Cite this Article: Abid, M. N., Latif, W., & Ghaffar, A. (2024 Effect of Digital Transformation on Students' Learning Outcomes: A Mediating Role of Teacher Resilience. *Journal of Higher Education and Development Studies (JHEDS), 4*(1), 235-251. https://doi.org/10.59219/jheds.04.01.63

Effect of Digital Transformation on Students' Learning Outcomes: A Mediating Role of Teacher Resilience

Muhammad Naseem Abid [1] Warda Latif [2] Abdul Ghaffar [3]

Volume 4, Issue 1 (Winter 2024) | ISSN (Online): 2959-300X | ISSN (Print): 2959-3174 | Pages: 235–251

Corresponding Author: Muhammad Naseem Abid ✉ abid@hust.edu.cn

Abstract: This study explores the influence of digital transformation on student learning outcomes, highlighting the mediating role of teacher resilience in Pakistani educational settings. Adopting a quantitative research design, the study collected data from 336 educators using structured surveys administered through Google Forms. Data analysis was performed using Smart-PLS-4, a robust tool for structural equation modeling, to dissect the interrelations among digital transformation, teacher resilience, and student learning achievements. The findings indicate that digital transformation markedly improves student learning outcomes, with teacher resilience playing a pivotal mediating role. Teachers adept in utilizing digital tools significantly boost student engagement and academic performance. These results underscore the importance of enhancing digital competencies and resilience among educators to fully leverage digital technologies' educational advantages.

Keywords: Digital Transformation, Teacher Resilience, Student Learning Outcomes, University Level, Education

Introduction

Digital technology has significantly impacted nearly all areas of activity, profoundly transforming society. In universities, digitalization is radically altering teaching and learning processes. It enhances the transfer of information, student evaluations, student support, and administrative processes, offering greater opportunities for effective learning (Brink et al., 2022). Although using digital devices in classrooms can provide a certain level of convenience and comfort, it also presents challenges in teaching and learning, as noted by students' experiences with these tools (Ugur & Science, 2020). Technologies like smartboards and projectors now connect wirelessly to computers or laptops, allowing lectures to be recorded and accessed anytime. Students increasingly take notes on laptops instead of writing by hand, indicating a significant shift toward using computers in classrooms.

[1] School of Education, Huazhong University of Science and Technology, Wuhan, China. Email: abid@hust.edu.cn
[2] Dr. Hasan Murad School of Management, University of Management and Technology, Lahore, Punjab, Pakistan. Email: warda.latif499@gmail.com
[3] Dr. Hasan Murad School of Management, University of Management and Technology, Lahore, Punjab, Pakistan. Email: abdul.ghaffar@umt.edu.pk

In 2019, the global outbreak of COVID-19 had a profound impact on education, prompting all educational institutions to shift from traditional to online learning. To facilitate this transition, educational institutions had to adopt various digital platforms, each with different capabilities and strategies, making digital technology the primary medium of education during the outbreak for students and universities (Mustapha et al., 2021b). The move to online learning by higher education institutions during the pandemic affected learners, lecturers, and learning performance (Maqableh et al., 2021). Higher education now delivers programs through three formats: distance learning (DL), face-to-face learning (FFL), and hybrid learning (HL). The use of technology in higher education offers several benefits, such as allowing students to watch recorded lectures at their convenience and engage in more interactive activities, thereby facilitating better collaboration among students and shifting the role of the instructor to that of a facilitator. However, higher education was unprepared for this sudden shift (Mahlangu, 2018). Mahlangu (2018) identifies several challenges associated with hybrid and distance learning, such as quality assurance, passive resistance, inadequate training for lecturers in the use of digital tools, and a shortage of tools and technologies that facilitate adaptability. In response to the pandemic, higher education institutions continue to utilize digital platforms to facilitate collaboration.

Digitalization has profoundly changed education, impacting teaching and learning styles. Both lecturers and students have adapted to this shift. The COVID-19 pandemic has forced universities to accelerate the digitalization of higher education, integrating digital technologies to accommodate social distancing measures. This has led to a large-scale shift to online learning, requiring institutions to swiftly adjust resources and methods (Mustapha et al., 2021a). The transition has posed significant challenges for students and lecturers who need technical support. While digital transformation began years ago, COVID-19 has significantly accelerated it, affecting students' experiences (García-Morales et al., 2021).

Higher education institutions recognize that remote learning experiences can vary, and teachers often consider students' diverse skill profiles to mitigate poor self-regulation and learning strategies (Juuti et al., 2022). During the COVID-19 pandemic, Learning, Media, and Technology have played a crucial role in education. The widespread closure of institutions led to a significant shift to online education and remote teaching methods (Williamson et al., 2020).

