in classrooms can be beneficial for preparing students, especially rural students, for 21st-century learning and provide an opportunity to transform and modernise education. Tablet computers have become one of the main instructional technologies in classrooms [1]. Tablets can assist in creating the environment necessary for students to learn in the 21st century [2]. Tablets can provide sufficient sources of learning to rural students, especially during online learning forced by the COVID-19 pandemic. Most schools changed to online classes rather than face-to-face, with regulations of COVID-19 pandemic, which negatively affected both teachers and learners worldwide, especially schools in rural areas.

This study took place in rural schools in the Al-Qunfudhah region of Makkah state in Saudi Arabia. Al-Qunfudhah has 175 schools for boys and 173 schools for girls [3]. Makkah is the second-largest Saudi Arabia's administrative area in its use of technology [3]. Approximately 631,764 people use computers in their homes, while over 714,564 people use the Internet, and 678,408 people have mobile phones [3]. Hence, for this study, I chose the three largest intermediate and secondary schools in Al Qunfudhah, one for boys and two for girls. Each school has over 200 students.

Saudi Arabian schools are divided into K-12 classes and are supervised by the Ministry of Education. In Saudi Arabia, schooling is referred to as general education and is categorised into three levels: primary, intermediate, and secondary [4]. The rural population consists of 16% of the total population of Saudi Arabia [5]. Generally, rural schools tend to require more support, which should be relevant to their environments. The Programme for International Student Assessment (PISA) found that 30% of schools in rural Saudi Arabia reported that instruction was hindered by a lack of infrastructure, compared to 21% of schools in large cities [6]. Principals of rural schools stated that the inadequacy of digital technologies for instruction hampered their school's ability to provide high-quality teaching [6]. In addition, three-quarters of the principals said that the lack of an Internet connection made it more difficult for their school to provide quality education. Although PISA did not discriminate between regions, Saudi Arabian principals were especially concerned about sufficient Internet connectivity and technological innovations [6].

While the globe struggles against the COVID-19 pandemic, Saudi Arabia's Ministry of Education has been working relentlessly to ensure students have access to their education. The Saudi Arabia's Ministry of Education made some initiatives to distribute tablets and computers during the COVID-19 pandemic, providing free access to the Internet. Despite the presence of these initiatives, these initiatives had some limitations, such as the difficulty of connecting to the online materials [7]. Additionally, students in Saudi schools were offered many options of virtual learning that they could access at any time and place [8]. The National Education Portal (IEN), the official online learning portal of Saudi Arabia's Ministry of Education, is one of these options. It has all course materials for grades from pre-primary up to secondary education [9]. There were also Ein services, derived from IEN

portal, that Ministry of Education offered. For example, students were offered 20 Ein's YouTube channels, Ein channels on TV, future gate, and Ein educational portal [8]. However, in rural areas, students were unable to access these channels because of several issues related to geography and telecommunications.

Figure 1: Students Engaged in Online Learning in One of the Rural Areas in Saudi Arabia [10]

Figure 1 shows students attending online classes in Al Kamil, one of the rural areas in the Makkah Region in Saudi Arabia, during the COVID-19 pandemic. Due to geographical factors such as the mountainous terrain, their educations suffered from the lack of Internet connectivity. Students need access to new tools for learning that are not reliant on stable Internet connections [8]. For these reasons, this study investigated the factors that influence rural students' acceptance of tablet PCs loaded with digital resources that do not require access to the Internet.

Tablet computers have become one of the main instructional technologies in classrooms [1]. Moreover, tablet computers are ideally suited to mobile learning. Mobile learning is an emerging learning method that requires access to mobile devices, wireless technologies, and the Internet [11]. In addition, mobile learning has recently become popular among young students in Saudi Arabia [11, 12]. It is estimated that around 50% of Saudi students own a personal or family tablet computer [13]. However, there is still a significant lack of evidence concerning students' acceptance of tablets for use in education [14]. To date, only a few studies have investigated the use of tablet computers in education in Saudi Arabia [11, 15].

My research examined rural students' acceptance of tablet PCs loaded with all necessary digital educational resources that do not need access to the Internet. Based on evidence from my own experience as a teacher and the published research when students in rural areas accept tablet PCs, they will begin to academically catch up to urban students.

Literature Review

Tablet PCs in Rural Areas

Tablet PCs are expected to become the primary device used in learning and classroom environments in the near future, although studies show that tablet adoption in higher education is not guaranteed [16]. Tablet PCs can create the necessary environment and foundation for students to learn in the 21st century [2]. In addition, their mobility and quality (viewing experience) are the greatest advantages tablet PCs have compared with smartphones or notebooks [17]. Therefore, many initiatives have been launched worldwide to introduce tablet PCs in rural areas including e-readers, digital textbooks, or activity tools. These initiatives, however, require students to rely entirely on the Internet to access class materials and download digital educational resources, such as multimedia, documents, and specific subject resources [3, 18]. The rural students suffered from a lack of access to the Internet [19]. As a result, they were unable to obtain benefits from these digital educational materials.

In Saudi Arabia, a few studies have investigated tablet computers in education; however, only half of Saudi students have their own or have access to a family tablet PC. explored how tablet computers could transform the Saudi Arabian education system. The results of their study showed that tablet PCs enhanced students' engagement in the classroom and greatly facilitated their learning process. However, their research also showed that tablet usage is still very limited among Saudi Arabian students. Additionally, pointed out that there is still a significant lack of evidence that students accept tablet PCs in education, especially in Saudi Arabia [13-15].

Most importantly, the introduction of tablet computers in rural areas has revealed numerous barriers that prevent students and teachers from reaping the significant benefits that come with using these tablets; accessing the Internet is one of those barriers [20]. As a result, rural students cannot gain the key advantages of using tablet PCs, although argued that implementing digital educational resources and digital learning in rural areas could positively impact the quality of education [1]. Thus, my study investigated students' acceptance of the tablet PC model via a prototype program as an initial step to improve the quality of education in rural areas.

Technology Acceptance Model (TAM)

The technology acceptance model (TAM) has been widely researched in response to the growing importance of tablet PCs in education and was a theoretical model developed specifically to explain computer/IT usage behaviour [21]. Studies have claimed that TAM measures attitudes and beliefs that forecast users' future behaviours. Gao (2005) stated that technology acceptance models could evaluate competing products such as textbooks and technology systems [22]. Even though technologies have advanced since TAM was developed, it has been a robust method for framing human factors, making it a frequently used method [23].

Several intention-based theories have been proposed to explain various scenarios for accepting tablet PCs, including and [17, 23]. Another study also that used TAM to investigate students' acceptance of tablet PCs was conducted in Malaysia [24]. The authors found that 46% of 8th-grade students strongly intend to use tablet PCs in their studies. However, none of these studies have focused on rural students' acceptance of tablet PCs.

