Relationship between Digital Leadership Competencies and Teachers' Performance: Structural Equation Model Analysis

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Abstract

Leadership competencies contribute to the ability of teachers to perform successfully and efficiently in the modern technology era. The purpose of this study was to determine the relationship between digital leadership competencies and teachers' performance. The study was correctional following the cross-sectional survey method. The sample of the study consisted of 273 social sciences teaching faculty members of Allama Iqbal Open University Islamabad and Virtual University of Pakistan selected through a simple random sampling technique. The reliability of the instruments; digital leadership competencies and teachers' performance were confirmed by calculating Cronbach's Alpha score; .969 and .936 respectively. After ensuring ethical considerations from participants, the data were collected by administering the Six E-Competencies model of Roman et al., (2019) consisting of 18-items and Goodman and Svyantek (1999) Teachers' Performance (TP) scale comprised of 15-items mode of 7-points Likert responses. Partial Least Square-Structural Equation Modeling [PLS-SEM] was computed to analyze the proposed hypotheses in this study while the measurement model and structural model were assessed. The findings of the study showed a significant correlation between digital leadership competencies and teachers' performance. The study helps to enhance the performance of university teachers through the support of digital leadership by using modern technology tools

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Introduction

Technology is being transformed in the modern era, globally. Technology has a revolutionary influence on changing the sectors of the economy of the world. This radical revolution in technology and communication has also influenced the leadership competencies of organizations (Salamzadeh et al., 2019). Leaders with mission, vision, values, and passion regarding digital leadership practices and technology learning culture may play a key role in determining the success of institutions (Macatuno-Nocom, 2019).

Sandel (2013) refers digital leadership as the skill and ability to provide an environment of creativity for the utilization of the optimum capacity of digital technology. Digital leaders feature; creativity, innovation, credibility, and collaboratively are important for productive outcomes of employees' performance. Innovative trends of digital leadership practices have challenges in managing the performance of workers and its impacting factors. Digital leadership as a process of social influence is to produce a change in attitudes, emotions, thinking, behavior, and performance in individuals, groups, and in an organization (Avolio, Kahai, & Dodge, 2000; Aziz, Butt & Noureen, 2021; Bass & Bass, 2008). Dervenis et al., (2022) reported that teachers' digital competencies are becoming important globally due to pandemic implications, unfortunately, still, currently they are considering it secondary in the teaching-learning process.

Digital leadership competencies have significant factors that contribute to university academicians' performance through operationalization of digital skills. Pakistani researchers executed studies to explore association between digital leadership and teachers' task performance (Mehmood, 2023; Khan, Mehmood & Shoaib, 2022) but fewer studies were framed to determine relationship between digital leadership competencies and teachers' Performance in higher education institutions. There is a dire need to determine the relationship between digital leadership competencies and teachers' performance in the Pakistani context. The results of the study may provide locus of point for higher education leaders in locating digital skills factors affecting their institutional performance. This study is designed to gauge the digital leadership competencies influencing the performance of university teachers in Pakistan.

Literature Review

Literature review of the current study has two major parts digital leadership competencies and teachers' performance.

Teachers' Performance

Performance is a holistic output of an individual during working effectively and efficiently. Robbins (2006) reported that performance is the function of the ability to motivate, an opportunity for a certain time. The performance also refers to work outcomes, task performance, and achievement of records for a specific timeline (Bernardin & Russel, 2013; Greenberg & Baron, 2005). Performance is an action, not an event that an employee acts to complete a task using specific abilities. Standard performance elements are being used to measure employee credibility. Performance is a basic aspect of the ability of a teacher to the quality of work. Employees' performance is evaluated through their ability, effort, and opportunity for completing tasks. Individual performance is also measured through knowledge of policies, quantity, and quality of work, cooperation, knowledge of work, timeframe, innovative ideas, and administrative skills and techniques (Schuler & Jackson, 2005). Performance is achieving the job objectives proficiently and effectively in a timeline.