Many academic institutions now prefer digital transformation to enhance communication and learning. Researchers are exploring how digital transformation influences students, teachers, and educational institutions (Mielgo-Conde et al., 2021). This study examines the impact of digital transformation on student performance and calls for further research into how specific technologies contribute to educational success. The findings will guide investments in technology and its link to new capabilities. In the literature, students' attitudes toward technology are categorized as a soft skill rather than a technical one (Dal Mas et al., 2021; Lombardi et al., 2019; Massaro et al., 2015).

Literature Review

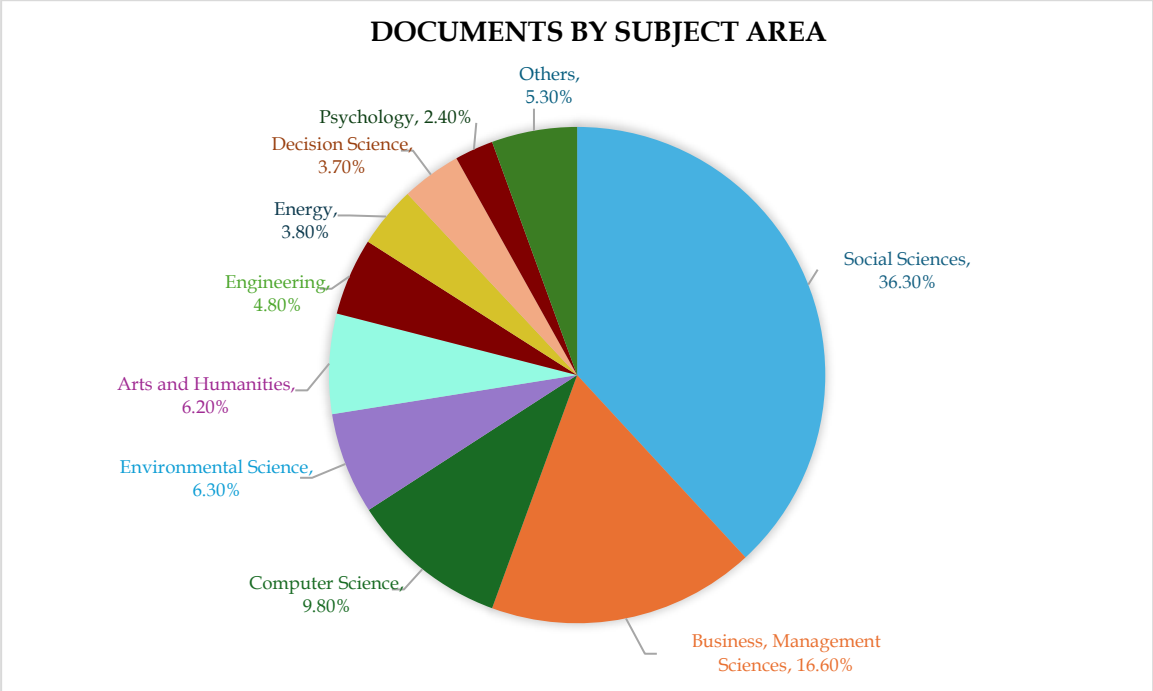
Digital Transformation

The term "digital transformation" is prevalent in academic and business circles. As we navigate the fourth industrial revolution, industries such as business, education, banking, government, and manufacturing are undergoing significant digital transformations. In the last 20–25 years, digital transformation elements,

drivers and barriers, and value creation through digital transformation have been frequently discussed in academic settings (Dal Mas et al., 2021; Shaughnessy & Leadership, 2018). Using Google Scholar data, three million results were returned for searches related to digital transformation. SCOPUS and Web of Science bases also produced plenty of research papers when looking for the keyword "digital transformation" (see Figure 1).

Figure 1

Digital transformation publications: results from SCOPUS database 2000-2023 (source: authors' compilation)



The European Commission (EU) and the Organisation for Economic Cooperation and Development (OECD) have prioritized digital transformation. Initiatives like the Digital Transformation Monitor and Digital Transformation Scoreboard track progress across EU nations (European Commission, 2019). The OECD's "Going Digital" project assists policymakers in fostering economic and societal prosperity in a digital world (OECD, 2018).

Digitalization is crucial for societal, economic, and business development. The European Commission predicts a transformative industrial and technological revolution affecting all societal aspects by 2030 (Navaridas-Nalda et al., 2020). Digital education has become vital during pandemics, with innovative digital practices enhancing student capabilities and mental well-being (Hanelt et al., 2021). Sustainable growth in education requires stakeholder engagement and quality management practices, which digital technologies facilitate (Verhoef et al., 2021).

