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The Effect of Digital Technology on Educational Outcomes through Student Engagement in Distance Education

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Abstract: In higher education, digital technologies completely change teaching and learning, with the rapid technological development compounding the problem. Because of the extensive usage of technology among today's college and university students, higher education institutions worldwide have recognized the need to use it in teaching and learning for certain reasons. Over the last two decades, studies have speculated on the beneficial and negative effects of students' constant interaction with technology in distance education. This study intended to investigate the effect of digital technology and educational outcomes through the mediating effect of student engagement. The convenience sampling approach was used to obtain 378 students and staff data. In addition, this study analyzed the data using the Partial Least Square Structural Equation Model (PLS-SEM). The study's findings indicated that digital technology and student engagement positively and significantly affect educational outcomes in distance education. In addition, the results revealed that digital technology indirectly influences educational outcomes through the mediation effect of student engagement. This study concluded that to comprehend the changes occurring in higher education. More attention should be devoted to establishing policies and strategies to increase student engagement in digital technologies in distance education of higher education contexts. From a distance education viewpoint, the current review investigated the determinants of educational outcomes through the mediating effect of student engagement. These findings have significant implications as distance education becomes a basic delivery mode of study in the coming decades. The methodological approach used in this study and the digital technology in distance education greatly improve current literature in the educational sector.

Keywords: distance education, digital technology, educational outcomes, higher education, Partial Least Square Structural Equation Model.

數字技術通過學生參與遠程教育對教育成果的影響

摘要: 在高等教育中，數字技術徹底改變了教學和學習，技術發展的快速速度使問題更加複雜。由於當今大學生中廣泛使用技術，世界各地的高等教育機構都認識到出於某些原因需要將其用於教學和學習。在過去的二十年裡，研究推測了學生在遠程教育中不斷與技術互動的有益和消極影響。本研究旨在通過學生參與的中介作用來調查數字技術和教育成果的影響。使用便利抽樣方法從 378 名學生和教職員工中獲取數據。此外，本研究使用偏最小二乘結構方程模型 (掃描電鏡) 分析數據。研究結果表明，數字技術和學生參與度對遠程教育的教育成果具有積極和顯著的影響。此外，結果表明，數字技術通過學生參與的中介效應間接影響教育成果。本研究得出的結論是，為了理解高等教育中發生的變化，應更加關注制定政策和戰略，以提高學生在高等教育背景下的遠程教育中使用數字技術的參與度。從遠程教育的角度來看，當前的審查通過學生參與的中介效應調查了教育成果的決定因素。隨著遠程教育在未來幾十年成為一種更重要的學習方式，這些發現具有重要意義。本研究中使用的方法論方法以及遠程教育中的數字技術是對當前教育領域文獻的重大改進。

关键词：远程教育、数字技术、教育成果、高等教育、偏最小二乘结构方程模型。

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1. Introduction

Higher education institutions are still grappling with the effects of digitalization. The present global crisis and pandemic scenario have necessitated significant higher education change. Many schools are exploring ways to speed up the digitalization process and the shift from on-campus instruction to digital education [3]. Nowadays, college and university students are part of a generation that has grown up in a technologically driven environment and is immersed in a world filled with all forms of digital technology. However, the precise use of these technologies for educational purposes by this highly technological, alternatively referred to as “Millennials," “the next generation” (N-Gen), “digital learners," “digital natives," “learners of the digital era, etc., are constantly discussed. Given that technology attributes align with educational contexts, i.e., from retrieving and sharing information to immediate access and engagement with peers and instructors, it is reasonable to assume that students utilize various technologies to enhance and facilitate their educational experiences and meet performance academic challenges.

However, it appears that increasing student learning is an issue of how technology is utilized rather than what sorts of technology are employed [5]. Consequently, higher education instructors' understanding of utilizing technology successfully in their courses appears critical for successful technology adoption in academics. The Interactive Constructive Active Passive approach [11, 15] recommended that the effectiveness of digital technologies is determined by the degree to which they prompt student engagement in constructive and interactive learning activities, in line with constructivist, learner-centered assumptions. Also, although technology usage in higher education has lately attracted researchers' attention [7, 10, 24], this is still unclear whether using technology makes teaching more learner-centered. Today, technology has been established to enable teaching more successfully in higher education, particularly in open institutions, to respond to curricular learning outcomes following the demands of students.

