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The Perceptions of Students and Teachers When using ICTs for Educational Practices Matter: *A Systematic Review*

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ABSTRACT

Before succumbing to the 2019 Coronavirus pandemic, information and communication technologies (ICTs) have sustained a ubiquitous presence in human lives and society. ICTs have changed the standards and dynamics of educational practices (EPs). Many academic institutions had already integrated technological-based pedagogical instructions into their educational practices but, in various cases, faced challenges of failing to consider the perceptions of chief users, students, teachers, and subjective norms. This paper is an extension of work originally presented at the 2022 11th International Conference on Education and Information Technology (ICEIT). This paper aims to demonstrate and provide future directions regarding the effects of ICTs and how such usage proliferates and disharmonizes learning and teaching experiences and academic achievement. The expanded version of the technology acceptance model (TAM2) is the theoretical foundation for this research. TAM2 provides insight into how the perceptions of students and teachers matter when adopting and using ICTs in educational practices. Depending on these perceptions of perceived ease of use and usefulness, using ICTs in educational practices can impact intentional and behavioral use, currently and futuristically. Subjective norms also influence individuals' perceptions and willingness to use ICTs for educational practices. Limitations, strengths, and future recommendations and directions are discussed.

1. Introduction

This paper is an extension of work originally presented at the 2022 11th International Conference on Education and Information Technology (ICEIT) [1]. The purpose of this paper is to demonstrate the effects of ICTs and how such usage proliferates and disharmonizes learning and teaching experiences and academic achievement. There is a need for this study, especially as research [1] suggested social networking sites (SNSs) have stated a claim in educational practices while losing the battle to the 2019 coronavirus pandemic and onward situations. It was suggested that future researchers take a student-center approach and to study teachers' and students' perceptions regarding the use of ICTs for education-based involvements [1].

Although the 2019 coronavirus and its variants are still omnipresent, onward situations remain inevitable. Outside of SNSs, information and communication technologies (ICTs) hold great promise in educational practices (EPs) [2], [3]. Education remains to be a significant factor in human connections and relationships and has become instrumental in increasing access to various opportunities [4]. It is at the heart of what, how, where, and when individuals learn and teach [5]. ICTs play a leading role in academic achievement and future endeavors, especially as it has become a considerable agent for changes in EP [5]. However, when deciding to place ICTs in educational institutions, many decision-makers and policymakers failed to consider students' and teachers' perceptions. This paper suggests that while ICTs for EPs are both beneficial and detrimental, these outcomes are influenced by students' and teachers' perceptions of acceptance and adoption, which affects their attitudes toward technology and intentional and behavioral use.

As the primary stakeholders in education, students', and teachers' perceptions of ICTs for EPs matter. Other factors that matter when using ICTs for EPs are subjects, types of digital apparatuses, the persons using the devices, and geographical locations [2], [6]. Material access, digital skills, technology literacy, and equality also matter [7], [8]. Many academic institutions have already embraced and implemented technology in their institutions. Much of this resulted from the inexplicable

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onset of the covid pandemic, forcing schools to use technology, thus accelerating the adoption and usage levels of ICTs for EPs. This implementation has resulted in a mega shift and has become revolutionary for improving the qualities and efficiencies of EPs [9].

In the 21st century, technology pedagogy and content knowledge (TPACK) is a requirement that teachers must encompass when engaging in new learning environments [10]. This requirement assists teachers restructure educational practices, thus minimizing the today versus the future learning and teaching gaps that currently exist [11]. The Organisation for Economic Co-Operation and Development (OECD) suggested that students and teachers could benefit from using innovative ICTs [3], primarily as teachers are critical assets to the qualities of EPs [12]. However, these benefits will result from how well the frontliners are trained and prepared to use the technologies provided, especially as ICTs have become the lifeline for EPs [2] and will continue to be post-pandemic and while facing onward situations. The benefits will also result from how accessible and easy ICTs are to use and navigate and their usefulness to students' and teachers' educational experiences and academic outcomes.

Governmental entities play a significant role in ensuring quality education [13]. Yet, digital and educational gaps between communities exist, which influence students' and teachers' intentional use of ICTs for EPs [14], [15]. It is essential to provide equal access to physical materials and resources to students and teachers regardless of their geographical location. It is equally crucial to equip classrooms with quality ICTs, maintain the facilities, keep the systems up to date, provide technical support, and train teachers and students to use them effectively and efficiently [9], [14], and [16]. For students and teachers to fully participate in EPs, they must be granted access to quality equipment and broadband connections [11], particularly as ICTs for EPs have become mandatory, not necessarily voluntary. They must not be subjected to digital divides or geographical disparities where they lack access to the necessary materials and resources to successfully engage in educational practices [8], [14], and [17], and [18]. The quality of training in ICTs for EPs is significant and can substantially affect learning and teaching experiences [3], [11], and [14]. Technology training can help students and teachers overcome their reluctance to learn and use ICTs for EPs [10]. Furthermore, it will enable them to perceive ICTs for EPs as easy to use and useful [10], resulting in intentional and behavioral use and positive attitudes.