Numerous studies confirm technology's role in enhancing student performance and achieving educational goals. Digital transformation involves adopting new technologies to allow flexible learning and performance, especially during crises like COVID-19 (Tauroginski et al., 2021). It includes a shift to

blended learning, combining traditional classroom learning with live broadcasts (Salta et al., 2022). Digital transformation positively impacts student performance through enhanced knowledge sharing (Halilić & Tinjić, 2020), though some studies report negative effects (Sung & Mayer, 2013).

Empowering students through digital tools is essential for achieving educational objectives, with assessments and rewards based on performance (Bogdandy et al., 2020). Digital teaching methods, such as lectures via Google Classroom and Zoom, enhance learning and interaction (Khalid et al., 2018). Effective digital transformation requires providing training for instructors and ensuring quality education through both physical and online methods (Al-Karaki et al., 2021).

Students Learning Outcomes

Higher education is a sector that increasingly recognizes the need to invest in infrastructure and digital technologies. Digital transformation significantly alters the university experience, necessitating universities to adapt by creating new scenarios for learning and interaction (Efimov & Lapteva, 2018). Digital technologies have become integral to studying, working, and leisure, particularly during and post-pandemic, making them indispensable in daily life. Consequently, the education system has shifted rapidly toward distance learning, with cloud computing emerging as a key technology for delivering online lectures. Distance learning, tutoring, and mentoring can all be managed remotely, and the digital recruitment and promotion of students have become commonplace (Mathur & Gupta, 2016). This shift means that students no longer need to be physically present at a university to attend classes or access educational resources. Additionally, universities can leverage digital marketing channels to reach a broader audience and enhance their services effectively.

As digital technologies advance, organizations and industries worldwide face increasing pressure to adapt to a disruptive marketplace. This challenge extends to educational institutions, including universities and schools, actively participating in this digital competition. Universities allocate substantial resources to expand their student base to secure the most advanced technologies. It is widely acknowledged that leveraging appropriate digital technologies significantly enhances the quality of graduates.

A notable observation is that leading institutions risk decline or failure when they cannot adapt to rapid technological changes (Nicolás-Agustín et al., 2022). Failure to stay current with technological advancements can diminish a university's appeal to prospective students, potentially leading to a downturn. Digitalization is thus crucial and should be a focal point for these institutions. According to Crittenden et al. (2019), digitalizing business practices has simplified channel interactions, facilitating new forms of engagement between businesses and customers and disrupting traditional marketing approaches. In education, this necessitates precise planning for online course delivery and demands that educators devise methods to integrate traditional classroom learning with digital tools. Incorporating technology extends the learning environment beyond physical classrooms, enhancing student engagement and participation (Henry, 2008).

Technologies such as artificial intelligence, augmented reality, blockchain, gamification, the Internet of Things (IoT), and 3D printing are staples in modern business practices, including in customer

service, where AI systems are extensively used. Universities and higher education institutions (HEIs) are encouraged to adopt these technologies to maintain educational quality and attract a broader student body.

Looking to the future, the evolution of social media applications, advancements in data analytics, search engine optimization, and the proliferation of e-businesses offer a glimpse into the potential of digitalization. Crittenden et al. (2019) emphasize that educational institutions must expose students to disruptive technologies and cultivate inquiry, critical thinking, creativity, and integrative learning to enhance future decision-making and capabilities. Therefore, it is evident that educational institutions worldwide should prioritize adapting to digital disruption to stay relevant and competitive in the evolving educational landscape.

Digitalization has revolutionized production processes into Industry 4.0 and transformed analog devices into Internet of Things (IoT) components, reshaping workplaces. COVID-19 accelerated the adoption of new technologies in universities, introducing a range of complex challenges that demand innovative solutions. Consequently, today's graduates need to develop what Sedelmaier and Landes (2019) refer to as "future skills"—competencies essential for thriving in the evolving technological landscape.

While these students generally manage well with the technical aspects of new technologies, the impact of these technologies on their learning experiences remains less understood. There is a dearth of research exploring the specific future skills that graduates need to leverage these new technologies and enhance their educational outcomes fully. Thus, a deeper investigation into how digital tools affect learning and what competencies will be most beneficial for future graduates is crucial.

Mediating Role of Teacher Resilience (TR)

Teacher resilience, identified as a crucial psychological construct impacting educators' well-being by Hascher, T., & Waber, J. (2021), encompasses several elements that aid individuals in navigating adversity, including self-esteem, self-efficacy, and motivation. Resilient teachers can manage their negative emotions, foster positive emotional experiences such as pride and achievement, and effectively handle pressures to develop in challenging situations, as noted (Sedelmaier & Landes, 2019). Scholarly interpretations of resilience, particularly in the teaching context, converge on the idea that teacher resilience is about adapting and growing through environmental challenges and adversities, a perspective supported by (Gillespie et al., 2007; Howard et al., 1999).

