THE CAUSAL EFFECT OF DIGITAL LEADERSHIP ON TEACHERS' ACCEPTANCE AND USE TECHNOLOGY IN HUAIHUA NO.5 MIDDLE SCHOOL

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ABSTRACT
The objective of this research is 1) To investigate and verify the congruence of the model. 2) To investigate the direct effect of digital leadership on teachers' technology acceptance at Huaihua No.5 Middle School. And 3) To investigate the indirect effect of effort expectation, performance expectation, social influence, and facilitating condition between digital leadership and behavioral intention to use technology among teachers at Huaihua No.5 Middle School. The population used in the research consists of teachers at Huaihua No.5 Middle School. Data is collected using a questionnaire from a sample group of 200 individuals, selected through convenient sampling. Data analysis includes frequency, percentages, mean, and standard deviation, along with hypothesis testing using the Multiple Indicators, Multiple Causes (MIMIC) model.
The research findings reveal that the structural equation model of the causal effect of digital leadership on teachers' acceptance and use of technology at Huaihua No.5 Middle School is congruent with empirical data. This is evidenced by a Chi-square value of 38.503, a p-value of 0.011, a Chi-square/df ratio of 1.833, GFI of 0.965, AGFI of 0.908, NFI of 0.989, CFI of 0.995, and RMSEA of 0.049. Statistically significant direct effects of Digital leadership on Behavioral intention to use technology at Huaihua No.5 Middle School were found at levels ranging from .034 to .000, with a predictive power of 89 percent. Additionally, Digital leadership exerts a positive indirect influence on Behavioral intention to use technology at Huaihua No.5 Middle School through Effort expectation, Performance expectation, Social influence, and Facilitating condition, with an indirect effect size of -0.019.
Keywords: Digital Leadership, Teachers' Acceptance and Use Technology, Huaihua No.5 Middle School

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INTRODUCTION

In recent years, digital technology has played a central role in transforming education, with distinct phases of development. The rapid advancement of digital and communication technology has interconnected nations through the internet, shifting the focus in education towards technological advancements and efficiency (Bates, 2019). Many experts see multimedia, data, and network communication as having significant potential in digitizing education, facilitating comprehensive reforms to meet the demands of a technology-driven society (Selwyn, 2017). The goal of educational digitization is to use existing computer technology to create more engaging classrooms and accessible course content. As research on digital technology deepens, scholars have broadened their understanding beyond technology alone, encompassing individuals, management groups, and institutional development (Fullan, 2016).

Some consider educational digitization a fundamental structural factor that integrates useful information into education, promoting modernization across various domains (Bejinaru, 2019). This transformation emphasizes data analysis and effective application of multimedia digitization. Educational information, seen as a system engineering project, goes beyond internet and computer data, encompassing reforms in education's organization, content, technology, evaluation, environment, mode, and concept. Its understanding has evolved from a technological level to organizational and institutional cooperation (Bonk & Khoo, 2014). Similar to the dynamic nature of social information, multimedia digitization in education is an ongoing, exploratory process, requiring continuous improvement by educational managers in practice (Bates, 2015).

Digital leadership in education is vital for enhancing teachers' acceptance and use of technology, leading to improved teaching quality and student learning outcomes, through strategies such as professional development, resource provision, and fostering a positive digital learning environment (Sunu, 2022). According to Hamzah, Nasir and Wahab (2021), digital leadership is as a leadership style in which leaders support and motivate teachers' technology acceptance and use through technology integration. Zhong (2016) study investigates the impact of digital leadership on teachers' technology acceptance and use, emphasizing that digital leadership encompasses not only technology integration skills but also the establishment of a tech-supportive school culture and continuous professional development opportunities.

The importance of digital leadership is reflected in its role in promoting educational reform and innovation. According to Ribble (2015), digital leadership is defined as the competencies and skills that enable educators to effectively use technology to support and enhance learning. Digital leadership not only includes the proficient use of technology, but also includes insight into educational development trends, the ability to integrate technology, and the ability to reflect on teaching practices. If teachers possess digital leadership capabilities, they will be able to better adapt and respond to the ever-changing educational environment and student needs and promote the improvement of school teaching quality (Harris & Jones, 2017).

