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Exploring Digital Leadership, Technology Integration, and Teacher Task Performance in Higher Education Institutions: A Moderated-Mediation Study

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Abstract

This study investigates digital leadership and teacher task performance in Pakistani higher education institutions, employing the planned behavior theory and a moderated-mediation model of technology integration, digital literacy, and digital engagement. A cross-sectional field survey was conducted, involving 390 teachers from diverse backgrounds employed by higher education institutes in Pakistan. Structural equation modeling (SEM) analysis revealed that perceived digital leadership positively influenced teachers' technological integration. The results further demonstrated the relationship between teachers' digital literacy, their use of technology as a moderator, their perception of digital leadership, task performance, and online engagement. Instructors' effective utilization of available media and technologies to achieve educational objectives emerges as a crucial factor. Future research should delve deeper into understanding the causes and effects of technology integration to address the complexities surrounding teachers' digital engagement.

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Keywords
Perceived Digital Leadership, Digital Engagement, Digital Literacy, Technology Integration, Task Performance

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1. Introduction

A teacher is one of the essential elements of educational success, making it a crucial issue in Pakistan to raise the standard of education generally (AlAjmi, 2022). The education administration sector in Pakistan continues to have a significant goal of raising educational standards so that they are good (Sadaf & Johnson, 2017). It must not be heedless of the function of different parties, including the faculty members. Administration is constantly paying attention to the performance issue since it directly affects the institution's production (Vanek et al., 2020). The skill and the willingness are the significant variables that can impact the performance. It is acknowledged that many people can do the job but may not always want to; therefore, a good performance is not produced (Zhang et al., 2023). Therefore, a performance is anything someone accomplished or demonstrated by someone or an institution.

The rise of digitalization has been seen as advantageous to institutions, communities, and society in general. Digital leadership in education refers to the use of electronic platforms, social networking sites, conferences, and technologies like the Internet of Things (IoT), artificial intelligence (AI), big data, and computer vision (Vanek et al., 2020). Most importantly, leaders care deeply about others and are receptive to ideas. When setting policy, leaders use current information and intuition to weigh numerous options. According to Obadimeji and Oredein (2022), they take risks and use ingenuity to address challenges. Leaders who relate to the data approach are more tolerant of uncertainty.

Furthermore, Pakistani governments have prioritized teaching quality due to the increased focus on

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responsibility in higher education (Purwanto, 2022). Meanwhile, since enrollment in Pakistani institutions has considerably expanded, the opportunities available to the people have highlighted grave worries about reducing the quality of higher education in Pakistan. A favorable and task mind, including energy, commitment, and immersion in the work, is teacher engagement (Li et al., 2022). It demonstrates the efforts teachers put forth when instructing, and as a result, it is directly tied to how well they perform at work. Teacher digital engagement, which encompasses a great desire and determination to remain in the field, is a sign of identification and technology involvement in teaching. The long-term viability of students and learning as a whole depends on inspecting instructors' passion and energy for teaching (Limon & Nartgün, 2020).

Nelson and Hawk (2020) and Vanek et al. (2020) mention digital literacy as one of the 21st-century competencies. Digital literacy, according to Limon and Nartgün (2020), is the ability to use information and communication technologies to find, evaluate, create, and convey information. This requires both conceptual and technical skills. This is particularly crucial in our technologically advanced world, which requires that each of us has accessibility to and the knowledge necessary to use digital technologies (Obadimeji & Oredein, 2022). Teachers need to have sufficient digital literacy to educate digitally, which is necessary in the current learning paradigm.

Technology use by teachers has been studied for a great many years. Furthermore, according to studies, there hasn't been much advancement in teachers' use of technology in the classroom over the previous 20 years (Yin et al., 2017). This concentration on technology goes beyond merely expanding the amount of technology in education. The current study determines digital leadership and teachers' task performance in higher education institutions of Pakistan and the moderated-mediation model of technology integration, digital literacy, and digital engagement. The present study establishes its planned behavior theory. Planned behavior theory refers to the idea that three core components, namely, attitude, subjective norms, and perceived behavioral control, shape an individual's behavioral intentions (Lung-Guang, 2019). People can identify obstacles to learning and put solutions in place by using behavior planning. Teachers may teach and encourage desirable behavior by using a behavior plan. In this study, the conceptual framework, which is founded on these research topics, is empirically tested.

