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UNDERSTANDING E-LEARNING SYSTEM ACCEPTANCE: AN EMPIRICAL ANALYSIS OF KEY FACTORS AMONG ELEMENTARY SCHOOL STUDENTS USING TAM MODEL

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Abstract
This study explores e-learning system acceptance among elementary school students, focusing on the factors that influence their behavioral intentions. Grounded in established psychological principles, the research investigates the relationships among perceived ease of use (PEOU), perceived usefulness (PU), attitude (ATT), and user intention (UI) within the framework of the Technology Acceptance Model (TAM). The study, involving 330 elementary school student respondents, formulates and validates a set of hypotheses to shed light on the dynamics of e-learning system acceptance. The findings underscore the pivotal role of PU and ATT in shaping students' intentions to use e-learning systems, providing valuable insights into this demographic's specific needs. By highlighting the interconnectedness of key factors, this research contributes to the enhancement of e-learning adoption and effectiveness in elementary education.

1. INTRODUCTION

Introduction In the rapidly evolving contemporary landscape, technological advancements wield significant influence across various domains, including education. Rita Komalasari's research highlights the multitude of digital technologies capable of simplifying and enhancing daily tasks and job performance for the general population [1]. Education, as a vital domain, is no exception to the transformative potential of technology in its teaching and learning processes [2].

Moses defines education as the systematic transfer of knowledge from one individual to another, guided by established standards and expert-formulated approaches [3]. High-quality learning encompasses interactions among students and diverse elements, encompassing teachers, the learning environment, media, and educational resources. It aims to augment knowledge, attitudes, and skills through the collaborative efforts of human components (both teachers and students) and resources such as textbooks, chalkboards, educational tools, as well as facilities like classrooms and audiovisual rooms. Achieving high-quality learning, facilitated by effective interactions between students and learning resources, is pivotal in achieving educational objectives [4].

However, the educational process has faced substantial disruptions in recent years due to the global impact of the COVID-19 pandemic. The spread of the virus has presented significant challenges to the global education system, particularly in Indonesia. These challenges have led to reduced access to educational facilities, diminished research activities among academic stakeholders, and distressingly, instances of students discontinuing their education due to the pandemic [5].

The repercussions of the COVID-19 pandemic have inevitably reached the elementary education sector. Elementary education assumes a crucial role

in nurturing the intellectual and psychological foundations of young children, setting the stage for their progression to secondary education [6]. During these formative years, children undergo rapid cognitive development and growth. Research in neuroscience indicates that a substantial portion of a child's intelligence is shaped during their early years, with approximately 50% of this development occurring before the age of 4. Moreover, brain development continues beyond these early years, with an estimated 80% reached by the age of 8. While these figures are approximations and shouldn't be employed to draw definitive conclusions about a child's intelligence or potential, they underscore the significance of cultivating cognitive development from an early age. Young children are characterized by their innocence, which facilitates effective knowledge imparting and the instillation of character values [7].

To mitigate the impact of the coronavirus pandemic, the government and educational institutions have integrated technology into the teaching and learning process. This approach, known as distance learning, often combines technology and is referred to as e-learning. According to Abas, e-learning comprises a collection of applications and processes that utilize electronic media to convey knowledge and facilitate educational activities [8].

The research on the acceptance of e-Learning has been a significant area of study, with various scholars exploring different facets of this topic. Theresiawati et al. (2020) conducted a study to evaluate and analyze the factors influencing the quality of e-Learning services in Indonesian higher education from the perspective of students. They employed the ServQual model and quantitative methods in their research. The findings revealed that three factors play a pivotal role in determining the quality of e-Learning from students' perspectives: content quality, teacher quality (encompassing empathy, responsiveness, reliability, and assurance), and the quality of the Learning Management System (LMS) in terms of usability and informativeness. Notably, the research showed that the quality of the LMS does not significantly impact satisfaction. This underscores the importance of improving or adjusting the quality of LMS to align with user needs, ultimately enhancing e-Learning in Indonesia [9].