The inaugural special issue of education, Media, and Technology in 2020, titled 'Education and technology into the 2020s: hypothetical visions,' featured a collection of studies that looked ahead to the future of critical educational technology research. However, opinions differ: on the one hand, some believe that digital technology enhances and has already 'transformed' teaching and learning in higher education [14]; on the other hand, there are those who believe that these technologies are 'disruptive,' and thus a challenge for universities to deal with, as [14] points out: “Not all forms of digital engagement are equipped to education.” Nonetheless, digital technology has absorbed the higher education environment, prompting researchers to focus on various related issues, particularly the effectiveness and efficacy of technology concerning the education process and outcomes. Asynchronous and always dispersed, distance education is a teaching paradigm that is generally asynchronous and disseminated. There is no requirement to attend lessons at a given physical location or specified time. The participant received and tried to access content to engage with their studies, then completes and conveys assessment and often group work, and can ask their specific question through the facilitated method: originally by traditional mail, fax, telephone, and, more recently, through various internet devices [6].

Conversely, in its conventional sense, distance education may be defined as the physical separation of the student and the instructor, at least during certain phases of the learning process. However, the distance would not be a distinguishing feature of this paradigm. Although it will be difficult to eliminate the physical separation between the student and the teacher (in the teaching/learning process) through the use of digital technologies, it may be possible to create a collaborative, virtual educational space that does not reproduce distance between the various actors in the educational process, as well as between these and the content [17].

The aim is to make this ideal learning environment a reality, either now or shortly, by utilizing the tools and resources accessible in our digital society. Those who study online are expected to be more responsible than students who study in conventional teaching. Students can also learn on their own with the right tools and guidance. This is one option for students who must study and work simultaneously. It is possible to argue that digital technology has significantly influenced learners to continue studying while lowering student retention. Thanks to digital technology, learners may now learn anywhere and at any time once they are no longer distracted by job or family obligations.

The influence of digital technology on students' educational outcomes has been well documented in the literature over the last two decades, but with mixed results ranging from positive to negative to zero effects and linkages. This study compiled a list of relevant studies to show the variety of results. According to Redondo *et al.* [18], students were able to attain a higher degree of direct engagement with the suggested material through technology, which increased overall performance. They discovered a strong link between the use of technology and student motivation and a link between technology use and academic success. Rogers [20] discovered that students' long-term information retention in digital technology affected educational

outcomes and that students who utilize technology outperform their colleagues in terms of engagement and success [18, 20].

Rogers [20] used a longitudinal approach to show significant evidence that technology improves student achievement and educational outcomes. The study found that children who used technology had considerably greater accomplishment and high scores on criterion-referenced standardized examinations than kids who did not utilize technology. Electronic gadget "smart use" enhances academic achievement. Students who reported using their electronic devices for academic purposes performed better in school than those who said they used them for other purposes, according to Uzun and Kilis [23]. The majority of research investigations have concentrated on the link between a single or a few types of technology and academic achievement. This research aims to understand more about the linkages between the usage of digital technology and educational outcomes through student engagement in distance education.

2. Literature Review

2.1. Distance Education in the Digital Society

Digital technologies, such as subject-specific learning tools, interactive whiteboards, desktop or mobile videoconferencing, mobile applications/computer software, gaming consoles, tablets, and smartphones, have become an integral part of daily activities in modern education, and their use is now even expected within formal learning environments [12]. Learning management systems (LMSs) such as Moodle and Blackboard, among other digital educational tools, have lately acquired prominence as vital tools within the context of education [16], despite previously being in use. LMSs aid in the creation, deployment, and maintenance of entirely digital forms of education and provide users with a meaningful e-learning experience. Learning management systems (LMSs) offers many benefits and advantages to teachers (e.g., by facilitating the tracking of learner progress and performance) and students (e.g., by incorporating social learning experiences into learning strategy) [25].

