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Revamping Education Systems: Studying the Impact of Learning Technology Adoption on stakeholder Engagement and stakeholder Performance during Pandemic Recovery: A Quantitative study

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Abstract

The post-pandemic educational landscape has enabled technology integration with traditional practices, leading to new paradigms. There is a need to study education stakeholders' performance and engagement behaviors in response to this sudden change. This includes assessing students' learning and performance and teachers' engagement in online learning environments. The comparison study included a sample of 360 teachers and 360 students and used questionnaire survey methods. This study used a two-phase study design. The average age and gender differences in technology adaptability among online teachers and learners were compared by cross-tabulating the teachers' and students' data. The adoption of learning technologies' mediating effects on the relationship between stakeholder engagement and performance were examined using SEM analysis. The results of this study quantified the weak mediator role that learning technology adoption played in the relationship between stakeholder engagement and performance. The study found a new statistical relationship showing the significance of stakeholder engagement in teachers' roles and stakeholder performance in students' roles. The analysis revealed that Learning Technology Adoption had a weak, negative mediating effect on the direct relationship between Engagement and Performance.

Keywords: Stakeholder Engagement, Stakeholder Performance, and Learning Technology Adoption.

1 Introduction

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There are two main and important factors in an educational system: students and teachers and engagement in academic roles, which indicates that performance is important for an educational system's sustainable and prosperous measurement. The teachers' active engagement in their assigned positions is crucial for the education system's effective functioning and educational standards' advancement (Xu & Margeviča-Grinberga, 2022). Following their engaged behaviors, the students' performance factor is a measure of student learning and grooming, as well as a measure of the teachers' intent of level of engagement (Al-shehri, 2020).

Students and teachers are regarded as education stakeholders as they are responsible for actively promoting or imposing traditional decorum of learning management arrangements to which they belong. With changes and modifications in the education sector, the decision-making authorities become answerable to the new development. Technological advancement is the primary and dominant factor that indicates the successful steps of education stakeholders in the field of knowledge. Since the covid, this technology's acceptance, advancement, integration, and gradation have been put forward numerous times as a measurable source for SE and performance (Deshmukh, 2021).

Since the COVID outbreak, the traditional education system has been drastically altered. First, the complete break in life has restored the flow of students' educational careers and teachers' professional growth. Then, a massive transformation in the education system ended this major break (Ashour, 2021). The integration and total capture of the education sector by digital technology was a new developmental and transformative change in the global era. Despite their lack of expertise or immature practices, stakeholders in the education sector were forced to adopt and adapt to new technological integration (Deshmukh, 2021).

Technology implementation and acceptance were forced, and compulsory policy for integrated education was made. Reluctantly, it changed and influenced the level of engagement of teachers and students' performance (Sethi & Roy, 2022). The system was a new addition to the normal teaching routine. Hence, connecting to technology was inaccessible for faculties, which ultimately impacted their engagement and performance by altering and disturbing them and reducing their effective outcomes. Every field of education, including every subject in education, has a unique mode of study (Koeswanti, 2021). Some courses may be technical, while others may be practical or theoretical. The learning mode is designed based on the practical essence of the course of study. However, in the case of COVID-19, the education sector has made significant progress toward adopting or adapting the technology mode (Cao et al., 2021).

The acceptance and use of online teaching systems have been identified as a factor in the lack of engagement of teaching stakeholders in their teaching roles. This is because before COVID-19, teachers were engaged in their teaching roles using traditional teaching styles (Sethi & Roy, 2022). Teachers have been forced to accept and implement online teaching modules to sustain the continuous education system since COVID-19. Teachers' engagement has been impacted by the forced implementation of new technology-integrated teaching techniques and rapid adoption (Asad et al., 2022). Teachers' focus is disrupted from their teaching activities due to their inability to learn the technology for teaching quickly, and they are more concerned with dealing with the technical actions of the online system (Rapanta et al., 2021).

Students' stakeholders are still learners with difficulty accepting and applying technology to the learning process. Students are still in the early stages of learning higher education course paradigms, and the abrupt shift from physical to online learning programs has significantly impacted students' learning-performing ability (Susilo, 2022). There may have been some students who were sharp enough or experts in their fields to use online platforms for learning purposes, but for the most part, the situation was completely different. As a result of their lack of technical ability, the student's performance ability dropped dramatically, implying their reluctance to accept

technology (Asad et al., 2022).

The case of students and teachers as stakeholders in technology acceptance can be seen in global higher education platforms. Learning technology had a different impact on students and teachers from different fields and ages based on their technical deficiencies. Teachers in technical fields were distracted by the need to develop new teaching methods to meet online teaching requirements (Ayush & Gupta, 2022). The students had difficulty understanding the course content that integrated the online learning mechanism because their knowledge of the study field and technical fields was still in its early stages (Rof et al., 2022).