Ansong-Gyimah (2020) delved into the success of Google Classroom as an e-Learning system and its impact on students' perceptions and continuous intention to use. Through quantitative methods and the Technology Acceptance Model, the study found that the perception of usefulness significantly influences the attitude towards usage, the perception of ease of use significantly affects the attitude towards usage, and the attitude towards usage significantly influences the intention for continuous use [10].

Another study by Sidik and Syafar (2020) explored the factors influencing students' intention to use mobile learning in Indonesian higher education. They employed the Unified Theory of Acceptance and Use Technology (UTAUT) in their quantitative analysis. The results of their research indicated that all the factors under investigation have a significant and meaningful relationship with the dependent variable, illustrating their impact on students' intentions to use mobile learning systems. These studies collectively contribute valuable insights into the acceptance and success of e-Learning systems, shedding light on various factors that influence their adoption in the context of higher education [11].

In research entitled The impact and effectiveness of e-learning on teaching and learning, this research paper delves into the efficacy and consequences of E-Learning within the context of the Undergraduate Program (UGP) and General Foundation Program (GFP) at Oman Tourism College. Employing a mixed methodology through online surveys, the study assesses teacher and student experiences with E-Learning, establishing five criteria of effectiveness for evaluation. The findings reveal a consensus between teachers and students, both providing favorable ratings, indicating that E-Learning is perceived as a potent tool for enhancing instructional delivery and fostering knowledge acquisition through transfer of learning. The research concludes that E-Learning stands out as a highly effective strategy for teaching and learning, asserting that the boundaries of education can extend beyond a single campus through the adoption of distance learning and E-Learning solutions. The paper recommends further research involving other Higher Education Institutions in Oman to formulate a more comprehensive knowledge-based plan for implementing E-Learning strategies. The practical implication lies in the potential transformation of education through web-based platforms, necessitating continuous evaluation of E-Learning utilization within the academic community. The research's novelty lies in its specific focus on Oman Tourism College and its contribution to understanding the consensus measures and perceptions of both teachers and students, advocating for the integration of E-Learning on a broader scale, potentially shaping the future of education in Oman [12].

This study examines the widespread repercussions of the COVID-19 pandemic on the global education sector, employing a cross-sectional study design with qualitative data collection and secondary literature analysis. Findings indicate a significant disruption in learning due to strict pandemic protocols, leading to extended closures of educational institutions worldwide. The closure of schools, coupled with financial constraints, has left numerous learners unable to access recommended online learning. The research highlights the daunting challenges faced by educational institutions in

adapting to new teaching methods and program structures. It emphasizes the imperative for governments to ensure equitable and inclusive education during the pandemic. The study delves into the shift to online learning, discussing its advantages and challenges, including issues of cost and accessibility. The paper concludes by underscoring the revealed inadequacies and inequalities within the education system, with a specific focus on the need for future interventions. The novelty of the research lies in its comprehensive exploration of the multifaceted impact of COVID-19 on education globally, shedding light on disparities in access to digital tools and the innovative efforts required by educators in adapting to online platforms. The proposed future study aims to address limitations by focusing on long-term interventions involving education professionals [13].

However, in the context of elementary education, particularly in Indonesia, there exists a notable dearth of research on e-learning systems. This research gap assumes particular significance in the aftermath of the COVID-19 pandemic, which has accelerated the adoption of e-learning solutions. As a result, there is growing curiosity regarding the impact of e-learning on elementary education. This research seeks to explore the indicators of effectiveness and efficiency in e-learning systems, employing structural equation modeling adapted from the Technology Acceptance Model (TAM). It employs a quantitative approach, gathering data through questionnaires distributed to elementary school educators who have implemented e-learning. The direct subjects of this study are students in elementary schools, ensuring that the collected data authentically represents the realities of elementary education, with validation from educators themselves.

As emphasized by Dian Andesta, "Children may struggle and become confused when faced with scientific questions, and when pressured, they may experience stress because their cognitive abilities have not yet reached the stage of complex thinking [14]." Nevertheless, the success of e-learning implementation primarily hinges on the reactions and responses of elementary school students. Consequently, the research will primarily focus on elementary school students while corroborating their experiences through input from their teachers.