However, the effective and efficient use of such technologies is dependent on student knowledge and skills [22]. More people have attended university thanks to more flexible models because of the increased usage of digital technology in education. The growth and variety of non-contact training modalities in recent years illustrate this: e-learning, streaming video, and flexible certification systems, to name a few.

This rise happens in the context of increasing employability expectations, such as the need for students to continue to train and integrate new skills throughout their careers. This has been accompanied by a rise in the percentage of students enrolled in non-contact institutions as a percentage of students enrolled in Spanish universities. Although non-contact university students accounted for just 4% of the 1987-1988 academic year, they now account for 16% in the 2017-2018 academic year. This percentage of distance students is considerably greater - and rising - in many developing nations. According to [21], in the United States, undergraduate enrolment of online students continues to rise (5.6 percent between 2015 and 2016), despite overall enrollment declining (-6.4 percent from 2012 to 2016). This accounts for 31.6 percent of all registered students, with almost half enrolling in "exclusively online" programs, which the authors claim is the fastest expanding model in the past few years. Aside from the obvious proliferation of distance education courses actively mediated by digital technologies and the rise in non-face-to-face university enrollment, the integration of digital technologies into campus universities has also resulted in significant changes in the design and analysis of teaching-learning processes. Some scholars have identified the emergence of a new learning paradigm, Digital and Network Learning, based on its capabilities and qualities and its expanding accessibility.

This new paradigm comes amid a discussion over the efficacy and long-term viability of educational methods in the digital world. This "new education" aims to establish an educational system capable of meeting new educational and development needs posed by the digital society, supporting new student profiles, and providing legitimacy and visibility to formal and non-formal educational contexts. Alternatively, they are just a cost-cutting strategy, i.e., engaging numerous students through improved digital content (delivery) techniques, but not certainly any quality advances in instructional methods.

2.2. Digital Technology, Engagement, and Educational Outcomes

The determinants of educational outcomes are frequently examined in an education system, which connects various inputs that affect student learning to educational outcomes. School resources, teacher quality, class size, and family characteristics such as cultural background and economic resources are among the inputs. Technology, in particular, may be thought of as one of the education operating method's inputs. In most cases, the outcome is quantified in terms of centralized student outcomes, but it has also been assessed in college attendance, school enrolment, graduation rates, dropout rates, and labor market consequences. The first set of research looked at the disparity in physical access, intending to understand the impact of computer ownership in the educational process. There is no clear-cut prediction concerning the effect of computer ownership on student outcomes from a theoretical viewpoint.

On the one hand, personal computers may be beneficial for learning various subjects, completing school tasks, and extending using computers in the classroom. However, the more time spent on the computer, the less time accessible for other higher education studies such as reading or doing the assignment. When children use computers to play games, download music and movies, or participate in social networks, they may become distracted. These time displacement effects may play a role in decreased educational outcomes. Furthermore, students may be exposed to the risk of obtaining and using information from questionable sources if they have access to the Internet.

Another set of researchers looked into the impact of Digital technology on educational outcomes. The impact of digital technology on the education process can be good, such as via the use of instructional software, or bad, such as through abuse and overuse, which can lead to physical and psychological issues. [21] investigate the academic implications of college students' excessive recreational use of the Internet, finding that it is negatively connected to academic performance. They are using data from the Longitudinal Study of Australian Children. The findings showed that computer time improves cognitive skills, while the evidence for non-cognitive skills is equivocal, with the effect varying depending on the children's score and age.

Longitudinal data for low-income children over 16 months includes continuous and automated tracking of Internet use [13]. The results showed a link between Internet use and educational success: children who use the Internet more frequently had higher scores on regulated literacy academic outcomes and higher-grade point averages than those who use it less frequently. Using PISA 2009 data, [14] discovered that, in most countries, the association between the frequency of various forms of Internet activity and reading or math literacy is typically negative, except for gaming.

