Research Article

Educational Administration Theory and Practice

The Impact of Teachers' Self-Efficacy and Teachers Training and Education on Information Communication Technology Competency with Mediation Role of Digital Leadership

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ARTICLE INFO	ABSTRACT
	When the education system was overwhelmed by the COVID-19 pandemic, school principals had to take on the mantle of digital literacy by ensuring that teachers and learners attained and utilized digital tools and platforms. Teachers and students should be prepared to integrate information and communication technology competency into their future teaching and learning practices. The motivation of this paper is to raise the concern for teaching and learning experience. As a complex adaptive system that is receptive to knowledge, creativity and learning build a leadership framework that enhances an institutional ability. This study aims to explore the impact of information and communication technology competency on digital leadership among school principals on teachers. Data was collected from 250 individuals of Chinese colleges and universities. This research will be based on a nonprobability sampling method that will be convenience sampling, gathering solid information from respondents. Smart-PLS has been used for analysis. The analysis of the data shows that teachers' self-efficacy and teachers' training and education have a significant and positive impact on information communication technology. The study is useful for educational institutes, faculty members, and students in information communication technology by focusing on the above factors. Future studies can identify other factors which have the significant effect on the relationship between leadership and information communication technology in any educational institutes. **Keywords:** Information Communication Technology Competency, Digital Leadership, Organizational Commitment, Teachers' Self-Efficacy, Teachers' Training and Education.

INTRODUCTION

Information communication technology (ICT) refers to all methods for handling and disseminating information as well as their use, particularly in the field of education. For instance, desktops, mobile telephony, projection technology, digital recording equipment, software applications, multimedia resources, information systems, Intranet, Internet, tablets, PCs, e-readers, laptops, etc., offer a lot of opportunities as well as challenges for education generally, particularly the technical aspects of the teaching and learning process (Lawrence & Tar, 2018). The future use of information and communication technology (ICT) in teaching and learning should be anticipated by student teachers. Fewer teachers want to incorporate ICT Competency into their teaching practices despite growing availability and encouragement for doing so (Sang, Ringle, Smith, Reams, & Hair Jr, 2010).

General observations have been made in this body of literature that student teachers today appear to be proficient and active in using technologies, which has been attributed to the prolonged period of "new experiences" and new environments where young people can easily relate themselves to a set of technologies (So, Choi, Lim, & Xiong, 2012). A key tool for education and school improvement today is networking, which is made possible by information technology. This is because connections made through networks open up a variety of opportunities for teachers to build their pedagogical skills (Kankaanranta, 2001). To prepare students for life in a complicated and changing world, one of higher education's main goals is to encourage students' critical thinking (CT) Indeed, having CT skills has been linked to higher employment rates, better financial standing, and greater civic engagement (Janssen et al., 2019). One of the few teacher traits that consistently correlates with student accomplishment is teachers' feeling of efficacy, or "their belief in their ability to have a positive effect on student learning" (Woolfolk, Rosoff, & Hoy, 1990). It's difficult to teach in an international school. While still adjusting to a new culture and language, new instructors are required to learn numerous new systems and technology, develop lessons from curricula they may not be familiar with, and start making preparations for the first day of class (Johnson, 2022). A person's belief in their ability "to organise and execute the courses of action required to obtain specific attainments" is known as self-efficacy. Self-efficacy ratings vary by activity category and teacher. The phrase "self-efficacy" refers to a teacher's confidence in their ability to support desired student outcomes, such as learning and engagement, or their confidence in their ability to take the necessary steps to complete a specific teaching assignment (Woodcock, Sharma, Subban, & Hitches, 2022).

Faculty development courses are commonly used by universities and other higher education organisations to increase the knowledge and abilities of their teaching staff. These faculty development programmes frequently continue to be unproductive because participants do not completely use the knowledge they have acquired in their lectures, classes, and seminars. The use of learned knowledge and abilities in the job is referred to as the transfer of training (Gegenfurtner, 2019). The labour market's requirements are evolving as a result of the global knowledge-based economy, and it is crucial to meet the public's need for greater education and training. Thus, it is generally agreed that lifelong education and training are essential for citizens to actively and successfully interact in knowledge-based and globalised societies (Aleandri & Refrigeri, 2014). In-service training programmes and continuous professional development for teachers have gained consistency over the past several years, and this is reflected in a variety of initiatives at the educational level (Ciolan, 2013). ICT competency is transforming education and how students learn, and it is prioritized when it comes to educating students who have particular assistance needs. Students had to get used to using online platforms and video conferencing tools to virtually attend classes, which required them to adapt to remote learning approaches in COVID-19. This transformation presented issues with internet accessibility, technological know-how, and the requirement for self-control and time management (Palomino, 2017). Managing a variety of areas, including curriculum development, faculty management, student services, and infrastructure upkeep, was a part of higher education administration prior to COVID-19. In order to make the school run smoothly, administrators strove to establish favourable learning environments. The problem of adjusting to remote learning and overseeing the supporting technology infrastructure arose after COVID-19 for the education sector. Administrators had to decide how to migrate to online platforms, allocate resources for technology, train staff for online courses, and provide assistance for students' technological requirements (AlAjmi, 2022).

Research Objectives

1. To examine the impact of information communication technology competency on digital leadership with the mediating role of teachers' self-efficacy.

2. To examine the impact of information communication technology competency on digital leadership with the mediating role of teachers' training and education.

LITERATURE REVIEW

Information Communication Technology Competency

Additionally, attitudes have a significant impact on how individuals interact with one another within groups and organizations. If ICT competency is considered to be a workplace innovation, then the diffusion of the innovation framework appears to be pertinent for describing the process that leads teachers to embrace and use ICT competency in their classrooms to support their classroom instruction (Player-Koro, 2012). ICT competency tools are enablers in the learning dynamic, in terms of not only content appropriation when developing students' key competencies but also creating appealing spaces that invite interaction and information exchange (Palomino, 2017).