Hence, in pursuit of optimizing the educational experience within the school and establishing a digitalized information learning environment, it becomes imperative to provide students with access to personal learning devices, including multimedia touch-screen TVs, laptops, tablets, and smartphones. Equally essential is the establishment of high-speed internet connectivity, enabling students, parents, and educators to access information seamlessly throughout the school premises. Furthermore, the teaching staff requires fast and reliable internet access to effectively support student learning. In their roles as school administrators responsible for overseeing the internet and digital information system, it is paramount to ensure data security and timely accessibility for all school teams. Given the significance and rationale outlined above, researchers are motivated to investigate the extent of information equipment coverage and the planning and management competencies of Huaihua No.5 Middle School

administrators. The primary objective of this research is to furnish crucial insights for the development and administration of an information-rich internet environment within the school. The research objective is to study digital leadership's impact on teachers' acceptance and use of technology at Huaihua No.5 Middle School.

LITERATURE REVIEWS

Concept and theories of Digital leadership is a dynamic and evolving concept that has gained significant attention in the field of educational leadership and management (DePietro et al., 2017). In an era marked by rapid technological advancements, the role of leaders in educational institutions has been redefined to encompass not only traditional leadership qualities but also a deep understanding of digital tools and their impact on teaching and learning (Harris et al., 2017). The dimension of digital leadership including 1) Technological proficiency: At the heart of digital leadership lies technological proficiency, encompassing the ability to effectively utilize digital tools, software, and hardware (Ribble, 2015). 2) Visionary leadership: Digital leadership is inherently future-oriented. Leaders in this domain are expected to have a clear vision of how technology can transform education, improve outcomes, and enhance the overall learning experience (Sheninger, 2014). 3) Digital citizenship: Digital leaders promote responsible and ethical use of technology, not only among students but also within the entire educational community (Ribble, 2015). And 4) Data-driven decision making: Digital leadership involves harnessing the power of data for informed decision-making (Harris et al., 2017).

Concept and theories of Unified theory of acceptance and use of technology is a contemporary framework that has significantly shaped the understanding of technology adoption and utilization. Initially proposed by Venkatesh et al. (2003), UTAUT integrates and extends several preceding technology acceptance models and theories, offering a comprehensive perspective on the factors influencing individuals' acceptance and use of technology. Core constructs of UTAUT including 1) Performance expectancy 2) Effort expectancy 3) Social influence and 4) Facilitating conditions. Since its inception, UTAUT has evolved and adapted to various contemporary contexts. For instance, the model has been utilized to examine technology adoption in healthcare (Holden & Karsh, 2010), e-learning environments (Venkatesh et al., 2016), and mobile applications (Venkatesh et al., 2012). Researchers have also extended UTAUT by incorporating additional variables, such as trust and perceived risk, to enhance its explanatory power in complex technological settings (Venkatesh et al., 2012).

The relationship between Digital leadership and technology acceptance has emerged as a critical area of inquiry within the educational leadership landscape. Digital Leadership, characterized by visionary leadership, technological proficiency, and the promotion of responsible digital citizenship (Harris et al., 2017; Sheninger, 2014), plays a pivotal role in influencing educators' attitudes and willingness to embrace technology (Ertmer, 2018). Research suggests that effective Digital Leadership positively impacts teachers' acceptance and use of technology in educational settings (Ertmer, 2018; Ribble, 2015). Leaders who model technology integration, provide professional development opportunities, and foster a culture of innovation tend to enhance educators' perceptions of technology's utility and ease of use, aligning with core UTAUT constructs (Venkatesh et al., 2003). The relationship between Digital Leadership and technology acceptance remains a dynamic area of investigation, shedding light on the significant role of leadership in shaping technology adoption within educational institutions.

Research hypothesis

H1: The model examining the causal effect of digital leadership on teachers' technology acceptance in Huaihua No.5 Middle School is congruent with the empirical data.

H2: Digital leadership has direct effect on teachers' technology acceptance in Huaihua No.5 Middle School.
H3: Effort expectation, performance expectation, social influence, and facilitating condition has indirect effect between digital leadership on behavioral intention to use technology of teacher in Huaihua No.5 Middle School.