Acceptance of technology, learning new online teaching methods, and modern integrated learning systems create a recognition barrier for both developed and developing countries such as Pakistan (Ahmmad & Ashfaq, 2022). Because the teachers and their teaching methods have never faced such challenges, their practical experience is also lacking. Second, students worldwide are in the learning stage, so their grasp of technical skills and expertise is also in the beginning stages (Minhas et al., 2021).

1.1 Research Objectives

Based on the above justifications, this research objectives developed are as follows:

RO1: To understand and observe the impact of Stakeholder Engagement on Stakeholder Performance

RO2: To understand and observe the impact of Stakeholder Engagement on Learning Technology Adoption

RO3: To understand and observe the impact of Learning Technology Adoption on the relationship between Stakeholder Engagement and Stakeholder Performance.

1.2 Research Questions

Based on the above Research Objectives, this study aims to address the following research questions:

RQ1: Does Stakeholder Engagement create a strong relationship with Stakeholder Engagement?

RQ2: Does Stakeholder Engagement create a strong relationship with Learning Technology Adoption?

RQ3: Does Learning Technology Adoption mediate the relationship between Stakeholder Engagement and Stakeholder Performance?

1.3 Problem Statement

Increased incorporation of technology has contributed to academic progress, and insufficient expertise and knowledge among stakeholders have created obstacles to technology implementation (Lazar et al., 2020). Besides other shortcomings in the education system, previous studies have emphasized stakeholders' lack of technical expertise (Ahmmad & Ashfaq, 2022). As key contributors to the educational system, educators have not previously acquired this level of technological proficiency. Likewise, students, also seen as important participants in education, are still in the early stages of adapting to technology and comprehending this new evolution in learning and utilising technology (Minhas et al., 2021; Susilo, 2022). According to scholarly sources, it has been demonstrated that educators within the education system possess more expertise in utilising physical, institutional, and educational resources compared to online tools. As a result, students' academic competencies are also enhanced.

Nevertheless, when technology is integrated into the teaching process, teachers' limited technical knowledge diminishes their confidence in delivering instructional content and utilizing technological tools. Consequently, their teaching methodologies influence students' learning and comprehension abilities, leading to subpar academic performance (Asad et al., 2022). In light of the uncertain factors contributing to educational shortcomings and the evolving landscape of the education sector, this study aims to explore the effects of new developmental influences. The

influence of LTA on teacher involvement and student achievement remains ambiguous, with potential for enhancement or adaptation. Thus, this research examines the direct impact of educational stakeholders on student performance and the indirect effect of LTA on the relationship between engagement and performance. Further sections of this study will detail the literature on the engagement-performance relationship mediated by LTA with the base of TAM Theory. The hypothetical framework developed will be analysed through the data collected and concluded in light of the literature review conducted.

2 Literature Review

2.1 Learning Technology Adoption

The study has integrated the TAM theory model to address the impact of unconscious behavior and negative perceptions towards technology usage in educational institutions during the pandemic. The reluctance to adopt new systems and techniques is often driven by concerns about negative mental perceptions and fear, leading to frustration (Shen & Ho, 2020). In literature studies, these are a few frequently mentioned critical characteristics of acceptance and adoption that address the fact that users are frustrated and stressed with every new online technical method due to fear of the unknown (Susilo, 2022). Anxiety is a key element within the field of education and plays a major role in shaping students' willingness to embrace technology. Limited technical knowledge and experience, as well as feelings of frustration and immaturity, all contribute to low interest in utilizing technology. Additionally, fear associated with technology, mental strain, and lack of proficiency diminishes the likelihood of successfully adopting technological tools (Meng et al., 2020). Educators and instructors need to focus on the intentions and behaviors of students when using online methods while continuously providing motivation and support during the learning process.

Online learning management systems come with various limitations and preconceived notions that can often instill apprehension in students (Kamal et al., 2020; Meng et al., 2020). Teaching faculty commonly experience a fear of unfamiliarity with technology and its use. As stated in the study by Bailey et al. (2021), teaching faculty who work remotely face challenges due to their lack of familiarity and expertise with new educational technologies, including their usage, functions, theories, and models. Recent studies have explored issues related to fear and acceptance of technology in education, often utilizing the TAM model. Several studies have examined the reasons for technology rejection, offering various explanations and rationales for users' aversion to technology. Gresham (2020) found that users may lack confidence in using technology effectively, leading to fear of making errors while utilizing technological tools and methods. Appavoo (2020), research suggests that people also avoid technology due to the perception that it is time-consuming to learn and use. Furthermore, concerns about data privacy, information security, and potential misuse of personal information serve as additional barriers to adopting new technologies (Distler et al., 2020).

2.2 Stakeholder Engagement

The pandemic has substantially impacted evolving conditions and professional endeavors during this operational era. The academic community is the sector most profoundly affected by these changes (Ratten, 2020). Educational stakeholders face a significant challenge in ensuring the effectiveness of both online and offline learning environments (Kumar, 2020). The lockdown significantly acted as a barrier, leading to the closure of all educational institutions and disrupting the conventional method of teaching and learning through online technology-based classrooms (Abidah et al., 2020). The shift to remote work has impacted the extent of students' participation in their education (Ratten, 2020).

