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ENHANCING SUSTAINABLE PERFORMANCE IN PAKISTAN'S TEXTILE INDUSTRY: THE ROLE OF ORGANIZATIONAL LEARNING AND INDUSTRY 4.0 TECHNOLOGIES THROUGH ORGANIZATIONAL INNOVATION

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Abstract
This paper explores how Organizational Learning (OL) and Industry 4.0 Technologies (I4.0) impact Sustainable Performance (SP) in Pakistan textile industry with Organizational Innovation (OI) acting as a mediating factor. Based on the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), the study formulates a framework on the conversion of capabilities to yield sustainability results, which involves employing knowledge and digital resources to generate sustainability. Based on a survey data of 308 Middle and Top Managers of textile firms of Pakistan and further processed with the help of the Partial Least Squares Structural Equation Modeling (PLS-SEM), the results show that Industry 4.0 technologies have a strong, positive, direct effect on sustainable performance and greatly contribute to the innovation of the organization. Organizational innovation has a positive impact on sustainable performance, and mediates the impact of organizational learning and Industry 4.0 technologies. The findings prove that sustainability is not a product of resources, but of innovation. The research can add to the sustainability and innovation literature in developing economies and provide strategic implications on digital transformation in the manufacturing industries.

Keywords: *Organizational Learning, Industry 4.0 Technologies, Organizational Innovation, Sustainable Performance*

1. Introduction

Sustainable performance has become a multidimensional strategic goal that incorporates economic sustainability, environmental management and social accountability in the modern organizational structures. The growing interest in mitigation of climate changes, resource efficiency and ethical governance across the world have relegated sustainability as a peripheral issue in corporations to the core determinants of competitive advantage. Companies are not judged solely based on their financial performance, but they are more judged based on their capacity to create a long-term value and work towards reducing environmental degradation, as well as improving social welfare.

The sustainability imperative is even higher in the case of emerging economies. The manufacturing industries are facing increasing pressure to balance between productivity and environmental compliance and expectations of the stakeholders. An example of this challenge is the textile industry of Pakistan, which is one of the largest sources of national GDP, export earnings, and employment. Although it has economic value, the industry has a huge sustainability limitation that includes energy-intensive production processes, high water use, chemicals use, and generation of waste. In addition, rising global compliance, sustainability awards and environmental directives carried out by buyers put pressure on companies to upgrade their operational systems (I. S. Khan

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JALT

& Halme, 2025). The sustainability of the sector is already being determined by its capacity to match the industry productivity with the values of sustainable development.

Theoretically, the research will be based on the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) to determine how the internal organizational capabilities influence sustainable performance. According to RBV, firm-specific resources (especially intangible ones), such as knowledge systems and technological capabilities, are the basis of sustainable competitive advantage (Wu, 2025). The digital transformation and organizational learning are very useful and indistinguishable resources that may drive better performance outcomes. RBV by itself however gives a rather fixed explanation of resource possession.

The Dynamic Capabilities Theory is a supplement of the RBV, highlighting the mechanisms where firms combine, develop and redesign internal competencies according to turbulence in the environment (Malhotra et al., 2025). In a situation involving technological disruption and regulatory change, companies need not just have resources but they need to dynamically convert them to be in the form of adaptive strategies. Organizational innovation can be viewed as a reconfiguration mechanism, and it allows companies to reorganize routines, processes, and governance systems with the aim of accomplishing sustainability goals.

Even though previous studies have explored the different contributors to sustainable performance, including the case of green supply chain management, environmental regulation, and corporate social responsibility, very little empirical research has been conducted to understand the association between organizational learning and Industry 4.0 technologies in relation to sustainable performance in the context of the Pakistani textile industry. Available literature tends to discuss digital transformation and sustainability as two separated spheres rather than focusing on organizational processes that transform technological and knowledge-based resources into sustainability. This work fills the said gap by hypothesizing and empirically validating a mediation model where organizational innovation acts as the capability-conversion process between organizational learning and Industry 4.0 technologies and sustainable performance.

2. Literature Review and Hypotheses Development

2.1 Organizational Learning and Sustainable Performance

Organizational learning is defined as the systematic way in which companies obtain, spread, interpret and implement information to improve the flexibility and performance. Absorptive capacity is developed in learning-oriented organizations, making them able to perceive valuable external knowledge and use it as an input in the internal processes (Hashem, 2024). This ability is more important in the sphere of sustainability since companies should constantly adjust according to the changing environmental standards, technological changes, and expectations of the stakeholders.