Significant findings in some studies [10], [19] suggested that teachers' acceptance and self-efficacy were associated with behavioral and intentional use of technology. Teachers are a significant asset in the educational field [11]. So, when teachers feel they lack proper training, feel unprepared, and are forced to use ICTs in EPs, it reduces teaching quality [3], [14]. It also diminishes the chances of accepting, adopting, intentional use, and contributing to negative attitudes toward ICTs for EPs. Studies [6], [9] showed evidence that ICTs could improve students' academic achievement, particularly in science, but not necessarily for practicing skills, math, and reading. Students reportedly had higher academic achievement when teachers used ICTs for EPs than teachers who did not [2]. For the types of ICTs, the system functionality should meet the standards to increase acceptance and adoption [13], which means being easy to use and navigate, which leads to usefulness and intentional use. Digital content should be attractive and interactive, encompassing audio, video, and animated simulations related to the learning content [6], [13]. Several scholars demonstrated positive effects of using visual content in learning environments [5], [20], and [21]. These visual and auditory aids were said to capture learners' attention, make learning more engaging and cooperative, and improve academic experiences [20], especially in the attempt to boost language proficiency [5], [21]. Additionally, response time should be fast and consistent in ways that cultivate users' interest [13], whereas working from slow and outdated systems can result in lower use and nonuse.

ICTs have shifted societal and life dynamics, where the influences are felt in schools [11], [22]. Now more than ever, ICTs have gained a leading role in EPs for knowledge acquisition and academic achievement [1], [14], and [16]. It has reshaped education into more flexible and efficient learning in developing nations, providing optimal learning, and teaching experiences [13], [16], and [22]. In OECD countries, the use of ICTs for EPs has increased significantly and has become an amalgamation into traditional education to provide cost-effective education [6], [13]. There are positive and negative associations of using ICTs in OECD countries to look up ideas and information [9]. However, the usage of ICTs in EPs in non-OECD countries remains marginal, as the effects may be less pronounced due to low levels of effective teaching [9].

There continues to be controversy and mixed views about how beneficial ICTs are in EPs and how it influences students' performance and academic success [4], [6]. It remains questionable whether introducing ICTs in EPs guarantees the acceptance and continued use or whether the material being taught, and the digital infrastructures are ample enough to implement in academic institutions [13]. In a study, [6] illustrated the differences of opinions in studies investigating the use of ICTs for EPs. Something researchers term the *null* effect [9]. Some advantages were related to improving students' academic outcomes by placing a wealth of information at their fingertips and more comprehensive resources [9].

Positive associations have been linked to using ICTs to look up information and explore new ideas that are otherwise unavailable in traditional settings [9]. They provide students and teachers with flexibility and autonomy, thus improving their attitudes and experiences toward usage [6]. Using ICTs in EPs can foster digital competencies required to reap the benefits that innovative technologies ICTs offer [3]. ICTs in EPs can optimize learning and teaching experiences and increase well-being [16], [23].

Furthermore, using ICTs for EPs could increase social presence, collaboration, and cooperation and promote active, diverse, and inclusive learning environments [1], [24]. Multiple studies [6], [11], and [25] argued that using ICTs can allow teachers to augment their teaching materials by making them more attractive and engaging, thus improving academic outcomes. Information and communication technologies can support teachers in assessing students' progress and levels of engagement at a group and individual level, monitor their

behaviors, and provide instant feedback or get assistance from teachers and other students [1], [16], and [25]. It also provides the means to form quality student- teacher dyads, increase communication, cooperation, and collaborative efforts, and boost social enrichment and academic and personal well-being [1], [11], [16], and [23]. When ICT activities fail to improve students learning experiences, it takes away from other activities that could potentially harvest students' academic outcomes [9]. It also removes their willingness to engage and accept ICTs for EPs.

While ICTs are instrumental in EPs, research has suggested that ICT use cannot determine whether students have learned what was taught, as good grades do not predict academic success [26]. In contrast, research suggested that ICT use can influence students' academic achievement, where specific environmental and family dynamics and using ICTs passively and recreationally resulted in low grades and markings [27]. ICTs in EPs can distract students from learning [1], [6], [16], and [17]. Placing an abundance of information at students' fingertips can result in cognitive and information overloads and technoference, thus negatively affecting their ability to process information [1]. Furthermore, ICTs can result in social disengagement, exclusion, or diminished human interactions [1], [6], and [14]. Studies have suggested that students are less creative when using ICTs for EPs and can be easily targeted for cyberbullying [1], [6], and [16].

A significant barrier associated with using ICTs for EPs is that many school districts and students, mainly those in rural and undeveloped areas, face the triple digital divide of not having physical, skill, and usage accessibility [14], [16], [17], [28], and [29]. Also, they cannot afford the required ICTs or home broadband connectivities to engage in EPs, which contributes to poor academic achievement, reduced social presence, attrition or dropout [14], [16]. More importantly, persons residing in rural communities face geographical disparities of lacking quality broadband and internet connections [14], [17], [23], and [30].

Using ICTs for EPs is also faced with endogeneity problems- unobservable characteristics that can dramatically impact students' and teachers' willingness to accept and intentionally use ICTs for EPs [6]. Many ICT interactions are done in private and unobservable settings. Moreover, individuals use technology to engage in activities other than for EPs. Therefore, it would be difficult to determine how often students and teachers intentionally engage in ICTs for EPs. It may also be nuanced to suggest that technology acceptance results from using it for EPs, whereas technologies offer many activities that could facilitate acceptance and intentional and behavioral use.

This study extends work originally presented at the 2022 11th International Conference on Education and Information Technology (ICEIT), where a study [1] suggested that social networking sites (SNSs) have stated a claim in educational practices while losing the battle to the 2019 Coronavirus pandemic and onward situations. This study examines the use of ICTs for EPs. The technology acceptance model (TAM2) is used to ground this research [31]. Adopting elements from this model will show how students' and teachers' perceptions matter when decisions are made to implement and use ICTs for EPs. Many of these perceptions result from perceived ease of use, usefulness, attitudes toward technology, and social influences, which may lead to intentional and behavioral use. Although technology holds a dominating presence in human lives and society, and many students already use ICTs for reasons other than for academic achievement, using ICTs for EPs may not directly affect their intentional use. Limitations and future recommendations are discussed.