In functionalizing an online class, the most essential tool is the teacher and their level of

involvement in their designated teaching role (Strielkowski, 2020). If the teachers are fully committed to providing insightful learning to their students, they can attain the intended outcomes (Lei et al., 2021). Online teaching can be a complex job and responsibility for teachers, as not everyone is technically trained to function through online teaching mediums (Toquero, 2020).

Online classrooms have significantly modified the teacher-student relationship, as it has become more critical for both to develop strong connections in a virtual learning culture. According to Raja et al. (2020), the online teaching and learning culture perceives effective and active SE to produce better outcomes and implementation. This expectation of educational administrators and monitors is the biggest challenge. Quick adoption of this new technology-based culture and stakeholder acceptance have not yet been achieved, which is further leading toward an effective SE. Raja et al. (2020) further stated in their study that teachers should learn new tactics and skills that could make their classes the most to enhance student engagement and overcome the stress and frustration of using online learning tools. However, reportedly, becoming innovative and functionally engaging in online classes has become difficult for teachers as they are still new to the system and need more space to get used to it (India Today, 2020). The shift to remote instruction has presented various difficulties for those involved in education, especially regarding the effectiveness of online and traditional classes.

2.3 Stakeholder Performance

With the lack of training and the sudden switch to an online classroom environment, many quality and performance-hindering issues have been raised and are trending in academic standard discussions. The students' performance is improving as teachers are simultaneously upgrading their skills. Students are the primary product of an educational institute, so their learning, expertise, and exposure are counted as performance indicators. The academic success factor lies in the positive or negative outcome of the student performance, and simultaneously it also shows what strategies and skills need to be educated or enhanced to sustain further online performance (Fidyah & Setiawati, 2020). Again, students are worthy indicators for measuring an institute's educational performance capability. As explained by Serdarević (2023), the level of student performance in knowledge represents the effective role of teachers in online teaching. The more satisfying student performance shows their learning capabilities and teachers' performing capability through any provided mediums (Shen & Ho, 2020). The same stance has been also supported by the study (Lazar et al., 2020), that SP is an essential measure of teachers' knowledge delivery tactics and students' picking power in an online learning program.

For obtaining students' positive engagement throughout the online class, the study of Gonzales et al. (2020), has suggested teachers should use new and collaborative manual and online tools to make learning and understanding easier. This can help foster deeper relationships between students, instructors, and the material itself, ultimately leading to increased student engagement and success in the online learning environment. The same phenomenon has been stated by Brown (2021), the sudden switch from the old traditional classroom method to new online learning classes with automated tools and techniques can be interesting and provide students a base to enhance their professional skills in a more interactive, collaborative simulation team-based learning environment that could be related to original curriculum and cases but in an advanced method. According to Aristika et al. (2021), these online learning tools have enhanced the base of performance for students as now it has become the need of an hour, so teachers encourage students to become more analytically skilled in learning problem-solving skills, simulate learning methods and use more analytical and investigative methods.

2.4 Hypothesis Development

Students' involvement and engagement in online classes are dependent upon the tactics and methods of teaching used by their instructors. As stated by Ratten (2020), if teachers are truly

involved in online classes then students also show enthusiastic behaviors and actively participate in classes. Teachers' involvement and active participation show their hard work and dedication toward providing students a better online learning exposure (Sethi & Roy, 2022). The excessive use of online teaching systems and their constant monitoring and assessment of teachers have actively engaged them in their teaching roles (Adnan & Anwar, 2020) and have also stabilized the active participation and engagement of students in online classes (Ozer, 2020). The proof of students' active involvement and contribution is their increased attendance in online classes (Cahapay, 2021). The study of Susilo (2022) provides a new dimension to the student-teacher online relationship by indicating the importance of teachers' support and motivation to students towards active participation. The guidance and the right kind of support have helped students gain exposure to a new era of knowledge and skills that would have been difficult and impossible without teachers (Minhas et al., 2021).

H1: *Stakeholder engagement has a positive relationship with Stakeholder Performance*

With the new era of online learning systems, there has been a significant shift in teachers' knowledge delivery with highly proficient manners and enhanced subject engagement (Ayush, 2022). The teaching faculty has proven their great acceptance and transition in teaching methods and techniques (Cao et al., 2021). The research of Rapanta et al. (2021), indicates that to adopt the online learning system, the teaching faculties have adopted and learned the necessary skills and technologies through various workshops and practical training so they can professionally adapt and perform in the virtual classes. The teaching faculties have shown a very positive and enthusiastic response to the online learning management systems through their flexibility to new paradigms. Sethi and Roy, (2022) state that usually youngsters of today are considered to be positive towards technology due to their high literacy level but in the field of education more specifically the teaching community the only thing that greatly matters is the teaching experience and urge to learn new methods. The difference in teachers' adaption and usage depends upon the level of competency, the content they are teaching as well as the technical and non-technical aspects required to be taught (Xu & Margeviča-Grinberga, 2022). However, teachers still need to learn and enhance their knowledge of technology and its use, as suggested by Fidyah and Setiawati (2020); the global environment is changing, and so the educational system and culture and so teachers need to upgrade their knowledge and skills in technology learning.