The learning systems advance strategic renewal through experimentation, cross-functional collaboration and continuous improvement. The connection between learning and sustainability is however not entirely automatic. Zgrzywa-Ziemak and Walecka-Jankowska (2021) state that learning should be incorporated into the patterns of a structured organizational work to bring about measurability in terms of sustainability. The learning of knowledge by itself will never ensure any kind of environmental or social change unless it will be transformed into any practical routine of innovation.

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JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

This subtle point of view is backed by empirical evidence. Qin et al. (2024) prove that organizational learning has a positive impact on innovation capability, which, in turn, leads to a positive effect on sustainable performance. On the same note, M. Ahmad et al. (2026) also suggest that sustainability gains become apparent when learning is institutionalized within the practices of innovation. These data prove that though organizational learning directly enhances the sustainability awareness and operational discipline, its total effect is fulfilled when it is included in the new organization systems.

Learning mechanisms within the context of the textile industry in Pakistan could be sustainability training programs, environmental audits, platforms of knowledge sharing and systems of performance reviews. Companies with a focus on formal learning can better re-design their processes to minimize resource use and meet international standards.

Resting on this argument, the hypothesis below is proposed:

H1: Organization Learning has a positive effect on Sustainable Performance.

2.2 Industry 4.0 Technologies and Sustainable Performance

Industry 4.0 technologies include more sophisticated digital systems that include: Internet of Things (IoT), Artificial intelligence, big data analytics, robotics, and cyber-physical systems. These technologies make it easier to monitor in real-time, make future predictions, and make decisions based on data (Choubey et al., 2026). Industry 4.0 technologies can equip a firm with the necessary tools to optimize the use of resources and minimize the impact on the environment by increasing the level of operational transparency and efficiency.

The digital transformation is the change that redefines the structure of decision-making due to the decentralized control and the integrated information flow (Joshi et al., 2024). By closely tracking the amount of energy used, the material movement and the production levels, companies are able to detect inefficiency and take corrective action. This type of operational intelligence has a direct contribution to environmental performance.

However, the success of digital transformation depends on the readiness and capacity to innovate in an organization (S. Wang & Zhang, 2025). As Andersen et al. (2022) stress, the adoption of technology is not associated with the increased performance unless the process is accompanied by the managerial alignment and organizational restructuring. As empirical evidence in the manufacturing settings can show, the Industry 4.0 implementation can have a great impact on sustainable performance under the condition of inclusion into wider strategic perspectives (Malhotra et al., 2025).

Industry 4.0 technologies can be used to benefit the textile industry in Pakistan by enhancing traceability, minimizing waste, improving energy efficiency, and aiding the industry in meeting international sustainability standards. These positive changes indicate a positive correlation between digital transformation and sustainable performance.

In line with this, the hypothesis that is suggested is as follows:

H2: Industry 4.0 Technologies positively impact on Sustainable Performance.

2.3 Organizational Learning and Organizational Innovation

Organizational learning is a planned activity whereby companies develop, obtain, perceive, and use knowledge to respond to the internal and external environmental developments. It includes systems that help in new learning at personal, group, and organizational levels, including sharing knowledge, reflective dialogue, and group problem-solving. These learning processes are all integrated in a strategic manner to enhance the cognitive and adaptive capabilities of the firm and

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JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

hence the employees become more responsive to the arising opportunities as well as complex challenges. A thorough review of the literature in terms of bibliometrics reveals that there is an intense and growing research interest on the relationship that exists between organizational learning and innovation, which means that the theoretical relationship between these two constructs is well-established in the management practice.

Empirical and conceptual studies have continued to support the thesis statement that organizational learning leads to a positive effect on organizational innovation. It has been demonstrated that learning practices do not only help firms to internalize new knowledge but also increase the capacity to transfer the knowledge into creative processes, products and management systems. To illustrate this point, studies in various industry settings have established that there is a strong positive dependence on organizational learning and innovation results, where learning is one of the antecedents that boost the innovation ability and performance of an organization. Organizations are more likely to come up with better innovation strategies and responsive solutions to the fluctuating market needs when it comes to knowledge acquisition and internal diffusion exercises in organizational settings.