There's little question that society wants youngsters to use digital tools primarily for their prospective educational benefits. Books, writing, telephone, television, photography, databases, games, and other formerly distinct instructional methods are all brought together by information and communication technology (ICT) competency. As a result, they connect different types of information and literacy, as well as different learning environments like homes, schools, workplaces, and communities (Livingstone, 2012).

How to gauge and foretell student teachers' intent to integrate ICT competency is of particular interest to scholars in teacher education. The research by Sang, Valcke, Van Braak, and Tondeur (2010), empirically examined the complex nature of beliefs, efficacy, and attitude and how various factors have a direct or indirect impact on student teachers' intention to use technology in future teaching, is a good example of such an attempt at ICT competency (So et al., 2012).

Although there is more ICT competency hardware available, schools are supporting ICT competency integration, and teachers are more aware of the value of ICT competency use in education, relatively few teachers are eager to include ICT competency into their teaching activities. In addition to technical expertise and skills, other elements appear to be important for teachers to successfully integrate technology. For example, emphasis was placed on teachers' knowledge, attitudes, and beliefs because they "influence what they choose to do in their classrooms and explain the core of instructional methods that have survived over time" (Sang et al., 2010).

Digital Leadership

The ability of the leaders to develop, manage, guide, and apply ICT competency knowledge to enhance the performance of their institutions is a key component of the digital leadership paradigm. Digital leadership is the adoption and application of leadership strategies that are appropriate for the digital age, including dependence on cutting-edge technological platforms. Digital leadership calls for a high level of innovation (AlAjmi, 2022). Emerging technologies such as big data analytics, the Internet of Things, artificial intelligence, machine learning, and other advancements have had a profound and far-reaching influence on multiple domains of society. This includes organizational culture, labor dynamics, strategic decision-making processes, work methodologies, and even the structure and operations of government institutions (Chatterjee, Chaudhuri, Vrontis, & Giovando, 2023).

ICT proficiency has had an influence on almost every part of our society. ICT competency is pervasive everywhere in the business world, in the workplace, and at home. Many nations have committed significant resources to integrate ICT competency into education to make sure that schools stay up with these societal changes and fully utilise ICT competency with great potential for teaching and learning (Arokiasamy, bin Abdullah, & Ismail, 2014). Many studies have been conducted on the use of ICT competency in schools, but very few focus on the connection between ICT competency's meaningful use and the influence of leadership techniques on it. The ultimate goal of adopting ICT competency is to enable successful learning transformation, inspire teachers to include ICT competency into their teaching approaches, and motivate students to use ICT competency in daily life (Qureshi, 2013). Numerous researches have suggested that school principals' use of technology influences instructional technology integration, which benefits student achievement and development (AlAjmi, 2022).

Teachers' Self-Efficacy

Sang et al. (2010) defined self-efficacy as "beliefs in one's capacities to plan and carry out the actions necessary to obtain specific attainments." According to Tschannen-Moran and Hoy (2001), teacher self-efficacy is "a teacher's assessment of his or her abilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated." This definition is consistent with the general definition.

It is not intended by the examination of how perceived self-efficacy affects performance that has just been done that anticipation is the only factor that determines conduct. If the component capabilities are missing, expectation alone won't result in the expected performance. Furthermore, many things that people may accomplish with a high possibility of success go uncompleted because they lack motivation. However, when given the correct skills and incentives, effacing expectations is a crucial influence in deciding people's choice of activities, the amount of effort they will put forth, and the length of time they will put forth effort in coping with stressful situations (Dittmer, 1977).

Self-efficacy for instructional strategies (e.g., perceived ability to use a variety of strategies to increase and assess student understanding), self-efficacy for classroom management (e.g., perceived ability to manage student behaviour, particularly disruptive behaviour), and self-efficacy for student engagement (e.g., perceived ability to motivate students to participate in class activities) are the most common ones (Symes, Lazarides, & Hußner, 2023).

Teachers' Training and Education

Teachers must have the necessary knowledge and a good attitude toward teaching a subject to be able to instruct and guide pupils in it. They must also believe that the subject is very relevant to teaching and that they are capable of doing so (Janssen et al., 2019).

A lot is riding on each of the 6 million teachers in Europe and their knowledge, abilities, and attitudes. After all, the effectiveness of their instruction directly affects the level of achievement and the learning experiences of their students. Teachers are under more and more pressure, and their jobs are changing substantially. Systems for teacher education must ensure that all educators may acquire the knowledge and skills they need and have access to the assistance they require throughout their careers (Aleandri & Refrigeri, 2014).

The students and learning environments in our schools have recently undergone an extensive, ongoing transformation, which has coincided with shifting expectations for the teaching profession. Some of these requests are reasonable and easily explicable because they are simply responses to how educational institutions have changed and evolved. However, other requirements are more novel and inventive, raising questions about the overall professional identity of instructors (Ciolan, 2013).

Hypothesis Developments

This study aims to explore the impact of digital leadership among school principals on teachers' technology integration (AlAjmi, 2022). This study investigates the influence of digital workplace on organization performance and the moderating role of digital leadership capability in digitally transforming the workplace (Chatterjee et al., 2023). The review highlights the role of pedagogy and suggests that teachers' beliefs about teaching and learning with ICT competency are central to integration (Mumtaz, 2000). This research is a case study of a private school system in Lahore which aims to get an insight into the impact of leaders on the meaningful use of ICT competency in teaching and learning (Qureshi, 2013). School leaders are key factors in the implementation of information and communication technology (ICT) competency in schools. They need to understand the capacities of the new technologies, have a personal proficiency in their use, and be able to promote a school culture that encourages the exploration of new techniques in teaching, learning and management (Arokiasamy et al., 2014).