H2: *Stakeholder Engagement has an impact on the Learning Technology Adoption*

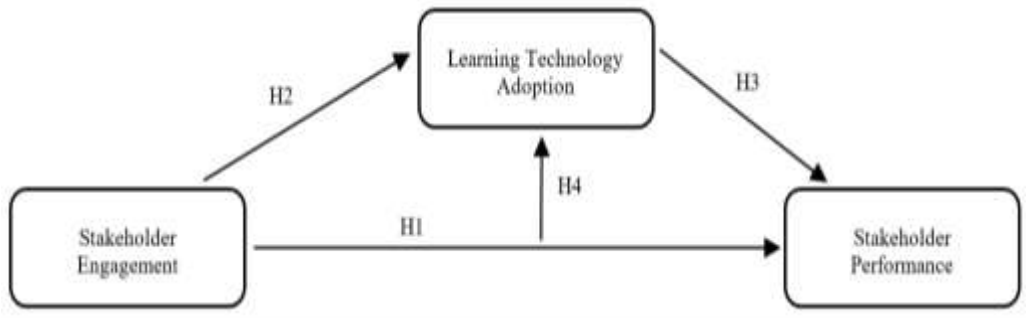
Technology and its implications have dominated in the era of COVID-19 (Singh et al., 2021). The lockdown has improved the use of home-based technology (Shen & Ho, 2020). LTA has advanced the level of skills and the usability approach of educational stakeholders. The sudden shift has also improved the capacity of online learning tools and technology for their application to educational institutes and other home-based assignments, making hands-free learning more accessible and more efficient in a friendly environment (Al-Rahmi et al., 2020). Communication has become more accessible and quicker between teachers and students. The integration of technology has also impacted the technology's applicability in the performance of educational tasks by improving functionality and competency of using online learning management systems through technically enhanced skills, abilities, and knowledge (Rapanta et al., 2021).

H3: *Learning Technology Adoption Has Impact on Stakeholder Performance*

COVID has revolutionized education technology by transforming the traditional book and board concept into the online classroom, conference training and workshops, online papers, and virtual presentations (Strielkowski, 2020). The role in the education sector especially for teachers and their influence on students has changed a lot (Kumar, 2020) and a dominating change has been observed in the acceptance and practice of technology use by the students and their families. The

online platforms were only conceptualized for entertainment and social connection purposes (Strielkowski, 2020). To some extent, the online platforms of learning introduced have a beneficial impact on the performing ability of teachers and students through their highly engaged behaviors (González et al. 2023). Through research surveys, it has been found that using technology sources has its kind of benefits and risks; as the system has marginalized the benefits and exposure for the elites and the poor students based on affordability and access to technology. Online technology and its learning programs are not beneficial for the community having disability of hearing (Manzoor, 2020).

H4: *Learning Technology Adoption mediates the relationship between SE and organizational performance.*



3 Research Methodology

This research is an experimental study in the field of education, mainly focusing on Pakistan's higher education system. There is a clear difference in acceptance and adaptability of technology among users, the quality of education, and the utility of technology in education in the regional diversion in Pakistan, so as per the scenario, the lower Punjab region of Pakistan is selected for the study. The reason for selecting the Lower Punjab population is that the main study region in Lower Punjab is Multan, as it has all educational facilities and is a hub for connecting rural areas. So, the students and teaching stakeholders of Multan are divided in their skills and technical adaption more specifically, their adaption of technology in teaching and learning.

This research will analyze the engagement and performance of teaching faculty and student community of university or bachelor degree pursuers and holders in the Multan higher education sector. They are the main stakeholders and primary representors of educational quality and have undergone the new online education system of technical and non-technical courses. The population is not only confined to Multan citizens. It includes the students and teachers that belong to surrounding areas of Multan but are residing and practicing their professions and learning in Multan because Multan is comprised of different learners and practitioners of educational technology and including them in research will enhance the findings of this study (Adnan & Anwar, 2020).

This research is a two-wave study based on a cross-sectional approach separately measuring teachers' experience and then analyzing students' experiences and responses. More specifically, those who were teaching and learning through online mediums were contractual, regular, and permanent staff teaching through virtual or physical classes. A total of 360 responses from both stakeholders were collected at the given time, and there were no missing surveys, as respondents were requested to provide their honest responses carefully. Data collection for this study has proceeded under the self-administration so that pure responses can be collected.

The developed questionnaire was validated by three faculty members from separate higher

education institutions before the survey was conducted. To assess the reliability of the questionnaire, a preliminary test was carried out on 6 students and 6 teachers from the same higher education institutions. Data collection commenced after verification of reliability and validity to ensure accurate results for this experimental investigation.