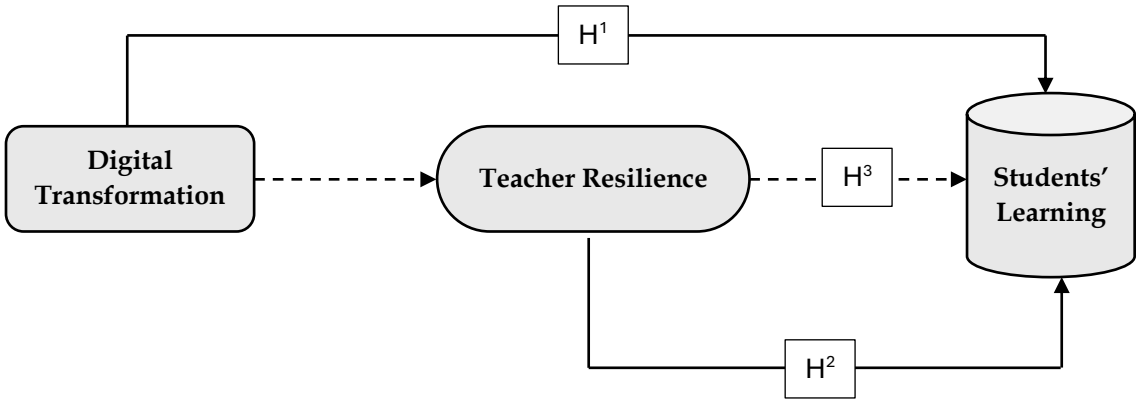
In COVID-19, online teaching has been mandatory to some extent, which is different from spontaneous teacher behavior, resulting in a stronger sense of stress. For teachers, the implementation of large-scale online teaching presents substantial challenges. During the COVID-19 pandemic, teachers were tasked with transitioning to remote instruction. This shift significantly increased their workload, thereby intensifying their daily pressures and requiring them to develop proficiency in various technical skills, adding to their stress. Research on educators with experience in online teaching indicates that they often experience a notable degree of stress associated with these demands (Beltman et al., 2011; Ebersöhn & Teaching, 2014). Teacher professional development reviews found that dilemmas and conflicts arise when

teachers face urgent issues such as digitization (Borko et al., 2010), intercollegiate collaboration, and research-based teaching methods. Research on teacher resilience has shown that it can be nurtured and stimulated during periods of stress (Vance et al., 2015), and strategies for fostering teachers' well-being can also be developed (Mansfield et al., 2016). In light of this, it is important to consider teachers' resilience during an epidemic as they adjust to the abrupt shift in teaching models and the use of technology in class.

Teachers must develop resilience in these challenges to survive and grow during emergencies. Numerous empirical studies have used qualitative research to confirm that individual and contextual factors influence teachers' resilience (Phillips, 2021). Many factors include school leaders, colleagues, relationships with students, and family support [58]. Teachers' personal factors are more important than complex contextual factors regarding resilience. Teachers' motivation and other abilities will help them show higher resilience, according to research on teachers' resilience (Trigueros et al., 2020).

There is some evidence that teachers' self-efficacy can promote their resilience. The ability to adapt to changes in the environment will be higher for teachers with high self-efficacy when faced with adversity or setbacks (Li, 2023). Teachers' resilience was explored using qualitative methods, that is, what personal protective factors helped them maintain their resilience when faced with adversity. Emotional intelligence, self-efficacy, intrinsic motivation, enthusiasm, teaching skills, and so on (Gratacós et al., 2023). In addition, studies have shown that teachers' pedagogical competence and personal protective factors may contribute to their resilience. During the COVID-19 pandemic, factors such as lack of competence and self-efficacy contributed to the decline in teachers' resilience and well-being in distance teaching (Soncini et al., 2021). A variety of qualities that characterize a competent teacher can be summarized as personal protective factors for teacher resilience. As a result, teachers with higher levels of online teaching competence are more likely to be resilient to overcome the adversities they face.

Conceptual Model



Hypothesis Development

H1: Digital transformation significantly and positively impacts student learning at the university level.
H2: Teacher resilience positively and substantially influences student learning at the university level.
H3: Teacher resilience positively and significantly mediates the relationship between digital transformation and student learning.

Methods

Research Approach and Sampling Technique

This research employed a survey strategy rooted in a deductive approach, which has become increasingly popular due to its ability to gather vast amounts of data economically from a varied participant base (Saunders et al., 2018). The study focused on Pakistan's education sector, noting that during the 2018-19 period, the country employed an estimated 1.83 million teachers. It was crucial to confirm that these educators were engaging with students via digital platforms during the COVID-19 pandemic to explore issues related to digital wellness. Consequently, the population for this study comprised teachers from across Pakistan.