TAM (see Figure 2) consists of six components: external variables, perceived ease of use, perceived usefulness, attitude, behavioural intention to use, and actual system use. Table 1 contains the definition of each of these components. Furthermore, TAM is built on two primary variables: the independent variables of perceived ease of use (PEOU) and perceived usefulness (PU) and the dependent variables of attitude towards using technology (AT) and intention to use (ITU).

Table 1: TAM Variables and Definitions

Variable	Definition
Perceived Usefulness (PU)	The extent to which an individual believes that tablet computers will assist in improving their performance.
Perceived Ease of Use (PEOU)	The extent to which an individual feels that using tablet computers would be free of effort.
Attitude Towards Using Tablet PCs (AT)	The degree to which users feel that using tablet computers is a good idea.
Behavioural Intention to use (BI)	The probability that an individual would use a tablet computer.
Actual Use (AU)	The behavioural intention, which, in turn, is dependent on PU and AT.

Note: These definitions are provided by [21]

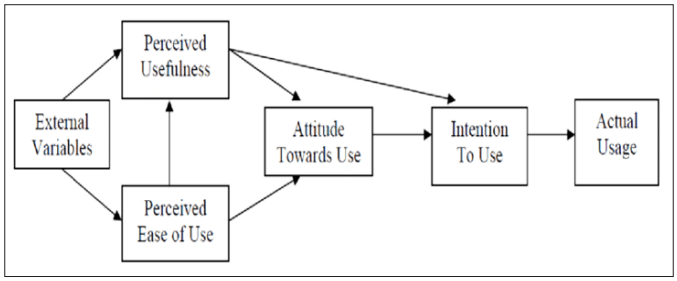


Figure 2: Technology Acceptance Model (TAM) by [21]

Research Problem and Question

Student preparation is a critical factor for successfully implementing tablet PCs, but other factors influencing students in rural areas, especially in Saudi Arabia, have yet to be identified. As a result, the purpose of this research was to use the original version of TAM to explore the factors impacting Saudi Arabian rural students' willingness to use tablet PCs in their learning. The methodology outlines how the project will answer the following research question: What factors affect students' acceptance of tablet PCs in rural areas in Saudi Arabia? Students' acceptance was measured through several factors, such as their attitudes and behavioural intentions. The tablet PC prototype called the IEN bag tablet PC was introduced to investigate students' acceptance in this study.

Contribution of Research

This research contributes to understanding and managing tablet PC initiatives in an educational setting in rural areas and the management of information technology (IT)-based initiatives in Saudi education. In addition, this study produced a report for school principals that will assist them in making decisions about further integrating technology, especially tablet PCs, into their schools (see Appendix A). claimed that tablets are a valuable tool for involving students in collaborative learning, learning materials, and social activities but require further development to be helpful in producing content [25]. From a theoretical perspective, this research measured rural Saudi students' acceptance of the tablet PCs' applicability when they contained all the necessary digital educational resources by applying TAM in rural Saudi schools.

Theoretical and Methodological Framework

Research Model

The TAM framework can serve as the foundation for a robust assessment of technological learning environments [26]. The benefits and sophistication of a particular IT device or technology are important factors shaping an individual's attitude towards them [27]. According to Davis and colleagues' original TAM study [28], the perceptions of a technology's usefulness and ease of use affect an individual's attitude towards that technology. This attitude also has a significant impact on an individual's intention to use the technology. Moreover, this experiment may guide the Ministry of Education in Saudi Arabia to distribute tablet PCs to rural students.

Furthermore, consumers are more likely to consider technology useful if they feel it is easy to use, according to [17]. However, another study on tablet PCs discovered that perceived usefulness has a higher impact on users' intentions than the perceived ease of use [23]. The research model (see Figure 3) suggests that when rural students encounter tablet PCs, two factors predict their intention to accept and adopt this technology: attitude and perceived usefulness [28]. Their attitude measures the degree to which they believe that using tablet PCs is beneficial. In comparison, perceived usefulness is the extent to which they believe that tablet PCs will help them succeed academically. Attitude is also influenced by the perceived usefulness [28].

In conjunction with perceived usefulness, perceived ease of use measures the degree to which rural students believe that using tablet computers will be free of effort and predicts their attitude. Perceived usefulness is also influenced by the perceived ease of use [28].

Moreover, found that perceived usefulness impacts behavioural intentions [23]. Thus, students' intentions convey the likelihood that rural students will use tablet PCs. Therefore, the hypotheses discussed below were developed to enable the researcher to answer the research question and discover the relationships between the TAM factors and how they influence rural students to accept tablet PCs.

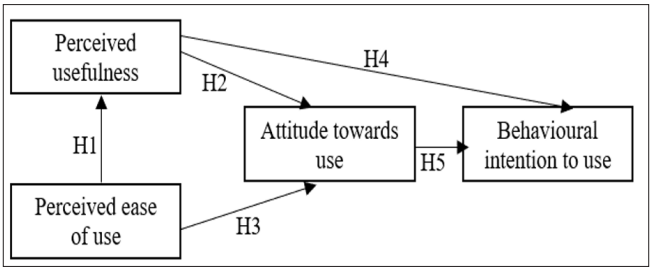


Figure 3: The Research Model Using TAM

Tablet PC Prototype

The tablet PC was designed as a prototype using the online tool Figma. The resulting tablet-based learning environment was named IEN bag, as it uses the digital educational resources provided by the IEN portal. This official online learning portal includes digital content for pre-primary to secondary education students. It includes Saudi textbooks, teaching materials, student workbooks and exercises, sample tests and quizzes, and digital knowledge materials [9]. However, rural students and teachers have not used this resource because it requires Internet access, which is the largest obstacle to its use in rural areas [18]. Thus, I have developed the IEN bag tablet PC (see Figure 4) specifically for students above 12 years old in rural areas. It allows these

students to use learning materials, scaffolds, and metacognitive and cognitive strategies tailored to their needs. Additionally, this tablet offers educators a mind map, timer, scheduler, and a camera, among other cognitive resources (see Appendix B). This study's investigation of students' technological acceptance of this type of tablet computer revealed factors that influence or impede the successful implementation of tablet PC learning in rural areas.

Figure 4: IEN Bag Tablet PC Prototype Home Page (Left) and the Course Resource (Right)

Research Hypotheses

The hypotheses below were derived from previous research using TAM:

- **H1:** The level of perceived ease of use is positively correlated with the use of the tablet PC prototype and influences the degree to which rural students believe that the tablet PC prototype will assist in improving their learning in school (perceived usefulness).
- **H2:** The degree to which rural students believe that the tablet PC prototype will help them improve their school performance (perceived usefulness) positively influences their attitudes towards the tablet PC prototype.
- **H3:** Perceived ease of use positively influences rural students' attitudes towards the tablet PC prototype.
- **H4:** The degree to which rural students believe that the tablet PC prototype will help them improve their school performance (perceived usefulness) positively influences their intention to use the tablet PC prototype.
- **H5:** The attitude of rural students towards the tablet PC prototype positively influences their intention to use the tablet PC prototype.