2. Theoretical Foundation

2.1. Technology Acceptance Model - 2

The technology acceptance model- TAM2 created in 2000 is an expansion of the 1989 technology acceptance model (TAM) and is used to guide this paper. Figure 1 displays the TAM2 model. It expands the model by incorporating the perceptions of students and teachers, information and communication technologies (ICTs), and educational practices (EPs) related to perceived ease of use (PEOU), perceived usefulness (PU), intentional use (IU) or behavioral use (BU), and social influences (SI). Since ICTs dominate most human lives and society and now play a significant role in communication methods, socialization, knowledge acquisition, and academic success, students' and teachers' perceptions matter when deciding to use ICTs for EPs. Additionally, the information provided below defines the concepts of TAM2 and its external variables and demonstrates their association with ICTs and EPs.

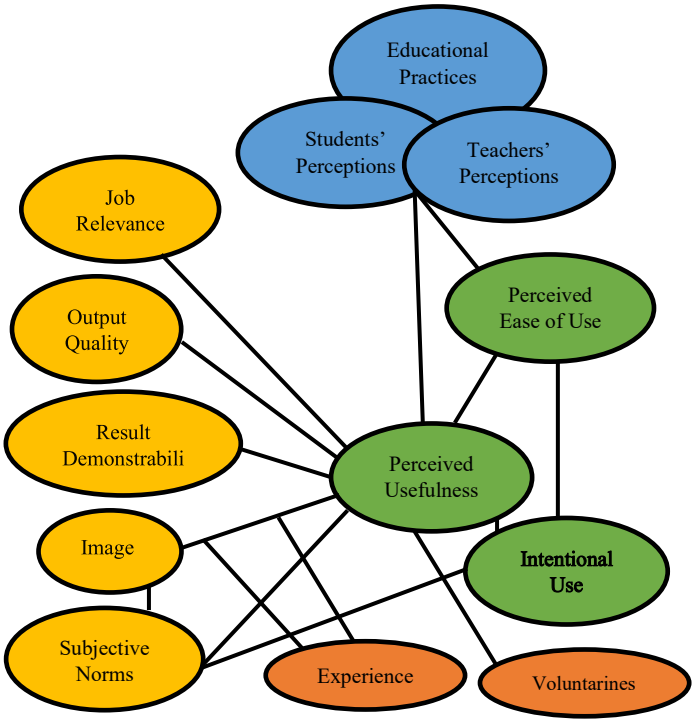

Figure 1: Technology Acceptance Model-2 and teachers' and students' perceptions of information and communication technologies for educational practices.

TAM stemmed from the theory of reasoned action (TRA) and the Theory of Planned Behavior (TPB) [32]. The TRA comprised three pillars, attitudes, subjective norms, and behavioral intentions, and focuses on two groups of variables: subjective norms and attitudes [33], [34]. TRA was designed to explain human behavior. It is also based on the premise that intention is

the primary determinant of an individual's actions and behavior [35]. As such, behavior is a direct function of intention [35].

As an extension of TRA, the central factors of TPB are individuals' intention to perform a given behavior [36]. These intentions are assumed to capture motivational factors that influence behavior, how hard a person is willing to try, and their effort in performing the behavior. The stronger the intention to engage in a specific behavior, the more likely it will be performed [35]. TPB comprises attitude toward the behavior, subjective norms, and perceived behavioral control (actual behavior) [32], [36].

The TAM model explains the behavior, attitudes, and intentions to use and adopt technology [37], [38], [39], and [40]. Constructs of TAM encompass various components, such as perceived ease of use (PEOU), perceived usefulness (PU), attitudes toward use (ATU), behavioral intentions to use (BIU), and actual use (AU) [39], [40]. PEOU is hypothesized to strongly influence PU, which directly impacts the ATU of various technologies [38], [41]. However, PEOU indirectly affects ATU [38]. Subsequently, BIU is influenced by AU [41]. Additionally, intentionality predicts users' willingness to adopt and use ICTs [39], [42]. These intentions are also influenced by an individual's attitudes [42]. The TAM model has been proven to be robust, the most influential, and has been widely applied to various regions examining technology acceptance and usage [13], [31], and [42]. Similarly, it is the most popular theory applied to research investigating students' behaviors and using and accepting ICTs for EPs [43], [44]. When individuals perceive ICTs as easy to use, useful, and beneficial, it increases their willingness to adopt, adapt, and accept technology [1]. More importantly, they develop positive attitudes toward technologies, resulting in continued and intentional use [39].

Due to the significant progress made over the past few decades in explaining and predicting users' acceptance and adoption of ICTs, the TAM model was expanded, constructing TAM2 [31]. The expansion aimed to determine how intentional use changes when individuals gain experience using ICTs [31]. While TAM rejected subjective norms due to their insignificant impact on usage, the TAM2 model incorporates these social aspects [40]. TAM2 theoretical constructs spanned from social influences (i.e., subjective norms, voluntariness, and image) and cognitive instrumental processes (i.e., job relevance and output quality) [31], [45]. The extension identifies and theorizes the social and cognitive influences that expand and determine usage perceptions [31], [45]. Job relevance, output quality, result demonstrability, and perceived ease of use capture to influences of cognitive instrument processes on perceived usefulness [45]. Social and cognitive influences are the most influential aspects that may result in students' and teachers' willingness to adopt ICTs for EPs. For example, when examining social influences or forces, many students are teachers face geographical disparities resulting from a lack of accessibility to physical materials and resources. Geographical disparities are also a result of poor broadband connectivity and internet access or no connections at all. Demographic disparities result from residing in rural rather than urban communities [14], [23]. Another contributing factor is financial stability, determining whether students, teachers, or other educational stakeholders can afford the essential ICTs needed to increase academic experiences and performances.