Conceptual framework

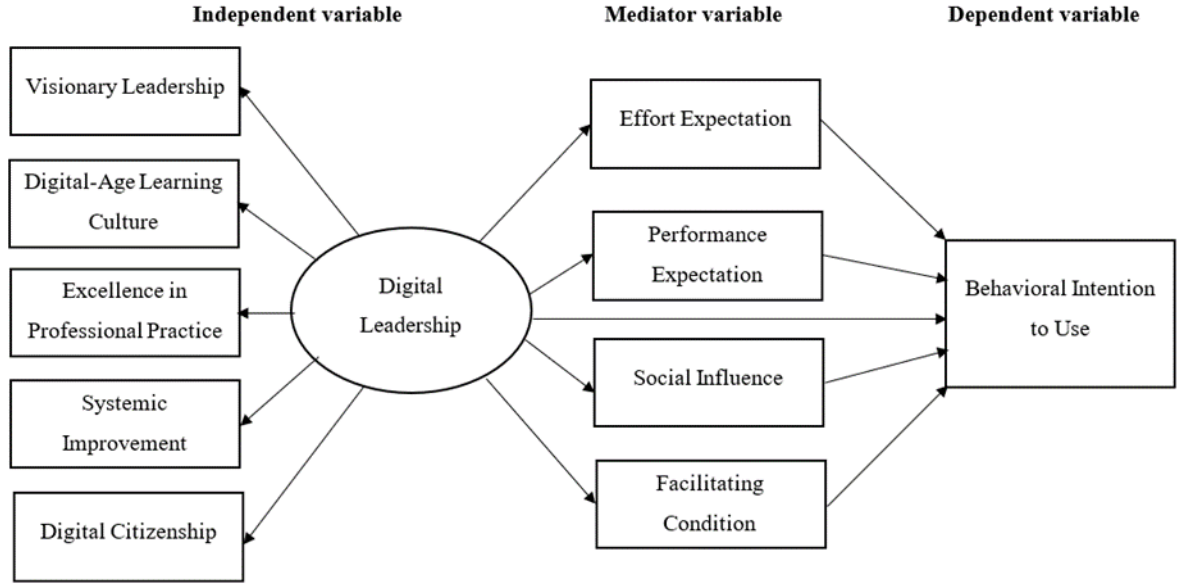


Figure 1 Conceptual framework

RESEARCH METHODOLOGY

The population used in this study consists of teachers at Huaihua No.5 Middle School, totaling 204 individuals. The determination of the sample size in this study takes into consideration a sufficient sample size for estimating parameters or the number of observable variables. In this research, there are a total of 10 observable variables. Hair, Black, Babin, and Anderson (2010) have suggested that the determination of observable variables in structural equation models should consider a ratio of 20 times the number of observable variables. Therefore, the adequate and suitable sample size for this research is 200 samples. The researchers have established a convenient non-probability sampling method by distributing questionnaires to respondents until the specified number is reached.

Research tools utilized in this study comprised a questionnaire designed for data collection, which included the following components: 1) The questionnaire collected personal information from respondents and was structured as a closed-ended questionnaire with multiple-choice questions. 2) The primary focus of the questionnaire was to evaluate Digital Leadership, assessing the leadership qualities of educational administrators through self-assessment. This assessment encompassed five dimensions and included a total of 21 questions. 3) Additionally, the questionnaire aimed to assess Teachers' Acceptance and Use of Technology at Huaihua No.5 Middle School through self-assessment. This evaluation covered five observable variables and consisted of a total of 20 questions. Lastly, 4) respondents were provided with the opportunity to offer suggestions and additional comments.

Data collection from two distinct sources: primary data and secondary data. Primary data was obtained directly for this study through the collection of responses from a sample group comprising 200 teachers at Huaihua No.5 Middle School, employing questionnaires as the data collection tool. In contrast, secondary data encompassed information gathered from diverse sources such as books, journals, articles, theses, research reports, and online resources.

Secondary data played a pivotal role in shaping the theoretical framework, facilitating the literature review process, and aiding in the development of research instruments.

The data analysis and hypothesis testing in this study involved two key approaches. Firstly, descriptive statistics were employed for a preliminary analysis of the sample group data, which was presented in the form of a frequency distribution table, percentages, mean values, and standard deviations. Secondly, hypothesis testing was carried out using the Multiple Indicators, Multiple Causes (MIMIC) model to examine the relationships and causal factors within the data.