Survey Instrument

This study employed a quantitative approach. An Internet-based survey was used to answer the research question and investigate the research hypotheses. A researcher's expectations determine whether a qualitative or quantitative approach should be used [29]. I decided to use a quantitative approach because it can help describe the relationships among the variables of interest [30]. Facts, data on attitudes and desires, views and predictions, perceptions, behaviour, and experiences – both past and present of a large population– can all be gathered through surveys [31].

Additionally, quantitative research is inexpensive to conduct, saves time, and allows for faster data entry. It enables the researcher to access minority and marginalised groups and allows the researcher to take large samples and collect large volumes of data. For these reasons, I chose to use an Internet-based survey design coupled with quantitative analysis to examine the factors that affect students' acceptance of tablet PCs in rural Saudi areas. The survey instrument includes the TAM variables: perceived usefulness, perceived ease of use, attitude, and behavioural intention. More information was gathered from the participants, such as their age, gender, and education level, to better understand their responses. All questionnaire items used a 7-point Likert scale to determine respondents' levels of agreement with the statements provided. This scale conveys more information than a 5-point scale, providing greater discrimination and reliability [32]. This ordinal scale ranged from "strongly agree" to "strongly disagree" (see Appendix C).

Ethical Considerations

This project did not seek Human Research Ethics Committee approval. As specified by the Human Research Ethics Protocols for master's coursework students at Western Sydney University, this study will not be published at any academic venues, and the analysed results will not be shared with anyone. In addition, the data was collected to complete one unit for the Master of Education (Leadership and Management) at Western Sydney University. There is no potential risk assessed at this stage or during the compilation of this study, as the participants did not experience harm or discomfort. The researcher collected the participants' age, gender, and grade level but no other personal information. During data collection, the participants' data was kept anonymous. Participants (students from intermediate and secondary schools) were asked permission before answering the survey, as were the school principals.

Moreover, participation in this survey was completely voluntary, and participants could withdraw without notice at any time. Participants' data was destroyed if they chose to withdraw [31]. All data was stored safely on my OneDrive (university account), which I have access to while enrolled in my Professional Project unit.

Data Collection

The survey, a TAM questionnaire, was used for data collection and integrated with the Pearson correlation coefficient and linear regression model for data analysis. The Pearson correlation coefficient was used to measure the convergence of the TAM questionnaire items and linear regression model to test hypotheses about the relationships between the primary TAM variables. Google Forms was used for the survey due to its facility with Arabic script compared to other survey platforms such as Qualtrics. An online Google Forms survey was available to rural students from the 20th of August 2021 to the 1st of September 2021 (see Appendix D). A link to the web-based survey provided in both English and Arabic was sent to the school principals via email to distribute it to their students (see Appendix E). The school principals posted the survey's link in school's social media channels (Twitter, Facebook, and WhatsApp) to solicit voluntary participation. The schools' principals assist the survey's distribution process in covering three schools that involve two educational levels (intermediate and secondary) and educate both genders (male and female). Of the total sample size of 196 students, 158 students responded, yielding a response rate of approximately 80%.

Additionally, the students at the three schools were also asked to sign an informed consent form before participating in the web-based survey. The consent form contained a summary of the study and stated that they could exit the survey at any time with

no repercussions (see Appendix F).

Data Analysis

This questionnaire was administered to 158 respondents via an online Google Forms survey. The questionnaire data were statistically analysed with the Statistical Package for Social Sciences (SPSS), version 27. SPSS is one of the most frequently used statistical software programs in researching human behaviour [33]. Firstly, descriptive analyses were employed to analyse the rural students' demographic information. Next, the reliability analysis was conducted to check the internal validity and consistency of the items used for each factor. The Pearson correlation coefficient was then examined to assess convergent TAM questionnaire items [33]. Finally, the linear regression model was conducted to test the five hypotheses of the study model. During data analysis, the significance level for all statistical tests was $p < .001$, which is statistically highly significant, meaning the chances of being wrong are less than one in one thousand. This level was chosen because the majority of authors describe statistically high significance as $p < .001$ or statistically significant as $p < .05$. Statistical power is an essential ingredient of quantitative research [33].

Descriptive Analysis

The survey respondents consisted of 80.38% female students and 19.62% male students (see Figure 5). The participation rates between boys and girls differed since, of the three schools that participated in this study, two are girls' schools and one is a boys' school. As Figure 6 shows, 41.77% of rural students used a mobile phone to study, followed by 29.11% of students who used a laptop. Students also indicated whether they had 3–5 years of experience (36.08%), over five years of experience (33.54%), or 0–2 years of experience using their personal devices (30.38%; see Figure 7).