Organizational learning is a strategic resource of innovation in the light of competitive industries such as textile where the technological change and environmental sustainability factors are eminent. Textile companies whose learning orientation is high are in a better position of adopting new coordination practices, environmentally friendly production processes, and sustainability management systems that react to the expectations of the stakeholders and regulatory demands. These firms promote progress of organizational learning and integration of knowledge between organizational units, thus establishing a condition that fosters organizational innovation, which increases the adaptability and competitive advantage of these firms. This hypothesis is based on theoretical and empirical foundation that Organizational Learning positively affects Organizational Innovation.

H3: Organizational Learning has a positive impact on Organizational Innovation.

2.4 Industry 4.0 Technologies and Organizational Innovation

The advent of Industry 4.0 technologies has become a potent force of organizational change due to the fundamental change in the way firms operate, coordinate, and make decisions. Automation, big data analytics, artificial intelligence, and digital platforms not only help to streamline operations but also change organizational structures and communication patterns and hierarchies in decision making. According to Joshi et al. (2024), the adoption of Industry 4.0 technologies forces organizations to abandon the strict, hierarchical structures in favor of more flexible, data-driven, and decentralized structures. This technology change frequently requires organizational change in terms of restructured workflows, novel coordination mechanisms and new managerial practices to fully utilize the digital potential.

Strategically, Industry 4.0 technologies allow companies to test new ways of business and new process setups. Atif (2023) emphasizes the fact that automation and analytics help organizations obtain real-time insights offered by digital technologies and reconsider the old routines and governance frameworks. The technologies force companies to embrace flexible organizational shapes that facilitate quick decisions and constant enhancements. In line with the dynamic capability view, digital transformation supports the reconfiguration of internal systems and resources, which enhances the innovativeness and responsiveness of an organization to

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JALT

environmental uncertainty. Consequently, organizational innovation will be an obligatory product of an adequate introduction to Industry 4.0 and not an option.

Digital integration in the context of the textile industry can bring about creativity in the coordination of supply chain, production planning, and systems of sustainability reporting. Consequently:

H4: Industry 4.0 Technologies have a positive impact on Organizational Innovation.

2.5 Organizational Innovation and Sustainable Performance

Organizational innovation is a process where there is introduction of new practices in management, administrative process and organizational structure to improve flexibility, efficiency and overall organization effectiveness. Organizational innovation, unlike technological innovation, is concerned with how firms are organized, make decisions, and distribute resources. Hayat and Qingyu (2024) underline that organizational innovation is a key to enhancing eco-efficiency through optimal use of resources, minimizing waste, and introducing sustainability measures to the organizational operations and management. With this kind of innovative organizational planning, companies can be in a situation to direct economic goals towards environmental and social concerns as well as enhancing their sustainability.

Javed et al. (2026) note that organizational innovation increases economic resilience and environmental responsibility at the same time. Basri et al. (2025) and EL Abiad et al. (2025) also support the evidence that innovation-based firms attain long-term sustainable competitive advantage when engaging stakeholders better and being more transparent in their operations.

H5: Organizational Innovation has a positive effect on Sustainable Performance.

2.6 Mediating Role of Organizational Innovation

Based on the Resource-Based View (RBV) and the Dynamic Capability Theory (DCT), organizational innovation has been well acknowledged as a very essential process where strategic resources are turned into excellent performance results. Such resources like organizational learning and Industry 4.0 technologies offer valuable knowledge and digital capabilities to firms, but still do not necessarily lead to sustainable performance. Chien and Tsai (2021) suggest that innovation as a conversion capability can help organizations to restructure, combine, and mobilize internal resources in a productive manner. In this regard, organizational innovation embodies the bridge between the resource ownership and performance actualization through institutionalizing the learning and technological abilities into the daily activity and management of the organization.

Recent research also indicates that organizational innovation is the core mediating factor as it is able to restructure knowledge and digital abilities into sustainability based processes. As pointed out by Zhang et al. (2023), innovation can help firms embed learning and digital knowledge into workflow standardization and governance processes and systems that are sustainable in decision-making. This argument is backed by empirical evidence, which shows that organizational innovation partially mediate the linkage between organizational learning and sustainable performance. As an example, Qin et al. (2024) and Setyawan et al. (2024) conclude that learning-oriented firms experience increased sustainability results when learning is transformed into the innovative organizational structure and management system, as opposed to staying at the cognitive or knowledge-acquisition stage only.

the influence of Industry 4.0 technologies on sustainable performance is enhanced when organizational innovation mediates this. Even though digital technologies have the direct impact on efficiency and transparency, the effect on sustainability is greater when companies restructure

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JALT

organizational operations, coordination and systems of governance to effectively utilize the technologies. The processes of innovation will help a firm to transform investments in technology into economic, environmental, and social performances in the long term. According to this logic of mediation, the current research suggests that the organizational innovation is a major mediating variable between the two organizational learning and Industry 4.0 technologies and sustainable performance. In line with this, the hypotheses are as follows:

H6: Organizational innovation moderates the association between Organizational Learning and Sustainable Performance.