H1: Information Communication Technology Competency has a significant effect on Digital leadership.

This paper examined the relationship between 41 primary teachers' self-efficacy and inclusive education practices (Woodcock et al., 2022). This study examines how comprehensive teacher training affects the delivery of the reformed entrepreneurship curriculum (Blimpo & Pugatch, 2019). This paper aims to focus on pedagogical debate and educational research about the crucial role of teachers' education and training (Aleandri & Refrigeri, 2014). This study aimed to analyze the perceptions that prospective Early Childhood and primary teachers have about using ICT for inclusion in the ordinary classroom (Palomino, 2017).

H2: Teachers' Self-Efficacy has a significant effect on Digital Leadership.

The purpose of this study is to look at the complexities of prior experiences with ICT Competency, pedagogical beliefs, and attitudes towards ICT Competency in education that Net Generation student instructors have regarding their intention to teach and learn with technology (So et al., 2012). The goal of this research is to determine the elements that may impact teachers' decisions to embrace and incorporate ICT Competency into the teaching and learning process (Lawrence and Tar, 2018). The goal of this research was to see if there was a link between instructors' feelings of efficacy and their general attitudes about how to manage, control, and inspire pupils. A second goal was to examine the construct of efficacy itself (Woolfolk et al., 1990).

H3: Teachers' Training and Education have a significant effect on Digital Leadership.

H4: Teachers' Self-Efficacy mediates the relationship between Digital Leadership and Information Communication Technology Competency.

H5: Teachers' Training and Education mediate the relationship between Digital Leadership and Information Communication Technology Competency.

Thus based on the above literature review and discussion the framework of the study developed which is shown in **Figure 1**.
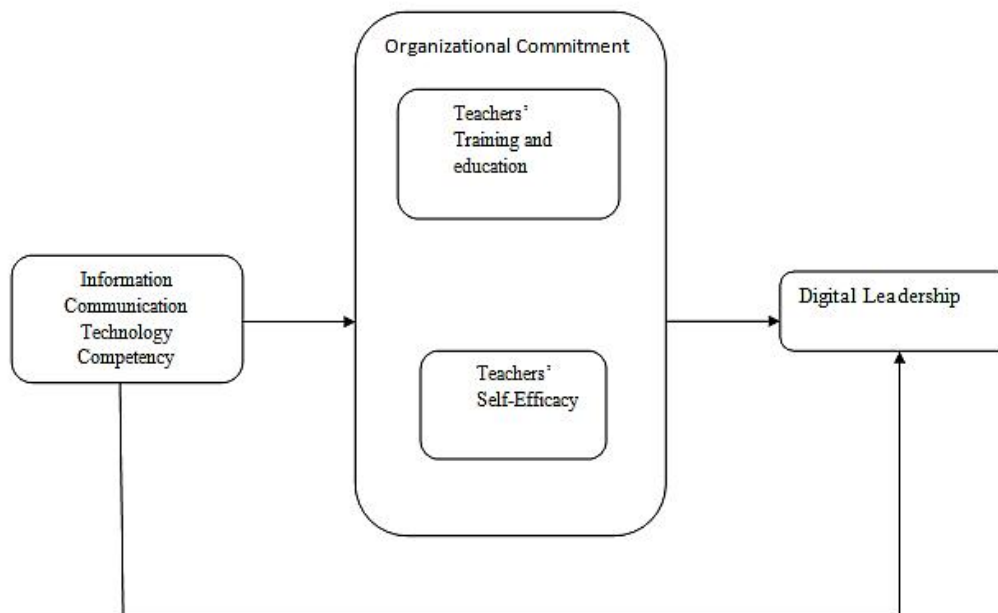
Figure 1. Conceptual Framework

METHODOLOGY

Research design is a set of methods used to complete a research study. Research design is defined as the method frameworks and techniques that the researcher is going to use to complete the study. In this study, we have used a quantitative research design. The sampling process starts with the identification of the population. To attain the objective of the study, data was collected from faculty members of colleges and universities in China. For this, a self-administered survey was used. Data from 250 respondents were collected by using a convenience sampling technique. A questionnaire is used as a tool for collecting data. A structured questionnaire is adapted from previous studies. The basis on which the questionnaire is adapted is the reliability of questions related to independent, dependent, and mediating variables. Out of 300 questionnaires, 250 were considered for statistical analysis because 50 questionnaires were not filled. This research will be based on a nonprobability sampling method that will be convenience sampling through which will gather information from respondents. Smart-PLS has been used for analysis. Analysis of demographic variables was done by using SPSS whereas to evaluate the reliability, validity, and relationship among variables, Smart PLS was used.

Measures

To gather information for the current study, an adapted questionnaire was developed by respective studies of Information Communication Technology Competency (Sang et al., 2010), Digital Leadership (AlAjmi, 2022), Teachers' training and education (Janssen et al., 2019) and Teachers' self-efficacy (Woolfolk et al., 1990). The data-collecting instrument was divided into two portions; the first was designed to collect demographic information about students (e.g., gender, qualification, and experience). The second part was devoted to assessing the constructs used in the study. The questionnaire contained 21 items. The 5-point Likert scale was used for data collection. A 5-point Likert-type scale was used to increase response rate and response quality along with reducing respondents' "frustration level" (Babakus & Mangold, 1992). A 5-point Likert scale ranging from 'strongly agree' to 'strongly disagree' was employed as it has been recommended by the researchers that it would reduce the frustration level of patient respondents and increase response rate and response quality (Sachdev & Verma, 2004).