Task performance and contextual performance are two main parts of the performance. Task performance refers to behaviors that are directly involved in producing goods and services to support the organization's social environment. Task performance also refers to role-described behavior that distinguishes one job from another. These behaviors are related to the benefits of the organization. On the other hand, contextual performance refers to individual efforts that are indirectly related to their main job functions. Contextual activities are important as they contribute to shaping an organization's social and cultural context effectiveness. Contextual performance activities socialization, cooperation, volunteering, altruism, and compliance serve as catalysts for task processes (Borman & Motowidlo, 1997; Edwards et al., 2008; Werner, 2000). Teacher performance is also the results of the synergy of organizational structure, institutional policies, competency, self-efficacy, professional development, work discipline, motivation, knowledge and skills (Yu, 2018; Ozder, 2011).

Digital Leadership Competencies

Competencies are a blend of knowledge, skills and abilities required to performance a particular function for a profession. Competencies are foundations for professional growth and performance measures. Professional competencies enable the professional to continue the occupation in the maximum level of performance in professional context (Fisher, 2001: Jordan 2012; Tajpour & Salamzadeh, 2019).

Leadership competencies are a blend of personal characteristics and professional work context abilities that include critical thinking, problem-solving, communication, identity, technical, and adaptability applied in an organizational setting (Chaudhary et al., 2022; Dole, Murych, & Liebst, 2005; Guerrero & Delos Rios, 2012). Leadership competencies contribute to the ability of teachers' performance, effectively, efficiently and successfully in the current technology revolt. The Fourth Industrial Revolution (4IR) focused on disruptive technology, analytics, and machine learning. In the era of industrial revolution 4.0., leadership has pivotal responsibility to generate competent personnel in educational institutions to compete in the modern era (Chang, 2012: Huamán, Rodriguez, Cordero & Huamán, 2021). Digital leadership has a strong role in creating workflow, innovation, social inclusion, collaboration, and digital transformation to realize the vision, mission, goals, and objectives of institutions through programs that are planned and implemented (Avolio et al., 2000; Montgomery, Roman, & Pierce, 2016; Wang, Wei, VanWart, McCarthy, Liu, Lim, & Ready, 2023). Technology revolution influences the professional working of leadership in planning, infrastructure support, implementation, communication, and providing motivation to teachers (Chang, 2012; Northouse, 2015; Wakabi, 2016). Digital leadership competencies and teachers' performance has become paramount notion and had drawn extensive interest from practitioners and researchers in the twenty-first-century era (Benitez, Arenas, Castillo & Esteves, 2022; Huamán et al., 2021; Lim & Teoh, 2021; Pham & Vu, 2022).

Digital leadership is the tactical use of digital gadgets to achieve delivery excellence and to lead disruptive change in an organization. Digital leadership encourages, enhances, and integrates technology in the teaching-learning process (Chang, 2012: Richardson, Bathon, Flora, & Lewis, 2012) and enhances employees' performance in an organization (Benitez, Arenas, Castillo & Esteves, 2022). Roman, VanWart, Wang, Liu, Kim, and McCarthy (2019) stated that digital leadership influences performance within organizations. There was a positive significant relationship between digital leadership and students' academic performance (Huamán et al., 2021). Teachers' digital leadership is the locus for policymakers in designing professional development for teachers regarding management, curriculum, andragogy, and assessment in higher education (Dervenis Fitsilis & Latrellis, 2022, Morze & Buinytska, 2019). Macatuno-Nocom (2019) executed a study in Philippine to measure the influence of digital leadership on university teachers' performance. The

results of the study reported that digital leadership has a significant effect on teachers' job performance.

Suratman, Arafat, and Eddy (2020) framed a research to explore the influence of deans' leadership on teachers' performance in Indonesia. The data were collected through a questionnaire and analyzed using multiple regression analysis. The findings depicted that there was no significant influence of leadership on teachers' performance.

Lim and Teoh (2021) framed a study to predict the influence of digital leadership on the performance of higher education institutions teachers in Malaysia. The study was descriptive following a correlational research design. The sample of the study consisted of 121 staff were selected through purposive sampling techniques. The data collected through questionnaires were analyzed using Partial Least Square Structural Equation Modeling (PLS-SEM). The findings of the study revealed that digital leadership has a positive influence on teachers' performance.