This study endeavors to address the research gap in examining the impact of e-learning within the context of elementary education, a critical area that significantly influences students' cognitive development and the future of education. Data analysis will be carried out using SmartPLS version 4. Subsequent sections will delve into the methodology, findings, and implications of e-learning in elementary education.

II. LITERATURE

2.1. Primary School Education

Primary education is the foundational level of formal education for students embarking on their educational journey. It plays a pivotal role in establishing the fundamental knowledge base for students to build upon at subsequent educational levels [15]. Therefore, the implementation of primary school learning must proceed effectively. According to the Government Regulation of the Republic of Indonesia No. 66 of 2010, Primary Education serves as the cornerstone for secondary education. Primary schools (SD) represent a formal educational institution that provides general education at the primary level [16]. Children attending primary education typically range in age from 6 to 12 years, a period marked by rapid intellectual growth. During this phase, a child's knowledge and skills development occurs at an accelerated pace. Their interests during this period are often oriented towards dynamic and moving elements. Consequently, children tend to engage in a variety of activities that will contribute to their future development.

2.2. E-Learning

According to Toto Sugiarto, e-learning aims to be an innovation that significantly contributes to the transformation of the learning process. In this innovative approach, learning is no longer one-sided; rather, students and teachers can interact online through electronic media in different learning environments in an interactive format [17].

Effendi and Zhuang also emphasize that e-learning offers several benefits, making it an attractive choice for both students and organizations. It reduces training costs, offers flexibility in terms of time and location, and can be tailored to the learning pace of each student. The utilization of the latest instructional designs enhances its effectiveness in the teaching and learning process, and its synchronous availability makes it accessible from anywhere. These advantages motivate users to promptly embrace e-learning [18].

2.3. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is employed in the examination of technology adoption, featuring two primary variables: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU signifies an individual's belief in the potential enhancement of their job performance through technology utilization. Conversely, PEOU represents an individual's perception of the ease of using a specific system. TAM stands as one of the pioneering acceptance theories, enabling the exploration of external variables alongside its core elements. Additionally, TAM can forecast factors influencing the uptake of technology [19].

The primary objective of TAM is to predict the adoption of new technology by users and to shed light

on potential design issues within the information system before it gains widespread adoption [20].

2.4. Hypotheses Development

The initial step in research is referred to as hypothesis construction. Hypotheses can be expressed as predictive statements about what is expected to be found through empirical data analysis. Formulating hypotheses is based on variables established within the conceptual framework and is also informed by hypotheses from prior related research. In this study, the hypotheses to be utilized have already been determined.

PEOU is examined in the context of e-learning as the user's perception that using e-learning would be straightforward. It has been shown to affect both PU and attitude ATT [19]. Consequently, the research hypotheses were formulated:

H1: The perceived ease of use (PEOU) of an e-learning system positively impacts its perceived usefulness (PU).

H2: The perceived ease of use (PEOU) of an e-learning system positively influences its attitude (ATT).

Earlier studies have confirmed that perceived usefulness (PU) plays a crucial role in shaping users' perspectives toward technology [21]. Furthermore, PU exerts an impact on behavioral intention, both directly and indirectly [22].

H3: The perceived usefulness (PU) of an e-learning system positively affects its attitude (ATT).

H4: The perceived usefulness (PU) of an e-learning system positively impacts its user intention (UI).

Attitude, or the perception of attitude, essentially, from a psychological perspective, is an implicit response with a driving force occurring within an individual in response to stimulus patterns and influencing other overt responses. Attitude then serves as a partial mediator of the influence of perceived benefits on the intention to use, adding a bit of explanatory power to an individual's intention to use a specific information system. Individuals who believe that using new technology will lead to more positive outcomes also tend to have a favorable attitude towards using information systems [21].

H5: The attitude (ATT) towards an e-learning system positively impacts its user intention (UI).