According to [15], everyday computer gaming has neutral or favorable benefits for guys but detrimental consequences for girls. [13] investigate the impact of Internet usage on children's academic performance, discovering that increased Internet use is linked to improved reading abilities, but only for those with low reading skills to begin with. [16] investigated the link between Internet addiction and academic performance among university graduates, discovering that Internet addiction is both adversely and substantially connected to educational outcomes.

[17] investigated the link between Internet addiction and academic performance among Malaysian international undergraduate students. Their findings show no discernible difference in educational success based on Internet usage. For decades, academics have been focused on student engagement, a wide word that encompasses physical, intellectual, and emotional reactions [17].

Technology may foster engagement and self-directed learning by providing a compelling source of interactive tools for academic purposes ranging from taking notes, participation in discussion forums, access to supplementary resources, software, and applications, and facilitating student-student and student-faculty interactions [25]. According to research, students who utilize digital technologies for academic reasons are more likely to contribute to and participate in active academic cooperation with other students [17].

Promoting a stronger link between students, instructors, and course material, such a relationship stipulates that as students' involvement with technology grows, so does their engagement with academics [18]. Students can participate in a community of learners due to the technology's limitless possibilities for collaboration, resulting in the increased achievement of learning outcomes, such as critical thinking and individual student development, as they become more engaged with the course content [19]. Past study findings show positive and negative relationships between technology and academic achievement and correlations between technology use and student engagement [18].

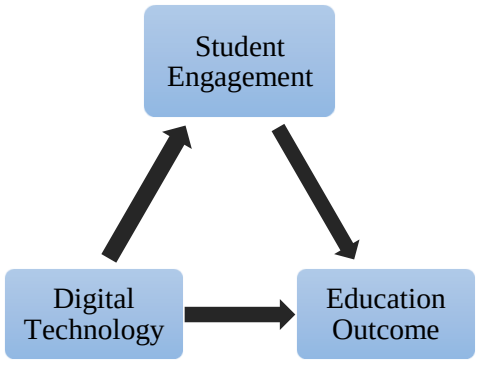

Fig. 1 Research framework

Figure 1 demonstrates the research model's educational outcomes and all determinants of digital technology and student engagement.

3. Research Methodology

The study used research with a descriptive research design using a quantitative method. A sample may be described in a research study as a group on which data is collected, while the population refers to the larger group to which the result is supposed to be applied [19]. [21] also argued that a good sample makes it easier for researchers to make a fair decision and helps them generalize the population they are researching. Hence, the sample size of this study is 384 students and staff. The sample was then increased to 600 to avoid response bias [22]. Consequently, the data were obtained via an online questionnaire from 20th April 2021 to 18th September 2021. Essentially, the modified questionnaire synthesized different previous study methods on this

phenomenon. To provide a clear understanding of the phenomenon and constructions of this research study, the study was developed based on previous relevant studies. Educational Outcomes (EDO) items were adopted and modified from [1, 13]. In addition, the items of Student Engagement (SE) were adopted and modified from Sokoloff [21] and Jansen [8]. Moreover, the items of Digital Technology (DT) were adopted and modified from Kintu [9] and Adnan and Anwar [2]. Variables were measured using a 10 Likert Scale recommended in the other studies [3].