Obadimeji and Oredein (2022) structured a study to determine the influence of digital leadership on teachers' job performance in Nigeria. The sample of the study consisted of 643 teachers selected through a simple random sampling technique. Reliability of the instrument was ensured;.793. Multiple regression analysis was employed to analyze the data. The findings of the study revealed that digital leadership influence on teachers' performance.

Tonich (2021) designed a study to explore the role of digital leadership abilities and teachers' job performance. The sample of the study consisted of 350 heads selected through a simple random sampling technique. A survey questionnaire was used to collect data regarding teacher performance. The findings of the study reported a positive relationship between digital leadership and teachers' job performance.

Pham and Vu (2022) executed a study to determine the association between digital leadership and teachers' performance due to government digital initiatives in education. The study was quantitative and used a correlational research design. The sample of the study consisted of 412 respondents selected through the convenience sampling technique. A survey questionnaire was used to collect data about teachers' performance. The results of the study reported a positive correlation between digital leadership and teachers' job performance.

Theoretical Framework

Competencies are blend of knowledge, skills, abilities, and behaviors that contribute to performance tasks individually or in groups for organization development. The framework for the current study is adopted

from Roma et al (2019). This six E-Competencies model evaluated the Digital Leadership Competencies as 1) E-communication, 2) E-social, 3) E-team, 4) E-change, 5) E-tech, and 6) E-trustworthiness that influence teachers' performance.
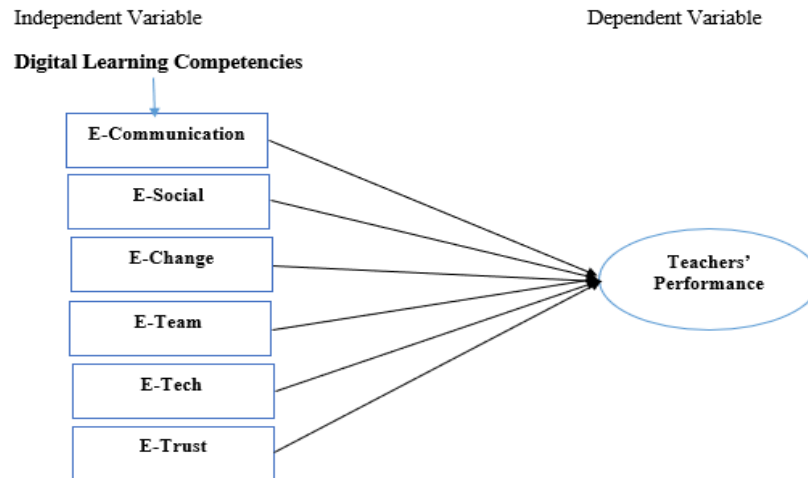

Figure 01. Theoretical Framework of the Study

Relationship between Digital Leadership Competencies and Teachers' Performance

The framework of the current study is based on six digital leadership competencies

Relationship between E-communication Competency and Teachers' Performance.
E-communication competency is the ability of the leader to interact in an effective and planned way through technology without channeling faults in performance (Roman et al., 2019). Moreover, E-communication has produced a new knowledge-driven economy in the workplace (Haughey, 2006). Technological communication telephone, teleconference, Skype, Facebook, and email are important sources of information from leadership to staff.

Edun and Soyebi (2022) framed a study to determine the relationship between e-communication competencies and administrative performance functions of public sector university professionals' in Nigeria. The study was descriptive in nature and used a correlational research design. The sample of this study consisted of 609 university professionals selected through a proportionate sampling technique. The findings of the study

measured a significant positive relationship between e-communication competencies and job performance that digital literate professional have more contribution in their job performance.

Umar et al., (2020) executed a study to measure the implication of e-technology on job performance of teachers in Nigeria. The study was quantitative and followed the survey research method. The sample of the study consisted of 214 academic staff from public sector higher education institutions selected through a simple random sampling technique. Partial Least Square Structural Equation Modeling (PLS-SEM) was used to analyze the data collected through an online questionnaire. The findings of the research reported that e-communication is positively associated with job performance. The findings from previous studies explained that e-communication and work performance are associated (Edun & Soyebi, 2022; Farooq, 2015; Umar et al., 2020) and are valuable for policymakers to take initiative in digital governance.