The measures adopted for this study are SE, SP, and LTA.

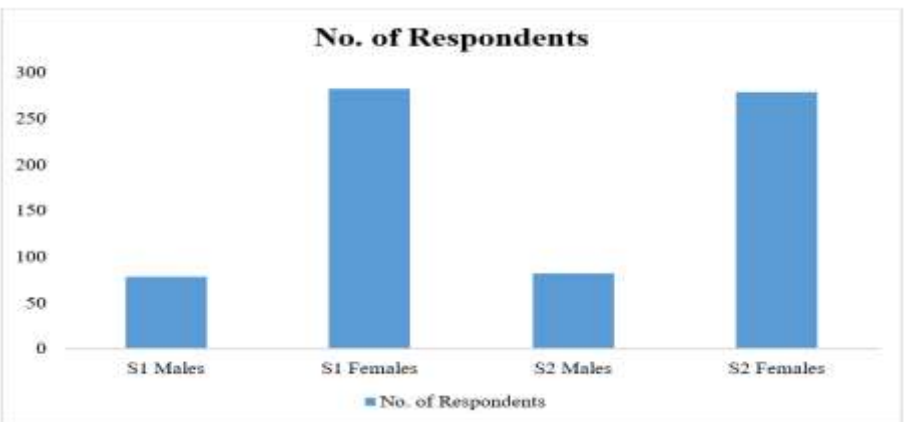
SP: This is the dependent variable with 18 items measured at a 5-likert scale adopted by Hung et al. (2010). This measures students' performance as educational stakeholders, which is influenced by the teachers' engagement in their teaching role as well as their behavior towards technology adoption. The SP has 5 measures: Computer self-efficacy, Self-directed learning, Learner control, Motivation for learning, and Online communication self-efficacy.

SE: This independent variable is adopted from the study of Kabir et al. (2020) using the 5-Likert scale with 7 measuring items. The variable has used teachers as stakeholders whose involvement and engagement in their teaching roles and technology adoption impacts the SP (students).

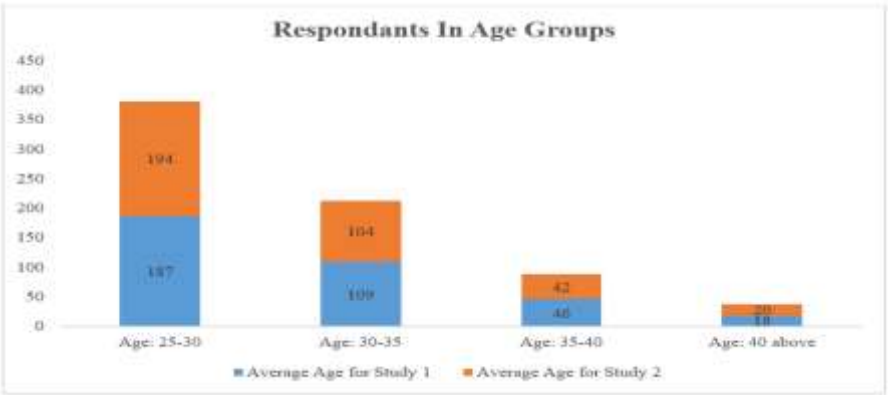
LTA: This is the mediating variable that indicates and measures the stakeholder adoption and acceptance level of technology and its impact on the performance of teachers and students by adopting new learning teaching methods. This variable has been adopted from the study of Kabir et al. (2020) on a 5-likert scale with 11 measuring items. Control Variables: Age, gender, education level, and job experience were the control variables of this study. For students, the control variables were age, gender, and education level, while for teachers, the control variables were age, gender, education level, and job experience. Structural Equation Modeling analysis has been used to understand the link between three connecting variables: SE, SP, and LTA. As this study aims to check the direct and indirect presence of mediating variables; SEM analysis will be performed. The structure equation modeling technique is comprised of further techniques; regression analysis and confirmatory factor analysis that shows the type of relationship developed among the variables.

4 Results

The initial study involved 360 participants, with 282 females and 78 males. The second study included 278 female respondents and 82 male respondents. In the first research, there were 187 participants aged between 25 and 30, while the number decreased to just 18 for those above the age of 40. On the other hand, in study two, there were 194 students between the ages of 25 and 30 and 20 over the age of 40. Numbers differ distinctly regarding both gender distribution as well as age range participation between Study One and Study Two.



According to the comparison graph for respondents in both the studies the ratio of female respondents was higher than the male respondents. There were 95% female respondents and 82% male respondents.



From the graph above, the age group comparison shows that the respondents in Study 1 were the majority in age groups of 25-30, 35-40, and above 40 while in Study 2 the respondents were the majority in the age group of 30-35. From the above comparative analysis for gender and age, it was seen in a previous study that using and adopting technology was highly seen among young male and female teachers and students and they were less hesitant in learning technology and getting trained for using it in daily educational duties.