TAM2 also measures adoption behavior [31], [38], and [39]. Reputable researchers [35] suggested that behavior is a function of intentions. However, intentional behaviors are attributes of attitudes and beliefs [41]. Frequently, behaviors and attitudes are not factored into adopting and accepting ICTs for EPs. Moreover, this framework focuses on three interrelated social forces which impact an individual's decision to adopt, reject, or intentionally use innovative systems [31]. When students and teachers lack access to vital resources, digital skills, or the wherewithal to acquire quality equipment and internet connections, these social normalcies make the decisions for them.

2.2. TAM2 Concepts Defined

TAM has been used in various studies examining individuals' technology acceptance and usage.

- ***Perceived Ease of Use***. Perceived ease of use (PEOU) is a cognitive instrumental process that determines perceived usefulness and refers to the degree to which individuals believe that using new and innovative ICTs is free of effort or effortless [31], [39], [41], and [46]. It is also defined by the degree to which usage lacks mental and physical effort [38]. Job and academic performances increase when little effort is put into using ICTs. [31]. PEOU is defined as the degree to which students believe using ICTs for EP is effortless and will simplify the learning process [5]. Therefore, PEOU is associated with students and teachers perceiving ICTs for EPs as easy to use, navigate, effortless, and user- friendly. When technologies are not user-friendly and users lack the necessary training, support, and technical knowledge, they are less inclined to adapt and accept ICTs for EPs [47]. Perceived knowledge about technology integration of ICTs for EPs directly influenced PEOU [48]. PEOU directly affects PU for both teachers and students [48]. Furthermore, when individuals find technology easy to use, they may find it useful, resulting in intentional usage and positive attitudes towards technology.
- ***Perceived Usefulness.*** Perceived usefulness (PU) is based on individuals believing that ICTs will improve their job performance [39], [41]. PU is the degree to which students and teachers perceive that using ICTs for EPs will enhance their performance in various ways [5]. Researchers [39], [48] posited that PEOU influences PU. That means using ICTs will assist individuals in performing or completing a task they set out to do. Several studies proved that PU strongly predicts intentional use [5], [20], and [38]. Therefore, the perceived usefulness of ICTs for educational practices is associated with students and teachers finding ICTs to be valuable tools that will assist them in effectively and efficiently completing specific educational tasks, inside and outside the academic settings. Even when students and teachers find ICTs for EPs useful, this does not necessarily contribute to their intentional use.
- ***Intentional Use.*** PEOU and PU are strong determinants of intentional use [31], [39]. However, intentional use can change over time with experience [31]. Attitudes toward

technology influence intended use [5], [48]. Several studies have demonstrated a positive effect that PEOU and PU can have on usage intentions [15]. Furthermore, researchers have suggested that system quality and trust in systems and institutions are critical factors affecting acceptance and adoption and users' satisfaction and intentional use [47], [49]. The program or content and the learning and teaching tools also influence the intention to use ICTs in EPs [5]. Therefore, it is essential to understand better which strategies influence the acceptance and adoption of ICTs for EPs [47]. Scholars have suggested fundamental ways to effectively implement innovative ICTs into EPs to improve learning and teaching experiences [11].

- ***Behavioral Use.*** The actual use of ICTs is a behavior [49]. Behavioral or actual use of ICTs for EPs is significantly associated with technology acceptance [5]. Intentional use of ICTs is influenced by an individual's attitude toward technology [49], [50]. Attitudes toward technologies are related to behavioral use [41]. The quality of services, satisfaction, trust in systems, and knowledge sharing were significant predictors of usage behaviors of ICTs for EPs [47]. When individuals set out to act, they do so without limitations or coercion [41]. This means peers or other social norms do not influence behavioral use. Therefore, it can be suggested that when teachers and students perceive ICTs for EPs to be easy to use and useful, they develop positive attitudes toward technologies, ultimately leading to intentional and behavioral use.

2.3. External Variables of TAM2 Defined

- ***Image.*** Image is a social process that refers to an individual's perception that using and accepting innovators will enhance their social status [31]. TAM2 is a supposition to subjective norms in that image is enhanced when individuals of a prominent group believe they can perform specific behaviors and that performing those behaviors will strengthen their standing and status within that group [31]. Therefore, image is students' and teachers' perceptions that innovative technologies will enhance their learning and teaching experiences or academic stance or status. Additionally, the image component can be seen as a significant contributor to increasing knowledge acquisition and academic achievement (students) and job performance (teachers), which others will recognize in ways that would increase their academic and professional status.

- ***Job Relevance.*** Job relevance is a cognitive instrumental process that determines perceived usefulness and refers to individuals' perceptions that ICTs are suitable for their job [31], [46]. The job relevance variable of TAM2 is a function of importance within one's job and using ICTs will support a person in completing specific tasks [31]. ICTs are advantageous when they enhance performance and assist in achieving functions [39]. Therefore, when ICTs can perform certain functions within the scope of educational practices, whereby enhancing academic experiences, the systems are categorized as being relevant to the job. Moreover, job relevance will ultimately lead to positive attitudes toward technology and continued usage.

- ***Output Quality.*** Just like most things, output quality is a result of input quality. Like job relevance, output quality is a cognitive instrumental process that predicts perceived usefulness. It refers to individuals perceiving ICTs as good enough to perform specific functions; however, it is also based on whether the tasks performed by ICTs fit the desired goal [31], [46]. ICT users are the ones that consider how well systems perform, thus determining their output quality [31]. An information system (IS) model suggests system and information qualities impact user satisfaction [49]. Therefore, system and information quality may result from output quality. When students and teachers find that the output of ICTs for EPs is of quality, it may increase their likeliness to develop positive attitudes, wherein increasing intentional and behavioral use. While output quality is significantly related to input quality and the quality of the machines and software, it may also depend on the quality of internet and broadband connections. How teachers and students interact with ICTs for EPs can also establish output quality.