Statistical Analysis

The hypothetical study employed a cross-sectional research design to investigate the relationship between ICT competency, digital leadership, organizational commitment, teachers' self-efficacy, and teachers' training and education. Convenience sampling was used to select 250 participants from educational institutions. Data were collected using validated scales and questionnaires to measure the variables of interest. Descriptive statistics and inferential techniques such as correlation analysis and regression analysis were used for data analysis. The

significance level was set at p < 0.05. The methodology section provided an overview of the research design, sample selection, data collection instruments, and statistical analysis techniques utilized in the study.

RESULTS

This section discussed the respondent's demographic characteristics. The demographics examined include gender, qualification, and experience. **Table 1** shows that 52% are male and 47% are female. The majority of the respondents, about 35% had MBA qualifications, 28% had BBA, 22% had a BA and 15% had BSc. 22% of employees had 1-year experience, 13% had 2 years, 20% had 3 years, 16% had 4 years and 30% had 5 years and above experience.

Table 1. Demographic Profile of the Respondents

		Frequency	Percentage
Gender	Male	94	52%
	Female	85	47%
Qualification	MBA	62	35%
	BBA	50	28%
	BSC	27	15%
	BA	40	22%
Experience	1 Year	39	22%
	2 Year	23	13%
	3 Year	35	20%
	4 Year	28	16%
	5 Years and Above	54	30%

Measurement Model

For the estimation and analysis of reliability and validity, the measurement model is used (Hair Jr, Sarstedt, Hopkins, & Kuppelwieser, 2014). For measuring the internal consistency of variables, composite reliability is used and for measuring the reliability of elements, outer loading is used. The connection between variables is said to be normal when the reliability and validity of this construct have been established or met (Peter & Churchill, 1986).

The measurement model has been analyzed based on PLS-SEM with the help of Smart PLS 3.0 (Ringle, Sarstedt, Mitchell, & Gudergan, 2020). For the assessment of the measurement model, factor loading, composite reliability, Cronbach alpha, average extracted variance (AVE), and discriminant validity were examined. PLS-SEM was used to conduct the initial analysis, during which the factor loadings, reliability, and validity of the data obtained from 250 faculty members of colleges and universities in China were investigated. The results of the validity, reliability, and factor loading tests for the items that were measured using the PLS measurement model are presented in **Table 2** and **Figure 2**. The value of Cronbach's alpha test must be equal to or greater than 0.70 as a rule of thumb because it represents the internal consistency of the items (Fornell & Larcker, 1981). Both the Alpha and CR values for Cronbach's correlation coefficient were higher than 0.70 for the variables that were chosen. This established convergent validity and demonstrated that the reliability was good because the values of the average variance extracted (AVE) for discriminant validity were higher than 0.50 (Fornell & Larcker, 1981). The values of CR ranged from 0.836 to 0.953, all of which are higher than the value that was considered to be the threshold, which was 0.70 (Zaman, Aktan, Baber, & Nawaz., 2022).

Table 2. Construct Reliability and Validity

	Items	Outer Loading	Cronbach's Alpha	RHO_A	CR	AVE
Information Communication Technology Competency	ICT1	0.795	0.788	0.839	0.849	0.507
	ICT2	0.771				
	ICT3	0.200				
	ICT4	0.784				
	ICT5	0.755				
	ICT6	0.768				
Teachers' Self-Efficacy	TE1	0.825	0.788	0.824	0.853	0.545

	Items	Outer Loading	Cronbach's Alpha	RHO _A	CR	AVE
	TE2	0.787				
	TE3	0.813				
	TE4	0.476				
	TE5	0.735				
	TTD1	0.699				
	TTD2	0.752				
Teachers' Training and Education	TTD3	0.795	0.811	0.815	0.869	0.570
	TTD4	0.786				
	TTD5	0.739				
	TTD5	0.789				
	DL1	0.802				
	DL2	0.775				
Digital Leadership	DL3	0.839	0.821	0.824	0.876	0.588
	DL4	0.772				
	DL5	0.628				

Discriminant Validity (HTMT)

Discriminant validity was obtained by comparing the correlation between the latent variables with the square root of AVE (Fornell &Larcker, 1981). According to the rule of thumb of Fornell and Larcker (1981), evaluating discriminant validity recommends the use of average variance extracted with a score of 0.50 or more. In line with the recommendation of Fornell and Larcker (1981), the square root of AVE must be greater than the value of latent variables which indicates discriminant validity. The bootstrapping strategy gives the confidence intervals where upper certainty ought to be underneath 1 (Valaei & Jiroudi, 2017). If HTMT worth is ≥1 this implies the null hypothesis has been accepted, which demonstrates the absence of discriminant validity (Sarstedt, Ringle, Smith, Reams, & Hair Jr, 2014). After determining that the criteria for the reliability and validity of all variables had been met, we continued our investigation by conducting a structural route analysis. This was done as we concluded that structural path analysis was necessary. In addition to this, the values of HTMT were lower than one, which substantiates the discriminant validity (Raz et al., 2015; Zaman et al., 2021). To examine discriminant validity, this study has undertaken discriminant validity to assure the external consistency of the model, based on the comparison between the latent variables as shown in **Table 3**. Summarly, the AVE of the variables: Information Communication Technology (ICT) Competency= 0.712; Teachers' Self-Efficacy (TE) = 0.739; Teachers' Training and Education (TTE) = 0.755; Digital Leadership (DL) = 0.767.