RESEARCH RESULTS

The research results revealed that the majority of respondents were male (120 people or 60.00%). Most fell within the age range of 31 to 40 years old (80 people or 40.00%). Additionally, 110 people (55.00%) held a Bachelor's degree, while 54 people (27.00%) reported an income of less than 3,000 CNY or between 3,001 and 4,000 CNY. Furthermore, 65 people (32.50%) had 1 to 5 years of work experience. The analysis of respondents' opinions revealed that their overall perception of Digital Leadership was at a high level ($\overline{X} = 4.13$, SD = 0.85). The specific aspects, arranged from the highest to lowest average, were as follows: Visionary leadership, Digital-age learning culture, Excellence in professional practice, Systemic improvement, and Digital citizenship. Regarding teachers' acceptance and use of technology at Huaihua No.5 Middle School, the overall opinion was at a high level ($\overline{X} = 4.06$, SD = 0.96). The averages in descending order were as follows: Effort expectation, Behavioral intention to use, Social influence, Performance expectation, and Facilitating conditions.

Hypothesis testing results

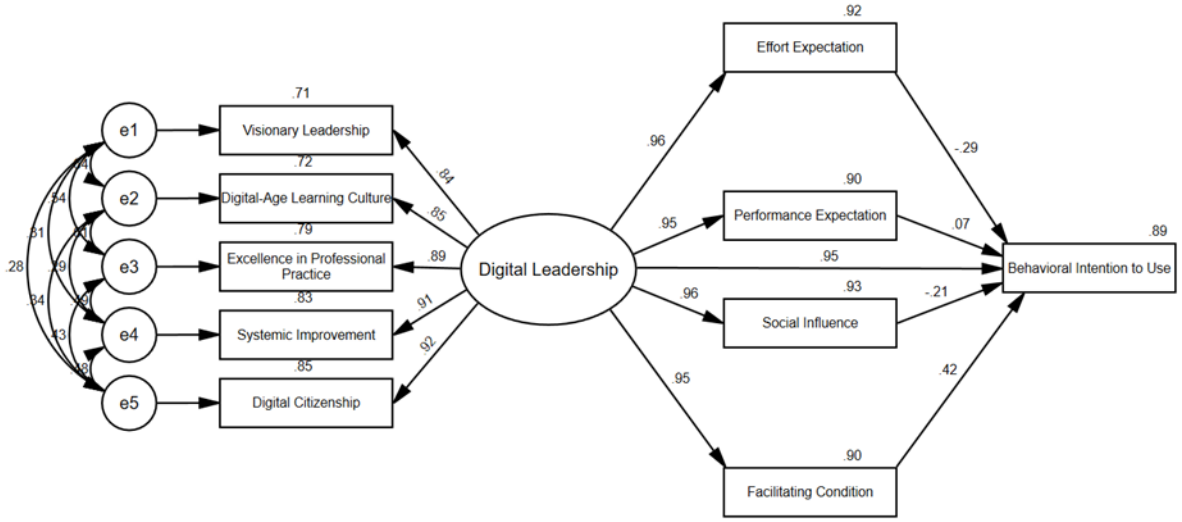
1) The results of hypothesis testing for the measurement model are as follows:

Table 1 Shows the overall reliability of latent variables and the extracted variance

Variables/Components	Factor Loading	R^2	CR	AVE
Digital leadership			0.97	0.87
- Visionary leadership	0.92	0.85		
- Digital-age learning culture	0.93	0.86		
- Excellence in professional practice	0.96	0.92		
- Systemic improvement	0.93	0.86		
- Digital citizenship	0.93	0.86		

From Table 1, it is evident that the observed variables used to measure the latent variable 'Digital Leadership' in this model exhibit factor loadings ranging from 0.92 to 0.96. These loadings effectively explain the variance, ranging between 0.85 and 0.92. The total reliability of the latent variables, as indicated by Composite Reliability (CR), is 0.97, surpassing the recommended threshold of 0.7. Additionally, the Average Variance Extracted (AVE) is 0.87, exceeding the minimum threshold of 0.5. Thus, the composite is considered reliable according to established criteria (Henseler, Hubona, & Ray, 2016).

2) Structural Model Testing



Chi-square = 38.503, df = 21, p-value = 0.011, Chi-square/df = 1.833, GFI = 0.965, AGFI = 0.908, NFI = 0.989, CFI = 0.995, RMSEA = 0.049

Figure 2 Results of the Structural Model Analysis

Figure 2, depicts the results of the Structural Model Analysis, focusing on the causal relationship between digital leadership and teachers' acceptance and use of technology at Huaihua No.5 Middle School. The model aligns well with empirical data, evidenced by a Chi-square value of 38.503 and a p-value of 0.011. The Chi-square/df ratio is 1.833, meeting established criteria. Key goodness-of-fit indices further support the model: GFI (0.965), AGFI (0.908), NFI (0.989), CFI (0.995), and RMSEA (0.049). These values surpass standard benchmarks, indicating a robust fit between the proposed model and the observed data. Detailed test results are presented in Table 2.