- ***Result Demonstrability.*** Result demonstrability (RD) is a cognitive instrumental process that determines perceived usefulness and is based on physical results and being able to attribute ICT use to increase performance [31], [46]. RD tangible results are positively associated with perceived usefulness [31]. Moreover, individuals will develop positive perceptions about how useful ICTs are when outcomes are of quality and noticeable [31]. Therefore, when ICTs are used in EPs, and the physical results can be attributed to increased performance academically, this demonstrates RD. Furthermore, all elements that have led to intentional and behavioral use may result in RD.

- ***Subjective Norms.*** Subjective norms (SNs) are social processes that refer to individuals perceiving social influences or social forces as the reason for performing a behavior or not [31], [36]. External variables and others influence many individuals' behaviors and actions. Internalization is based on individuals taking on the perceptions of others they see as crucial in their lives [46]. Furthermore, SNs are when inferior persons believe superior others approve or disapprove of specific behaviors. These beliefs of the inferior persons will result in them internalizing the perceptions of the majority figure in which they base their decisions on whether to engage in certain behaviors or believe that ICTs are useful [31], [36]. TAM2 reflects three interconnected social strengths that play a critical role in individuals' willingness to adopt or reject innovative ICTs when given the opportunity [31]. These social dynamics are subjective norms, voluntariness, and image [31]. Because subjective norms focus on social experiences and influences, these social dynamisms can relate to facilitating conditions, environmental factors, affordability, and accessibility. The usefulness of ICTs can be based on the perceptions of others and internalized processes [31], [36]. However, when individuals set out to perform specific behaviors, they do so

without limitations or coercion, as peers or other subjective norms do not influence their behaviors [41].

- ***Voluntariness.*** According to the TAM2 model, voluntariness is associated with subjective norms and intention to use. Voluntariness is a social process that refers to how technology adopters and adapters perceive their decisions to adopt new and innovative technologies as voluntary and not mandatory; freedom to choose [31], [46], and [51]. Moreover, it represents an individual's state to act or behave in a specific manner [51]. The use of ICTs voluntariness is significantly associated with TAM elements that lead to intentional and behavioral use [46]. Therefore, when using ICTs for educational practices, the voluntariness aspect refers to how teachers and students use digital devices of their own volition; usage is not mandatory or forced, and users do not take on the perceptions of essential others or social influences. Individuals who take the initiative to learn new and innovative technologies increase their experience and confidence levels in navigating the various functions [46] related to job relevance and evaluating the output quality.

There are two primary factors associated with actual or intentional use [51]. These factors are ease of use (technological contacts) when using ICTs in mandatory environments (low voluntariness) and 2) organization facilitating conditions (implementation context) and voluntary environment (high voluntariness) [51]. Demonstrating such relationships, when teachers and students find ICTs easy to use and usage or adoption is mandatory, it contributes to low voluntariness, which indicates that they were forced to use ICTs and were not provided with a choice [51]. Some students and teachers are exposed to specific organizational and facilitating conditions where ICTs are readily implemented. However, when using ICTs is mandatory, they are free to use or not use ICTs for educational practices, thus demonstrating high voluntariness in ICT use [51]. In sum, facilitating conditions predicted voluntariness and the actual use of ICTs in EPs [51].

3. Methodology and Study's Focus

This paper is an extension of work originally presented at the 2022 11th International Conference on Education and Information Technology (ICEIT) [1].

A researcher [1] suggested that social networking sites (SNSs) have stated a claim in educational practices while losing the battle to the 2019 coronavirus pandemic and onward situations. This study focuses on previous literature on accepting and adopting information and communication technologies (ICTs) in educational practices (EPs). ICTs have stated a claim in EPs and become a facilitating factor in academic engagements and success. However, when making decisions to implement ICTs in educational institutions, decision-makers and policymakers fail to consider the perceptions of students and teachers. This research seeks to understand the perceptions of students and teachers regarding the usefulness of ICTs for EPs as they relate to social influences and intentional use. The questions addressed in this research are:

1. What factors influence a student's perception of using ICTs in EPs that results in intentional use?
2. What factors influence a teacher's perception of using ICTs in EPs that results in intentional use?

4. Students' Perceptions of ICTs for EPs

Several dynamics influence students' perceptions of ICTs for EPs. Students are more likely to continually and intentionally use educational-based infrastructures through individual acceptance and personal willingness to using ICTs in EPs [5], [16], and [52]. In an article, a scholar [1] suggested various intricacies of using technology for learning. Some intrinsic factors include beliefs and attitudes toward ICTs [31], [39] cognitive abilities, learning styles [21], ICT literacy and competence [5], [52], and [53], academic intellect, motivation [5], [54], and gender [54], [55]. Moreover, previous experience, learning content and subject, and grade level [54] also contributed to students' perceptions of using ICTs in EPs.

While internal and self-motivating factors influence students' perceptions of using ICTs in EPs, students' willingness to use ICT and EPs depend on their learning styles [21]. More importantly, external, and contextual factors also shape their perceptions. These underlying forces are associated with social and peer influences, access to quality equipment, internet connections, training, academic settings, and learning environments [5], [23], and [52]. Many students feel they could use ICTs for EPs, especially as technology has become a significant part of their lives [54]. Children who started using technologies at younger ages demonstrated higher competence with using ICTs for EPs than those who began using technology later [56], resulting in positive perceptions of using ICTs in EPs and suggesting that ICT competency matters. Contrastingly, students from low socioeconomic and poor households who did not have previous exposure to ICTs performed at lower academic rates than students with prior ICT exposure and experiences [20]. However, this is not to suggest that students with later or no exposure to various technologies will develop negative perceptions about using ICTs, but that more experienced users were less confident in using ICTs for EPs than students with less experience [54]. Relatively, those students in lower grade levels were more satisfied with using ICTs in EPs than those in higher grade levels [54].