Table 3. Discriminant Validity (HTMT)

	Digital Leadership	Information Communication Technology Competency	Teachers' Self-Efficacy	Teachers' Training and Education
Digital Leadership	0.767			
Information Communication Technology Competency	0.691	0.712		
Teachers' Self-Efficacy	0.498	0.572	0.739	
Teachers' Training and Education	0.671	0.480	0.470	0.755

Table 3 shows that the square root of AVE has been greater than the correlation among latent variables, indicating adequate discriminant validity. This study explained the framework and indicated the links of relationships among the variables based on what has been obtained in previous literature.
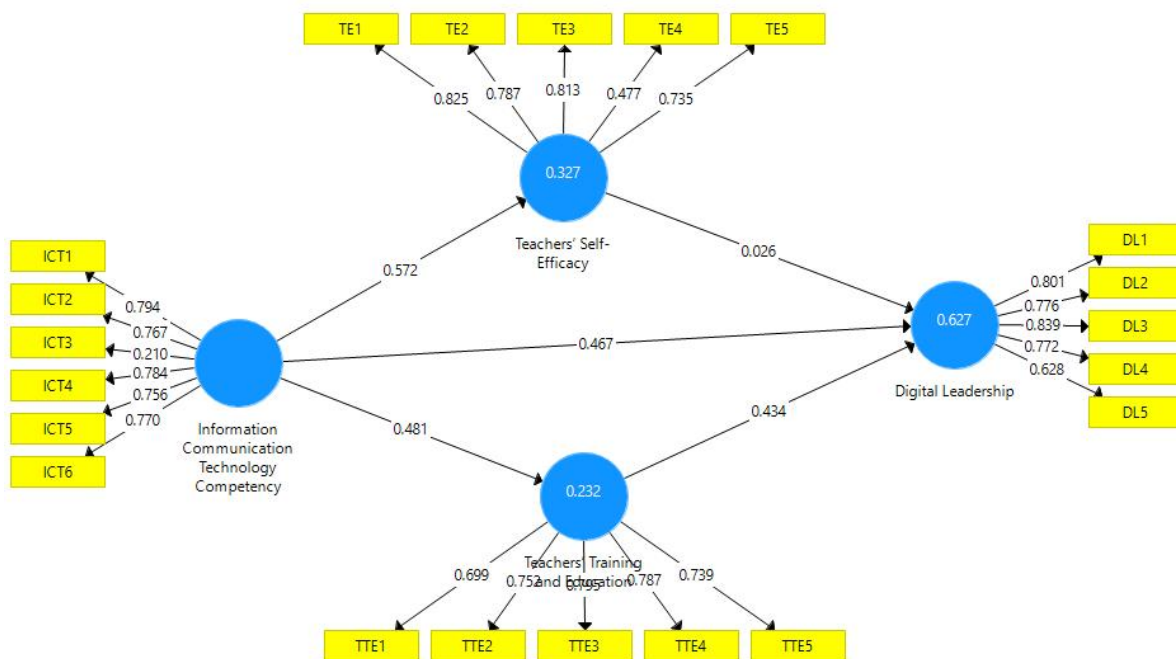
Figure 2. Measurement Model

Structural Equation Model

Through the use of the PLS-SEM bootstrapping technique, the structural model route coefficients that indicate the hypothesized correlations were found to be statistically significant. According to **Table 4**, which illustrates the path relationships and testing decision for hypotheses, the PLS-SEM assessment for digital health technologies, empirically proved that it is a significant predictor of psychological well-being. **Table 4** also depicts the path relationships and testing decisions for hypotheses. According to the findings, there is a statistically significant connection between Information Communication Technology Competency and digital leadership (t = 8.396, p = 0.0001). Therefore, Hypothesis 1 is permitted.

The PLS-SEM analysis found a significant relationship between Teachers' Self-Efficacy and Digital Leadership (t = 0.459, p = 0.0001). As a consequence, the study's second hypothesis was statistically confirmed to be right.

The significance of the connections that exist between Teachers' Training and Education and Digital Leadership was the subject of the third hypothesis that was investigated in this research. It was demonstrated by the results of the PLS-SEM study (t = 9.062, and p = 0.416); hence, the third hypothesis is not supported. The conclusions reached by the researchers are presented in **Table 4** and **Figure 3**.

Table 4. Tested Hypothesis

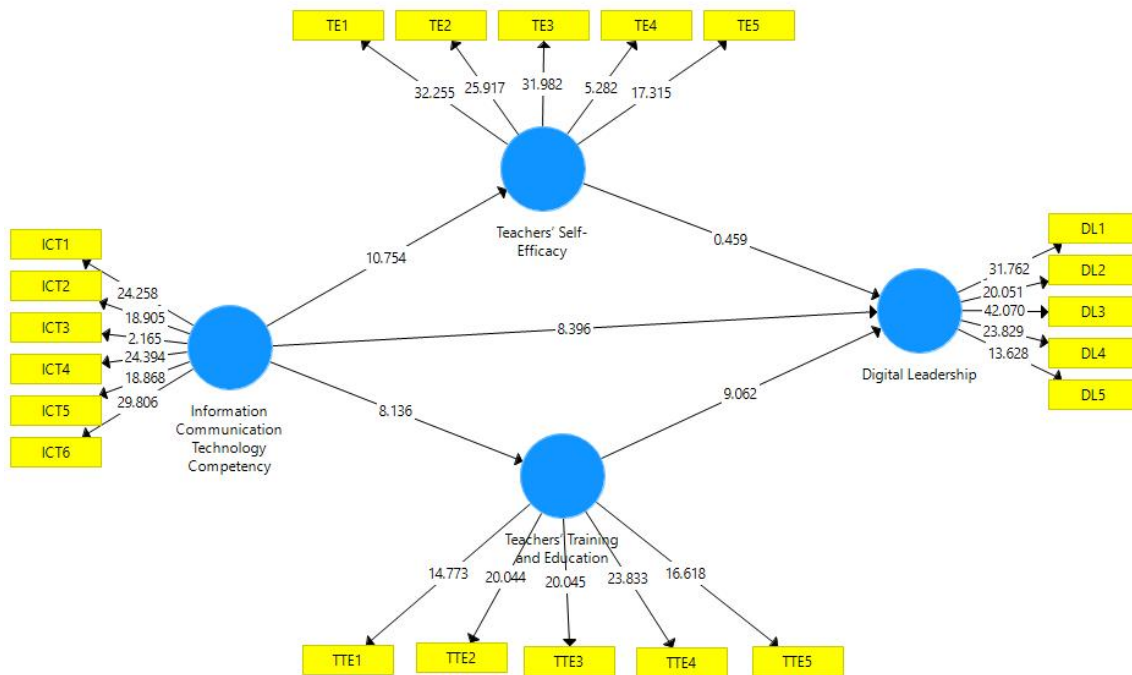|	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	F Square	R Square
Information Communication Technology Competency -> Digital Leadership	0.467	0.467	0.056	8.396	0	0.359	
Teachers' Self-Efficacy -> Digital Leadership	0.026	0.026	0.056	0.459	0	0.001	0.627
Teachers' Training and Education -> Digital Leadership	0.434	0.433	0.048	9.062	0.416	0.359	