Relationship between E-social Competency and Teachers' Performance. E-social Competency is the ability of a leader to provide an optimal working environment and improve collaboration among employees through different communication channels (Roman et al. 2019). It is difficult to obtain the social occurrence of a leader in recognition and teamwork through a virtual environment (Connaughton & Daly, 2004). The findings from previous studies clarified that e-social competency and work performance are linked (Connaughton & Daly, 2004; Lozano-Peña, Sáez-Delgado, & López-Angulo, Mella-Norambuena, 2021; Farooq, 2015) and are important for higher management to have clear guidelines to develop social-competencies of teachers through teachers training programs.

Relationship between E-change Competency and Teachers' Performance. E-change competency is the ability of leader to control change management professionally through technology (Roman et al. 2019). E-change leadership skills are used for knowledge explosion, forward-looking change implementation monitoring, and controlling environmental conditions through technological practice (Bell & Kozlowski, 2002; Montgomery et al., 2016).

Relationship between E-team Competency and Teachers' Performance. E-team competency identifies the capability of a leader to motivate and hold accountable to all team members (Roman et al. 2019). The leader's task is to integrate the team into unit work with self-management capacity development for better organizational performance. Successful leaders create team orientation through share objectives, positive attitudes, and team bonding to achieve the mission of the organization. Two leadership

functions team performance and team development are important for scanning the context of the environment (Zaccaro & Bader, 2003). Essential team competency in organizing activities, team members' feedback, and planning work are important to e-team skills (Fernandez & Jawadi, 2015).

E-team leadership has less limitation to acquire geographically scattered human capital and a greater pool of specialized knowledge and human resources to complete complicated tasks (Zaccaro & Bader, 2003). Wang et al., (2023) reported that an effective e-leader builds team trust in document sharing and team discussion through group work performance.

Relationship between E-tech Competency and Teachers' Performance.
E-tech competency refers to the leader's technological knowledge for effective implementation of e-leadership (Roman et al. 2019). It identifies to the leaders' better knowledge of (ICT) and security risks (Roman et al., 2019). One of the competencies of digital leadership is to understand the need and best time to use communication technology to educate colleagues on its effective usage (Cascio & Shurygailo, 2003; Roman, 2013). The findings from previous studies explained that e-tech and work performance are associated (Edun & Soyebi, 2022; Farooq, 2015; Roman et al. 2019).

Relationship between E-trustworthiness Competency and Teachers' Performance. E-trustworthiness competency is the leader's ability in creating a sense of trust and security by using information communication technology (Roman et al. 2019). A cognitive-based trust environment creates feelings, emotions, and ethics of staff trust (Kanawattanachai & Yoo, 2002). Umar et al., (2020) planned a study to measure the implication of e-technology on job performance in Nigeria. The research was quantitative in nature following the survey method. The sample of the study consisted of 214 academic staff from public sector higher education institutions selected through random sampling. Partial Least Square Structural Equation Modeling (PLS-SEM) was used to analyze the data collected virtually. The findings of the research reported that e-communication is positively associated with teachers' performance.

Chaudhary et al., (2022) executed a study to gauge the influence of e-leadership competencies on work performance in India. The data of 810 subjects was collected through survey method. Confirmatory Factor Analysis (CFA) and Partial Least Square Structural Equation Modeling (PLS-SEM) were used to analyze the data collected through structured instruments. The findings of the research reported that e-competencies of leaders' e-communication, e-change, and e-technology influence employees' performance. The findings from previous studies predicted

that e-tech and work performance are linked (Aziz et al., 2021; Chaudhary et al., 2022).

Hypothesis
H_1: There is a relationship between digital leadership competencies and teachers' performance.