Sekaran and Bougie (2016) suggest that for populations of indeterminate size, a sample size ranging from 50 to 700 respondents is generally adequate for most social and behavioral science research. Mason (2010) provides a formula for calculating sample size:$z^2 \times p(1-p)/e^2$, where z=1.6384, p=0.25, and e^2=0.0016, yielding a sample size of approximately 600 for this study. Consequently, the researchers distributed 570 questionnaires among teachers at educational institutions in Pakistan. Given the lack of precise data on the total number of teachers in these institutions, the research team opted for convenience sampling. This method is particularly suitable in scenarios where access to the entire population is restricted.

Data Collection Method

This study adopted an empirical methodology, gathering data through a structured questionnaire delivered via a web-based platform, specifically Google Forms, during the COVID-19 pandemic. To ensure the impartiality of responses, each questionnaire was accompanied by a cover letter detailing the study's purpose, reaffirming the anonymity of responses and emphasizing that participation was entirely voluntary. The self-administered questionnaires were distributed via email to 570 respondents, as direct personal contact was impractical due to COVID-19 restrictions, and external visitors were not permitted at the company.

After three weeks, only 245 completed questionnaires were returned. To reach the remaining respondents, follow-up reminder emails were sent, which successfully garnered 124 responses. Following a data screening process that removed invalid or incomplete entries, 336 usable questionnaires were retained for analysis.

Measures

The items were sourced from validated surveys previously employed in academic studies and were presented in English, the official language of educational institutions in Pakistan. A five-point Likert scale was utilized to assess the responses, ranging from 1 (strongly disagree) to 5 (strongly agree) for all metrics. The questionnaire was divided into two sections: the initial section gathered demographic information of the participants, while the subsequent section focused on various scales, including digital transformation, student learning outcomes, and teacher resilience.

Digital Transformation

The scale for measuring digital transformation in this study was adapted from Westerman et al. (2014)'s digital transformation scale and Bharadwaj et al. (2013)'s digital business strategy scale. Building on these

foundational works, modifications were made to include specific items addressing current educational practices, such as "Online e-learning practices influence students' growth principles" and "Digital techniques were used for continuous improvement among students during COVID-19." A total of ten measurement items were developed to assess these dimensions.

Multidimensional Teacher Resilience Scale (MTRS)

we selected the Multidimensional Teacher Resilience Scale (MTRS), developed by Mansfield and Wosnitza in 2015, due to its satisfactory psychometric properties. It comprises 26 statements that evaluate four dimensions of teachers' resilience as identified by Mansfield et al. (2012): professional resilience, emotional resilience, social resilience, and motivational resilience. Participants rate their agreement with each statement on a 5-point Likert scale, ranging from 1 (absolutely disagree) to 5 (absolutely agree). For this study, we adapted only 12 items at the university level.

Student Learning Outcomes

To assess student learning, we utilized the Student Learning Questionnaire (SLQ) originally developed by Zhoc, K. C. et al. (2018) and later adapted by Shafait, Z., & Huang, J. (2022). This 15-item scale evaluates students' self-perceived achievement of educational goals. For this research article, however, we selected only nine items from the scale tailored to measure student learning more effectively. The scale is divided into three categories: cognitive outcomes, social outcomes, and self-growth outcomes, with each category originally consisting of five items. Our study defines student learning outcomes to encompass both academic performance and the broader educational objectives of the institution, which aim to develop generic skills throughout the student body.

Data Analysis Methodology

Smart-PLS was employed to analyze the data through a method that integrates variance-based structural equation modeling (SEM) with partial least squares (PLS) path modeling. This approach, known as PLS-SEM, is particularly advantageous for exploratory research settings, as outlined by (Hair et al., 2019). Unlike traditional methods, the PLS algorithm separately calculates the relationships in measurement and structural models, rather than simultaneously enhancing clarity and precision in the analysis (Sarstedt et al., 2016).

PLS is highly effective for structural equation modeling in practical research scenarios, especially beneficial when dealing with small sample sizes and non-normal data distributions (Wong, 2013). It adeptly manages both single and multi-item measures (Leguina, 2015). According to Benitez et al. (2020), partial least squares path modeling (PLS-PM) is a robust estimator widely utilized in causal information systems research. Recent advancements have further refined this method, including consistent PLS (PLSc) for latent variable models, a bootstrap-based test for assessing overall model fit, and the heterotrait-to-monotrait ratio of correlations to evaluate discriminant validity.

PLS-Structural Equation Modeling (SEM) outcomes are evaluated through a two-phase process. This includes the examination of the measurement models followed by the analysis of the structural models, as detailed by (Hair et al., 2019).