3.1. Data Analysis Technique

Partial Least Structural Equation Modeling (PLS-SEM) was used in this research to analyze the data gathered through the online questionnaire. Before actual data analysis is performed, the researcher behaviors a data mining technique to ensure adequate representation of data. In addition, the collected data were analyzed using SmartPLS 3.0 to check the fitness of the model or structure proposed by the study and test the proposed research hypotheses. To analyze the mediating effect of Student Engagement on Digital technology and educational outcomes, PLS-SEM has been used. For using PLS-SEM, there are several rationales. The purpose of this study is to analyze the causal relationships between constructs that have been previously established. PLS-SEM, however, is the instrument that this study uses to analyze the data collected from the respondents. PLS-SEM is a quantitative tool for testing and evaluating such causal relations in the light of empirical knowledge and subjective causal assumptions. SEM is a mixture of part research and unique degenerations. It is possible to individualize the SEM into two parts. The estimation model is the aspect that relates measured factors to inactive factors. The basic model is the section where there are related static variables. In addition, the reflective-reflective type I model was implemented in this analysis. The lower-order constructs are reflectively calculated constructs that can be separated but are associated. The 'organizational common factor model' by [16] is called this sort of model, where the higher-order structure represents the common factor of several different factors. Therefore, if the purpose of the analysis is to find the common factor of several connected but distinct reflective constructs, this type of organizational latent variable model is most suitable.

4. Results

Six hundred questionnaires were distributed, but only 378 responses were received, indicating a 63 percent overall response rate. The results presented were based on the research objectives, including the structural equation model's findings. Missing data arise if the respondents have not replied to one or more items in the survey. This study performed frequency and missing value analysis for each measurement object to ensure that the data was free of missing values. The screening results showed a minimum amount of missing data, which was substituted using the median variable responses for each measurement item. For observations of a single variable, outliers display an exceptional value. For unit-variate disclosure, each variable was checked for a standardized (z) value in addition to the analysis of histograms and box plots. They achieved an outlier case with [18] if its standard score is ± 4.0 or higher. Therefore any Z-score greater than four or less than-4 is considered an outlier.

4.1. Measurements Model

The reliability was evaluated using the internal consistency process by testing the composite reliability values. All variables have shown reliability for composites (values greater than 0.7) [18]. As shown in Table 1. If it is found that the reliability of the indicators (squaring of external loadings) is less than 0.7, but composite reliability and AVE are appropriate for measurement, then the indicators have been maintained as clarification indicates [7]. Convergent validity was assessed by calculating AVE values that would surpass '0.5' (Table 1), while discriminant validity was evaluated by the Fornell-Larcker test (Table 2). The criterion of discriminant validity is that the square root of AVE should be greater than the correlation between latent variables for each latent variable. As shown in Table 3, the variables follow the criteria for discriminant validity.

Table 1 Loading and internal consistency reliability of the measurement model

Variables	Loading	CA	CR	AVE
Educational Outcomes		**0.923**	**0.936**	**0.621**
EDO1	0.738			
EDO2	0.781			
EDO3	0.831			
EDO4	0.828			
EDO5	0.838			
EDO6	0.798			
EDO7	0.71			
EDO8	0.768			
EDO9	0.791			
Digital Technology		**0.911**	**0.930**	**0.656**
DT1	0..654			
DT2	0.835			
DT3	0.84			
DT4	0.861			
DT5	0.848			
DT6	0.735			
DT7	0.791			
Knowledge Application		**0.920**	**0.937**	**0.714**
SE1	0.837			
SE2	0.866			
SE3	0.827			
SE4	0.886			
SE5	0.862			
SE6	0.79			

Table 2 Fornell-Larcker criterion analysis to check discriminant validity

	Digital Technology	Educational Outcomes	Student Engagement
Digital Technology	0.810		
Educational Outcomes	0.731	0.788	
StudEDO9ent Engagement	0.793	0.763	0.845

4.2. Common Method Bias

In this study, to assess the impact of CMB, both Harman's single factor and common latent factor (CLF) analysis were used [8]. Harman's single factor test results showed no CMV issue because the first variable explained about 44.456 percent of the variance, below the 50 percent threshold.

Table 3 The assessment for CMV in dataset – Harman's one factor solution

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.337	44.456	44.456	13.337	44.456	44.456
2	4.093	13.643	58.099	4.093	13.643	58.099
3	1.863	6.209	64.309	1.863	6.209	64.309

4.3. The Results of the Structural Model Analysis

PLS is a non-parametric analysis and does not require the normality of data. Consequently, the chances are that the t-values will be inflated or deflated, leading to type one error. Thus, bootstrapping procedure is suggested by Wong [10]. In bootstrapping procedure, many subsamples (e.g., 5,000) are taken from the original sample with replacement to determine standard bootstrap errors, giving approximate t-values for the significance testing of the structural path [10]. Smart PLS Structural Equation Modeling's first step is to define a theory-based research framework or model-based schematic diagram. In addition, the analysis method is converted into SmartPLS 3.2.9 graphics.