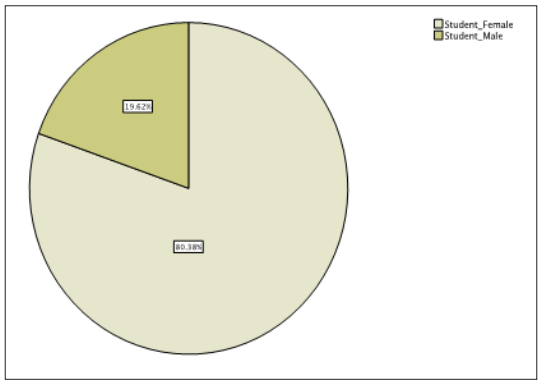


Figure 5: Student Gender

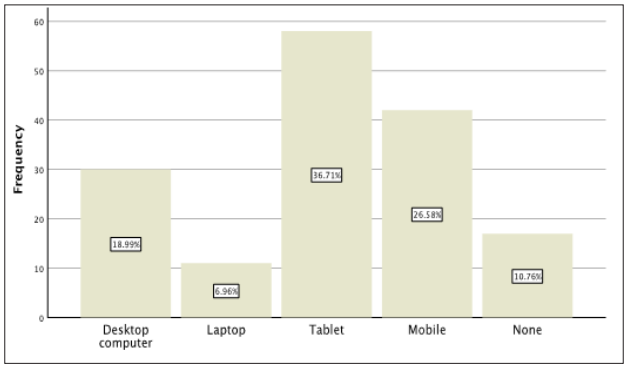


Figure 6: Students' Own Devices

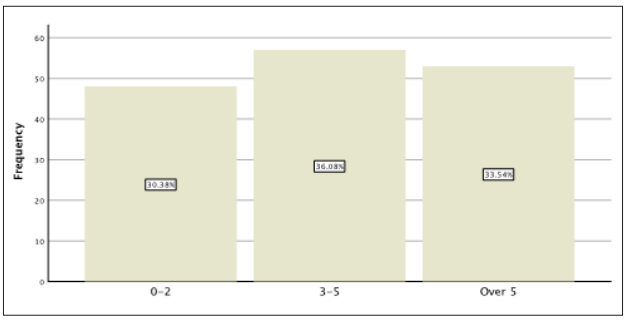


Figure 7: Students' Years of Experience Using Devices

Moreover, 41.77% and 29.11% of rural students suffered from slow or very slow Internet speeds, respectively (see Figure 8). In comparison, 44.30% of students noted their Internet speed was weak at home when they wanted to download the IEN's digital educational resources (see Figure 9). However, 36.71% of rural students sometimes use IEN's digital educational resources (see Figure 10). Meanwhile, 37.97% of rural students often used IEN's digital educational resources, and 26.58% of rural students sometimes used them to understand their subjects. In addition, 36.61% of rural students often used IEN's digital educational resources, and 25.95% of rural students sometimes used them to complete their assessments (see Figures 11 and 12). More descriptive analysis data are detailed in Appendix G.

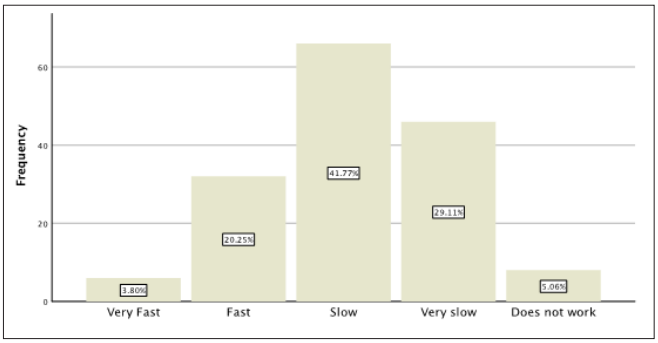


Figure 8

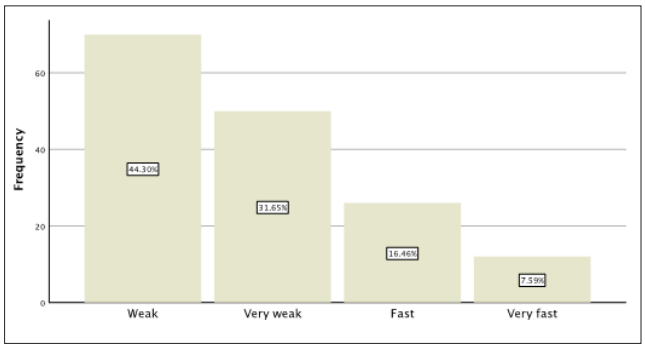


Figure 9: Students' Internet Speed When Trying to Download the IEN's Digital Educational Resources

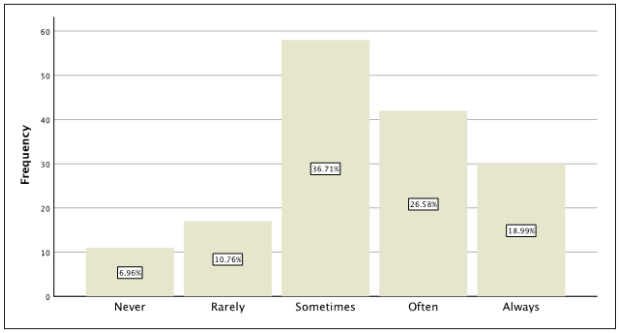


Figure 10: Using IEN's Digital Educational Resources

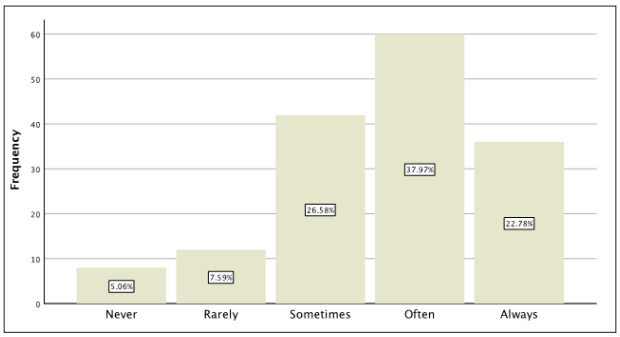


Figure 11: Using IEN's Digital Educational Resources to Understand Subjects

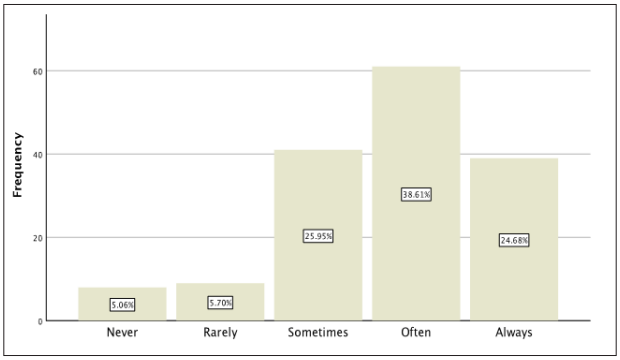


Figure 12: Using IEN's Digital Educational Resources to Complete Assessments

Instrument Reliability

Using a survey questionnaire to obtain data from respondents is one of the broadest data collection techniques. For this reason, I needed to verify the surveys responses' correctness and consistency before moving on to the next stage of analysis. This stage of the analysis is characterised by measuring the validity and reliability of the instrument [34]. Thus, the reliability analysis was conducted to check the internal validity and consistency of the items used for each factor. Nawi et al. (2020) explained that internal consistency reveals the items' degree of interrelatedness [35]. Nawi et al. (2020) also discussed the dependability of any measurement, focusing on the extent to which it is a consistent measure of a concept [35]. Measuring Cronbach's alpha provides a way for researchers to analyse the level of consistency in their data (Nawi et al., 2020) [35]. Cronbach's alpha is also the most frequently used measurement of internal consistency [36]. During the reliability analysis, the internal validity and consistency of the items used for each component were checked with SPSS. The reliability analysis findings are summarised in Table 2. Based on standards for reliability, the questionnaires used to assess various factors of the IEN bag, the tablet-based learning environment, were found to be highly reliable measuring instruments, with Cronbach's alpha values consistently above .898. Additional reliability statistics are detailed in Appendix H [35].

