

The Impact of Strategic Human Resource Practices on Supply Chain Resilience: The Roles of Workforce Agility and Supply Chain Integration

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Abstract

With a number of supply chain disruptions, geopolitical unpredictability and accelerating technological transformation, organizations are finding it a strategic level to utilize human capital to increase their supply chain resiliency. This paper explores how strategic human resource practices (SHRP) have an effect on supply chain resilience (SCR) through a mediating variable of workforce agility (WA) and a moderating variable of supply chain integration (SCI). Based on the Dynamic Capability Theory, we theorize workforce agility as a dynamic capability of the human level that converts HR investments into dynamic supply chain delivery. The respondents were 312 managerial level employees of manufacturing and service sector companies in an emerging economy setting. The performance was conducted in terms of Partial Least Squares Structural Equation Modeling (PLS-SEM) which revealed that SHRP has a direct and indirect positive impact on SCR via WA. Besides, SCI plays a major role in enhancing the relationship between SHRP and WA, indicating the conditional nature of integrated supply chains in exploiting human-based capabilities. The results highlight the importance of the interaction between HR systems and workforce agility and structural integration in the creation of resilient supply chains and provide empirical evidence on what actions can be taken by managers and policymakers to find human-centered resilience solutions in volatile environments.

Keywords: Strategic Human Resource Practices, Workforce Agility, Supply Chain Resilience, Supply Chain Integration, Dynamic Capability Theory, Emerging Economies

1. Introduction

Over the past few years, the world has been experiencing unprecedented uncertainty in the form of supply chain disruptions, geopolitical instabilities, pandemics, climatic-induced shocks, and a high pace of technological change. Such shocks have revealed systemic weaknesses within global and regional supply chains forcing companies to rethink the way they design and operate resilience-based strategies. Although the past methods of achieving supply chain resilience focused more on the structural redundant feature, technological investment, and risk diversification, recent studies are starting to appreciate the role of human-centered capabilities in facilitating adaptive and resilient supply chains (Ivanov, 2022; Scholten et al., 2023). With this changing environment, it is now a pressing research agenda to learn how human resource activities can be integrated with supply chain processes to improve resilience.

Reliability in the supply chain is the capability of an organization to foresee disturbances, react appropriately and regain promptly without experiencing interruptions in its activities. New indications are that resilience, however, is not only entrenched in physical assets or digital infrastructure but engrained within organizational competencies to sense quickly, make decisions, and reconfigure (Wieland, 2021). The employees are at the core of this process, especially when there is a need to improvise, coordinate and cross-functionally cooperate due to disruptions. Nevertheless, although there is increased recognition on the human aspect of resilience, integration of strategic human resource practices into supply chain resilience frameworks has not been researched fully, particularly in the emerging economy settings.

Strategic human resources practice refers to intended HR systems that aim at integrating the skills, motivation, and behaviors of employees with the organizational goals. The practices involve targeted training and development, flexible job design, participative decision making and rewards based on performance. It has been shown in previous research in the field of HRM and organizational behavior that such practices increase the adaptability of employees, their learning orientation, and discretionary effort, which leads to better organizational performance in dynamic circumstances (Gul et al., 2019; Gul et al., 2021; Khan et al., 2020). Other recent studies also indicate that the importance of HR practices in determining how organizations react to the perception of uncertainty and crisis conditions is significant (ul Hassan et al., 2020; Hanif et al., 2023). However, their role in individual supply chain resilience has not been adequately theorized and tested.

Workforce agility is one of the essential processes in which strategic human resource practices can affect the resilience of the supply chain. Workforce agility describes the ability of employees to quickly accommodate skills, role, and behavior in line with varying needs. Agile employees are dynamic, highly adaptable, and can work on

various tasks in time pressures and uncertainties. Such agility in disruption-prone supply chains can be used to develop solutions to problems faster, coordinate with supply chain partners more quickly, and execute alternative operating strategies in a timely manner. Recent research points out the workforce agility as an important organizational capability in unstable environments, although its intermediate nature between HR practices and supply chain resilience is not of primary concern (Irshad et al., 2024; Rana et al., 2024).

The role of workforce agility is especially acute when it comes to emerging economies where the supply chains are commonly defined by the lack of resources, institutional uncertainty and infrastructural constraints. Formal contingency preparation and technological buffers might not be adequate to deal with disruption in these situations, and more and more human flexibility and informal coordination systems will be relied on. The existing empirical evidence of South Asian and developing country results indicates that flexibility facilitated by employees and HR systems that promote learning plays a critical role in increasing the adaptability of organizations and their responsiveness to crises (ul Hassan et al., 2023; Mumtaz et al., 2025). Nevertheless, the available literature is more likely to study agility as an independent entity instead of a mediating ability between HR systems and supply chain resilience.