Figure 2 shows the diagram, which begins with Digital Technologies, Student Engagement, and Educational Outcomes.

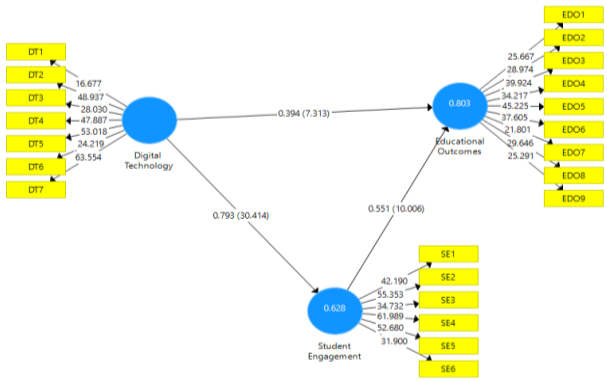

Fig. 2 SmartPLS standardized result

Furthermore, Figure 2 above explains the standardized estimate for the structural model of this report, showing the factor loading for each item and the mediating influence of Students Engagement on Digital Technologies and Educational Outcomes in Distance Education.

Table 4 Summary of path coefficients

	Beta	STDEV	T-Statistics	P-Values
Digital Technology -> Educational Outcomes	0.394	0.053	7.442	0.000
Digital Technology -> Student Engagement	0.793	0.026	30.232	0.000
Student Engagement -> Educational Outcomes	0.551	0.054	10.151	0.000
Mediation Effect				
Digital Technology -> Student Engagement -> Educational Outcomes	0.437	0.040	10.815	0.000

4.4. Assessment of Structural Model

The R2 value shows how the independent variables explain the variance-independent variables. The R2 estimates are shown in the model in Table 5. The degree of variance on the dependent variable, expressed by the independent variables, was shown. However, table 5 reports that digital technology and student engagement explain 80.3 percent of its variance. In other words, roughly 19.7 percent of the difference in educational outcomes itself is the error variance of educational outcomes.

Additionally, Table 5 estimated that the predictors of student engagement are 62.3% of its variance. In other words, the error variance of student engagement is approximately 37.20% of the variance of Job Satisfaction itself.

Moreover, f2 of all the exogenous latent constructs is considered a substantial side effect. Similarly, the present study's predictive relevance Q2 of all the exogenous latent constructs is small. According to [12], as a relative measure of predictive relevance, the values of 0.02, 0.15, and 0.35 indicated that an exogenous construct has a small, medium, or large predictive relevance for a certain endogenous construct.

Table 6 Saturated model results

	R2	R2 Adjusted	f^2	Q^2
Educational Outcomes	0.803	0.802	0.04	0.140
Students Engagement	0.628	0.627		

4.5. Goodness of Fit Index (GoF)

The Goodness of Fit Index (GoF) test was used to verify the combined output of the external model and the internal model obtained by these calculations. The results of the GoF calculation show that the 0.706 value shows that the overall combined output is good since the Goodness of Fit Index (GoF) value is greater than 0.36.

$$GoF = \sqrt{AVE \times R^2} = \sqrt{0.621 \times 0.803} = \sqrt{0.499} = 0.706$$

5. Discussion

This study examined the mediating effect of student engagement on digital technology and educational outcomes in distance education. The summarized results of the study's SmartPLS Structural Equation Model (SmartPLS SEM) are presented in Table 4 above. It shows that with the result of the respective construct of this analysis, the path coefficients, Standard Deviation (STDEV), and the probability value (P-value). Moreover, a significant positive relationship was discovered between digital technology and educational outcomes in distance education. The findings showed that a 1 percent rise in digital technology would lead to a 0.394 increase in educational outcomes in distance education. The pattern of findings is partially in line with the results of some studies demonstrating a positive relationship between the usage of digital technology and educational outcomes [5, 11].