When considering gender differences, researchers [54], [55] revealed that male students were more confident in using ICTs in EPs than females. This finding could be based on some students' having equitable access and independently making decisions regarding the use of technology. Nonetheless, females may be less inclined to use technology because they perceive ICT usage as a male-centric activity [54].

Geographically, students in Portugal and Ukraine favored using ICTs for EPs compared to United Arab Emirate (UAE) students [57]. Students in all three countries, Portugal, Ukraine, and UAE, reported favorable perceptions and attitudes toward using ICTs in EPs [57]. This is because it allowed them to manage their time, work independently, and at their own pace and from their desired learning environments [57]. While some students in the United States found that educational-based technologies were too restrictive, their perceptions were based on teachers' knowledge, skills, and abilities (KSAs) to use ICTs for course instructions effectively and efficiently. American students' perceptions also resulted in whether teachers could assist in resolving technical issues [58].

Additionally, the learning environments, whether teachers cared about students' academic success, and whether students experienced a disconnect or disassociation between in-class and out-of-the-classroom settings also influenced their perceptions of how beneficial ICTs were for engaging in EPs [58]. In the United States and France, the quality, satisfaction, and loyalty of services provided to students through e-learning played a significant role in students constructing their perceptions of using ICTs in EPs [59], [60]. The quality of educational technologies that can assist with optimal learning experiences and successful outcomes also influenced students' perceptions of using ICTs in EPs [61].

With innovative technologies holding a ubiquitous presence in human lives and society, it is essential to account for how students use ICTs in everyday life and how such usage differs from educational purposes [53]. This is mainly because some students reported that educational-based technologies and digital infrastructures are too restrictive [58], particularly as they have unlimited access and usage of everyday technologies outside academia. While a few studies [53], [57], and [62] reported that past and previous experiences synchronously and asynchronously impact students' perceptions of using ICTs in EPs, others [52] suggested that this is not the case. Instead, some researchers [52] advocated that past experiences are not predictors of a student's willingness to accept ICTs for EPs simply because students' ICT usages and engagements differ from one context to the next.

Scholars [53] proclaimed that Chinese students' perceptions of using ICTs were based on past experiences, as they spent numerous hours on their devices which increased their comfort levels with using ICTs for EPs. Because of technology's flexibility and convenience, students in India developed positive perceptions of using ICTs in EPs [62]. Indonesian students' perceptions resulted from ICTs providing them with the capability to improve their motivation to learn, level of independence, understanding of the topics being taught, time management skills, self-discipline, and interactions. Information and communication technologies (ICTs) also increased their exposure to vital resources that would have been otherwise inaccessible without technology [52]. Some researchers [62], found that students preferred to use their smartphones, pre-recorded instructions, and take online quizzes [62]. Also, in an analysis based in India and South Korea, researchers [63] found that students' perceptions of using ICTs in EPs were influenced by classroom and social interactions, motivation, course structures and layout, instructors' knowledge, and facilitation [57]. Not long ago, Turkish students' perceptions of using ICTs resulted in their basis and motivation to learn [54].

Studies in several countries demonstrated students' positive perceptions and attitudes toward using ICTs in EPs [52], [53], [54], [57], [62], and [63] and how using ICTs are attractive but can be both beneficial and detrimental [1], [14], [16], and [23]. However, Canadian students demonstrated negative perceptions of ICTs in EPs due to cognitive overload, poor communication and interactions between students and teachers, technical issues, and inability to follow and navigate course structures [64], [65]. Using ICTs in EPs is not always beneficial, whereas some students, experienced and inexperienced, will face challenges and complexities related to cybersecurity, hacks, viruses, cyberbullying, and internet instability and outages. When using ICTs in EPs, some students face concerns about interacting with teachers and peers [57]. Some of these issues are associated with technical problems. However, technological disruptions and complexities were not always significant factors influencing a student's perception of using ICTs in EPs [52], [57]. Skills or digital literacy, time management, language, behavior, motivation, and their objectives and goals to learn were [52], [54], [57], and [66].

Digital knowledge and skills were primary determinants of a student's willingness to participate fully and accept ICTs in EPs [52], [66]. Students are not motivated to learn, accept, or use technology if they lack the necessary confidence to use ICTs for EPs [55]. This can result in students' fear of learning and unwillingness to engage or position themselves in novel situations due to negative technological experiences [55]. It can also increase attrition, enrollment, and academic disengagement rates [1], [23]. Some students' motivation to use ICTs in EPs deals with their ability to strategically communicate and interact with other students and teachers [52]. For novice language learners, systematic communication practices are essential, especially as they need to develop their language skills and competencies [5], [21], and [57] or have a desire for academic success [61]. Students that developed positive perceptions toward ICTs for EPs were those who found ICTs to be useful and easy to use [52]. The usefulness aspect allowed them to improve their understanding and academic competencies in a specific subject [52]. It also provided them the means to study independently and increased self-discipline and motivation to learn [52], [54]. Those who developed negative perceptions and attitudes toward ICTs found that the digital infrastructures and platforms were not designed to meet students' specific needs, presented navigation complexities, were not user-friendly, and produced cognitive overloads [65].