III. RESEARCH METHODS

This study utilized a quantitative research approach to analyze data and draw conclusions that can be applied to a broader population beyond the study's sample. The research process began with an extensive review of existing literature, encompassing books, journals, and relevant research findings, to establish the theoretical framework for the study. Subsequently, data was gathered at a single point in time, focusing on primary school students in Bali province. Data collection involved a combination of secondary and primary methods. Interviews were conducted with key individuals within institutions that offer early childhood education services, and questionnaires were distributed to 330 primary school students who were utilizing e-learning. The selection of 330 respondents was based on convenience sampling since the exact population size was unknown, and it satisfied the minimum requirement of 30 respondents [23]. Respondents were categorized based on age, school origin, and e-learning usage duration.

Table 1. Sample Distribution Table

Number of samples = 330		Frequency
Age	9 years old	88
	10 years old	72
	11 years old	86
	12 years old	84
The respondent's school of origin	SD N 2 Panjer	243
	SD N 5 Pedungan	87
Usage duration	2 Years	330

In this research, the data analysis process consisted of three distinct phases, and SmartPLS version 4 software was employed for this purpose. The primary goal of employing Partial Least Squares (PLS) analysis is to assist researchers in deriving latent variable values for predictive purposes. Weight estimates for constructing the components of latent variables are determined based on the specifications of both the inner and outer models.

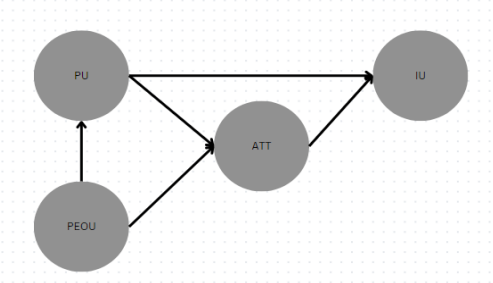

Figure 1. Research Model [19]

The analysis encompassed the following key stages:

1. Descriptive Analysis: Descriptive analysis was carried out to provide an in-depth characterization of the phenomena or events observed in the sample data. Various statistical measures, such as the mean (representing the average response of participants to statements), standard deviation (indicating the extent to which individual data points deviate from the mean), and excess kurtosis (revealing the peakedness of the dataset), were used for this purpose. Descriptive analysis played a critical role in illustrating and comprehending data patterns and trends, thereby furnishing valuable insights for

generalizing and drawing conclusions from the research findings [24].

2. Ensuring the validity and reliability of the questionnaire used is of utmost importance to establish its credibility as a data collection tool. In this research, two critical tests were conducted: the convergent validity test and the discriminant validity test. During the convergent validity test, 18 out of the 35 indicators did not meet the required criteria and were subsequently removed from consideration. An indicator was considered valid if its Outer Loading (OL) exceeded 0.7 during the initial evaluation. Indicators falling below this threshold were excluded from the model [25].
3. In the Discriminant Validity Test, the focus was on verifying that cross-loading values adhered to the specified criteria for discriminant validity testing. This implied that an indicator's cross-loading value on one variable should be higher than its cross-loading value on another variable. The results revealed that certain variables were found to be invalid, necessitating their removal from subsequent analyses to uphold the quality and integrity of the research findings.
4. In the Reliability Test, the research instrument's reliability was assessed based on Cronbach's Alpha and Composite Reliability values. An instrument was deemed reliable if these values exceeded the established threshold of 0.7, indicating its capability to yield consistent and dependable results. Conversely, if the values fell below 0.7, the instrument was considered unreliable, necessitating refinement or replacement of pertinent questions or statements to enhance data consistency [25]. Notably, in this examination, all variables demonstrated reliability. The outcomes of the reliability test instilled confidence that the data collected from respondents exhibited satisfactory consistency and dependability. As a result, the model and the indicators under scrutiny in the subsequent stages can be observed in the following sections.