4.1 Reliability Check

Reliability statistics is the test of the coefficient of reliability. This coefficient of reliability is termed as "Cronbach's Coefficient Alpha" which represents reliability statistics for data analyzed. In the reliability test, the values of Cronbach's Alpha have certain values of acceptance. Value above .9=excellent, .7-.9=good, .6-.7=acceptable, .6-.5=poor and below .5=not acceptable. The items on the measurement scale with increased values of correlation show an increase in the value of Cronbach alpha which indicates good reliability statistics.

4.2 Reliability Check for Teachers

Scale	Cronbach's Alpha
Stakeholder Engagement	0.872
Stakeholder Performance	0.892
Learning Technology Adoption	0.814

4.3 Reliability Check for Students

Scale	Cronbach's Alpha
Stakeholder Engagement	0.843
Stakeholder Performance	0.826
Learning Technology Adoption	0.805

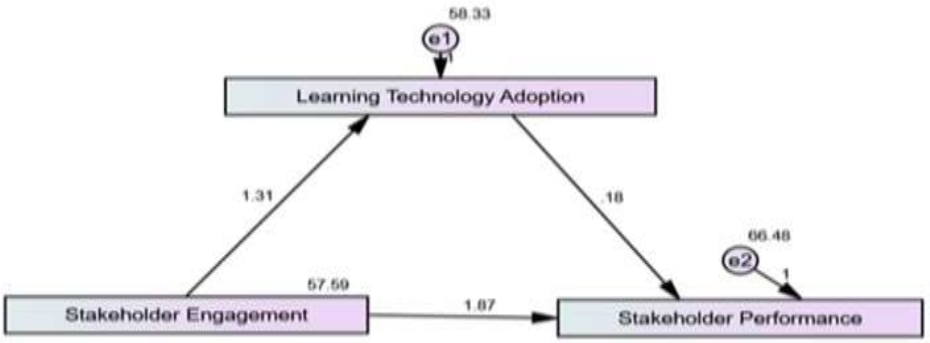
4.4 Validity Check

To check the validity of the variables, a correlation test is performed which shows that when the variable coefficient of correlation is closer to 1, there is more acceptability of the variable for further study. In this study, stakeholder performance has the highest correlation among the three variables and stakeholder engagement has a negative value which means a 1 unit increase in other variables will cause a -.649 decrease in engagement.

	Stakeholder Performance	Stakeholder Engagement	Learning Technology Adoption
Stakeholder Performance	1		
Stakeholder Engagement	.850**	1	
Learning Technology Adoption	-.649*	-.588**	1

*** Correlation is significant at the 0.01 level (2-tailed).*

Phase 1

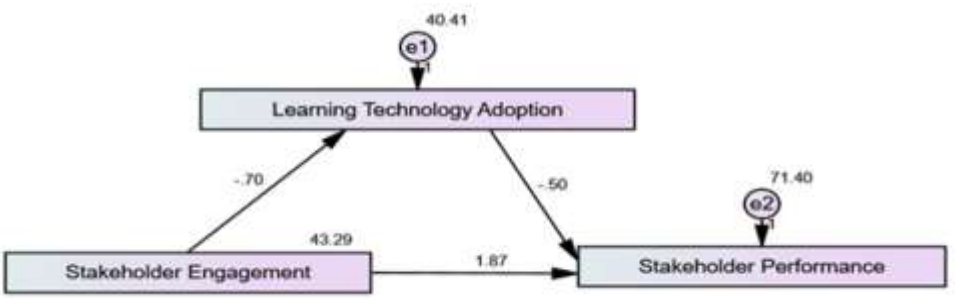


4.5 Regression Weights

			Estimate	S.E.	C.R.	P	Label
LTA	←	SE	-.702	.051	-13.765	***	par_1
SP	←	SE	1.867	.084	22.282	***	par_2
SP	←	LTA	-.497	.070	-7.090	***	par_3

The value of 1.87 develops a considerable relationship between SE and SP. It means that in the case of a strong teacher's performance in class, students' engagement throughout the learning program should be positive. While the indirect relationship between variable LTA and SE and performance is weak. While the indirect impact of the mediating variable may result in a relationship with the dependent variable, it is weak in comparison to the independent variable's direct relationship. With a value of 0.81, the LTA of teachers has an impact on faculties teaching methodologies which does not make a considerable impact on teachers' performance consequently weakening students' understanding. However, the integration of LTA improves students' interest and involvement. SE and LTA have an indirect relationship of 1.31, which is less than the direct relationship between SE and SP. Furthermore, the value obtained between the LTA and SP is 0.18. As a result, implementing learning technology does not affect SP because SE has a direct impact on SP.