2. Literature Review

2.1. Planned Behaviour Theory

The Planned Behavior theory was the conceptual model utilized to investigate teachers' views on their intents to incorporate digital literacies in their teaching (Cheng, 2019). The theory suggests that behavioral intentions are based on normative perceptions of support from others and social obligation to act in a particular manner, such as integrating digital literacy in the classroom. Teachers' desire to follow what they believe to be important individuals' demands weighs this conviction's validity (Lung-Guang, 2019). The theory assumes that the mindset is based on the belief that specific behaviors, like teachers' incorporation of digital literacy, are linked to particular outcomes or results. Control beliefs influence the assessments of actual behavior, and they indicate that teachers with more abilities and trust in their abilities feel a greater sense of influence.

As described by Lung-Guang (2019), cognitive factors encompass assumptions about the existence or absence of necessary options and resources that can be inferred from prior behavior or second-hand knowledge about engagement with the activity. Perceived behavioral control, according to Cheng (2019), is concerned with the presence or absence of specific elements that may encourage or inhibit the adoption of a given activity. The level of perceived behavioral control linked to control attitudes reflects how easy or difficult the behavior is perceived to be to carry out. Since teachers' beliefs represent their understanding of what is appropriate to do inside and outside the classroom, research on teachers' perspectives is crucial for understanding the strong attachment that motivates their choices. In

this regard, Lung-Guang (2019) asserts that teachers' expectations and aspirations toward integrating technology into the education and learning process have been significant predictors of their effectiveness in doing so in their institutions.

As defined by Abbas et al. (2019), behavioral beliefs are influenced by connecting attitudes with a specific object. According to Cheng (2019), behavioral beliefs are developed through connecting activity with particular outcomes and are personal. Hence, based on their own favorable or unfavorable assessment of specific conduct, individuals may have a different viewpoint on a favorable or unfavorable attitude toward behavior. The following Research framework in Figure 1 is proposed.

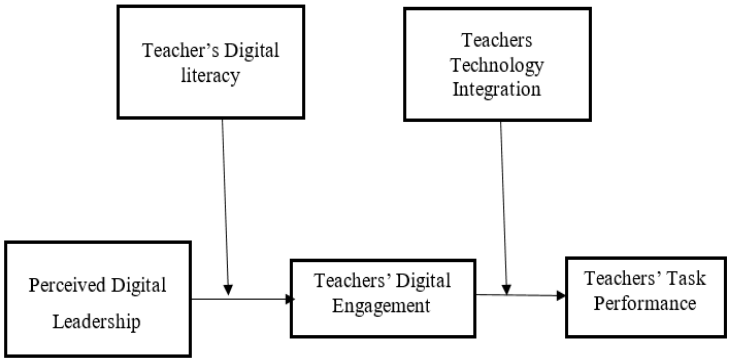

Figure 1: Research Model

2.2 Perceived Digital Leadership and Teacher's Digital Engagement

The ability of leaders to develop, manage, guide, and use technological expertise to enhance the performance of their institutions is highly valued in the notion of perceived digital leadership (Abbas et al., 2019). Digital leadership refers to adopting and applying leadership strategies that are appropriate for the digital age, including a reliance on cutting-edge technological platforms. It requires leaders to have high expectations and effectively utilize technology. Research has shown that using technology in higher education institutions influences instructional technology integration, benefiting student growth and achievement (AlAjmi, 2022; Downes & Bishop, 2012).

Han et al. (2016) conducted a study on 1000 Pakistani teachers and found that perceived digital leadership enhances teachers' technical literacy and motivates them to integrate technology into their teaching practices. Digital leaders, as described by Herminingsih and Supardi (2017), communicate their views and opinions without apologizing, demonstrating a neutral communication approach. However, Andriani et al. (2018) suggest that such leaders may achieve limited results in effectively managing people to accomplish institutional goals. Teachers need to transition from traditional administrators to curriculum and technology leaders. By developing and implementing goals and corporate strategies, administrators are responsible for acting as technological leaders in their respective institutions.

Hypothesis 1: Perceived digital leadership positively influences teachers' digital engagement, enhancing task performance in higher education institutions.