Methodology
The current study was planned to determine the relationship between digital leadership competencies and teachers' performance. The study was correctional in nature, following the cross-sectional survey method. The sample of the study consisted of 273 social sciences teaching faculty members of Allama Iqbal Open University Islamabad and the virtual university of Pakistan selected through a simple random sampling technique. The reliability of the instruments; digital leadership competencies and teachers' performance was confirmed by calculating Cronbach's Alpha score; .969 and .936 respectively. After ensuring ethical considerations from participants, the data were collected by administering Roman et al. (2019), six E-Competencies model; E-communication, E-social, E-team, E-change, E-tech, and E-trust consisted of 18-items and Goodman and Svyantek (1999) Teachers' Performance (TP) scale comprised of task performance and contextual Performance consisted of 15-items mode of 7-points Likert responses.

Partial Least Square- Structural Equation Modeling [PLS-SEM] was computed to analyze the proposed hypothesis in this study while the measurement model and structural model were assessed

Findings
Data was analyzed by administering PLS-SEM according to the proposed hypotheses in this research study.

Table 01
Descriptive analysis

Dimensions	Mean	Std. Deviation
E-Communication	5.24	.94
E-social	4.78	.97
E-team	4.89	.83
E-change	4.83	1.03
E-tech	5.02	1.12

E-trust	4.98	.92
Digital Leadership Competencies	4.95	.96
Task Performance	4.78	.96
Contextual Performance	5.27	.92
Teachers' Performance	5.02	.94

Table 01 reported that descriptive analysis was administered to analyze the existing level of the university teaching faculty about digital leadership competencies and teachers' performance. The results of study revealed that the mean score of the dimensions regarding digital leadership competencies was from 4.78 to 5.24 and overall M = 4.95, SD = .96 whereas, the mean score of the dimensions about the dimensions of teachers' performance was from 4.78 to 5.27 and overall M = 5.02, SD = .94. It concluded that the respondents agreed about the constructs of the study.

Measurement Model

For this study, PLS-SEM was computed to assess the measurement model and structural model whereas; reflective indicators were designed (Henseler et al., 2009). To assess the measurement model; consistency reliability, convergent validity and discriminant validity, and factor loading were analyzed. By administering PLS the threshold value of (α) is greater than o.7, average greater than 0.5, and loading greater than 0.6 (Elliot & Woodward, 2007; Chin, 1998; Hair et al., 2014; Peng & Lai, 2012). Therefore, table 2 indicated that the Alpha coefficient and average statistical values and factor are greater than threshold values whereas, the loading value of the items were shown in Figure 01 which were greater than .6.

Table 2
Internal consistency and convergent validity

Variables	Alpha	CR	AVE
Digital Leadership Competencies	0.969	0.972	0.661
Teachers' Performance	0.936	0.945	0.557

Discriminant Validity

In order to examine the discriminant validity, it was administered the Fornell & Larcker criterion (Fornell & Larcker, 1981; Hair et al., 2014).

The threshold value of this statistical test is that the value of first latent construct must be greater than another construct (Chin, 1988; Duarte & Raposo, 2010; Urbach & Ahlemann, 2010). Thus, the values of various constructs are acceptable according to the recommended which are indicated in table 03.

Table 03

Fornell-Larcker Criterion

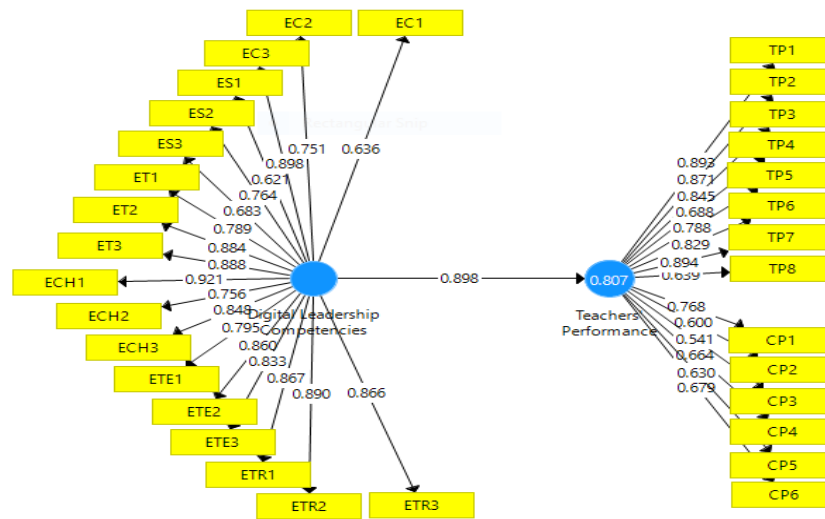| Constructs	DLC	TP
Digital Leadership Competencies	.813	
Teachers' Performance	.898	.746