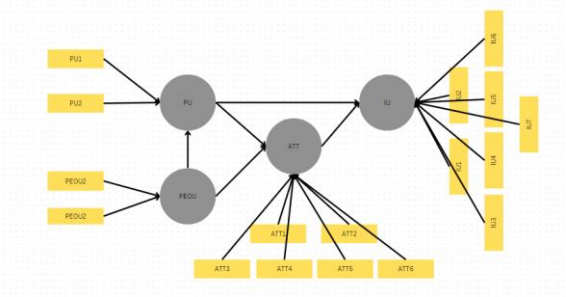

Figure 2. Models And Indicators That Will Be Used in Research

IV. RESULTS

Hypothesis testing, particularly the Path Coefficient test, plays a pivotal role in the Structural Equation Modeling (SEM) analysis. Its primary objective is to gauge the extent of relationships between variables contained within a research model [26]. In this context, researchers employ P-values and T-statistics as essential tools for decision-making during their analysis.

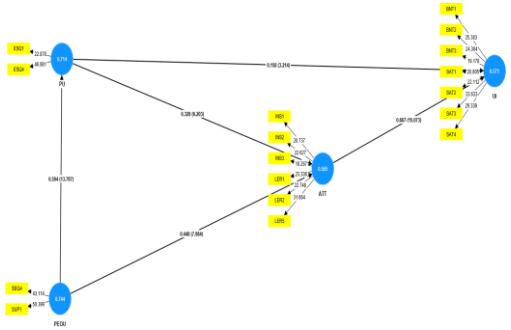

Figure 3. Structural Model from SmartPLS4

In the realm of hypothesis testing, when the P-value falls below the threshold of 0.05, the study supports the acceptance of the hypothesis. This implies that alterations in one variable have a significant impact on other variables within the model. Conversely, if the P-value exceeds 0.05, it suggests a weaker or less significant relationship between variables in the research context, leading to the rejection of the hypothesis.

Furthermore, when interpreting T-Statistics values, the study utilizes a benchmark of 1.96 as a reference point for ascertaining statistical significance. A T-Statistics value exceeding 1.96 indicates that the Path Coefficient is statistically significant. This signifies that the relationship between variables, as measured by the Path Coefficient, is not merely a result of random chance but is statistically well-founded. Conversely, when the T-Statistics value is below 1.96, it signifies that the relationship between variables lacks statistical significance within the research context [27].

In summary, the process of hypothesis testing through Path Coefficients and T-Statistics in SEM analysis equips researchers with the means to evaluate the strength and significance of relationships between variables within the research model. This, in turn, enables the delivery of precise and valid interpretations of the analytical findings.

Table 2. Hypotehesis Test Table

Path	T statistics (|O/STDEV|)	P values
ATT -> UI	15.073	0
PEOU -> ATT	7.984	0
PEOU -> PU	13.787	0
PU -> ATT	6.203	0
PU -> UI	3.214	0.001

It can be seen in the table above that the results found in this hypothesis test are, in hypothesis testing, we evaluated several Paths based on the values of T-

Statistics and P values. For the "ATT -> UI" Path, with a T-Statistics value of 15.073 and a P value of 0, our study concluded that the hypothesis regarding the relationship between Attitude and User Intention is accepted. This indicates that Attitude significantly influences User Intention within our research context.

Similarly, in the "PEOU -> ATT" Path, with a T-Statistics value of 7.984 and a P value of 0, the hypothesis regarding the relationship between Perceived Ease of Use (PEOU) and Attitude is accepted. This demonstrates that Perceived Ease of Use significantly influences Attitude in our study.

The "PEOU -> PU" Path also yielded similar results with a T-Statistics value of 13.787 and a P value of 0. This confirms the acceptance of the hypothesis regarding the relationship between Perceived Ease of Use and Perceived Usefulness (PU), indicating that Perceived Ease of Use significantly influences Perceived Usefulness in our research.

Furthermore, in the "PU -> ATT" Path, a T-Statistics value of 6.203 and a P value of 0 suggest that the hypothesis concerning the relationship between Perceived Usefulness and Attitude is accepted. This illustrates the significant influence of Perceived Usefulness on Attitude in our study.

Finally, for the "PU -> UI" Path, a T-Statistics value of 3.214 and a P value of approximately 0.001 indicate that the hypothesis regarding the relationship between Perceived Usefulness and User Intention is accepted. This reflects the significant influence of Perceived Usefulness on User Intention in our research.