2.3 Teacher's Digital Engagement and Teacher's Task Performance

Teacher digital engagement and task performance are crucial aspects in this investigation that significantly affect educational outcomes. Teacher digital engagement, which encompasses the instructor's engagement in classroom instruction on behavioral, affective, and intellectual levels, has been linked to career advancement, subject matter knowledge, and classroom observations (Purwanto, 2022). Experienced teachers prioritize their students' learning and instructional concerns and exhibit

greater adaptability and alternative approaches (Rafi et al., 2019). Self-efficacy and teacher involvement are associated with greater engagement and accomplishment (Nelson & Hawk, 2020). Engagement can be investigated from various theoretical angles, including cognitive, interpersonal, educational, corporate, and spiritual views (Vanek et al., 2020). It is influenced by curiosity, inspiration, and the ability to mold attention in response to the surroundings (Li et al., 2022; Nelson & Hawk, 2020; Sadaf & Johnson, 2017; Limon & Nartgün, 2020; Obadimeji & Oredein, 2022). Teachers, through creativity and instructional ability, have the potential to create engaging and pleasurable contexts for both students and themselves (Vongkulluksn et al., 2018).

The task performance of teachers is a crucial determinant of educational outcomes. Task performance is defined as the degree of accomplishment that fulfills organizational goals (Zhang et al., 2023). It encompasses the effectiveness of teachers in reaching objectives and goals, demonstrating their competence and willingness (Lung-Guang, 2019; Vanek et al., 2020). Strong task performance is crucial for achieving educational goals and positively impacting student engagement (Rafi et al., 2019). Teachers play a crucial role in assisting students in developing skills and knowledge, ultimately contributing to the objectives of the educational setting (Obadimeji & Oredein, 2022). Therefore, understanding the factors that influence teacher task performance, such as digital engagement and the use of technology, is of great interest to education scholars (Li et al., 2022; Limon & Nartgün, 2020; Rafi et al., 2019; Vanek et al., 2020).

Hypothesis2: Higher levels of teacher digital engagement positively influence teacher task performance.

2.4 Mediating Role of Teacher's Digital Engagement

As described by Li et al. (2022), teacher engagement encompasses vitality, commitment, and concentration, reflecting a state of contentment and happiness. Commitment is characterized by a sense of responsibility, passion, pleasure, and motivation, while vigor and participation denote high levels of enthusiasm and willingness to exert effort in one's work (Yin et al., 2017). Concentration, the third facet of engagement, involves complete focus and immersion in activities. Studies have shown a positive correlation between teachers' digital engagement and task performance, indicating that higher levels of engagement contribute to improved performance (Zhang et al., 2023). Digital engagement among teachers is marked by vigor, devotion, and concentration, collectively known as "digital vigor" (Rafi et al., 2019). Digital vigor represents a high level of energy and passion exhibited during work, while commitment encompasses emotions such as encouragement, confidence, eagerness, and the ability to embrace challenges. Digital concentration refers to intense focus and reluctance to take breaks, indicating a strong dedication and passion for work (Nelson & Hawk, 2020). Engaged teachers tend to perform more effectively and are more motivated to take on additional responsibilities (Limon & Nartgün, 2020). Engagement is regarded as a valuable resource that can address various challenges, including improving teachers' task performance during times of economic crisis, and can contribute to enhanced academic achievements and the effective integration of technology in education (Purwanto, 2022). Teachers who perceive strong digital leadership are more likely to feel empowered and motivated to engage in digital practices, leading to higher levels of digital engagement. This, in turn, positively influences their task performance. Teachers' digital engagement serves as a mechanism through which perceived digital leadership impacts their performance in the classroom (Lung-Guang, 2019).

Teachers possessing the competencies related to engagement and effectively carrying out their duties in alignment with organizational requirements are considered to perform satisfactorily (Howell & Silva, 2022). The quality of teachers' task performance directly affects the overall success of the educational program and the standards of education set by the community (Herminingsih & Supardi, 2017).

Several factors can impact a teacher's task performance and engagement, as a positive mindset can contribute to the development of personal resources, such as task performance (Limon & Nartgün, 2020). Teachers who have confidence in their abilities and efficacy are likelier to engage in their work (Howell & Silva, 2022). Engagement experiences provide opportunities for professional growth, skill development, and identity formation, leading to increased competence and effectiveness (Cheng, 2019; Han et al., 2016).

This hypothesis implies that stronger digital leadership will lead to higher levels of digital engagement, which, in turn, will positively impact teachers' task performance in educational settings.

H2: Teacher's digital engagement mediates the relationship between perceived digital leadership and teachers' task performance.