Figure 3. Structural Model

Mediation Analysis

The mediating analysis includes establishing the theoretical indirect relationship between variables. A mediator variable is a variable that causes mediation in the dependent and independent variables. The relationship between the dependent (Y) and the independent variable (X) is explained by the mediator variable (Me). The purpose of the mediating analysis was to create a theoretical indirect relationship between the paths and the constructs. After introducing teachers' self-efficacy and teachers' training and education as mediating variables, the relationship between ICT Competency and Digital Leadership remained significant. The indirect effect of potential variables is tested by bootstrapping. For testing the mediation effect bootstrapping is one of the most rigorous and powerful procedures which is getting more attention from researchers' perspective (Zhao, Lynch Jr, & Chen, 2010). Furthermore, according to Zhao, Lynch, and Chen (2010), the type of mediation will be partial if the direction of both direct and indirect effects is the same and statistically significant. Following this, the variance accounted for (VAF) was used to measure the mediation power (Nitzl, Roldan, & Cepeda, 2016), and the calculated value (VAF=0.135) and (VAF= 0.316) confirmed the partial mediating role of teachers' self-efficacy and teachers' training and education in the relationship between ICT Competency and Digital Leadership (Hair Jr, Hult, Ringle, & Sarstedt, 2017). As a consequence of this, the results of the study in **Table 5** revealed that the mediating hypotheses (H4), and (H5) were all accepted.

Table 5. Mediation Hypothesis

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	VAF	Types of Mediation
Information Communication Technology Competency -> Teachers' Self-Efficacy -> Digital Leadership	0.015	0.452	0.651	0.135	Partial
Information Communication Technology Competency -> Teachers' Training and Education -> Digital Leadership	0.209	6.150	0.0001	0.316	Partial

DISCUSSION

The first objective of the study was to investigate the relationship between Information Communication Technology Competency and Digital Leadership. The study showed that there is a significant relationship between Information Communication Technology Competency and Digital Leadership. The ability of the leaders to develop, manage, guide, and apply ICT competency knowledge to enhance the performance of their institutions is a key component of the digital leadership paradigm. Digital leadership is the adoption and application of leadership strategies that are appropriate for the digital age, including dependence on cutting-edge technological platforms. Digital leadership calls for a high level of innovation (AlAjmi, 2022). Many studies have been conducted on the use of ICT competency in schools, but very few focus on the connection between ICT competency's meaningful use and the influence of leadership techniques on it. The ultimate goal of ICT competency adoption is to enable successful learning transformation, inspire teachers to include ICT competency into their pedagogical practices and motivate students to use ICT competency in everyday life. The finding of our study is aligned with these previous studies. These studies are aligned with the findings of our results thus based on the above discussion H1 is also accepted.

The second objective of the study stated that Teachers' Self-Efficacy has a significant impact on Digital Leadership. The findings of the study stated that there is a significant relationship between Teachers' Self-Efficacy and Digital Leadership. Teachers must have the necessary knowledge and a good attitude toward teaching a subject to be able to instruct and guide pupils in it. They must also believe that the subject is very relevant to teaching and that they are capable of doing so (Janssen et al., 2019). The ability of the leaders to develop, manage, guide, and apply ICT competency knowledge to enhance the performance of their institutions is a key component of the digital leadership paradigm. Digital leadership is the adoption and application of leadership strategies that are appropriate for the digital age, including dependence on cutting-edge technological platforms. Digital leadership calls for a high level of innovation (AlAjmi, 2022). This study supported our finding and hence H2 is accepted.

The third objective of the study stated that Teachers' Training and Education have an insignificant impact on Digital Leadership. The findings of the study stated that there is an insignificant relationship between Teachers' Training and Education and Digital Leadership. Teachers are under more and more pressure, and their jobs are changing substantially. Systems for teacher education must ensure that all educators may acquire the knowledge and skills they need and have access to the assistance they require throughout their careers (Aleandri & Refrigeri, 2014). Numerous research studies have suggested that school principals' use of technology influences instructional technology integration, which benefits student achievement and development (AlAjmi, 2022). This study supported our finding and hence H3 is not accepted.

These findings are aligned with the previous studies H6 and H7 regarding mediation analysis. These hypotheses stated that Teachers' Self-Efficacy, Teachers' Training and Education mediate the relationship between Digital Leadership and Information Communication Technology Competency respectively. The finding of the study stated that digital leadership is a significant mediator in the relationship between Digital Leadership and Information Communication Technology Competency. Teachers can utilise technology for a number of purposes, both professionally and personally. They can utilise this for administrative purposes such as tracking attendance, grading online scripts, and sharing information about students with administrators like as the one at the school. Lesson plans, notices, and other documentation are just a few of the professional documents that teachers are expected to create. This essay investigates how technology can be used in the classroom (AlAjmi, 2022). Based on this H4 and H5 are accepted. **Table 6** shows the summary of the hypothesis.