Table 2: Cronbach's Alpha of Variables

Factor	Items	Cronbach's alpha
Perceived Usefulness (PU)	6	.898
Perceived Ease of Use (PEOU)	6	.928
Attitude (ATT)	3	.916
Intention to Use (ITU)	6	.931

Correlation Analysis

After completing the reliability analysis, I examined the correlation coefficients to see how the four variables were interrelated and tested the research model's hypotheses using SPSS. The Pearson correlation coefficient is the most often used statistic globally, and it identifies the magnitude and direction of a linear relationship between two variables [37]. Based on standards for correlations, the correlations between the PU, PEOU, AT, and ITU have a statistically significant linear relationship, which confirms my initial hypotheses and supports previous research on TAM in the literature, as shown in Table 3 [37]. Furthermore, the direction of the relationship between the variables is positive, meaning these variables tend to increase together. The association's magnitude or strength between variables is relatively high ($.6 < | r | < .9$).

Table 3: The Correlations of Variables

		Perceived Ease of Use (PEOU)	Perceived Usefulness (PU)	Attitude (ATT)	Intention to Use (ITU)
Perceived Ease of Use (PEOU)	Pearson Correlation	1	.693**	.803**	.797**
	Sig. (1-tailed)		<.001	<.001	<.001
Perceived Usefulness (PU)	Pearson Correlation	.693**	1	.659**	.711**
	Sig. (1-tailed)	<.001		<.001	<.001
Attitude (ATT)	Pearson Correlation	.803**	.659**	1	.824**
	Sig. (1-tailed)	<.001	<.001		<.001
Intention to Use (ITU)	Pearson Correlation	.797**	.711**	.824**	1
	Sig. (1-tailed)	<.001	<.001	<.001	

** Correlation is significant at the 0.01 level (1-tailed).

Hypotheses Testing

The analysis of the correlation coefficient (r) is used to quantify the strength of a relationship in the sample, meaning that if I used a different sample, I would find that the r values would be different, and the conclusions may differ as well. I therefore need to conduct hypotheses testing to infer conclusions about the population, not just the sample, a process known as statistical inference [38]. Using hypothesis testing, researchers may determine whether or not the evidence from a sample supports their claims [38]. The regression analysis was performed to test the hypotheses of this study.

Firstly, I examined the impact of PEOU on PU using the linear regression model (see Table 4 below). To test hypothesis H1, the dependent variable PU was regressed on the predicting variable PEOU. PEOU significantly predicted PU, F (1,156) = 144.109, $p < .001$, which indicates that the PEOU can play a significant role in shaping PU ($\beta = .693$, $p < .001$). These results reveal the positive effect of PEOU. Moreover, the $R^2 = 0.480$, indicating that the model explains 48% of the variance in PU. Thus, based on the standardised coefficient beta value ($\beta = .693$), perceived ease of use (PEOU) had a significant impact on perceived usefulness (PU). Table 4 shows this finding, proving that the hypothesis is supported.

Table 4: Predictors: PEOU à Dependent Variable: PU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.693[a]	.480	.477	1.10373

ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	175.555	1	175.555	144.109	<.001[b]
	Residual	190.041	156	1.218		
	Total	365.597	157			

a. Dependent Variable: Perceived Usefulness (PU)
b. Predictors: (Constant), Perceived Ease of Use (PEOU)

Coefficients[a]

	Model	B	Std. Error	Beta	t	Sig.
1	(Constant)	1.236	.279		4.431	<.001
	Perceived Ease of Use (PEOU)	.742	.062	.693	12.005	<.001

Subsequently, the impact of PU and PEOU on students' attitudes (ATT) towards the IEN bag tablet PC was examined using the linear regression model (see Tables 5 and 6 below).

To test the hypotheses H2 and H3, the dependent variable ATT was regressed on the predicting variables PU and PEOU. PU significantly predicted ATT, F (1,156) = 119.795, $p < .001$, indicating that PU can play a significant role in shaping ATT ($\beta = .659$, $p < .001$). PEOU also significantly predicted ATT, F (1,156) = 283.073, $p < .001$, revealing that PEOU can play a highly significant role in determining ATT ($\beta = .803$, $p < .001$). These results demonstrate the positive effects of PU and PEOU.

Moreover, For PU, $R^2 = .434$; in other words, the model explains 43.4 % of the variance in ATT. Meanwhile, the R^2 of PEOU is equal to 0.654, and the model therefore explains 65.4 % of the variance in ATT. Thus, based on the standardised coefficient beta value of PU ($\beta = .659$) and PEOU ($\beta = .803$), PEOU had a more significant impact on students' attitudes (ATT) towards the IEN bag than PU. Tables 5 and 6 provide the findings that support the hypotheses H2 and H3.

Table 5: Predictors: PU à Dependent Variable: ATT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.659[a]	.434	.431	1.26638

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	192.118	1	192.118	119.795	<.001[b]
	Residual	250.180	156	1.604		
	Total	442.298	157			

a. Dependent Variable: Attitude (ATT)
b. Predictors: (Constant), Perceived Usefulness (PU)

Coefficients[a]

		Unstandardised Coefficients		Standardised Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.538	.309		4.974	<.001
	Perceived Usefulness (PU)	.725	.066	.659	10.945	<.001

Table 6: Predictors: PEOU à Dependent Variable: ATT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.803[a]	.645	.642	1.00367

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	285.152	1	285.152	283.073	<.001[b]
	Residual	157.146	156	1.007		
	Total	442.298	157			

a. Dependent Variable: Attitude (ATT)
b. Predictors: (Constant), Perceived Ease of Use (PEOU)

Coefficients[a]

		Unstandardised Coefficients		Standardised Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	.687	.254		2.710	.007
	Perceived Ease of Use (PEoU)	.946	.056	.803	16.825	<.001

Finally, the impact of PU and ATT on students' intentions to use the IEN bag tablet PC was examined using the linear regression model (see Tables 7 and 8 below).

For testing the hypotheses H4 and H5, the dependent variable students' intentions (ITU) was regressed on the predicting variables PU and ATT. PU significantly predicted ITU, $F(1,156) = 159.883$, $p < .001$, demonstrating that PU can have a significant impact on ITU ($\beta = .711$, $p < .001$).

In addition, ATT significantly predicted ITU, $F(1,156) = 330.847$, $p < .001$, revealing that ATT can have a highly significant impact on ITU ($\beta = .824$, $p < .001$). These results show the positive effects of PU and ATT.

For PU, $R^2 = .506$, indicating that the model explains 50.6% of the variance in ITU, while for ATT, $R^2 = .680$, meaning the model explains 68% of the variance in ITU. Thus, based on the standardised coefficient beta value of PU ($\beta = .711$) and ATT ($\beta = .824$), students' attitudes towards the IEN bag had a more significant impact on their intention to use the IEN bag than PU. Tables 7 and 8 show the results that confirm the hypotheses H4 and H5. Table 9 provides an overview of the hypotheses testing results.