H7: Organizational Innovation is a mediator between Industry 4.0 Technologies and Sustainable Performance.

3. Conceptual Framework

The conceptual model upon which the given study is based is based on the combination of the Resource-Based View (RBV) and the Dynamic Capabilities Theory (DCT), which provides a systematic approach to explaining the relationship between the internal organizational capabilities and the implementation of the sustainable performance outcomes. The framework suggests that Organizational Learning and Industry 4.0 Technologies serve as strategic antecedents of Sustainable Performance and have a direct and indirect influence on Organizational Innovation.

Organizational Learning and Industry 4.0 Technologies are the concept that is developed within the scope of the RBV perspective as an asset that is considered valuable, resource-intensive, and strategically embedded (Wu, 2025). Organizational Learning improves the knowledge base, absorptive capacity and orientation to adaptability of a firm, which can respond in a positive manner in response to environmental pressures. The automation systems, digital integration platforms, and real-time data analytics are components of industry 4.0 Technologies that reinforce operational intelligence and efficiency of resources. The two capabilities are complementary strategic assets that help to improve the firm competitive position.

Nevertheless, the framework goes further than the resource-based interpretation that is fixed and includes the Dynamic Capabilities Theory. DC focuses on the fact that resources do not create a sustainable advantage unless they are constantly reconfigured and adapted to the evolving environmental conditions (Malhotra et al., 2025). The dynamic transformation mechanism is hence placed in the model as an Organizational Innovation. It reflects the capacity of the firm to restructure, reformulate procedures, systems of governance, and managerial habits upon technological and greenery requirements.

The framework hypothesizes that Organizational Learning drives Organizational Innovation through experimentation, sharing of knowledge and renewal of strategies. Cognitive flexibility and institutional memory are formed in the learning systems and these assist in innovative restructuring. Equally, Organization Innovation is driven by Industry 4.0 Technologies which requires structural adjustments, digital transformation, and redesign of workflow. This means that, besides being an operational tool, the digital transformation has been a catalyst to restructuring of organizations.

Organizational Innovation, in its turn, directly contributes to the improvement of Sustainable Performance by introducing the principles of eco-efficiency, ensuring better coordination of stakeholders, and institutionalizing the processes of making decisions on a sustainable basis. With the help of innovation, digital capabilities and knowledge resources can be transformed into quantifiable changes in environmental performance, economic resilience, and social responsibility.

ISSN E: 2709-8273
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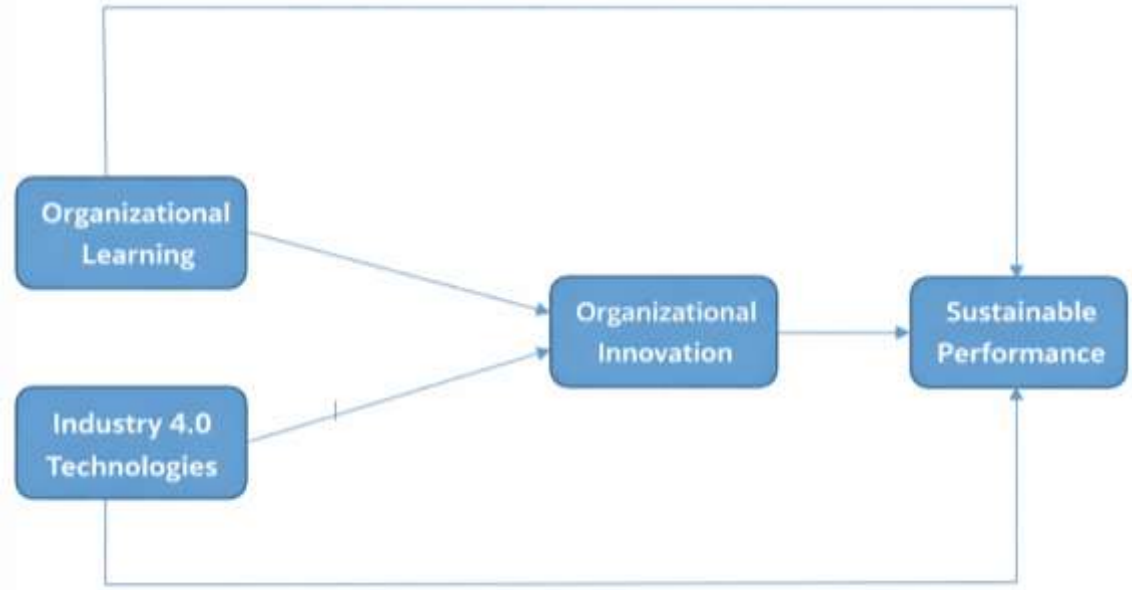
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