Figure 02. Measurement Model

Structural Model

In order to analyse the hypothesis which was proposed in this research, structural model was administered. This model provides the authenticity of the correlation among the various constructs (Chin, 1998; Hair et al., 2014). For this research to analyse the direct correlation between the exogenous construct and endogenous construct, Path Coefficient test was applied. Moreover, to assess the effect of one construct on other construct effect size (f2) was administered. Furthermore, predictive relevance (R2), and cross-validated redundancy (Q2) were also directed to assess the authenticity of the proposed model. Moreover, for significance p value must be less than 0.5 and t value more than 1.96. Suggested by (Hayes,

2012; Henseler et al., 2009). The current study proposed hypothesis was accepted.

Table 4
Path Coefficient (Direct Effect)

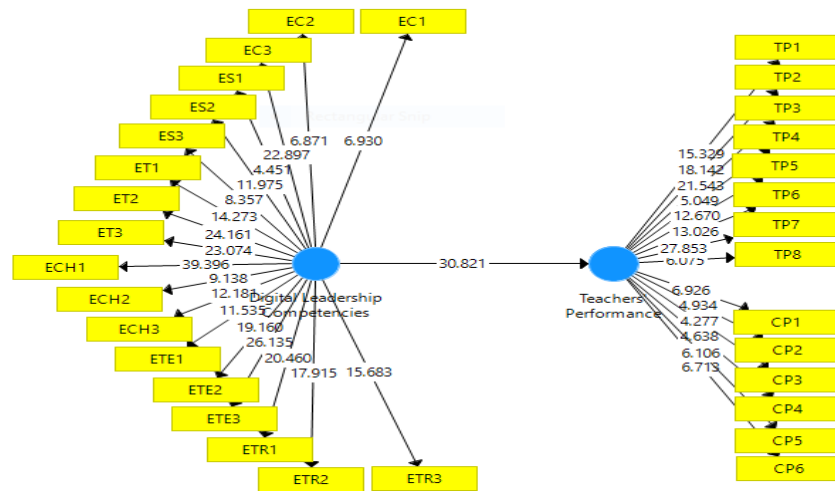| Constructs	Beta	SD	T-Value	P-Value
DLC → TP	.898	.029	30.821	.00*

Figure 03. Path Coefficient (t-value)

In order to measure the effect of exogenous variable on endogenous variable effect size [f2] was administered which indicated the strong effect of digital leadership competencies on performance of the respondents according the threshold recommendations such as; .02, .15 and .35 which shows weak, moderate and strong respectively (Elliott & Woodward, 2007;Gim et al., 2015; Preacher & Kelley, 2011). The following formula was directed to find out the effect size suggested by (Cohen, 1988; Selya et al., 2012).

$$\text{Effect size: } f2 = \frac{Rincluded2 - Rexcluded2}{1 - Rincluded2}$$

Predictive relevance (R2) validates the capacity of the exogenous construct in calculating the endogenous construct (Hair et al., 2014). The recommended value of R2 which is acceptable .1 (Falk & Miller, 1992). Moreover, the values of .19, .33, and .67 are considered weak, moderate and substantial. The findings indicated the .807 value of R which shows the strong variance of 80.7% of digital leadership competencies with performance of the respondents.

Table 05
Predictive Relevance (R2) and Effect Size (f 2)

Variables	R2	Range	f 2	Range
Teachers' Performance	0.807	Substantial	0.898	Strong

Moreover, to evaluate the relevant prediction of the proposed model, Cross-validated redundancy (Q2) was directed (Hair et al., 2014). For these statistics blindfolding process was administered by using Structural Equation Model. The suggested coefficient of this test must be 0 or greater said by (Chin, 1998; Henseler et al., 2009).