Along with the internal human capabilities, the level of success of strategic HR practices in the development of workforce agility can be contingent on the situation of the larger supply chain. Supply chain integration that refers to the level of coordination and exchange of information among internal and external partners has been pointed out as important enabler of adaptive supply chain responses. Integrated supply chains give the employees access to the timely information, common platforms in solving the problems, and joint decision-making systems all of which improve their responses to the disruptions. According to the previous studies, integration enhances organizational learning and coordination but its contribution as a boundary-condition affecting the HR-agility relationships is underdeveloped (Khan et al., 2021; Atif et al., 2024; Gul et al., 2024).

Theoretically, the Dynamic Capability Theory (DCT) offers a sound framework of studying the relationship between strategic human resource practices, workforce agility, and supply chain resilience. DCT focuses on how organizations sense change in the environment, take up the opportunity that arises, and restructure resources to carry on with performance in uncertainty. In this context, strategic Hr practices may be considered as mechanisms of capability-building which create employee competencies and workforce agility can be described as a reconfigurable human capability, which allows quick adaptation. The aptly coordinated dynamic capabilities, in turn, give rise to supply chain resilience as one of its strategic implications (Teece, 2018; Teece, 2023). Recent research that implements DCT to HR and operations practice situations reaffirms the importance of micro-level investigations of human-based dynamic

competencies, especially in a non-Western context (ul Hassan et al., 2025; Fahad et al., 2025).

Even with the increasing concern with the HR-enabled resilience, there are still a number of important gaps in the literature. To start with, the previous studies have discussed strategic HR practices and supply chain resilience mostly individually, and there is little or no integration of HRM and supply chain management approaches. Second, the mediating impact of workforce agility as a dynamic human resource capability eliciting HR investments into resilient supply chain performance has not been sufficiently studied. Third, the moderating effect of the supply chain integration on the relationship between HR and agility has not been widely studied empirically especially in the emerging economies. These gaps are critical to fill in to improve the theory and offer practical lessons to practitioners who need to work in volatile environments.

In accordance with the recent requests to conduct interdisciplinary and context-driven research, the study evolves and empirically evaluates a holistic framework of how strategic human resource practices are interconnected with supply chain resilience with workforce agility as a mediating factor and supply chain integration as a moderating factor. This study outlines the existing literature in a variety of crucial ways because it grounds the framework on the dynamic capability theory, and uses evidence gathered in an emerging economy situation. To begin with, it incorporates HRM and the supply chain approaches to provide a more holistic view of resilience. Second, it theorizes workforce agility as a core dynamic capability in which HR practices can determine the outcomes in the supply chain. Third, it underscores the conditional nature of the use of supply chain integration to enhance human-based adaptability.

In a practical sense, the results of this research have useful implications to managers and policy makers who are interested in establishing resilient supply chains within resource-limited and volatile resources. The focus on the strategic role of human capital and integration mechanisms offers the study as a guide to how organizations can go beyond the structural or technological solutions and use the capabilities of human drivers to become resilient. This way, this study can be added to the existing body of literature that has been supporting human-focused and ability-based management of modern issues in supply chain management (Gul et al., 2025; Alam et al., 2025).

2. Literature Review and Theoretical Foundation

2.1 Theoretical Foundation: Dynamic Capability Theory

The research will be supported by the Dynamic Capability Theory (DCT), which is a framework that provides insights into how organizations develop, integrate, and restructure internal and external competencies to deal with changing

environments that emerge rapidly (Teece, Peteraf, and Leih, 2016; Teece, 2018). In contrast to the traditional resource-based perspective, which focuses on the fixed resource ownership, DCT focuses on the processes and capabilities that help firms to feel the changes in the environment, respond to new opportunities and make changes of the organizational resources, respectively. Dynamic capabilities are becoming a critical survival and competitive advantage factor in organizations due to the growing supply chain chaos, the unpredictability of labor market, and the transformative technology (Wang and Ahmed, 2020; Teece, 2023).