This conceptual model, therefore, portrays an ability-conversion reasoning: Organizational Learning creates knowledge-based assets, Industry 4.0 Technologies offer digital infrastructure and operational intelligence, and Organizational Innovation reacts and restructures these components into routines to sustainability. The immediate operational impacts of the Organizational Learning and Industry 4.0 Technologies are reflected in the direct paths and the transformation-driven impacts highlighted by the Dynamic Capabilities Theory are reflected in the indirect paths.

The framework proposes that Organizational Learning and Industry 4.0 affect Sustainable Performance by explaining how and why, rather than whether, these relationships take place by positioning Organizational Innovation as an intermediating construct. The model thus provides an all inclusive account of sustainable competitiveness within the textile sector of Pakistan and offers a theoretically correct foundation to test empirically.



4. Methodology

4.1 Research Design

To test empirically the relationships between Organizational Learning (OL), Industry 4.0 Technologies (I4.0), Organizational Innovation (OI), and Sustainable Performance (SP), the proposed study is based on a quantitative and cross-sectional research design. This study will use a cross-sectional study design to examine structural relationships between latent constructs and to test mediation relationships in an organizational context (Freedman et al., 2024). The study is explanatory and its purpose is to verify a theoretically based framework based on capability-conversion.

4.2 Population and Sampling Technique

The study population will consist of textile manufacturing enterprises that have their operations in Pakistan, having business type spinning, weaving, dyeing, finishing, and composite units. The textile industry has been chosen because of its strategic position in the Pakistani economy, as well as its vulnerability to sustainability and the impact of digital transformation.

ISSN E: 2709-8273
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JALT

The sampling technique was purposive to make sure that the respondents were knowledgeable enough on matters pertaining sustainability practices, digital transformation efforts, and organizational innovation efforts. The target respondents were Middle and Top Managers. The choice of informants with knowledge increases the reliability of data and minimizes the common method bias (McMahon et al., 2024).

Online survey via google form was conducted and response of 332 received in which 308 valid responses were kept to be analyzed.

4.3 Demographic Profile of Respondents

Table 1 provides the demographic information about respondents.

Table 1: **Demographic Characteristics of Respondents (n = 308)**

Variable	Category	Frequency	Percentage (%)
Position	Senior Management	98	31.4
	Middle Management	162	51.9
	Sustainability/Digital Officers	52	16.7
Experience	1–5 years	74	23.7
	6–10 years	118	37.8
	11–15 years	76	24.4
	16+ years	44	14.1
Firm Size	Small	72	23.1
	Medium	141	45.2
	Large	99	31.7

Most of the respondents were in middle and senior management positions indicating that most of them were informed in their response on organizational strategy and sustainability practices.

4.4 Measurement Model Assessment

Measurement reliability and validity were determined before evaluation of the structural model.

Table 2 **Construct Reliability and Convergent Validity**

Construct	Items	Cronbach's Alpha	Composite Reliability	AVE
Organizational Learning	6	0.89	0.92	0.66
Industry 4.0 Technologies	5	0.91	0.94	0.71
Organizational Innovation	5	0.88	0.91	0.64
Sustainable Performance	8	0.93	0.95	0.69

All the alpha of Cronbach and composite reliability values are above the suggested high of 0.70 indicating high internal consistency. The values of AVE are greater than 0.50, which proves the convergent validity.