As some students continually face digital divides, such as access to physical materials and resources and geographical disparities [1], [14], [16], [18], [23], and [30], other students have access and can afford ICTs [57]. Academicians [1], [23], and [67], illustrated some advantages and disadvantages of using ICTs in EPs, a significant benefit of using ICTs in EPs is that students can actively, authentically, and cooperatively engage in the learning process, which ultimately resulted in them developing a positive perception of using ICTs in EPs. Overall, students' positive perceptions of using ICTs in EPs outweighed negative perceptions, but this may not be the same when considering teachers' perceptions.

5. Teachers' Perceptions of ICTs for EPs

Teachers' perceptions of using ICTs in EPs matter, especially as they are responsible for integrating technology into their classrooms, curricula, and pedagogies [68]. While there are several advantages and disadvantages of using ICTs in EPs [1], teachers' positive or negative perceptions or attitudes toward ICTs result from how easy and useful they use them in EPs [69]. When teachers perceive ICTs as useful and easy to use, they develop positive attitudes toward technology, which increases their intentional use [15]. Factors that motivated teachers to use ICTs in EPs resulted from self-efficacy, educational values, impact on teaching, and the quality of training in ICTs to be used in EPs [68].

Furthermore, educationalists accepted educational-based technologies because they provided them with the flexibility to deliver instructions [1], [70], and [71]. ICTs assist teachers with obtaining information easily and swiftly and make teaching and learning more interesting [72]. While ICTs offer significant benefits in teaching practices, teachers' gender [71] and the subjects they teach [73] played an essential role in their willingness to adopt and use ICTs in EPs. Furthermore, based on their own experiences, many teachers will form their individual attitudes and beliefs about how valuable and effective ICTs are when used for educational purposes.

Endogenous and exogenous factors influenced teachers' perceptions of using ICTs in EPs [74]. Endogenous factors were based on nonmanipulative conditions, while exogenous factors were manipulative and changeable [74]. Teachers and school levels are both endogenous and exogenous dynamics [74]. However, when considering the use of digital pedagogies and instructions, the digital platforms must not only be understandable and available to teachers and within the academic milieu, but students must be able to comprehend the material they are being taught through digital instructions.

Some teachers are apprehensive about using ICTs in EPs when they lack the training to use technological infrastructures, platforms, software, and hardware effectively and efficiently. There are two sides to teachers' perceptions of using ICTs in EPs, whereas some teachers had positive attitudes toward technologies and felt that ICTs were beneficial in teaching practices [72]. However, some teachers had opposing views and felt there was no value or benefit in using ICTs in EPs where language learning is concerned [72]. Despite such trepidations, academics [68], [72] advocated that those teachers who taught in Indonesia's rural school districts felt using ICTs in EPs was beneficial. Teachers found that using ICTs in EPs effectively increased students' motivation to learn, fostered positive attitudes toward ICTs, and made learning and teaching activities more exciting and enjoyable [68]. Additionally, teachers found that using ICTs in EPs helped students better understand how various technologies affected their lives. Regardless, teachers perceived ICTs in EPs to improve teaching performances and assisted them with developing new teaching skills [68].

In the West Indies, teachers' perceptions of ICTs significantly influenced how beneficial ICTs were in EPs [74]. These considerations were based on cooperation, job satisfaction, and self-confidence [74]. For Malaysian teachers, evidence showed that these teachers faced various challenges in integrating and using ICTs in EPs [69]. They found that using ICTs was helpful in ways that increased their job performance and productivity and allowed them to work more quickly and effectively. A teacher's perception of using ICTs heavily dealt with them finding that the provided digital infrastructures were straightforward, understandable, and easy to remember and control [69]. In Sweden, teachers had positive perceptions of using ICTs in EPs and used the digital platforms for various reasons [71]. Teachers felt that ICTs provided them with the flexibility needed in the time and space and allowed them to provide students with online instructions and readily available assignments [71]. Palestinian teachers perceived ICTs to positively influence their teaching and educational practices [24]. In Ethiopia, some researchers [75] found a positive relationship between teachers' perceptions toward ICTs in teaching and learning practices, especially when they were encouraged to do so and received the necessary support. Although using ICTs in EPs increased the quality of courses and productivity and allowed teachers to prepare and deliver course material for students more efficiently, most teachers did not use ICTs as a teaching tool [75]. Significant barriers to using ICTs in EP were that teachers lacked the necessary technical knowledge and experienced substantial shortages of resources and materials [75].

In East African countries, students and teachers continually face digital transformation challenges of not having access to various technologies, physical materials, and resources. African countries, among other developed and undeveloped countries, incessantly lack vital resources for teaching and learning, resulting in educators' and pupils weakened digital knowledge and technology fluencies [12], [76]. Sub-Saharan African teachers who actively use ICTs in EPs are those who acquired equipment and training at their own expense [77]. While students are excited to use ICTs in EPs, teachers are open to such usability provided they receive the appropriate training and support needed to operate the devices effectively and efficiently [77]. Human, physical, technical, system, and policy environmental readiness' are some significant caveats that African countries face [77].

Insofar, there are several barriers that impact Indian teachers' perceptions of using ICTs in EPs [78]. Moreover, researchers found that while a large portion of teachers was ready and willing to use ICTs in EPs, many teachers were not [78]. Teachers with unfavorable attitudes toward ICTs in EPs felt that using technology was not beneficial to the teaching practices [78]. For example, several studies demonstrated challenges teachers faced when implementing ICTs into EPs. Challenging encounters were adequate training, teacher and technical competencies, accessibility and broadband/internet connectivity issues, lack of technical support, quality of equipment, updated software, and inability or time constraints to shift from formal/traditional teaching paradigms to informal teaching practices [68], [69], [71], [72], [75], and [78]. Some academic investigators [75] conjectured that equipping teachers' and academic institutions with ICTs are not enough to successfully integrate ICTs into EPs. Teachers and students must receive adequate training so that the ICTs for EPs afforded for learning and teaching can easily be understood.