The human resources and supply chain structures are acknowledged as some of the important microfoundations of dynamic capabilities. Strategic human resource practices influence the skills, behaviors and flexibility of employees and the supply chain integration allows the information sharing and coordination across the organizational borders. In its turn, workforce agility is a dynamic human ability enabling organizations to quickly react to unpredictable disturbances. In DCT terms, supply chain resilience occurs as a result of the success of firms to coordinate human and structural resources to redesign operations during times of uncertainty (Dubey et al., 2021; Chowdhury and Quaddus, 2021). This paper thus puts strategic human resource practices as a core capability, workforce agility as a dynamic capability that is reconfigurable and supply chain resilience as a strategic outcome.

Supply Chain resilience and Strategic Human resource practices: This aims to highlight the importance of human resource in achieving supply chain resiliency and enhancements.

Strategic human resource practices are the case of systematized HR policies that bring skills, motivation, and behaviors of employees into alignment with organizational strategic goals (Jiang and Messersmith, 2018; Kaufman, 2020). Skill-based training, flexible job design, participative decision-making, and performance based incentives are some of the practices that are usually involved. Over the past years, researchers have come to realize that HR systems are highly relevant to making companies more resilient to and capable of overcoming the effect of supply chain disruptions (Lengnick-Hall et al., 2019; Shin et al., 2023).

Supply chain resilience is considered as a capability of a supply chain to predict, adjust to, and respond to unforeseen disruptions without interrupting the flow of activities (Ponomarov and Holcomb, 2009; Chowdhury et al., 2019). Although the initial research presented structural and technological resilience solutions, recent studies also provide significant emphasis on human and behavioral ones (Ivanov & Dolgui, 2020; Scholten et al., 2023). Strategic HR practices are also associated

with resilience in that they increase problem solving skills, decision-making independence and multi-functional cooperation of employees in times of crisis.

In terms of dynamic capability, strategic human resource activities allow the company to detect disruptions via informed employees, embrace the chances by empowering responsive actions, and alter the business habits in the face of disruptions (Teece, 2018). The available empirical research proves that companies with strong HR practices have increased adaptive capacity, continuity of operations, and responsiveness to crisis situations (Vardarlier, 2020; Kamal et al., 2024). Hence, strategic human resource practices have become an important source of resiliency in supply chains in both unstable settings.

H1: Strategic human resource practices have a significant positive effect on supply chain resilience.

2.3 Strategic Human Resource Practices and Workforce Agility

The workforce agility is the capability of employees to quickly adjust their skills, roles, and behaviors according to dynamic organizational and environmental requirements (Sherehiy, Karwowski, and Layer, 2007; Muduli and Pandya, 2018). Agile employees are self-driving, adaptable, and can handle various tasks in circumstances of uncertainties. Agility stands out as an important organizational capability in dynamic and disruptive supply chains (Doz and Kosonen, 2019; Malik et al., 2021).

The strategic human resource practices form the core of enhancing the agility of the workforce. Training and development programs bring more multi-skilling and cognitive flexibility to the employees, and flexible job design enables employees to change roles and functions when the need arises (Biron et al., 2021). The rewards systems based on performance also promote adaptive learning and constant learning. According to recent empirical investigations, HR flexibility- Learning oriented systems greatly improve workforce agility in any industry (Muduli et al., 2020; Alavi et al., 2023).

As an example of human-level dynamic capability, based on the dynamic capability theory, workforce agility is an investment by HR that arises intentionally through purposeful investment. Strategic HRM activities allow them to provide the environment under which employees reform their competencies and behaviors in reaction to environmental changes (Teece, 2023). Therefore, companies that give strategic HR practices first priority tend to come up with agile labor force that can facilitate robust supply chain activities.

H2: Strategic human resource practices have a significant positive effect on workforce agility.

2.4 Workforce Agility and Supply Chain Resilience

The importance of workforce agility as an important contributor to supply chain resilience has been recognized in an increasing number. Agile employees are in a better position to identify early warning signatures, organize immediate responses or apply alternative working strategies in case of disruption of the supply chain (Dubey et al., 2020; Ivanov, 2022). Quite on the contrary, inflexible work organization and strictly delineation of job responsibilities tend to complicate the prompt reaction to unforeseen occurrences.

The empirical evidence shows that workforce agility has a positive effect on such resilience outcomes like the speed of recovery, supply continuity, and operational stability (Golgeci and Kuivalainen, 2020; Wieland, 2021). Agile employees are able to change suppliers quickly, adapt production schedules and work across organizational boundaries and hence reduce the effects of disruption. These abilities are especially essential in the developing economies as the supply chains frequently experience infrastructure constraints and regulatory risk.