Table 6. Summary of Hypotheses

Hypotheses	Decision
Information Communication Technology Competency has a significant effect on Digital Leadership.	Accepted
Teachers' Self-Efficacy has a significant effect on Digital Leadership.	Accepted
Teachers' Training and Education have an insignificant effect on Digital Leadership.	Not Accepted
Teachers' Self-Efficacy mediates the relationship between Digital Leadership and Information Communication Technology Competency.	Not Accepted
Teachers' Training and Education mediate the relationship between Digital Leadership and Information Communication Technology Competency.	Accepted

CONCLUSION

This study aimed to find the impact of Information Communication Technology Competency on Digital Leadership. The study further explored the mediating effect of Teachers' Self-Efficacy and Teachers' Training and Education between Information Communication Technology Competency and Digital Leadership respectively. Data was collected from those college and university faculty members of China. SPSS and Smart PLS were utilized for the analysis of data. The findings of the study showed that relationships between Digital Leadership and Information Communication Technology are significant and positive and Teachers' Self-Efficacy, Teachers' Training and Education partially mediate this relationship.

The hypothetical study's practical applications for ICT leadership and competency are highlighted in the conclusion. The following recommendations are made: integrating ICT competency development into teacher training programmes; fostering digital leadership through training and support; allocating resources for technology integration; encouraging collaboration and sharing among teachers; offering opportunities for ongoing professional development; and keeping up with practices informed by research. These initiatives seek to empower teachers, improve learning results and student engagement, and get kids ready for the digital era. To better understand the long-term effects and creative ICT integration strategies, more research is required.

This study has a certain practical implication. This study will help educational institutes, policymakers, and specifically teachers to increase leadership qualities in the education sector. No study is without limitations. This study also has some limitations. This study used a quantitative method. Future studies can be used qualitative or mixed-method strategies. Another limitation is that this study identified only those factors that have a positive effect on Digital Leadership. This study considers faculty members as a population, and future studies can consider students from the education sector.

IMPLICATIONS

Theoretical Significance

This study has added value to the literature on Information Communication Technology Competency by giving deep insight into these Teachers' Self-Efficacy and Teachers' Training and Education from the perspective of educational institutions (Janssen et al., 2019). Indeed a literature review and the findings of the study gave the direction to the researchers to enhance the literature on Information Communication Technology Competency (Johnson, 2022). Participants in this study completed a self-reported instrument, according to prior research. It was entirely possible that principals exaggerated or undervalued their proficiency given the self-reporting nature of this measure (AlAjmi, 2022). All school, elementary school, college, and high school teachers have enthusiastically embraced this new vision because they should be aware of who is best suited to further their educational objectives and who can assist them in organizing and achieving high performance and high expectations goals: a teacher among his or her fellow educators (Dina, 2013). The study was limited to using self-report instruments; thus, using direct observations, checklists, and case studies would be a good recommendation for future research.

Practical Implications

It was quite difficult to promote an Information Communication Technology Competency while balancing the various sets of ordinary work-related tasks used in the university during the research. This study will offer a few practical implications about the influence of Information Communication Technology Competency on digital leadership Teachers' Self-Efficacy and Teachers' Training and Education effectiveness Firstly, the institutions that will lead their members by using this Information Communication Technology would have benefited from the faculty members and also for the students. Second, digital leadership plays a vital influence in the organization's success or failure. The practical implication of ICT competency on digital leadership with the mediation role of teachers' self-efficacy and teacher's training and education is that it can help foster a culture of digital literacy and innovation in the classroom.

Additionally, this research underscores the importance of providing comprehensive teacher training and education in ICT proficiency and digital leadership. However, significant limitations in the research design should be noted.

LIMITATIONS

For starters, the lack of a control group made it difficult to assess the effects of ICT competence and digital leadership between those who got teacher training and those who did not. A control group would have supplied useful information on the effectiveness of such training. Furthermore, the study's sample size was small, including participants from only one country. This hampered the findings' generalizability and the ability to make broad inferences. Future research should incorporate varied samples from many countries to acquire a more representative picture. Furthermore, the study did not investigate the possible impact of other criteria on digital leadership, such as gender, age, or socioeconomic position. Considering these variables could provide a more comprehensive understanding of the broader contextual factors that impact the development of digital leadership skills. In addition, the study solely focused on the relationship between ICT proficiency, teacher training, and digital leadership, neglecting other crucial aspects like organizational culture, structure, and technological infrastructure. A more holistic investigation that incorporates these factors would provide a more nuanced understanding of the complexities involved in fostering digital leadership within educational institutions. Another important consideration that the study overlooked is the impact of digital leadership on student outcomes, including learning, engagement, and motivation. Exploring this connection would shed light on how digital leadership practices directly affect students' educational experiences and achievements. Lastly, the study did not examine how different contexts and environments influence ICT competency and digital leadership. Since these factors can vary significantly across educational settings, it is essential to investigate their role in shaping and enhancing digital leadership capabilities. By addressing these limitations and considering a broader range of factors, future research can provide a more comprehensive understanding of the relationship between ICT proficiency, teacher training, digital leadership, and their impact on educational outcomes in diverse settings.

REFERENCES

AAlAjmi, M. K. (2022). The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. *International Journal of Educational Research*, *112*, 101928.

Aleandri, G., & Refrigeri, L. (2014). Lifelong education and training of teacher and development of human capital. *Procedia-Social and Behavioral Sciences*, *136*, 542-548.