6. Research Strengths, Implications, and Future Recommendations

This study demonstrates various strengths and limitations regarding the perceptions of students and teachers as they relate to their willingness to accept and intentionally use information

and communication technologies in educational practices. Furthermore, this study provides recommendations that future researchers could conduct to expand this study or add to existing bodies of literature regarding the use of ICTs in EPs. Strengths, limitations, and future recommendations are as follows:

6.1. Research Strengths

Some significant strengths of this research are that it illustrates how students and teachers are the primary stakeholders and frontliners when using ICTs in EPs. Yet, decision-makers and policymakers fail to consider their perceptions of how valuable ICTs are in EPs, especially regarding job relevance, output quality, result demonstrability, perceived ease of use, and all cognitive instrumental processes that contribute to perceived usefulness [46]. Another strong point is that the information presented is timely and relevant, mainly because ICTs have stated a claim not only in human lives, but in EPs and have become essential in educational practices. Students' and teachers' perceptions matter. This research demonstrates how using ICTs provides flexibility in teaching and learning practices and how they can increase the potential of academic experiences and achievement given that students and teachers are provided with adequate training and vital resources and equipment. Most importantly, this study demonstrates how teachers' and students' perceptions of using ICTs in EPs matter, as they are not harvested based on opinion but real-world circumstances and actualities.

6.2. Study Limitations

This study comes with limitations. A limitation associated with this study is that it is based on previous literature. At the same time, this study demonstrated the perceptions of students and teachers and how their perspectives matter when making decisions to integrate information and communication technologies into educational practices. However, examining specific learning management systems (LMS) and digital platforms while considering students' and teachers' perspectives jointly and individually may yield precise results. Comparing students and teachings in rural school districts versus urban academic settings may produce other meaningful outcomes, those that are distinct from what is revealed in this study.

6.3. Future Recommendations

Although this study provides evidence to show how students' and teachers' perceptions matter when using ICTs in EPs, it is suggested that future researchers examine students' and teachers' educational experiences as they relate to using ICTs in EPs while taking a diverse approach. A qualitative or quantitative approach that produces robust information can help understand how ICTs influence EPs among students and teachers. Future researchers should consider various demographics, socioeconomic status (SES), environmental and social influences, age, culture, geographical positions, and accessibility when trying to understand the perceptions of students and teachers as they relate to their intentional use of ICTs in educational practices. All educational stakeholders must realize that students and their learning styles are not homogenous and should be viewed differently. Researchers should also note that teachers and their teaching styles are heterogeneous, as these aspects should be considered when examining the perceptions of students and teachers and their willingness to using ICTs in EPs, where technology acceptance paradigms are concerned.

7. Conclusion

The main objective of this paper was to expand the previous work presented at the 2022 11th International Conference on Education and Information Technology (ICEIT) [1]. This study [1] suggested that social networking sites (SNSs) have stated a claim in educational practices while losing the battle to the 2019 coronavirus pandemic and onward situations. However, when making critical decisions on whether to implement technologies into educational practices, the perceptions of students and teachers matter, but in frequent cases, they are not always considered. Therefore, this paper addressed two pressing questions a) what factors influence students' perceptions when using ICTs in EPs that result in intentional use, and b) what factors influence teachers' perceptions when using ICTs in EPs that result in intentional use. Understanding these factors and knowing what it takes to implement ICTs into EPs successfully, primary stakeholders will start to value the perceptions of students and teachers and not just focus on the affordability and geographical aspects.

While many governmental entities and policymakers encourage school districts to implement technologies into their learning and teaching practices, they do not bring students and teachers to the forefront to acknowledge what is doable. Instead, they take it upon themselves to purchase and decide whether to implement technology into schools, leaving students and teachers in the background. Yet, students and teachers are the primary users.

There are numerous advantages and disadvantages of using ICTs in EPs. Meanwhile, various endogenic and exogenic factors influence the perceptions of students and teachers about using and accepting educational-based digital infrastructures and platforms that will result in intentional use. However, to increase intended use, it is imperative that frontline users, such as school districts, students, and teachers, be provided with the necessary resources. The properties include funding, adequate training, access to quality equipment, software, internet connections, technical support, and unending support from primary decision-makers and educational and governmental stakeholders. Policymakers must pay attention to endogenous and exogenous factors and value students’ and teachers' perceptions when deciding whether to implement ICTs in EPs [74]. Otherwise, it can result in students and teachers developing negative attitudes toward technology use in educational practices. These negative attitudes can stem from teachers and students facing the challenge of not being heard or receiving adequate training or resources.

As ICTs have stated a claim in educational practices, the perceptions of students and teachers matter. Their perceptions go beyond the scope of elements described in the technology acceptance model regarding ease of use and perceived usefulness and spill over into the extended model-TAM2. Teachers and students must receive essential materials and resources to successfully integrate digitally-based pedagogical instructions into their learning and teaching curricula and reap the full benefits technologies offer. Training will increase students' and teachers' confidence levels, comfortability in use, and knowledge acquisition. Studies have suggested that using ICTs in EPs can optimize learning and teaching experiences, mainly when training is provided. However, the training process cannot be a one-time thing, as training must be ongoing, as hardware and software packages and licenses are updated and supported frequently. Teachers' and students' perceptions are valuable assets in discovering the practicality of how beneficial and easy ICTs are to use EPs. Given that, this study suggests that primary decision-makers account for teachers' and students' perceptions when deciding what technologies are implemented into learning and teaching practices. In short, teachers and students are the frontliners when using ICTs in EPs, as their perceptions are not a matter of opinion but a matter of fact.

Conflict of Interest

The authors declare no conflict of interest.

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