2.5 Moderating Role of Teacher's Digital Literacy

Teachers play a crucial role in demonstrating and promoting technology use to others. The significance of digital literacy for instructors has been stressed by Arifin et al. (2014), emphasizing that it is no longer a luxury and must be integrated into our students' and colleagues' capacities. Understanding efficient teaching methods for fostering digital literacy is crucial (Duyar & Normore, 2012). Digital literacy refers to people's ability to effectively use digital tools and services to recognize, acquire, organize, incorporate, assess, synthesize digital materials, develop new knowledge, produce media expressions, and interact with others (Gurung & Rutledge, 2014). It serves three main purposes: promoting highly structured and innovative thinking, facilitating speedy information access, and preparing students for life beyond school. Teachers must know how technology affects society and be prepared to critically evaluate it while remaining unbiased toward its drawbacks and independent from its influence. Andriani et al. (2018) and Herminingsih and Supardi (2017) argue that educators must develop digital awareness to select the ideal settings for digital engagement. Teachers who recognize the importance of media literacy tend to integrate more technology into their teaching compared to their colleagues who do not (Hsu, 2010). Teachers' digital literacy development has been identified as a crucial concern in education and research (Kangas et al., 2017; Laksani, 2019). Enhancing instructors' abilities and creating accessible digital learning environments have gained significant attention (Li & Yu, 2022). In e-learning societies dealing with the global market and digital systems, digital literacy is a prospective competency for teachers' career development (Nelson & Hawk, 2020). Additionally, basic digital literacy is essential for individual teacher professional development in effectively utilizing e-learning platforms (Purwanto, 2022). The term "teachers' digital literacy" frequently describes the knowledge and skills instructors need to teach in a digital learning society (Sadaf & Johnson, 2017).

Teachers require digital tools to handle technology, communicate, access information, and collaborate quickly and effectively on projects (Ustundag et al., 2017). The growth of teachers' digital literacy enhances classical education and generates vitality in environments involving complex structures (Vanek et al., 2020). The more proficient teachers are in teaching, the greater their digital literacy growth (Vongkulluksn et al., 2018). Previous studies have shown that the successful increase of teachers' digital literacy significantly alters the traditional education and learning environment in higher education institutions (Yin et al., 2017; Zhang et al., 2023; Zhao & Bryant, 2006). However, as digital technology advances, there are potential hazards of digital inequality. The growth of teachers' digital literacy can be influenced by various circumstances (Limon & Nartgün, 2020). Particularly in teacher-centered traditional education, teachers may hesitate to learn digital skills through current career development techniques. Some educators find it difficult and time-consuming to acquire digital competencies within existing workshops (Lung-Guang, 2019), which can decrease their readiness to adopt online learning. The absence of school officials' participation in accessible teaching support presents another barrier to complete digitalization (Purwanto, 2022). Academics primarily focus on institutional and peer interactions instead of network formation and instructional abilities. Schools' support systems and technological environments can also hinder students' digital literacy development.

The level of academic staff preparation at the school partially influences the growth of teachers' digital literacy (Rafi et al., 2019; Sadaf & Johnson, 2017; Ustundag et al., 2017). The adaptability of the educational platform largely depends on the willingness of teachers.

Hypothesis 3: Teacher's digital literacy moderates the relationship between perceived digital leadership and teacher engagement.

2.6 Moderating Role of Teacher's Technology Integration

Technology plays a significant role in a teacher's professional and personal life. It facilitates administrative tasks such as attendance management, online grading, and student information tracking (Nelson & Hawk, 2020). Additionally, teachers utilize technology tools like smartphones, workstations, and laptops to access course materials and deliver innovative and user-friendly instruction (Han et al., 2016). Technology also allows teachers to assess student understanding through quizzes and surveys, enabling them to plan effective teaching strategies (Høigaard et al., 2012). By leveraging technology, teachers can actively engage with students' learning, enhance their productivity, and streamline their responsibilities.

However, integrating technology into teaching can be challenging for teachers due to various factors (Hsu, 2010; Kangas et al., 2017). These factors include prior experience with online learning, technological proficiency, curriculum practices, and the availability of support networks (Laksani, 2019). Students' low productivity, limited access to technology, and unreliable internet connections also hinder effective technology integration (Li & Yu, 2022).

Integrating technology into education requires specialized knowledge and skills beyond basic computer literacy (Limon & Nartgün, 2020). Teachers need to consider student needs, curriculum requirements, available technologies, and the challenges of lesson planning and material creation (Kangas et al., 2017). An integrated technology curriculum has been proposed to address these challenges and develop digital literacy skills (Lung-Guang, 2019). Additionally, Rafi et al. (2019) emphasize the importance of expanding technology education by utilizing digital and mathematical skills to enhance technology integration and model presentations. Task performance demonstrates a teacher's ability to fulfill their responsibilities effectively (Sadaf & Johnson, 2017). Teachers must meet the expectations of all stakeholders, including the general public and institutions, to develop learners successfully. Creating a positive learning environment and utilizing technology to enhance teaching practices contribute to teachers' task performance (Lung-Guang, 2019; Vanek et al., 2020).