Table 2 Shows the results of the Structural Model Testing of the causal impact of digital leadership on teachers' acceptance and use of technology at Huaihua No.5 Middle School.

Independent variables	**Dependent variables**	**b**	**S.E.**	**β**	**C.R.**	**p-value**
Digital leadership	Effort expectation	1.068	0.039	0.960	27.156	.000***
	Performance expectation	1.119	0.043	0.948	25.779	.000***
	Social influence	1.072	0.039	0.964	27.522	.000***
	Facilitating condition	1.134	0.043	0.951	26.080	.000***
	Behavioral intention to use	1.117	0.527	0.950	2.121	.034*
Effort expectation	Behavioral intention to use	-0.306	0.158	-0.290	-1.940	.052
Performance expectation	Behavioral intention to use	0.065	0.118	0.066	0.553	.580
Social influence	Behavioral intention to use	-0.217	0.169	-0.205	-1.281	.200
Facilitating condition	Behavioral intention to use	0.409	0.123	0.415	3.339	.000***

*** Statistically significant at the .001 level.
** Statistically significant at the .01 level.
* Statistically significant at the .05 level.

From Table 2, it is observed that Digital Leadership exhibits a direct impact on Behavioral Intention to use technology at Huaihua No.5 Middle School, with statistical significance at .034. Additionally, Digital Leadership directly influences Effort Expectation, Performance

Expectation, Social Influence, and Facilitating Condition in Huaihua No.5 Middle School, all with statistical significance at the .000 level. Moreover, in the context of teachers' acceptance and use of technology, Facilitating Condition has a direct impact on Behavioral Intention to use technology in Huaihua No.5 Middle School, demonstrating statistical significance at the .000 level. This relationship accounts for a predictive power of 89 percent.

Table 3 Shows the values of direct effect, indirect effect, and total effect.

Independent variables	Effect	Dependent variables				
		Effort expectation	Performance expectation	Social influence	Facilitating condition	Behavioral intention to use
Digital leadership	DE	0.960	0.948	0.964	0.951	0.950
	IE	-	-	-	-	-0.019
	TE	0.960	0.948	0.964	0.951	0.931
Effort expectation	DE	-	-	-	-	-0.290
	IE	-	-	-	-	-
	TE	-	-	-	-	-0.290
Performance expectation	DE	-	-	-	-	0.066
	IE	-	-	-	-	-
	TE	-	-	-	-	0.066
Social influence	DE	-	-	-	-	-0.205
	IE	-	-	-	-	-
	TE	-	-	-	-	-0.205
Facilitating condition	DE	-	-	-	-	0.415
	IE	-	-	-	-	-
	TE	-	-	-	-	0.415

DE = Direct Effect, IE = Indirect Effect, TE = Total Effect

From Table 3, it is evident that Digital Leadership exerts a positive direct effect on teachers' acceptance and use of technology in Huaihua No.5 Middle School across all dimensions, including Effort Expectation (0.960), Performance Expectation (0.948), Social Influence (0.964), Facilitating Condition (0.951), and Behavioral Intention to use (0.950). Furthermore, Effort Expectation, Performance Expectation, Social Influence, and Facilitating Condition each exhibit a positive direct effect on Behavioral Intention to use technology in Huaihua No.5 Middle School, with values of -0.290, 0.066, -0.205, and 0.415, respectively. Additionally, Digital Leadership demonstrates a positive indirect effect on Behavioral Intention to use technology in Huaihua No.5 Middle School through Effort Expectation, Performance Expectation, Social Influence, and Facilitating Condition, with an indirect effect value of -0.019. Consequently, Digital Leadership has an overall positive effect on Behavioral Intention to use technology in Huaihua No.5 Middle School, with a total effect value of 0.931.