Table 7: Predictors: PU → Dependent Variable: ITU

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.711[a]	.506	.503	.97289

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	285.152	1	285.152	283.073	<.001[b]
	Residual	157.146	156	1.007		
	Total	442.298	157			

a. Dependent Variable: Intention to Use (ITU)
b. Predictors: (Constant), Perceived Usefulness (PU)

Coefficients[a]

		Unstandardised Coefficients		Standardised Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.517	.238		6.387	<.001
	Perceived Ease of Use (PEoU)	.643	.051	.711	12.644	<.001

ATT → Dependent Variable: ITU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.824[a]	.680	.678	.78367

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	203.185	1	203.185	330.847	<.001[b]
	Residual	95.805	156	.614		
	Total	298.990	157			

a. Dependent Variable: Intention to Use (ITU)
b. Predictors: (Constant), Attitude (ATT)

Coefficients[a]

		Unstandardised Coefficients		Standardised Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.146	.187		6.120	<.001
	Attitude (ATT)	.678	.037	.824	18.189	<.001

Table 9: Summary of Hypotheses Testing

Hypothesis	Specification	Results
H1	The level of perceived ease of use is positively correlated with the use of the tablet PC prototype and influences the degree to which rural students believe that the tablet PC prototype will assist them in improving their learning in school (PU).	Supported (β = .693, p < .001)
H2	The degree to which rural students believe that the tablet PC prototype will help them improve their school performance (PU) positively influences their attitudes towards the tablet PC prototype.	Supported (β = .659, p < .001)
H3	The level of perceived ease of use positively influences rural students' attitudes towards the tablet PC prototype.	Supported (β = .803, p < .001)

H4	The degree to which rural students believe that the tablet PC prototype will help them improve their school performance (PU) positively influences their intention to use the tablet PC prototype.	Supported (β = .711, p < .001)
H5	The attitude of rural students towards the tablet PC prototype positively influences their intention to use the tablet PC prototype.	Supported (β = .824, p < .001)

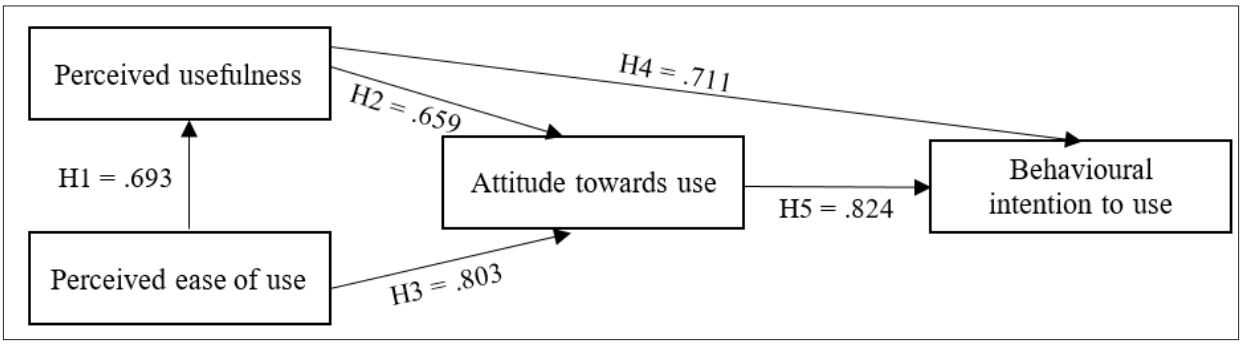


Figure 13: Linear Regression Analyses Model Results

In summary, the five hypotheses were confirmed by the results of the linear regression analyses. Students' attitudes (ATT) towards the IEN bag tablet PCs had the strongest impact on their intention to use the IEN bag (ITU), followed by the influence of perceived ease of use (PEOU) on students' attitudes (ATT) towards the IEN bag tablet PCs. Perceived usefulness (PU) positively impacted students' intention to use the IEN bag tablet PCs (ITU). In addition, perceived ease of use (PEOU) positively impacted the perceived usefulness (PU) of the IEN bag tablet PCs. Finally, perceived usefulness (PU) had a moderate influence on students' attitudes (ATT) towards the IEN bag tablet PCs (see Figure 13).

Findings and Discussion

The purpose of this study was to investigate rural Saudi students' acceptance of the IEN bag tablet PC, a tablet-based learning environment, by examining the relationships between PEOU, PU, ATT, and ITU in TAM. This study determined the factors that influenced rural students' acceptance of tablet PCs loaded with digital resources that do not require access to the Internet. The findings of this study indicate that the perceived ease of use of the IEN bag tablet PC has a strong influence on its perceived usefulness, supporting hypothesis H1 (β = .693). This finding is consistent with research conducted by [23], who found that a technology's perceived ease of use is a significant determinant of perceived usefulness and students' attitude. Thus, this may suggest that offering necessary training to rural students is crucial for improving students' perception of the usefulness of the IEN bag tablet PC or any new technology. The results of this study indicate that perceived usefulness and ease of use are core determinants of the students' perception of the IEN bag tablet PC, which is consistent with Park and [17] conclusion that consumers view technology as useful if it is easy to use. Accordingly, rural students can use the IEN bag tablet PC anytime, inside, or outside of school.

Additionally, tablet PCs feature better usability and convenience than traditional laptop PCs or mobile technologies [1]. Therefore, enhancing the ease of use of the IEN educational resources on the IEN bag should improve students' satisfaction. That is, they can use IEN tablet PCs to perform various study tasks, which eventually increase rural students' achievements and improve their academic outcomes. Lim et al. (2019) described how the quality of education might be positively affected by implementing digital educational resources and digital learning in rural areas [1].

Moreover, the results indicate that rural students in Saudi Arabia have a positive attitude toward the IEN bag tablet PC. The IEN bag PC's perceived usefulness and ease of use affect students' attitudes towards it, supporting hypotheses H2 (β = .659) and H3 (β = .803). The results also highlight that the IEN bag tablet PC's perceived usefulness has a higher impact on students' intentions to use it, supporting hypothesis H4 (β = .711). This result is also compatible with study, which found that a technology's perceived usefulness influences consumers' behavioural intentions [23]. Thus, students' intentions predict the probability that rural students in Saudi Arabia will use IEN bag tablet PCs. The students' attitudes also significantly impact their intention to use IEN bag tablet PCs, supporting hypothesis H5 (β = .824). This finding is consistent with previous research conducted by Davis and colleagues in their original TAM study (Davis et al., 1989), which showed that an individual's attitude towards the technology can influence an individual's intention to use the technology. In addition, the results show that the perceived ease of use of the IEN bag tablet PC would enhance the students' intentions to use it because its perceived ease of use has a significant influence on students' attitudes towards the IEN bag tablet PC, which in turn impacts their intention to use it. This finding is consistent with study [39]. Perceived ease of use is critical, as this was a stronger factor than perceived usefulness in students' acceptance of the IEN bag tablet PC. Therefore, if the Ministry of Education in Saudi Arabia adopts and implements the distribution of the IEN tablet PC initiative in rural areas, it is important to consider the IEN bag tablet PC's ease of use.