In addition, the results revealed a significant positive effect of digital technology on student engagement. The results indicated that a 1 percent increase in digital technology would lead to a 0.793 increase in student engagement in distance education. These findings align with the studies demonstrating the positive relationship between digital technology and student engagement [24]. Furthermore, student engagement and educational outcomes revealed a significant positive relationship. The findings showed that a 1 percent rise in student engagement would lead to a 0.551 increase in educational outcomes in distance education.

Moreover, to test the mediating relationship, this study follows the guidelines suggested by [12]. Bootstrapping method and indirect effect were observed to see the mediating relationship. Furthermore, [7] indicates that the indirect effect, 95% boot confidence interval (CI: LL- UL), does not straddle a "0" between variables. Table 8 shows the results of mediating hypothesis. Table 4 revealed the bootstrap results indicated that the indirect effect (Digital Technology -> Student Engagement -> Educational Outcomes, β = 0.437, t-value of 10.815) was significant at $p< 0.01$. The researcher also confirmed a mediation given that the indirect effect 0.309, 95% Boot CI: (LL= 0.209, UL= 0.392) does not straddle a 0 in between, which indicated support for mediating effect. It can be concluded from the sequences of the results that if empirical investigation models of digital technology use are successfully conveyed in educational contexts and integrated into instructional approaches, it may not only enhance student engagement and educational outcomes but also mitigate negative outcomes, as research has shown that 'technology implementations are acceptable.

6. Conclusion and Limitation of the Study

Does technology increase educational outcomes and student engagement in distance education? This is a critical question for every higher educational institution throughout the world. The current study adds to the existing literature by investigating the mediating influence of student involvement on digital technology and educational results in distance education using a path model. Furthermore, the link between a set of essential academic behaviors to today's academic contexts is digital technology, student engagement, and educational outcomes. The findings are presented in light of hypotheses based on literature, and it is suggested that new models be widely tested to investigate the pathways of digital technology in order to understand better how it can be used as an appropriate educational and academic tool to improve educational outcomes while also increasing student engagement.

The conclusions of this study will add to the literature more informative knowledge leading to increased awareness of digital technology in distance education. Furthermore, this study bridged the gap created by some of the reviewed studies by examining the mediating effect of student engagement on the effect of digital technology on educational outcomes. Again, the Partial Least Square Structural Equation Model (PLS-SEM) greatly improves the literature. The conclusion of this study will apply to a broad range of distance education.

Highlighting the limitations of the study is critical for determining future research priorities. First and foremost, the current analysis examined the digital technology framework. Incorporating student engagement as a mediating influence, on the other hand, might lead to some fascinating outcomes. Second, because the study was limited to students/learners, expanding educators' perspectives on digital technology adoption in developing countries would be a major task. As an essentially fundamental component of the learning process, educators must assess technology adaptability, applicability, and convenience. Third, the study was limited to a particular site; future research should broaden the scope of inquiry to include other academic institutions.

Although the results provided an interesting view on the mediating influence of student engagement on digital technology and educational outcomes in distance education and suggested several avenues for future study, they have certain limitations. To begin with, faculty and organizational factors are critical to student engagement; "students require obstacles, guidance, and assessment in their effort to become conscience students, and hence require constant attention from faculty." Future research, including the faculty role and organizational factors concerning the use of technology in education, would undoubtedly contribute to the model's knowledge and provide new insights. It would also be fascinating to investigate the models that link certain technologies to student engagement and educational outcomes. The study's methodology is

quantitative. Thus, it simply showed associations; experimental designs, particularly pre- and post-experimental designs, should be examined to investigate the mediating effect. Finally, the inherent limitations of self-reports apply to this study; future studies may explore employing a multimethod approach to alleviate self-inadequacies. Furthermore, a blended approach would provide a better and more comprehensive knowledge of the subtleties of interlinkages.

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