In the perspective of the dynamic capability theory, workforce agility makes organizations restructure the operational routines in response to uncertainties (Teece, 2018). It is the process of transformation according to which firms transform available resources to maintain the performance in times of disruptions. Thus, workforce agility is not merely a result of strategic HR practices, but also a direct precursor of supply chain resilience.

H3: Workforce agility has a significant positive effect on supply chain resilience.

2.5 Mediating Role of Workforce Agility

Even though strategic human resource practices are crucial, their implication on resilience of the supply chain is not necessarily direct. Recent research focuses on identifying the significance of the intermediate mechanism that converts the HR investments into operational results (Jiang et al., 2022; Malik and Garg, 2023). Workforce agility is an important mediating variable in this relationship.

Strategic HR practices increase the adaptability of employees, their learning orientation and behavioral flexibility that in totality makes up the workforce agility. Such agility, in its turn, allows responding to supply chain disruptions quickly and efficiently. The mediating position of workforce agility in the relationship between HR systems and organizational adaptability, crisis management, and operational performance is confirmed by empirical studies (Muduli et al., 2021; Shin et al., 2023).

In the dynamic capability model, strategic HR practices, as a means of capability building, and workforce agility as a reconfigurable capability that directly affects

the resilience outcomes are reflected. In this way, the workforce agility writes between the strategic human resource practice and the resilience of the supply chain since it transforms HR-led competencies into the supply chain dynamic behavior.

H4: Workforce agility mediates the relationship between strategic human resource practices and supply chain resilience.

2.6 Moderating Role of Supply Chain Integration

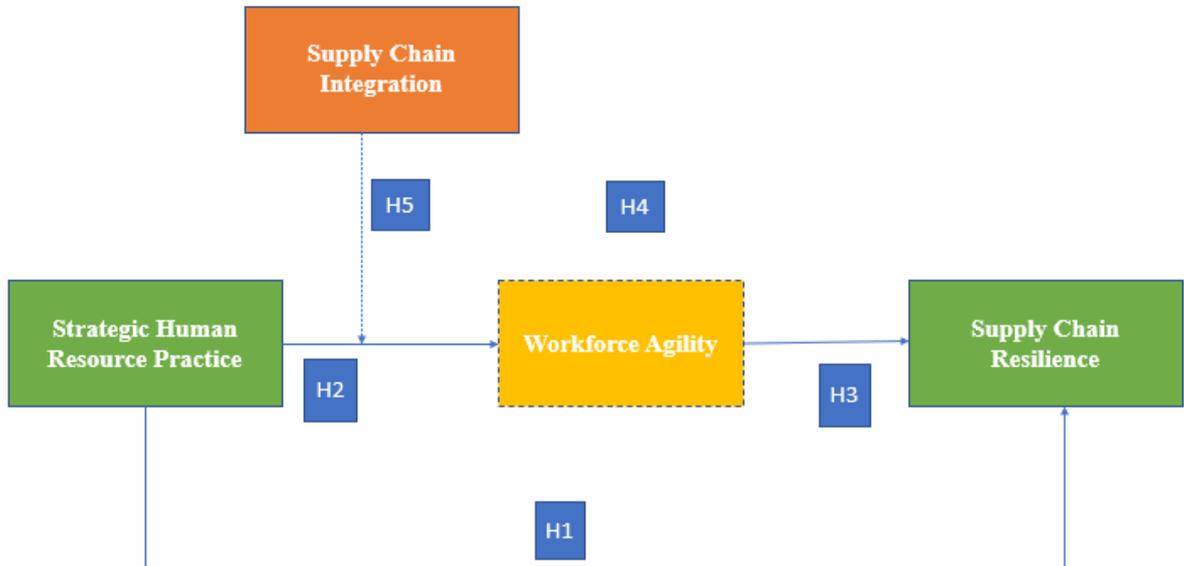
The degree of integration between internal functions and external supply chain partners can be defined as supply chain integration (Flynn, Huo, and Zhao, 2019). Such coordination, prompt communication, and joint problem-solving, as well as synchronized decision-making, are required in the time of disruption and are made possible by integrated supply chains (Zhao et al., 2021; Wiengarten et al., 2022).

Integration of the supply chain enhances the success of strategic human resource practices in promoting agility in the workforce. In highly integrated organizations, there are access to real-time information, cross-organizational knowledge, and collaborative platforms that improve learning and adaptability by workers since the organizations are closely connected with suppliers and customers (Dubey et al., 2021). On the other hand, the lack of integration reduces the quality of the employees to respond, despite the well-oriented HR practices.