Additionally, the findings of this research indicate that TAM can provide clear insights of students' acceptance of IEN bag tablet PCs with perceived ease that is a significant determinant of perceived usefulness and students' attitude towards IEN bag tablet PCs which was consistent with the finding from in their study [23]. The results of this study also confirm that TAM presents a reliable explanation of rural students' acceptance of tablet computers. Mobile technologies, particularly tablets such as the IEN bag tablet PC, are expected to improve learning outcomes for rural students who attend schools in underprivileged areas [11]. Finally, this study's results not only inform effective educational technology initiatives but also serve as a foundation for further investigation into issues that affect rural students.

Limitations and Future Research

This study explored rural Saudi students' acceptance of tablet PCs. The scope of the study was limited to rural Saudi students

in only one region. This study was also restricted by the time restraints of conducting this research project as an assignment. It would therefore be interesting to explore rural Saudi students' acceptance of tablet PCs across multiple regions. In addition, survey respondents consisted of 80.38% and 19.62% male students because two girls' schools and one boys' school participated in this study. For this reason, there was no balance between male and female students in this study, affecting my ability to examine the differences in rural students' intentions to adopt the IEN bag tablet PC according to gender, age, or specific user characteristics, factors that should be considered in future research. This study also applied the original TAM model, though it would be helpful to examine rural Saudi students' acceptance of tablet PCs by applying an extended TAM model, adding external variables such as self-efficacy, social influence, or years of experience with technology. Furthermore, this project did not consider the TAM's "actual use" variable. Future studies should thus explore the distribution of actual tablet PCs, which can be used to measure students' intentions to actually use the tablet. Finally, this study focused on rural students' acceptance of the IEN bag tablet PC. To complement this research, future studies could identify teachers' willingness to integrate IEN bag tablet PCs into their classroom, as teachers' positive perceptions are crucial to the success of technology integration.

Conclusions and Recommendations

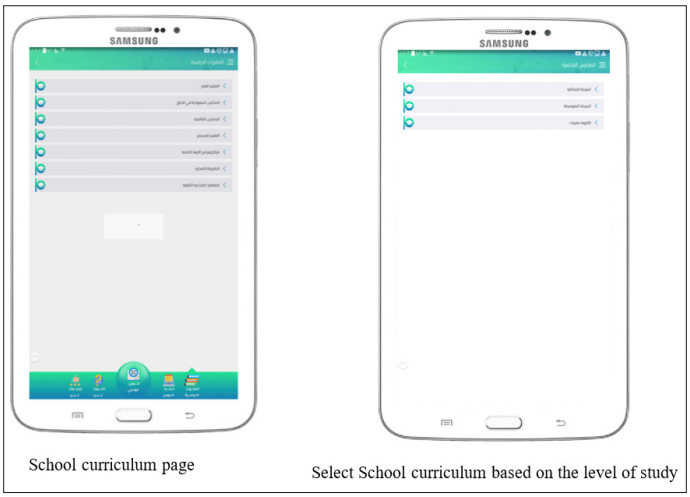
This study investigated the factors that influence Saudi rural students' acceptance of tablet PCs loaded with digital resources that do not require Internet access using the original version of TAM. Overall, the results indicate that TAM might reasonably explain rural students' acceptance of the IEN tablet PC. These findings may be used to establish diagnostic objectives and plan and manage tablet PC distribution in rural Saudi areas for educational purposes. The results indicate that perceived usefulness and perceived ease of use are key determinants of rural students' perceptions of the IEN bag tablet PC. In addition, the perceived ease of use and the usefulness of the IEN bag tablet PC were positively related to attitude and the intention to use this technology, in keeping with prior studies [17, 23]. This study thus provides a solid explanation of students' attitudes and intentions to use tablet PCs, revealing that their attitude towards the IEN bag tablet PC was the dominant determinant of their intention to use it. Consequently, it seems that developing rural students' favourable attitudes towards this technology is crucial. This experiment may guide the Saudi Ministry of Education in implementing a strategy for distributing IEN tablet PCs among rural students. The results of this study also provide an initial estimate of students' acceptance of tablet PCs in rural areas for stakeholders, including policymakers, administrators, teachers, school principals, and the Ministry of Education. These results can assist them in distributing tablet PCs for rural students, especially during COVID-19, to address the lack of access to online materials in rural areas [7].

Furthermore, this study helps stakeholders understand the factors that facilitate and hinder the successful integration of tablet PCs into the learning processes at rural schools. Notably, this study found that rural students accept the IEN bag tablet PC as an initial tablet PC model to improve the quality of education in rural areas. Thus, these results provide an initial overview for stakeholders in Saudi education concerning the adoption and implementation of IEN tablet PCs in rural classes [40].

Moreover, this study found that 44.30 % of rural students suffer from weak Internet speed at home when they want to download the IEN's digital educational resources. I therefore recommend that school principals improve the Internet speed in their schools so students can download the IEN's digital educational resources at school to use later at home. I also recommend that the Saudi Ministry of Education allocate a budget that can assist school principals in rural areas improve the Internet speed. In addition, the study found that 36.71% of rural students use the IEN's digital educational resources in their daily studies to help them understand their subjects and complete assessments. Based on this finding, I suggest that school principals encourage teachers to use the IEN's digital educational resources in their teaching, which can help students discover more of the IEN's digital educational resources related to a particular subject. I further recommend that the Ministry of Education improve the IEN's digital educational resources, making them easier to download with low Internet speeds. Finally, with the proliferation of tablet PC initiatives throughout rural areas, I suggest that the IEN bag tablet PC initiative become the logical next step in improving students' learning in rural schools.