Table 3**Discriminant Validity (HTMT Ratios)**

Constructs	OL	I4.0	OI	SP
Organizational Learning (OL)	—			
Industry 4.0 Technologies (I4.0)	0.63	—		
Organizational Innovation (OI)	0.69	0.71	—	
Sustainable Performance (SP)	0.58	0.67	0.74	—

ISSN E: 2709-8273
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JALT

All values of HTMT are less than 0.85, which supports the discriminant validity.

5. Structural Model Results

5.1 Direct Effects

Bootstrapping was done using 5,000 resamples to assess the structural model.

Table 4 **Structural Path Coefficients**

Hypothesis	Path	B	t-value	p-value	Decision
H1	OL → SP	0.28	4.91	<0.001	Supported
H2	I4.0 → SP	0.41	7.36	<0.001	Supported
H3	OL → OI	0.35	6.14	<0.001	Supported
H4	I4.0 → OI	0.44	8.02	<0.001	Supported
H5	OI → SP	0.39	6.87	<0.001	Supported

As the outcomes show, Industry 4.0 Technologies have the most significant direct impact on the Sustainable Performance, then Organizational Innovation and Organizational Learning.

5.2 Mediation Analysis

Table 5 **Indirect Effects and Mediation Results**

Hypothesis	Indirect Path	β	t-value	p-value	Mediation Type
H6	OL → OI → SP	0.14	4.02	<0.001	Partial
H7	I4.0 → OI → SP	0.17	4.88	<0.001	Partial

Bootstrapping checks the fact that Organizational Innovation is a partial mediator of both relationships. The fact that there are high direct and indirect effects means that there are complementary partial mediation.

5.3 Model Explanatory Power

Table 6 **Coefficient of Determination (R^2)**

Endogenous Variable	R^2	Interpretation
Organizational Innovation	0.52	Moderate
Sustainable Performance	0.61	Substantial

The R2 figure of the Sustainable Performance is 0.61, which means that the Organizational Learning, Industry 4.0 Technologies, and Organizational Innovation explain 61 percent of the variance in sustainable performance.

5.4 Effect Size (f^2)

Table 7 **Effect Size (f^2)**

Path	f^2	Effect Size
OL → SP	0.08	Small
I4.0 → SP	0.21	Medium
OI → SP	0.19	Medium
OL → OI	0.15	Medium
I4.0 → OI	0.27	Medium-Strong

The greatest effect size on Organizational Innovation is shown in Industry 4.0.

Summary

The model has a robust predictive capacity and statistically significant correlation on all hypotheses. The most powerful factor of sustainable performance is the Industry 4.0 Technologies,

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JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

which impact sustainable performance both directly and indirectly via Organizational Innovation. The mediation outcomes serve to prove the fact that the sustainability results are the results of the innovation-driven process, but not the technology-driven one.

6. Discussion

The results of the present study have strong empirical evidence of the theory of integrating the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) in the explanation of sustainable performance in the context of the textile industry in Pakistan. In line with RBV, the findings validates that organizational learning and Industry 4.0 technologies are substantial and strategically important resources that contribute to the better performance of firms (Wu, 2025). Organizational learning enhances the acquisition of knowledge, absorptive capacity and routines, whereas digital technologies increase the visibility of operations, efficiency and accuracy of decision-making. These are the resources that can be considered as the base on which competitive sustainability can be created.

Nevertheless, it has also been shown in the study that the possession of resources is not sufficient to produce optimal sustainability results. Consequently, according to the Dynamic Capabilities Theory, the findings indicate that sustainability performance is premised on how the firm is capable of reorganizing internal resources by means of innovation-driven processes (Malhotra et al., 2025). The innovative process of organizations is revealed as the dynamic process that reorganizes the learning products and digital architecture into the routines that increase sustainability. This results supports the case that competitive advantage in turbulent industrial settings is not only a result of the possession of strategic resources, but their conversion into adapting and value-generating aspects.

The mediating impact of organizational innovation is important, which offers much conceptual elucidation on the relationship of digital transformation and sustainability. Although the direct effect of Industry 4.0 technologies is direct benefits to the efficiency and the monitoring environment, their more paramount beneficial influence on sustainable performance is relevant when it is integrated into the activities of innovative organizational structures. This connects the logic of capability-conversion, which is developed by X. Zhang et al. (2023), according to which knowledge and technological potential are converted into actual performance results through innovation. That is, the digital technologies open up strategic opportunities, which organizational innovation realizes into sustainable practices.