DISCUSSION & CONCLUSION

Conclusion

This research found that the majority of respondents were male, aged 31-40 years, holding a Bachelor's degree. The majority also reported an income of less than 3,000 CNY and 3,001-4,000 CNY, with 1-5 years of work experience. The analysis of respondents' opinions revealed that, overall, their views on Digital Leadership and teachers' acceptance and use of technology at Huaihua No.5 Middle School were consistently at a high level. The results of the hypothesis testing indicate that the Structural Model assessing the causal effect of digital leadership on teachers' acceptance and use of technology in Huaihua No.5 Middle School aligns with the

empirical data. The model exhibits a Chi-square value of 38.503, a p-value of 0.011, a Chi-square/df ratio of 1.833, GFI of 0.965, AGFI of 0.908, NFI of 0.989, CFI of 0.995, and RMSEA of 0.049, all meeting the required criteria. Digital leadership has a direct effect on Behavioral Intention to use technology in Huaihua No.5 Middle School, reaching statistical significance at .034. Additionally, it has a direct effect on Effort Expectation, Performance Expectation, Social Influence, and Facilitating Condition in Huaihua No.5 Middle School, all statistically significant at the .000 level, with a predictive power of 89%. Moreover, Digital leadership demonstrates a positive indirect effect on Behavioral Intention to use technology in Huaihua No.5 Middle School through Effort Expectation, Performance Expectation, Social Influence, and Facilitating Condition, showing an indirect effect value of -0.019. As a result, Digital leadership has an overall positive effect on Behavioral Intention to use technology in Huaihua No.5 Middle School, with a total influence value of 0.931.

Discussion

The findings of this research provide compelling evidence for the model asserting the causal effect of digital leadership on teachers' technology acceptance at Huaihua No.5 Middle School. The consistency between the proposed model and empirical data can be attributed to several key factors. Firstly, it is essential to acknowledge that digital leadership, characterized by visionary leadership, technological proficiency, and the promotion of responsible digital citizenship, aligns with contemporary best practices in educational leadership (Harris et al., 2017; Sheninger, 2014). These attributes resonate with the expectations and needs of educators in an increasingly technology-driven educational landscape. As a result, when educational administrators exhibit digital leadership qualities, teachers are more likely to perceive the benefits and ease of technology adoption, as supported by the Performance Expectancy and Effort Expectancy constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

Furthermore, the consistency between the model and empirical data can be substantiated by previous research that supports the pivotal role of digital leadership in fostering technology acceptance among educators. Ertmer (2018) emphasized the significance of digital leadership in stimulating teachers' technological motivation, enhancing their confidence and ability in technology use, and positively influencing their attitudes and concepts toward technology. These findings corroborate our research, showcasing the tangible impact of digital leadership on teachers' technology acceptance.

Moreover, studies examining technology adoption in educational settings have consistently highlighted the importance of visionary leadership in creating a conducive environment for technology integration (Ribble, 2015). The vision set forth by digital leaders aligns with the Performance Expectancy construct, where educators perceive the usefulness of technology in enhancing their teaching practices and student learning outcomes.

Implications of the study

First, the study underscores the critical role of digital leadership in educational institutions. Educational administrators at all levels, including school principals and district-level leaders, should recognize the importance of developing and nurturing digital leadership qualities. This involves not only proficiency in technology but also visionary leadership, promoting responsible digital citizenship, and fostering a culture of innovation. Educational leadership training programs and professional development should incorporate these elements to prepare leaders for the ever-evolving educational landscape.

Secondly, the findings emphasize the need for educational institutions to adopt technology integration strategies guided by digital leadership principles. These strategies should focus on providing educators with the necessary training and support to enhance their technological confidence and skills. Moreover, leaders should actively engage in creating a vision for

technology integration that aligns with educators' perceptions of the utility and ease of technology use.

Thirdly, policymakers in the education sector should take into account the empirical evidence linking digital leadership and technology acceptance among teachers. The findings highlight the potential positive impact of policy decisions that encourage and support digital leadership development. Policymakers should consider initiatives that recognize and reward educational leaders who exemplify digital leadership qualities and facilitate technology integration in schools.

Finally, Schools and educational authorities should prioritize ongoing professional development opportunities that empower educators to embrace technology effectively. This includes training programs, workshops, and access to resources that promote technological proficiency and innovation. Digital leaders can play a pivotal role in shaping these professional development initiatives.

Future Research

The study opens avenues for further research into the nuanced aspects of digital leadership and its influence on technology acceptance. Future studies can delve deeper into specific leadership behaviors and strategies that have the most significant impact on educators' technology acceptance. Additionally, comparative research across different educational contexts and institutions can provide valuable insights into the generalizability of these findings.

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