Measurement Model Assessment

Henseler et al. (2014) proposed that for a model to demonstrate good fit, the square root of the mean squared residuals (SRMR) between the theoretical model and the empirical correlation matrix should be less than 0.10. In this study, the SRMR value was 0.061, which confirms that the model exhibits an acceptable fit. The model designed for this research includes reflective constructs; therefore, the assessment of the measurement model involves examining both indicator reliability and internal consistency reliability. Additionally, the convergent and discriminant validity of the constructs are also evaluated.

To assess the reliability of each item, it is necessary to measure its factor loading. Hair et al. (2019) suggest that a factor loading of 0.7 or higher for each item indicates reliability. According to Table 1, all item loadings exceed this threshold. However, six items with factor loadings below 0.7 have been excluded from the model.

Figure 2

Measurement model of the study

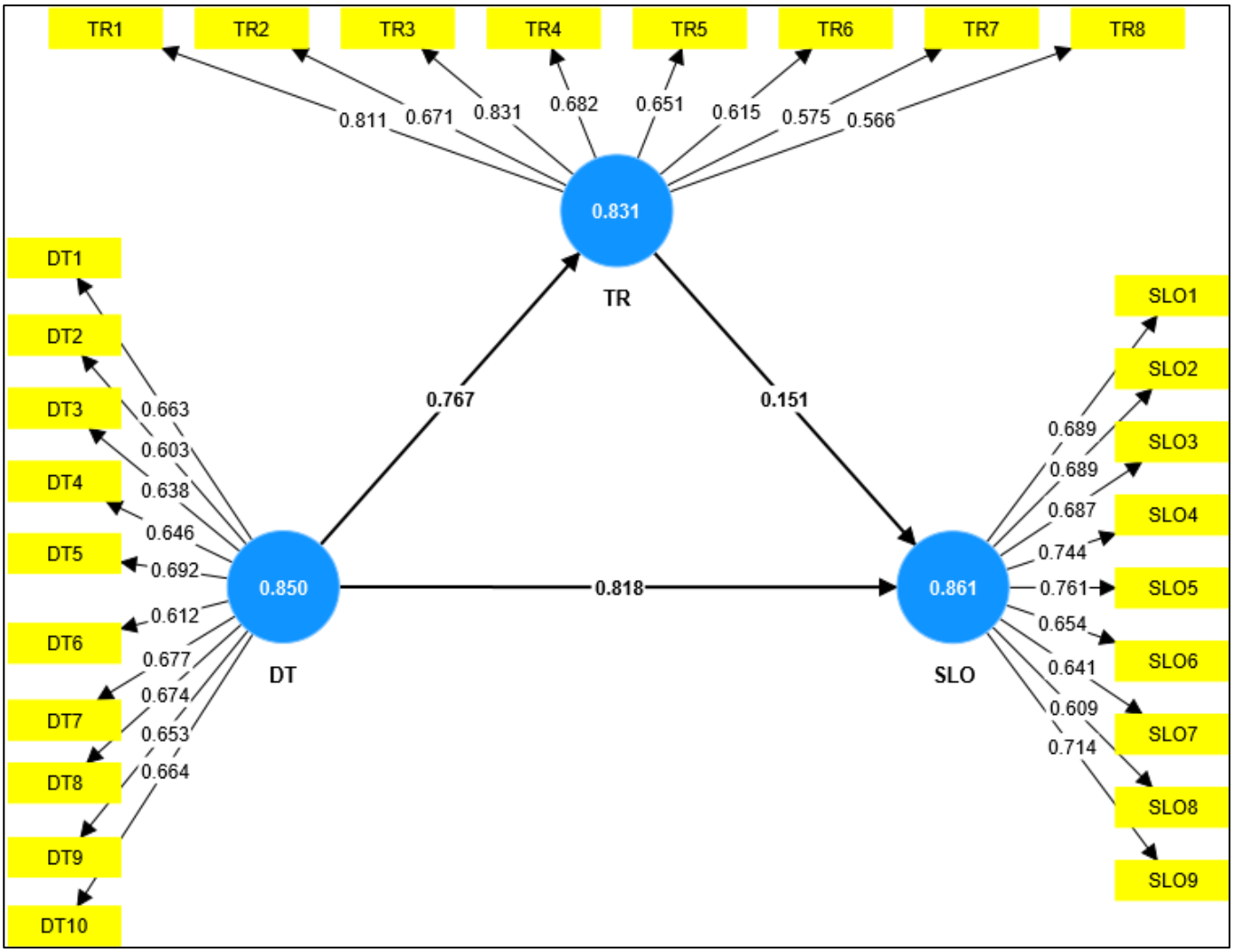


Table 1

Factor loading and VIF

Constructs	Items Code	*FL*	*VIF*
Digital Transformation ***Source:*** *Westerman et al. (2014) and Bharadwaj et al. (2013)*	DT1	0.663	1.591
	DT2	0.664	1.255
	DT3	0.603	1.530
	DT4	0.638	1.511
	DT5	0.646	1.798
	DT6	0.692	1.889
	DT7	0.612	1.550
	DT8	0.677	1.765
	DT9	0.674	1.181
	DT10	0.653	1.432
Multidimensional Teacher Resilience Scale (MTRS) ***Source:*** *Mansfield et al. (2012),(2015)*	TR1	0.811	1.019
	TR2	0.671	1.495
	TR3	0.831	1.585
	TR4	0.682	1.532
	TR5	0.651	1.480
	TR6	0.615	1.542
	TR7	0.575	1.338
	TR8	0.566	1.452
Student Learning Outcomes ***Source:*** *Zhoc, K. C. et al. (2018); Shafait et al., J. (2022).*	SLO1	0.689	1.643
	SLO2	0.696	1.720
	SLO3	0.687	1.596
	SLO4	0.744	2.079
	SLO5	0.761	2.110
	SLO6	0.654	1.637
	SLO7	0.641	1.467
	SLO8	0.609	1.361
	SLO9	0.714	1.647

Interpretation

Digital Transformation (DT) Item DT1: The factor loading of 0.663 suggests a moderate relationship with the digital transformation construct, which might be considered slightly below the ideal threshold. Its VIF of 1.591 indicates an acceptable level of multicollinearity, suggesting that the item does not overly duplicate the information captured by other items in the construct.