Arokiasamy, A. R. A., bin Abdullah, A. G. K., & Ismail, A. B. (2014). Correlation between Cultural Perceptions, Leadership Style and ICT Usage by School Principals in Malaysia. *Turkish Online Journal of Educational Technology*, *13*(3), 27-40.

Babakus, E., & Mangold, W. G. (1992). Adapting the SERVQUAL scale to hospital services: An empirical investigation. *Health Services Research*, *26*(6), 767.

Blimpo, M. P., & Pugatch, T. (2019). Entrepreneurship education and teacher training in Rwanda. *Journal of Development Economics*, *140*, 186-202.

Chatterjee, S., Chaudhuri, R., Vrontis, D., & Giovando, G. (2023). Digital workplace and organization performance: Moderating role of digital leadership capability. *Journal of Innovation & Knowledge*, *8*(1), 100334.

Ciolan, L. (2013). Better Teachers for Better Schools. The Position and Role of Higher Education in the Training Process. *Procedia-Social and Behavioral Sciences, 76*, 34-38.

Dina, A. T. (2013). Challenges faced by educational leadership on influencing student learning. *Procedia-Social and Behavioral Sciences, 93*, 290-295.

Dittmer, L. (1977). Thought reform and cultural revolution: An analysis of the symbolism of Chinese polemics. *American Political Science Review*, *71*(1), 67-85.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50.

Gegenfurtner, A. (2019). Reconstructing goals for transfer of training in faculty development programs for higher education teachers: A qualitative documentary method approach. *Heliyon*, 5(11). doi:10.1016/j.heliyon.2019.e02928

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Los Angeles, CA: Sage Publications.

Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, *26*(2), 106-121.

Janssen, E. M., Mainhard, T., Buisman, R. S., Verkoeijen, P. P., Heijltjes, A. E., Van Peppen, L. M., & Van Gog, T. (2019). Training higher education teachers' critical thinking and attitudes towards teaching it. *Contemporary Educational Psychology*, *58*, 310-322.

Johnson, J. L. (2022). Teacher self-efficacy and teacher work engagement for expats at international K12 schools in China: A correlation analysis. *International Journal of Educational Research Open*, *3*, 100176.

Kankaanranta, M. (2001). Constructing digital portfolios: Teachers evolving capabilities in the use of information and communications technology. *Teacher Development*, *5*(2), 259-275.

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, *55*(1), 79-105.

Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education, 38*(1), 9-24.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education*, *9*(3), 319-342.

Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modelling, helping researchers discuss more sophisticated models. *Industrial Management and Data Systems*, *116*(9), 1849-1864.

Palomino, M. D. C. P. (2017). Teacher training in the use of ICT for inclusion: Differences between early childhood and primary education. *Procedia-Social and Behavioral Sciences*, *237*, 144-149.

Peter, J. P., & Churchill Jr, G. A. (1986). Relationships among research design choices and psychometric properties of rating scales: A meta-analysis. *Journal of Marketing Research*, *23*(1), 1-10.

Player-Koro, C. (2012). Factors influencing teachers' use of ICT in education. *Education Inquiry*, *3*(1), 93-108.

Qureshi, A. A. (2013). Impact of leadership on meaningful use of ICT. *Procedia-Social and Behavioral Sciences*, *93*, 1744-1748.

Raz, Y., Henseler, J. F., Kolk, A., Riaz, M., Van der Zwaal, P., Nagels, J., . . . Raz, V. (2015). Patterns of age-associated degeneration differ in shoulder muscles. *Frontiers in Aging Neuroscience*, *7*, 236.

Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2020). Partial least squares structural equation modeling in HRM research. *The International Journal of Human Resource Management*, *31*(12), 1617-1643.

Sachdev, S. B., & Verma, H. V. (2004). Relative importance of service quality dimensions: A multisectoral study. *Journal of Services Research*, *4*(1), 93.

Sang, G., Valcke, M., Van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education*, *54*(1), 103-112.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy*, *5*(1), 105-115.

So, H. J., Choi, H., Lim, W. Y., & Xiong, Y. (2012). Little experience with ICT: Are they really the Net Generation student-teachers?. *Computers & Education*, *59*(4), 1234-1245.

Symes, W., Lazarides, R., & Hußner, I. (2023). The development of student teachers' teacher self-efficacy before and during the COVID-19 pandemic. *Teaching and Teacher Education*, *122*, 103941.

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, *17*(7), 783-805.

Valaei, N., & Jiroudi, S. (2016). Job satisfaction and job performance in the media industry: A synergistic application of partial least squares path modelling. *Asia Pacific Journal of Marketing and Logistics*, *28*(5), 984-1014.

Woodcock, S., Sharma, U., Subban, P., & Hitches, E. (2022). Teacher self-efficacy and inclusive education practices: Rethinking teachers' engagement with inclusive practices. *Teaching and Teacher Education*, *117*, 103802.

Woolfolk, A. E., Rosoff, B., & Hoy, W. K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education*, *6*(2), 137-148.

Zaman, U., Aktan, M., Baber, H., & Nawaz, S. (2021). Does forced-shift to online learning affect university brand image in South Korea? Role of perceived harm and international students' learning engagement. *Journal of Marketing for Higher Education*, 1-25. doi:10.1080/08841241.2021.1998285

Zaman, U., Florez-Perez, L., Anjam, M., Ghani Khwaja, M., & Ul-Huda, N. (2023). At the end of the world, turn left: Examining toxic leadership, team silence and success in mega construction projects. *Engineering, Construction and Architectural Management*, *30*(6), 2436-2462.

Zhao, X. S., Lynch Jr, J. G., & Chen, Q. M. Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research, 37*(2), 197-206.