Ultimately, the effective use of technology in teaching goes beyond mere utilization; it is about leveraging technology to improve student learning outcomes. Technology integration should foster interaction, resolve challenges, and facilitate more consistent and efficient technology use in education. To achieve this, targeted training programs or tutoring systems for technology integration are recommended (Nelson & Hawk, 2020; Obadimeji & Oredein, 2022; Yin et al., 2017; Zhang et al., 2023). These programs aim to provide ongoing support and guidance to teachers, enabling them to maximize the potential of technology in their teaching practices.

Hypothesis 4: Teacher technology integration moderates the relationship between teacher digital engagement and teacher task performance.

3. Methodology

The methodology of this study was based on the planned behavior theory, which supported the conceptual framework and hypotheses. The study assessed the relationships between perceived digital leadership and teachers' digital engagement using partial least squares structural equation modeling

(PLS-SEM). Additionally, the study examined the moderating effects of teachers' technology integration and digital literacy on teachers' task performance among higher education teachers in Pakistan.

Data for this study was collected through a survey, which is considered an objective data-gathering technique for capturing participants' thoughts, opinions, ideas, and ethics. The survey allowed participants complete flexibility in responding without concerns about their colleagues' or superiors' reactions. To select the samples for this investigation, the strategy focused on organizations aspiring to follow the pattern of perceived digital leadership. An email was sent to higher education institutions in Pakistan, providing a link to an online survey, a brief explanation of the study's objectives, and an invitation to participate.

To ensure the accuracy of the data, a modified version of a literature-based questionnaire was used, specifically tailored to validate the relationship between the components of the study. Participants were required to indicate their English language proficiency in the cover letter since the survey was available only in English. Participant replies were treated confidentially, and only the study's overall findings were reported. The collected data was analyzed using descriptive and inductive methods in the SPSS. Descriptive approaches included analyzing frequencies, percentages, charts, measurement items, mean values, and standard errors.

3.1 Participants

The study included teachers from higher education institutions in Pakistan. The objectives and details of the psychometric tools were explained to each participant, emphasizing the confidentiality of their participation and their freedom to choose whether or not to participate. Of 550 eligible teachers, 390 agreed to participate, resulting in a response rate of 71%. Data collection was discontinued after reaching this number due to time constraints. Only self-reports were permitted for the measurement of each metric. Sampling was conducted using a non-probability technique to provide a reliable representation of the population if the units were appropriately chosen. The method involved obtaining samples that were conveniently accessible either near a physical site or through an internet service (Sarstedt et al., 2022). The collected data was analyzed using the PLS-SEM Smart PLS 3 method to test the research hypotheses (Baghaei & Ravand, 2016).

3.2 Measurement Scale

A 24-item questionnaire was developed to assess the variables of digital leadership, teachers' task performance, technology integration, digital literacy, and digital engagement in higher education institutions in Pakistan. The questionnaire incorporated well-developed scales from existing studies that were relevant to the research context. All items were measured using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Perceived Digital Leadership: A 3-item scale adapted from AlAjmi (2022) was used. Example items include "Facilitate a change that maximizes learning goals using digital resources" and "Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans." Teacher's Digital Engagement: A 4-item scale adapted from Li et al. (2022) was used. Example items include "I am immersed in my work" and "I can motivate students who show low interest in class." Teacher's Technology Integration: A 7-item scale adapted from Zhang et al. (2023) was used. Example items include "I feel confident I can help students when they have difficulty with the computer" and "I feel confident that I have the skills necessary to use the computer for instruction." Teacher's Digital Literacy: A 5-item scale adapted from Ustundag et al. (2017) was used. Example items include "I know how to solve my own technical problems" and "I can learn new technologies easily." Teacher's Task Performance: A 5-item scale adapted from Amin & Khan (2009) was used. Example items include "The quality of work in a pressure situation" and "The ability to reason and track motivating students."