Phase 2



4.6 Student Regression Weights

			Estimate	S.E.	C.R.	P	Label
LTA	←	SE	1.310	.053	24.665	***	par_1
SP	←	LTA	.177	.056	3.149	.002	par_2
SP	←	SE	1.871	.093	20.097	***	par_3

The coefficient of determination for the direct relationship between the independent and dependent variables is 1.87. That is, SE significantly impacts SP in the case of students, with a significant value of 1.87. The indirect relationship between LTA and student engagement is negative, with a value of -.70. In the case of students, this means that the use of learning technology does not increase SE sufficiently to affect SP. With a value of -.50, the discovered relationship between LTA and SP is negative. Adoption of learning technology reduces SP by a factor of -50. The model shows a strong, positive direct relationship but a weak, negative indirect relationship. There is no mediation, and using one further weakens the relationship between the independent and dependent variables. Both studies show that the direct effect is stronger than the indirect effect for teachers. In Study 1, the direct relationship between engagement and performance is more positive, but with mediating effects, the direct relationship is reduced but still greater than the indirect effect.

The direct relationship between engagement and performance is stronger in Study 2 and is the same as in Study 1. However, the obtained indirect effect hurts the direct relationship of variables, resulting in negative mediation. The overall findings of this comparative study show that LTA is a weak mediator but still significantly impacts Study 1 because it increases the impact of engagement while decreasing the direct relationship between engagement and performance. In study 2, as the effect of LTA increased, the direct impact decreased and had a negative association. It means with increasing indirect effect of LTA, the strong association developed with the direct effect of Engagement and Performance is reduced and has become negative

5 Discussion

The research analysis was based on a comparison study, so the results obtained are also discussed in comparison. From the results obtained in Study 1, teachers' engagement impacts student performance. There is a direct relationship between performance and engagement. The results obtained are supported by the study of Kritikos (2021), where he states that the teacher-student relationship is strong in the physical classroom. Compared to other learning methods, the physical classroom is more effective as it directly connect and communicates. With face-to-face discussions, students learn more quickly and effectively (Al-Rahmi et al., 2020). Students are new to each concept and content taught in class, so direct contact helps them engage and develop a clearer understanding (Fidyah & Setiawati, 2020).

SE (teachers) is influenced by LTA, according to Hypothesis 2. In study 1, hypothesis 2 shows that increasing the impact of LTA has a positive impact on teachers' engagement, whereas in study 2, the relationship developed between SE (teachers) and LTA is negative. Study 1 involved a sample of teachers with prior teaching experience and had developed expertise in using technology, making them more likely to adapt to the technology-integrated platform than students. (Cao, 2021). The advancement in technology and its continuous integration into teaching has improved teachers' capabilities, knowledge, and expertise within the new paradigm by managing an easy adoption of the new educational modifications (Koeswanti, 2021). The students were the study's population in Study 2, and the results show that, with changing times, teachers need to upgrade their knowledge and develop their abilities, but due to their lack of technical abilities, they can perform well. Teachers are experts in their fields, but they are not up to date on the latest technological advancements, so they cannot engage students through virtual systems. Teachers are not used to teaching using new advanced systems, so they may encounter technical difficulties

while delivering lectures (Asad et al., 2022).

The hypothesis statement that LTA affects SP is also accepted with a positive association result for study 1. The results state that learning technology and the adoption of technology in education are solely dependent upon students, and students believe that learning technology is important. In case 2, the students as stakeholders do not support the idea of learning technology, so the hypothesis is rejected for the case 2. It has been reported in a study by Rapanta et al. (2021) that the use of technology in higher education is beneficial for students in numerous ways, such as gaining extensive knowledge in some particular course or subject, and students can use multiple online sources. But initially, students are not multi-taskers, so it becomes difficult for them to learn and practically deal with technology simultaneously (Rof et al., 2022).

In hypothesis 4, the mediating effect of LTA impacts the direct relationship between SP and SE, which is rejected for cases 1 and 2. The results obtained are similar to the study of Sethi and Roy (2022); for obtaining students' optimum level of performance through technology platforms, it is essential to have proper training and workshops in the supervision of teachers. If teachers show full engagement throughout the process, the outcomes of student performance will be positive, but it also requires high technical knowledge and skills among the instructors. Teachers ' engagement is the most important factor in guiding students while training them on technology tools and mediums (Susilo, 2022). There is a significant level of importance beep predicted by teachers' engagement in online technology platforms to produce an effective SP (Xu & Margeviča-Grinberga, 2022). According to psychological surveys in the literature, when students are pressured to present their capabilities and expertise in online programs, they become stressed and exhausted because they are often unaware of all the online methodologies and core basics. They are frustrated due to a lack of support and experience in operating software and learning management systems. As a result, their performance suffers (Rakic et al., 2020).

5.1 Theoretical Implications

This research aimed to explore the immediate transformations in the field of education that worked in collaboration with technology. A conceptual framework was developed in this study to illustrate how teachers' engagement affects students' academic performance through the adoption of learning technology. The results indicated that the influence of LTA on teacher engagement and student performance was negative. However, a statistically significant direct correlation was observed between teacher engagement and student performance.