IEN bag tablet PCs prototype home page

IEN bag home page



School curriculum page

Select School curriculum based on the level of study

Select School curriculum based on the level of classroom

Select School curriculum based on semester

Browsing the educational media of School curriculum

Browsing the contents of School curriculum

Browsing the test models of School curriculum

Browsing the test models of School curriculum based on the level of study

References

1. Lim K, Kim Y, Kim M, Jang Y, Joo M H (2019) The Digital Divide? Analysing Regional Differences of Tablet PC Use in Korean Middle Schools for Sustainable Development. Sustainability 11: 5054.
2. Corey L (2019) A case study of iPad implementation in one rural elementary school. Journal of Educational Technology Systems 48: 305-316.
3. General Authority for Statistics (GASTAT) (2017) Education and training survey 2017 https://www.stats.gov.sa/sites/default/files/nshr_ltlym_wltdryb_2017.pdf.
4. UNESCO (2021) Saudi Arabia: Education and Literacy http://uis.unesco.org/en/country/sa.
5. Worldometer (2020) Saudi Arabia demographics 2020 (population, age, sex, trends) https://www.worldometers.info/demographics/saudi-arabia-demographics/#urb.
6. Schleicher A (2019) PISA 2018 insights and interpretations. OECD https://www.oecd.org/en/about/programmes/pisa.html.
7. Makkah Newspaper (2020) An initiative to provide smart tablets for students of Takaful. Makkah News https://makkahnewspaper.com/article/1519772.
8. Arabnews (2020) Saudi Education Ministry takes on distance learning of 6 million students in 10 days https://www.arabnews.com/node/1648561/saudi-arabia.
9. UNESCO (2021) National Learning Platforms and Tools https://en.unesco.org/covid19/educationresponse/nationalresponses.
10. Albjali A (2021) Images of rural students on the top of mountain. Sabaq newspaper https://sabq.org/TsKMYZ.
11. Narayanasamy F S, Mohamed J B K (2013) Adaptation of mobile learning in higher educational institutions of Saudi Arabia. International Journal of Computer Applications 69.
12. Alshahrani H (2016) Investigating the determinants of mobile learning acceptance in higher education in Saudi Arabia. [unpublished doctoral dissertation]. US: Northern Illinois University https://huskiecommons.lib.niu.edu/cgi/viewcontent.cgi?article=4640&context=allgraduate-thesesdissertations.
13. Alahmad M (2014) Smartphones and tablet computers as effective tools for teaching engineering students. In The Clute Institute International Academic Conference proceedings. San Antonio, Texas, USA 132.
14. Clarke B, Svanaes S (2014) An updated literature review on the use of tablets in education. Tablets for Schools. UK: Family Kids & Youth https://www.kidsandyouth.com/pdf/FK%26Y%20T4S%20Literature%20Review%209.4.14.pdf.
15. Alqhtani E, Samsudin Z, Fakrany H (2013) The transformation of Saudi Arabia through tablet-based technology. International Journal of Scientific & Engineering Research 4: 149-151.
16. Percival J, Claydon T (2015) A study of student and instructor perceptions of tablet PCs in higher education contexts [Paper presentation]. Higher Education in Transformation Conference, Dublin, Ireland 250-264.
17. Park E, del Pobil A P (2013) Technology acceptance model for the use of tablet PCs. Wireless Personal Communications an International Journal 73: 1561-1572.
18. Heinrich C J, Darling Aduana J, Martin C (2020) The potential and prerequisites of effective tablet integration in rural Kenya. British Journal of Educational Technology 51: 498-514.
19. Sundeen T H, Sundeen D M (2013) Instructional technology for rural schools: Access and acquisition. Rural Special Education Quarterly 32: 8-14.
20. Kapasia N, Paul P, Roy A, Saha J, Zaveri A, et al. (2020) Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. Children and Youth Services Review 116: 105194-105194.
21. Davis F D (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly 13: 319-340.
22. Gao Y (2005) Applying the technology acceptance model to educational hypermedia: A field study. Journal of Educational Multimedia and Hypermedia 14: 237-247.
23. El-Gayar O, Moran M (2007) Examining students' acceptance of tablet PC using TAM. Issues in Information Systems 8: 167-172.

24. Elyazgi M G, Nazâ M, Rahim N Z A, Imtiaz M A (2014) Feasibility study of tablet PC acceptance among school children in Malaysia. Jurnal Teknologi 69: 2180-3722.
25. Fischer N, Smolnik S, Galletta D F (2013) Examining the potential for tablet use in a higher education context. In Wirtschaftsinformatik 1.
26. Alomary A, Woollard J (2017) The determinants influencing Saudi undergraduate students' motivation and acceptance of tablet use in learning. International Journal of New Technologies in Science and Engineering 4: 2349-0780.
27. Pyshkin E, Kuznetsov A (2010) Approaches for web search user interfaces. Journal of Convergence 1: 1-8.
28. Davis F D, Bagozzi R P, Warshaw P R (1989) User acceptance of computer technology: A comparison of two theoretical models. Management Science 35: 928-1003.
29. Kanaan R K (2009) Making sense of e-government implementation in Jordan: A qualitative investigation [unpublished doctoral dissertation]. De Montfort University https://www.semanticscholar.org/paper/Making-sense-of-e-government-implementation-in-%3A-a-Kanaan/04db0569c4fd2debdd705a5d5233782ad37deb9b.
30. Creswell J W (2011) Controversies in mixed methods research. The Sage Handbook of Qualitative Research 4: 269-284.
31. Dillman D A, Smyth J D, Christian L M (2014) Internet, phone, mail, and mixed-mode surveys: The tailored design method. John Wiley & Sons https://www.wiley.com/en-fr/Internet%2C+Phone%2C+Mail%2C+and+Mixed-Mode+Surveys%3A+The+Tailored+Design+Method%2C+4th+Edition-p-9781118456149.
32. Chomeya R (2010) Quality of psychology test between Likert scale 5 and 6 points. Journal of Social Sciences 6: 399-403.
33. Cohen L, Manion Lawrence, Morrison Keith (2018) Research Methods in Education. (8th ed.). London: Routledge https://www.routledge.com/Research-Methods-in-Education/Cohen-Manion-Morrison/p/book/9781138209886?srsltid=AfmBOorNtFGAK2s1TsQl44s2ZEnHtetyJGOS4l35jthEa_UEzqfMcrKu.
34. Taherdoost H (2016) Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. How to test the validation of a questionnaire/survey in a research 5: 28-36.
35. Nawi F A M, Tambi A M A, Samat M F, Mustapha W M W (2020) A review on the internal consistency of a scale: the empirical example of the influence of human capital investment on Malcom Baldridge quality principles in tvet institutions. Asian People Journal (APJ) 3: 19-29.
36. Panayides P (2013) Coefficient alpha: interpret with caution. Europe's Journal of Psychology 9: 687-696.
37. Jaadi Z (2019) Everything you need to know about interpreting correlations. Towards Data Science https://towardsdatascience.com/eveything-you-need-to-know-about-interpreting-correlations-2c485841c0b8.
38. Davis R B, Mukamal K J (2006) Hypothesis testing: means. Circulation 114: 1078-1082.
39. Weng F, Yang R J, Ho H J, Su H M (2018) A TAM-based study of the attitude towards use intention of multimedia among schoolteachers. Applied system innovation 1: 36.
40. Hu P J, Chau P Y, Sheng O R L, Tam K Y (1999) Examining the technology acceptance model using physician acceptance of telemedicine technology. Journal of Management Information Systems 16: 91-112.