In addition, the results indicate that sustainability in the textile sector, of Pakistan, is basically innovation based, but not with technology. This is a distinction that is essential. Adoption of technology without structural change could result in short term increase in productivity but may not result in long term sustainability. The empirical findings show that the most successful sustainable performance of firms is achieved through the combination of digital transformation and managerial restructuring, process redesign, and knowledge institutionalization. Innovation incorporates the concept of eco-efficiency, incorporates sustainability measures into decision-making processes, and resonates the functioning systems with the aim of the environment and society.

The fact that the path coefficients are stronger between Industry 4.0 technologies and organizational innovation only increases the emphasis on the transformative character of digitalization. Online media, machine learning applications, and data analytics systems seem to trigger structural change in companies, transforming the channels of communication, performance

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

measurement systems, and governance procedures. This observation is consistent with the previous literature on the topic that proposes that digital transformation can initiate more extensive organizational renewal (Chien & Tsai, 2021). The digital integration in the textile context can be more useful in terms of traceability, minimize waste of resources, and provide an opportunity to meet the requirements of international sustainability certifications, but these benefits are the most effective with the innovative managerial practices.

It is also understood during the discussion that organizational learning is complementary but equally important. Digital information can be better interpreted and the ability to be more adaptive to environmental regulations and institutionalize knowledge on sustainability increases the capability of learning oriented firms. Learning systems create a culture of experiment and constant improvement, which enhances the ability of innovation. The findings of the partial mediation indicate that the organizational learning has both direct and indirect impacts on the sustainable performance. This means that, the process of acquiring knowledge will increase sustainability not just in terms of innovation but also in terms of direct impact on the environmental awareness and operational discipline.

Contextually, the results are especially important to the industries of emerging economies that have limited resources and are technologically behind. The textile industry in Pakistan is characterized by financial constraint and infrastructural issues that usually hinder the functioning of firms in the industry. This paper has shown that sustainable competitiveness is not simply a matter of capital investment in advanced technologies but depends on the effectiveness with which firms combine learning and innovation processes with digital adoption. This supports the strategic significance of development of managerial capabilities and technological modernization.

Additionally, the innovation-based view of sustainability is one of the factors that help to develop a more sophisticated perspective on the industrial modernization within developing economies. As opposed to the meaning of Industry 4.0 as a technological revolution, the findings are that it can be interpreted as an organizational change process. The concept of sustainable performance can be defined as the scenario, in which companies align digital systems with governance systems, knowledge regimes, and sustainability goals. Such alignment is what makes digital transformation deep-rooted or piecemeal.

On the whole, the discussion proves that sustainable performance is the result of the interconnected capability system. Organizational learning develops knowledge assets, Industry 4.0 technologies improve the prospects of operation, and organizational innovation combines and reconfigures these factors into routines that are sustainability-oriented. It is the combination of these capabilities that defines the potential of the firm to realize a balanced economic, environmental and social performance. Such a combined reading enhances clarity in the theory and relevance in management, providing a detailed account of the role played by internal capabilities in creating sustainable competitiveness in the textile industry in Pakistan.

7. Theoretical Contributions

The paper has a number of significant theoretical implications to the literature on sustainable performance, organizational capabilities, and digital transformation. First, it contributes to the synthesis of the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) through the operationalization of a framework of capability conversion in a sustainability-based context. RBV focuses on the relevance of the firm-specific resources including the organizational learning and digital capabilities as the sources of competitive advantage (Wu, 2025). Nevertheless, RBV is

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JALT

not some complete answer concerning how these resources are being converted to performance results in technological and environmental turbulence conditions. This paper explains sustainable performance generation more dynamically and process-oriented, by adding DCT, which emphasizes the reorganization and transformation of internal capabilities (Malhotra et al., 2025).

Second, the research paper leads to the increasing body of literature that associates Industry 4.0 technologies with the sustainability outcomes. A lot of existing studies follow an assumption that digital transformation is a direct precursor of improvement in performance. Conversely, the current research shows that organizational innovation mediates the impact of Industry 4.0 technologies on sustainable performance to some extent. This observation is consistent with the arguments on capabilities that technological resources generate strategic potential, which is converted into actual value in innovation processes (Chien and Tsai, 2021; X. Zhang et al., 2023). The empirical validation of the organizational innovation as a mediating process allows the study to demonstrate the structural pathway by which digital transformation leads to sustainability.