This research has developed a theoretical framework that illustrates a clear link between engagement and performance, suggesting that effective teaching and learning can occur even without technology adoption. The study advocates for traditional educational methods where teachers and students interact in person and utilize non-digital learning resources. The first hypothesis establishes an educational system devoid of digital implementation and reliant on outdated conventional teaching techniques.

It is further postulated that there is a connection between performance and engagement, with the mediating effect of the adoption of learning technology. The results show a negative relationship between the adoption of learning technology both directly and indirectly. The underlying factors for this drawback are that teachers and students across all subject areas might have the knowledge required for their specialized courses or degrees, but they might not have the technical proficiency. Additionally, although students and teachers may be technologically savvy, they may not have the fundamental skills to use online learning software due to a lack of practical experience.

Thoroughly examining the adoption of learning technology is necessary for enhancing engagement and performance through technology-assisted learning programs. Future research should add new technology factors that impact education and SE performance, along with other variables

influencing LTA. Understanding these behaviors and their effects is important for gaining insights into technology adoption in education.

5.2 Practical Implications

This study has initiated a new avenue for exploration in the realms of research and education. Its main objective was to gain valuable insights into the effects of the abrupt shift in the education sector from traditional to virtual systems. In light of this, the developed conceptual framework proposes that teachers' engagement and students' scholastic achievement serve as intermediary factors in embracing educational technology.

On a practical level, educators' involvement in the education sector is observed to be particularly noteworthy and effective when they utilize traditional teaching methods. Similarly, students' academic achievements were notably impressive as they adhered to conventional approaches to acquiring knowledge. These time-honored methods include utilizing chalkboards and engaging in direct, in-person interactions between teachers and students. This approach is preferred because it allows higher education stakeholders to cultivate understanding and gain extensive exposure through meaningful discussions with both instructors and peers.

The correlation between performance and the implementation of educational technology, along with its influence on engagement and performance, demonstrates a limited and unfavorable relationship. This suggests that the incorporation of technology into the academic environment has been ineffective, resulting in difficulties for educators and students in accepting it, ultimately impacting their engagement and performance. Initially, those involved in education faced challenges integrating technology into their instructional responsibilities due to obsolete systems that were not adaptable to new technological resources. As a result, this greatly impacted the performance and engagement of those involved in education.

The effective management and integration of technology in the education field were insufficient. Outmoded educational facilities were paired with modern technologies, and many teachers lacked the necessary practical skills for these systems. This led to reduced levels of student engagement and overall performance. To gain a deeper understanding of this aspect's attributes and present its optimal use more accurately, forthcoming research models should encompass LTA in conjunction with related factors. This research lays the necessary foundation for future studies related to creating infrastructure that enhances the integration of technology, leading to increased levels of engagement and improved academic performance among members of educational organizations.

5.3 Limitations

The limitations of the study include, that it was cross-sectioned so the scope was limited to very few optional areas of Punjab. In the southern region of Punjab, there are significant challenges in embracing a technology-based teaching culture due to limited awareness and motivation among learners. There is a pressing need to not only improve students' knowledge of technology but also enhance teachers' understanding, as they play a crucial role in motivating and guiding students through technological education initiatives. There were only two behavioral indicators engagement and performance that were mediated by technology adoption, to understand behavior in depth the future results should be analyzed through a longitudinal procedure. This procedure will provide detailed information about the users and their perceptions of technology adoption. In the case of the framework and population, the same framework should be studied on a sizable population from different regions of the nation to make the study generalize, as this study has a limited focus on population and ultimately cannot be generalized on a sizable population.

The adoption of new technology is required in various sectors such as hospitality, health care, industries, and banking. However, this research conducted in lower Punjab specifically focuses on the challenges related to the inefficient implementation of technology in the education sector. To

gain a comprehensive understanding of how technology affects their engagement and performance, these industries should also be included in the study plan.

Further, the mediating impact of LTA was found to be weak and negative. For an experimental study to investigate and assess the engagement-performance phenomenon in the educational sector, additional technologically influential factors need to be considered. The theoretical frameworks of the Slippery Slope Model and Theory of Planned Behavior should also be incorporated in further studies to improve LTA. Further experimental studies using various mediating and moderating factors, or at least one moderating factor, should be tried to improve the engagement and performance behavior of education stakeholders. These studies should look at the factors that could affect and strengthen the relationship between engagement and performance. Additional research should include psychological variables that can help predict technology adoption behaviors and improve the performance impact within the same framework.

5.4 Conclusion

This research aimed to assess the framework developed for evaluating the mediating influence of LTA on the direct impact of SE and SP. The study's results indicate that the incorporation of learning technologies has a statistically insignificant and adverse mediating effect, but there is a meaningful direct effect on the association of SE and SP. It was observed that integrating learning technologies had an unfavorable influence on SE and SP but had a considerable improvement in teachers' engagement and performance.

6 References

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