Teacher Resilience (TR) Item TR1: With a factor loading of 0.811 and a VIF of 1.019, this item is a strong indicator of the teacher resilience construct and shows minimal issues with multicollinearity, making it a robust item for the scale.

Student Learning Outcomes (SLO) Item SLO1: The factor loading of 0.689 is just below the preferred threshold, but still acceptable, showing a good relationship with the student learning outcomes construct. The VIF of 1.643 is well within the safe range, indicating low multicollinearity.

Table 2

Reliability and validity

	Cronbach's alpha	rho_A	CR	AVE
Digital Transformation	0.850	0.851	0.881	0.527
Student Learning Outcomes	0.861	0.861	0.890	0.541
Teacher Resilience	0.831	8.841	0.872	0.538

Note: CR indicates (Composite Reliability); AVE indicates (Average Variance Extracted)

Table 3

Discriminant and convergent validity

	1	2	3
Digital Transformation	0.653		
Student Learning Outcomes	0.934	0.689	
Teacher Resilience	0.767	0.779	0.682

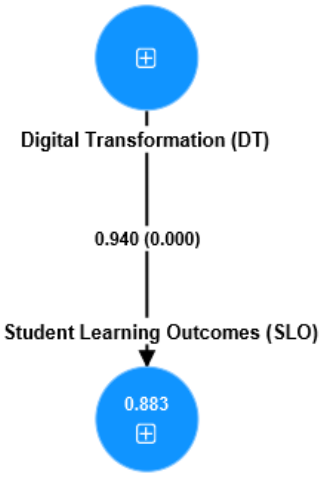
Note: HTMT mean Heterotrait-Mono trait Ratio of Correlations

Hypothesis Testing

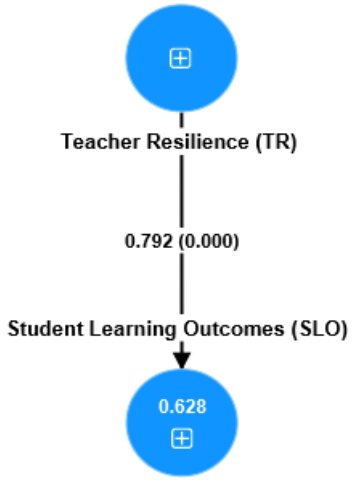
In the second stage, we initially developed two separate models using Smart-PLS to test the study hypotheses. Model 1 evaluates direct relationships between DT and SLO, TR and SLO, while Model 2 assesses indirect relationships and interactions (DT through TR on SLO), as illustrated in Figure 2. We conducted bootstrap resampling with 5,000 subsamples for each model sequentially. In recent years, within the context of PLS-SEM, this methodology has been extensively adopted by researchers, such as (Aboelmaged & Hashem, 2019; Wang et al., 2023). This approach allows for more realistic observations of complex models, making it easier to identify the effects of mediation in the structural model. The results—including R-squared, f-squared, path coefficients, standard errors, and t-statistics (referenced from Hair, Ringle, and Sarstedt, 2014)—are detailed in Table 4. In Model 1, the positive direct effect of DT on SLO (0.994; $p < 0.000$) supports Hypothesis 1 (Figure 3). Similarly, in model-1 the positive direct effect of TR on SLO (0.792; $p < 0.000$) supports Hypothesis 2 (Figure 4).