4. Result

4.1 Demographics

These descriptive statistics provide an overview of the dataset and its measures, helping to summarize and understand the important characteristics of the variables in the study (Hair et al., 2020). Table 1 shows that 56% of teachers in higher education institutes in Pakistan are male, while 44% are female. The distribution of teachers' age shows that 28% are between 25-35 years old, 49% are between 35-45 years old, and 23% are above 45 years old. In terms of qualification, 69% of teachers hold an MS/M.Phil degree and 31% have a Ph.D. Regarding experience, 33% of teachers have 1-2 years of experience, 38% have 2-3 years of experience, and 29% have more than 3 years of experience in higher education institutes in Pakistan.

Table 1: Demographic profile

Demography	Description	No. of Responses	%
Gender	Male	220	56
	Female	170	44
Age	25-35	110	28
	35-45	190	49
	Above 45	90	23
Qualification	MS/M.Phil	270	69
	Ph.D.	120	31
Experience	1-2 Years	130	33
	2-3 Years	150	38
	More than 3 Years	110	29

4.2. Measurement model

4.2.1 Composite Reliability, Cronbach's Alpha

The measurement model's factor loadings, validity, and reliability are presented in Table 3. The internal consistency of the items was assessed using Cronbach's alpha, which should be 0.70 or higher (Fornell & Larcker, 1981). The Cronbach's alpha and composite reliability (CR) values for all variables exceeded 0.70, indicating high internal consistency. Additionally, the average variance extracted (AVE) values for discriminant validity were above 0.50, demonstrating convergence validity and reliability (Fornell & Larcker, 1981). The composite reliability values ranged from 0.829 to 0.904, indicating strong reliability.

Table 2: Composite reliability, Cronbach's Alpha and AVE values

Constructs	Cronbach's alpha	CR	AVE
Perceived Digital Leadership	0.707	0.835	0.629
Teacher's Digital Engagement	0.769	0.852	0.591
Teacher's Digital Literacy	0.703	0.831	0.623
Teacher's Task Performance	0.868	0.904	0.654
Teacher's Technology Integration	0.750	0.829	0.505

4.2.2 Discriminant Validity (HTMT)

Discriminant validity, which assesses the degree to which a latent variable differs from other latent variables, was examined using the heterotrait-monotrait (HTMT) ratio of correlations (Fornell & Larcker, 1981). HTMT values below 1 indicate good discriminant validity (Hair et al., 2020).

Table 3: Discriminant validity

	PDL	TDE	TDL	TTP	TTI
Perceived Digital Leadership	0.793				
Teacher's Digital Engagement	0.394	0.769			
Teacher's Digital Literacy	0.473	0.452	0.789		
Teacher's Task Performance	0.500	0.581	0.743	0.809	
Teacher's Technology Integration	0.198	0.366	0.285	0.234	0.710

Table 3 presents the HTMT values, indicating the discriminant validity of the constructs. All values in the diagonal are 1, representing the correlations between each construct with itself. The values outside the diagonal are below 1, demonstrating good discriminant validity.

4.3 Structural Equation Model

The PLS-SEM bootstrapping approach statistically determined the structural model route coefficients demonstrating the hypothesized relationships

4.3.1. PLs Algorithm

Figure 2 examines the external loading of the lower-order constructs in the PLS-SEM technique. Except for "TDL1, TDL2, TTI1, and TTI6," which have outside loadings below 0.40 (Hair et al., 2020), there are no issues with the other indicators. The Cronbach's alpha values for all constructs exceed 0.789, indicating high reliability. The measurement model demonstrates validity as the AVE values exceed the threshold of 0.50.