Overall, these findings confirm significant relationships between the tested variables in our study.

Table 3. Hypothesis Result

Hypothesis	Explanation	Conclusion
H1	*The perceived ease of use (PEOU) of an e-learning system positively impacts its perceived usefulness (PU).*	Hypothesis accepted and had a significant effect.
H2	*The perceived ease of use (PEOU) of an e-learning system positively influences its attitude (ATT).*	Hypothesis accepted and had a significant effect.
H3	*The perceived usefulness (PU) of an e-learning system positively affects its attitude (ATT).*	Hypothesis accepted and had a significant effect.
H4	*The perceived usefulness (PU) of an e-learning system positively impacts its user intention (UI).*	Hypothesis accepted and had a significant effect.
H5	*The attitude (ATT) towards an e-learning system positively impacts its user intention (UI).*	Hypothesis accepted and had a significant effect.

V. CONCLUSION

The conclusions derived from this study are concise and directly aligned with the research objectives. Through the application of T-Statistics and P values on the analyzed paths, the research reveals several significant relationships. Firstly, the study affirms that a positive Attitude (ATT) significantly influences User Intention (UI) in the realm of e-learning, indicating that a favorable attitude towards e-learning enhances the intention to use it. Furthermore, Perceived Ease of Use (PEOU) is established to significantly impact Attitude (ATT), emphasizing that an e-learning system's ease of use correlates with a more positive attitude. The research also identifies a noteworthy relationship where Perceived Ease of Use (PEOU) significantly influences Perceived Usefulness (PU), underscoring the pivotal role of ease of use in determining the perceived usefulness of an e-learning system. Moreover, Perceived Usefulness (PU) is found to significantly affect Attitude (ATT), shedding light on the influence of perceived usefulness in shaping users' attitudes toward e-learning. Lastly, the study discloses that Perceived Usefulness (PU) significantly impacts User Intention (UI), signifying that users' perception of e-learning's usefulness positively influences their intention to use it. In summary, this research enriches our understanding of the intricate relationships among these factors within the context of e-learning, offering valuable insights into the determinants of user intention and acceptance of e-learning systems.

Several valuable suggestions for future research in the field of e-learning acceptance are put forth in this study. Firstly, there is a recommendation to broaden the research scope beyond the Technology Acceptance Model (TAM) to delve into the influence

of individual characteristics, institutional support, and external factors on e-learning adoption, aiming for a more comprehensive understanding of acceptance. Longitudinal studies tracking users' experiences and evolving attitudes over time are suggested to provide insights into changes in acceptance and areas for improvement. Comparative analyses of different e-learning platforms and systems are proposed to explore how design, content quality, and usability variations impact user attitudes and intentions. Acknowledging the potential influence of cultural factors, cross-cultural studies are encouraged to examine how different cultural backgrounds affect e-learning adoption, contributing to the creation of more inclusive e-learning platforms. Investigating the impact of user training and support mechanisms on e-learning acceptance is suggested to enhance user experiences and intentions to use e-learning systems. The recommendation to complement quantitative research with qualitative methods, such as in-depth interviews or surveys, is made to uncover underlying reasons behind specific attitudes and intentions, providing a deeper understanding of user acceptance. Research focused on making e-learning systems more accessible and inclusive, particularly for users with disabilities or diverse learning needs, is deemed crucial. Continuous improvement through iterative enhancements of e-learning platforms, guided by user feedback and evolving technology, is emphasized to effectively meet users' changing needs and expectations. Additionally, investigating e-learning acceptance across various educational levels, from primary schools to higher education, is proposed to address the diverse needs and preferences of different user groups. Lastly, staying updated on emerging technologies like virtual reality, augmented reality, and artificial intelligence and their integration with e-learning is suggested to open new avenues for research into innovative technology acceptance. These suggestions collectively aim to guide future research towards a more nuanced and comprehensive understanding of e-learning acceptance, ensuring that e-learning systems are not only effective but also user-friendly for a broader range of users.

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