Structural Model 1

Hypothesis-1 (*Direct-Effect)* (Figure-3)

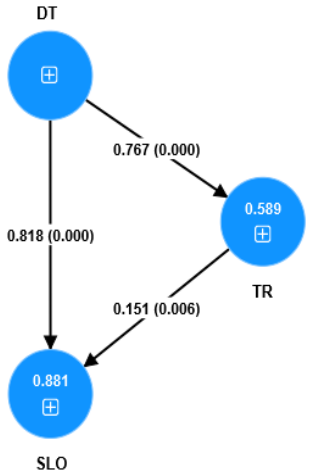


Hypothesis-2 (*Direct-Effect)* (Figure-4)



Structural Model 2

Hypothesis-3 (*Indirect-Effect)* (Figure-5)



In Model 2 (Figure 5), when the mediator (FR) enters a model, the direct relationships (DT & SLO) are significant, supporting hypothesis H3. The inclusion of a mediator in the model also changes the value of R Sq. from 0.79% to 0.88%, a net 9% increase in the endogenous construct (SLO).

Table 4: Results of the Structural Model

Hypothesis and Relationships Between Variables		Beta	SD	T-Statistics	P values	Decision
H1-Direct Relationship	DT -> SLO	0.818	0.055	14.796	0.000	Accepted
H2-Direct Relationship	TR -> SLO	0.152	0.055	2.746	0.000	Accepted
H3-Indirect Relationship	DT -> TR -> SLO	0.116	0.043	2.724	0.006	Accepted

Discussion

Our analysis substantiated that student engagement and participation are essential for achieving effective learning outcomes. The active involvement of management with students is also crucial, as effective communication helps mitigate numerous challenges. According to research by Gong et al. (2020), sustaining students' mental well-being by promoting participation in online classes is important. Implementing online training sessions can greatly boost students' morale. Additionally, the pandemic period has introduced specific challenges for students; the reduction in physical activities has led to mental stress, adversely affecting their learning practices.

Student performance declined during the COVID-19 pandemic as adapting to online lectures proved challenging. Students accustomed to in-person classes faced difficulties with the transition to online learning. Innovations in teaching methods are crucial for enhancing the effectiveness of students' learning processes. According to a study by Gautam and Bahl (2020), students' engagement in learning is closely tied to their interest in attending lectures.

Digital teaching methods have become increasingly important for adhering to health protocols such as social distancing (Musliadi et al., 2021). Utilizing online e-learning tools, such as Zoom and Google Classroom, can enhance student learning, as the motivation provided by course instructors during these sessions offers ample opportunities for students to acquire substantial knowledge. Research by Asghar et al. (2022) suggests that digital learning methods are more effective compared to traditional face-to-face instruction, as many students experience lower confidence in physical classroom settings. However, online classes offer a more comfortable environment for each student, positively affecting their learning outcomes.

Conclusion

This research contributes to the understanding of key institutional and individual factors in digital transformation that affect its effectiveness, conceptually broadening the scope of flexible capacities in such settings. The findings indicate that adapting to technological transformation necessitates a comprehensive blend of individual component variables. Furthermore, while many studies have supported the concept of digital transformation, empirical research testing these experiences in real-world scenarios remains nascent. The theoretical model presented in this study illustrates the relationship between flexible capacities for digital transformation and their empirical and performance outcomes. It also marks a significant achievement in developing and implementing educational structures and processes. Additionally, this research provides validation of the connections between the initial empirical and operational impacts of digital transformation capabilities, which have not yet been extensively explored in scholarly literature, by assessing the framework.

Limitations, Implications and Future Research

The primary limitation of this study is its reliance on cross-sectional data, which limits the ability to establish causality (Bryman, 2017). Future longitudinal studies are needed to examine causal relationships between the variables. Additionally, there are methodological constraints.

The research outcomes may impact teacher education and professional development. Rising attrition rates in the teaching profession globally (Craig, 2017) underscore the need to develop strategies to reduce teacher stress and burnout. The results suggest educational programs for teachers should include resilience-building protective factors. Teachers need to expand their coping mechanisms for job-related stressors. Boosting protective resilience factors—emotional, social, professional, motivational, and adaptive—should be a key component of these programs.

The findings on teacher resilience and adaptability highlight the need for professional and peer counseling and support, especially for new teachers. Early-career teachers have rated peer learning as invaluable, significantly increasing their motivation, satisfaction, and commitment to the profession (McCormack et al., 2006; Le Cornu, 2013).

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