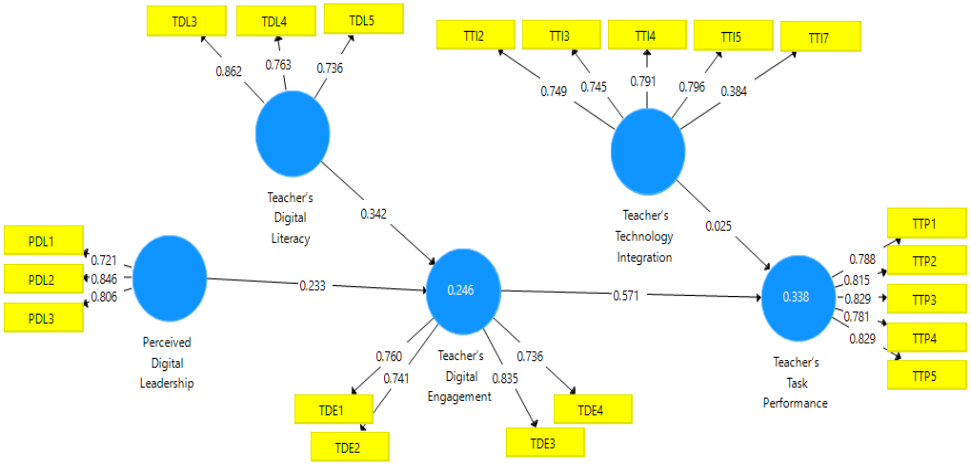

Figure 2: Assessment of Algorithm

4.3.2 Significance Analysis

The analysis examines the planned behavior theory, the moderating effects of teachers' technology integration and teachers' digital literacy on teachers' task performance in Pakistani higher education institutions, and the relationships between perceived digital leadership and teachers' digital engagement using PLS-SEM. The results indicate significant relationships between variables See Table 5. The relationship between perceived digital leadership and teachers' digital engagement is significant (β = 0.233, t = 3.494, p = 0.001), supporting Hypothesis 1. Additionally, the relationship between teachers' digital engagement and teachers' task performance is significant (β = 0.571, t = 11.086, p = 0.000), supporting Hypothesis 2.

Table 4: Relationship Decision

Relation	Original Sample	T Statistics	P Values	Decision
Perceived Digital Leadership -> Teacher's Digital Engagement	0.233	3.494	0.001	Supported
Teacher's Digital Engagement -> Teacher's Task Performance	0.571	11.086	0.000	Supported
Perceived Digital Leadership -> Teacher's Digital Engagement -> Teacher's Task Performance	0.133	3.149	0.002	Supported
PDL * TDL -> TDE	0.195	4.236	0.000	Supported
TDE * TTI -> TTP	0.198	3.084	0.003	Supported

Mediation involves a neutral third party facilitating the discussion of differences between parties (Hair et al., 2021). By introducing teachers' digital engagement as a mediating variable, the relationship between perceived digital leadership and teachers' task performance remains significant ($\beta = 0.133$, $t = 3.149$, $p = 0.002$), supporting Hypothesis 3.

Moderating variables are used when there is an inconsistent or weak link between independent and dependent variables (Hair et al., 2021). The moderating role of teachers' digital literacy between perceived digital leadership and teachers' digital engagement is significant ($\beta = 0.195$, $t = 4.236$, $p = 0.000$), supporting Hypothesis 4. Similarly, the moderating role of teachers' technology integration between teachers' digital engagement and task performance is significant ($\beta = 0.198$, $t = 3.084$, $p = 0.003$), supporting Hypothesis 5.

Hair et al. (2020) state that R^2 values between 0.13 and 0.67 can be classified as weak, moderate, and strong, respectively. The R^2 values in Figure 2 for teacher's digital engagement is 0.246, indicating a moderate explanation of variance. The R^2 value for teacher's task performance is 0.338, suggesting a moderate explanation of variance in this variable.

5. Discussion

The current study explores the relationship between digital leadership and teachers' task performance in higher education institutions of Pakistan. It also investigates the moderated-mediation model involving technology integration, digital literacy, and digital engagement, within the framework of planned behavior theory.

The results reveal a significant relationship between perceived digital leadership and teachers' digital engagement. Digital leadership plays a crucial role in facilitating teachers' adoption of digital learning approaches that align with the demands of their teaching activities. The compatibility between requirements and the use of technology in the classroom enhances student outcomes and improves teacher effectiveness. Previous studies have also emphasized the positive impact of teacher engagement on adopting effective teaching strategies in higher education institutions (AlAjmi, 2022; Downes & Bishop, 2012). Leaders must learn to utilize technology (AlAjmi, 2022) effectively. Furthermore, the findings demonstrate a significant relationship between teachers' digital engagement and task performance. Teachers' digital engagement, which is influenced by the availability of technology in their teaching environment, impacts their overall psychological commitment to their profession. Engaged teachers are likelier to perform effectively and demonstrate a solid dedication to their work. In an academic context, task performance refers to the teacher's role in assisting students in achieving the set learning objectives (Obadimeji & Oredein, 2022).

Moreover, the study highlights the mediating role of teachers' digital engagement between perceived digital leadership and teachers' task performance. When highly engaged in their work,

teachers demonstrate improved performance and a willingness to take on additional responsibilities. Engagement is influenced by individual and educational resources and factors like freedom and performance feedback (Han et al., 2016). Administrators should transition from traditional managerial roles to become leaders in curriculum and technology, aligning their actions with organizational goals and strategies (Howell & Silva, 2022). The results also indicate that teachers' digital literacy moderates the relationship between perceived digital leadership and their digital engagement. Support from the educational setting and faculty availability are crucial factors in developing teachers' digital literacy. Teachers with higher levels of digital literacy are better equipped to engage with digital tools and incorporate them effectively into their teaching practices (Andriani et al., 2018; Herminingsih & Supardi, 2017). Media literacy is also an essential aspect that influences technology integration among teachers (Hsu, 2010).