Third, the research contributes to the existing sustainability literature on developing economy situations. There is much empirical data regarding sustainable performance that is based on technologically advanced economies with developed institutional systems. This study concentrating on the textile sector of Pakistan gives contextualized knowledge to the working of internal organizational capabilities in institutions under resource constraint and changing environments. It proves that companies in the emerging markets are able to improve the sustainable performance not only by using capital-intensive technological investments but also by using strategic balance between learning systems and innovation processes.

Lastly, the findings of mediation also build on the performance theory to the effect that sustainability is not an entirely resource-based or technology-based entity, but an innovation-based one. Organizational innovation is dynamic (capability) that re-organizes knowledge and digital inputs into routines to create sustainability. The ability-conversion logic enhances our concept of sustainable competitive advantage and also it provides a replicable framework in future studies across industries and geography.

8. Practical Implications

The implications to the findings are significant in creating a meaningful impact to the managers, industrial practitioners and policy makers who are interested in sustainable industrial transformation. To managers working in textile companies, the findings highlight the importance of investing in Industry 4.0 technologies which should be accompanied by a conscious approach to the enhancement of organizational learning processes and systems of governance of innovations. Digital transformation is not something that can be taken as a technical upgrade, but it involves organizational restructuring, cross-functional work, and institutionalization of innovation routines. Companies are to develop systematic knowledge-based platforms, ongoing improvement systems, and training initiatives that can improve the absorptive capacity and innovation preparedness. Learning in an organization should be part of normal working conditions and digital technologies should be not only embraced but also strategically used to address sustainability goals. In the absence of these complementary capabilities, the end result of technological investments might not imply any significant environmental or social benefits.

The results underline the significance of synchronizing the process of innovation and sustainability objectives as well. The principles of eco-efficiency, responsible resource management strategies and practices related to stakeholder-oriented governance should be incorporated into the

organizational innovation. Managers are required to make sure that long-term sustainability metrics inform the digital transformation efforts but not the short-term productivity stays. Sustainability-oriented innovation can be institutionalised by entrenching environmental and social indicators into performance evaluation systems.

Policy wise, the findings indicate that policy formulation on industrial modernization should not rely on single subsidies in technological procurement. Policymakers are supposed to build combined frameworks that enhance adoption of digital at the same time ensure growth of managerial capabilities and innovation systems that are based on sustainability. Environmental certifications, energy efficiency, and readiness to digital transformation incentive schemes can be used to hasten sustainable industrial development. In third world economies where there are capital limitations and skills gaps, the government and other partners must engage in joint ventures so that they can build capacity and spread technology.

9. Limitations and Future Research

In spite of the theoretical and practical contributions, this study is still limited in some aspects that offer future research opportunities. To start with, the study design is cross-sectional in nature (Freedman et al., 2024), which does not allow establishing firm causal connections among variables. Even though PLS-SEM provides opportunity to model the mediation effects with a high degree of robustness, the longitudinal research design would allow the study of the manner in which organizational learning, digital transformation, and innovation capabilities change over time. Future researchers may utilize panel data or time lagged analysis to encompass the development of dynamic capability and long term sustainability patterns.

Second, it mostly emphasizes on the internal organizational capabilities, which is in line with its RBV and DCT orientation. As much as this internal focus enhances theoretical coherence, external institutional conditions including regulatory pressure, competition among companies and stakeholder activism can also affect sustainable performance outcomes. In the future, the study can be combined with institutional theory or stakeholder theory viewpoint to investigate the interaction of external forces and internal capabilities.

Third, the empirical environment is restricted to the textile industry of Pakistan. Even though such setting has strategic importance, other sectors and countries may be limited in generalizing. Comparative analyses across industries or cross-national ones would contribute to the confirmation of the strength of the capability-conversion framework. Also, further studies may be done by examining the high-technology industries or service sectors to evaluate the hypothesis that whether the mediating effect of organizational innovation depends on the various technological and institutional circumstances.

Lastly, the possible moderating factors that can be used to determine the strength of the mediation process can also be examined in future studies. The approach to leadership, the digital maturity level, the organizational culture, and the turbulence in the environment can cause the shifts in the translation process of learning and digital capabilities into the innovation and sustainability results. The analysis of these boundary conditions would increase the theoretical accuracy and deliver more detailed managerial instructions.

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