Table 06
Cross-validated redundancy (Q2)

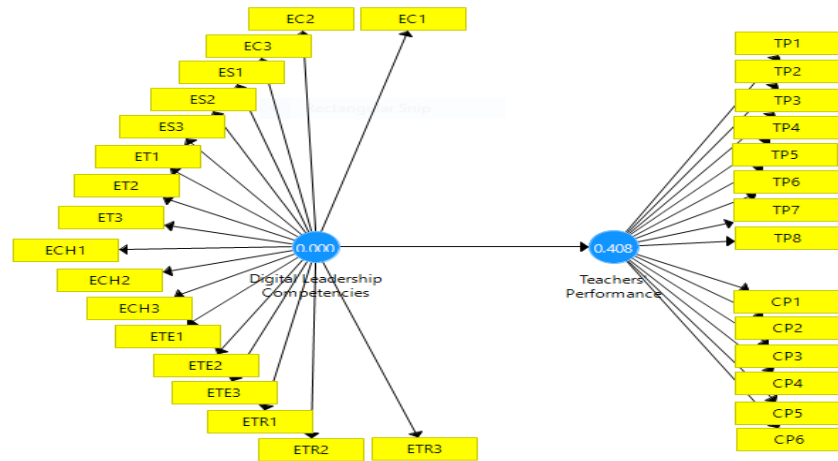| Construct	SSO	SSE	Q2 = (1-SSE/SSO)
Teachers' Performance	560.00	331.612	0.408

>0

Figure 04. Cross-validated redundancy (Q^2)

The findings of the study indicated that the respondents agreed about the variables of the study such as; E-digital competencies and teachers' performance. Moreover, there was a positive and significant correlation between E-digital competencies and teachers' performance. The current accepted the proposed hypothesis.

Discussion

Digital leadership as a process of social influence helps in obtaining institutional goals using technology. Performance is the ability to contribute in the job that involves task and context performance. The findings of the current study revealed a significant correlation between digital leadership competencies and teachers' performance were consistent with the results of the study framed by Lim and Teoh (2021) in Malaysia that digital leadership competencies have a positive significant association with teachers' performance due to practices of technology learning culture of the institutions, consistent with results of the study designed by Obadimeji and Oredein (2022) in Nigeria that there existed a positive significant relationship between digital leadership competencies and teachers performance due to directive decision-making for teachers usage of technology, and inconsistent with results of the study structured by Suratman et al. (2020) in Indonesia that there was no relationship between digital leadership competencies and teachers job performance due to management lack of understanding of technology.

The researchers employed a simple random sampling technique to collect data from two university academicians in Pakistan. As Allama Iqbal Open University Islamabad and Virtual University of Pakistan are providing a virtual working environment. The results of the current research have practical implications for university management regarding the provision of digital leadership competencies for the optimum performance of employees. The researchers administrated structured instruments after obtaining permission from the authors. These tools are nationally and internationally worth measuring digital leadership competencies and teachers' performance in virtual organizations. The current study has a significant contribution to existing knowledge of leadership especially in the field of digital leadership for 21st century universities. The results of this study revealed valuable in-depth and noticeable insights for policymakers in digital initiatives for university management and governance. The results of the present study may help in yielding optimal results in the development of digital competencies among teachers through teacher training programs.

Conclusion

Based on the findings, it was concluded that the respondents were agreed about the constructs of this research such as digital leadership competencies and teachers' performance. Furthermore, it was indicated that digital leadership competencies had significant correlation and effect on performance of the respondents. Additionally, The R^2 value .807 shows the 80% variance of exogenous variable with endogenous variable. Moreover, .408 score of Q2 indicated the authenticity of the proposed model.

The study recommends that university management should concentrate on university teachers' training through contemporary technology tools for optimum job performance and effective teaching-learning processes according to the needs of learners. Moreover, university leadership provides a learning culture for teacher acceptance and usage of digital technologies to improve the quality of education.

Researchers decided to collect a large sample for the geographical representative of data and generalization of results, but during data collection, only 273 teachers participated in the study.

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