Furthermore, the study reveals teachers' technology integration's moderating role in digital engagement and task performance. Mentoring and professional development opportunities significantly enhance teachers' technology integration skills, allowing them to effectively incorporate technology into their curriculum without compromising instructional time. Successful technology integration requires specialized knowledge and skills beyond basic computer use (Limon & Nartgün, 2020).

In conclusion, the current study emphasizes the importance of digital leadership, engagement, digital literacy, and technology integration in enhancing teachers' task performance in higher education institutions. These findings contribute to our understanding of the complex dynamics between digital leadership, teacher engagement, and performance, shedding light on the significance of technology integration and digital literacy in the educational context.

5.1 Theoretical and Practical Implications

The findings of this study have several implications for teachers, administrators, and students in Pakistani higher education institutions who seek to enhance digital leadership, teachers' digital engagement, and the moderating role of digital literacy, technology integration, and task performance. Firstly, this study provides a unique perspective on how leadership influences teachers' motivation to learn and commitment to their work. It emphasizes the importance of teacher engagement as an indicator of their identification, involvement, and enthusiasm for their profession. Secondly, the study highlights the positive association between teachers' digital engagement and task performance, underscoring the significance of effective technology integration beyond mere computer use. Teachers must have subject-specific knowledge and skills to leverage technology in their teaching effectively. Various stakeholders, including the media, educational authorities, academic institutions, and parents, should encourage and support teachers using technology. However, the challenge lies in balancing technology integration with standardized testing requirements. Thirdly, the study elucidates the pathway for teachers to develop digital literacy through perceived digital leadership and engagement. Policymakers can support the advancement of digital leadership and technology integration in classrooms by improving existing regulations and fostering a conducive legal framework. This necessitates the engagement of all stakeholders in policy formulation. Lastly, the study highlights the crucial role of administrators in recognizing the importance of teachers' technology use and task performance. Institutions should prioritize technology integration to maximize individual potential and prepare students to navigate global challenges, changing markets, and evolving technologies.

5.2 Limitations and Future Research

This study has certain limitations that should be acknowledged when generalizing the findings. The focus solely on higher education institutions in Pakistan limits the applicability of the conclusions to other countries with different contexts and varying degrees of emphasis on digital leadership and technology integration. Future research could expand the scope to include institutions from other fields

and employ a longitudinal survey design to enhance generalizability. The small sample size, limited geographic scope, and convenience sampling process also hinder the global generalization of the study's results. Exploring the impact of teachers' digital literacy on perceived digital leadership and engagement could be a topic for future research.

Future studies could also explore other institutions, fields, and geographical areas to advance theoretical understanding. A mixed-method approach incorporating focus groups, surveys, and interviews could provide a more comprehensive understanding of cause-and-effect relationships. Using in-depth interviews with higher education administrators and leaders would yield valuable insights into perceived digital leadership and technology integration. Finally, future studies should address the limitations of the survey methodology employed in this research and explore additional dimensions of teachers' participation.

5.3 Conclusion

In conclusion, this study has made significant progress in achieving its objectives and provides valuable insights for decision-makers, organizations, management, and employees, particularly those involved in digital leadership in Pakistani higher education institutions. This study has made a significant contribution by incorporating the planned behavior theory into a comprehensive framework. It examines the mediating role of teachers' digital literacy and the moderating influence of technology integration on their engagement and task performance. Future research in technology integration can further explore the drivers of teachers' task performance and digital engagement, building upon the unique perspective offered by this study. The study confirms the implications of planned behavior theory, the moderated-mediation model of technology integration, digital engagement, and digital literacy in the task performance of teachers in Pakistani higher education institutions. This research provides important policy and theoretical insights for stakeholders and academics in leadership, satisfaction, and innovation. It underscores the significant impact of higher education institutions on adopting digital technology in the classroom. The challenges teachers face in implementing digital literacy in their work environment, such as access to digital equipment and internet connectivity, need to be addressed. Ultimately, teachers' effective utilization of available tools and media to achieve educational goals is of utmost importance.

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