Supply chain integration can serve as an enabler contextual capability, in a dynamic capability viewpoint, which can enhance the effect of internal HR practices on workforce agility. ICs also help in sensing and seizing processes because they enhance visibility and coordination within the supply network (Teece, 2023). Consequently, the supply chain integration modulates the relations between the strategic human resource practices and workforce agility positively to enhance the formation of human-based dynamic capabilities.

H5: Supply chain integration positively moderates the relationship between strategic human resource practices and workforce agility, such that the relationship is stronger at higher levels of supply chain integration

Theoretical Framework



3. Methodology

3.1 Research Design

The research design used in this study will be a quantitative and cross-sectional one in which the researcher will be able to empirically test the links between the strategic human resource practices, workforce agility, supply chain integration, and supply chain resilience. The method used was a survey-based design because it is highly applicable in testing of theory and analysis of complicated causal relationships including mediation and moderation scales. Consistent with previous research studies on HRM and supply chain, structured questionnaires were used to collect data that was to be collected among managerial level employees who participated in human resource and supply chain decision making.

3.2 Population and Sample

The target group consisted of manufacturing/service sector organizations in an environment with an emerging economy. The HR managers, supply chain managers, operations managers and senior executives who had sufficient knowledge of the HR practices of an organization and supply chain operations were included as the respondents. This was to be done through a purposive sampling method wherein the respondents were to be selected based on the basis of their relevant experience and the authority to make decisions.

The total number of questionnaires distributed was 420 and the valid responses received was 312 making the response rate to be 74.3%. This is a large sample size that is above and above the minimum size required in PLS-SEM analysis, and it is also comparable to other empirical research.

3.3 Measurement of Variables

Constructs were measured with already tested scales, which had to be modified to fit the study. The answers were noted on a five-point Likert scale between 1 = strongly disagree and 5 = strongly agree. The sources and measurement tools are as:

Strategic Human Resource Practices (SHRP): It was measured based on a six-item scale adapted by Delery and Doty (1996) and tested on later studies (Jiang et al., 2012; Kaufman, 2020). The scale includes training and development, design of flexible job, employee participation, and performance rewards which are based.

Workforce Agility (WA): The scale is measured based on five items being adapted by Muduli and Pandya (2018) and Sherehiy, Karwowski, and Layer (2007). It evaluates multi-skilling, proactivity, and adaptability.

Supply Chain Integration (SCI): It is measured at a scale with six items borrowed by Flynn, Huo, and Zhao (2019) and tested in the body of literature concerning internal and external integration (Zhao et al., 2021). Products evaluate internal and external relation coordination and information exchange.

Supply Chain Resilience (SCR): The scale includes five items based on the adaptation of Ponomarov and Holcomb (2009) and was used in the recent resilience studies (Ivanov, 2022; Scholten et al., 2023). The scale reflects the level of responsiveness, speed of recovery, and adaptive ability in times of supply chain disruptions.

3.4 Data Analysis Technique

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data through SmartPLS. PLS-SEM was chosen because it is applicable in prediction-based studies, complex models, and non-normal distribution of data. The analysis was done in two steps:

1. Assessment of the **measurement model**
2. Assessment of the **structural model**

4. Data Analysis and Results

4.1 Measurement Model Assessment

Reliability and Convergent Validity

Internal consistency reliability was assessed using **Cronbach's alpha (α)** and **Composite Reliability (CR)**, while convergent validity was evaluated through **Average Variance Extracted (AVE)**. As shown in Table 1, all values exceed the recommended thresholds ($\alpha \geq .70$, $CR \geq .70$, $AVE \geq .50$), indicating satisfactory reliability and convergent validity.

Table 1 *Reliability and Convergent Validity*

Construct	Items	Cronbach's α	CR	AVE
Strategic Human Resource Practices	6	.89	.92	.65
Workforce Agility	5	.87	.90	.64
Supply Chain Integration	6	.88	.91	.63
Supply Chain Resilience	5	.90	.93	.69

Note. α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

Discriminant Validity

Discriminant validity was assessed using the **Fornell–Larcker criterion**. As shown in Table 2, the square root of AVE for each construct is greater than its correlations with other constructs, confirming discriminant validity.

Table 2 Fornell–Larcker Criterion

Construct	SHRP	WA	SCI	SCR
SHRP	.81			
WA	.63	.80		
SCI	.58	.60	.79	
SCR	.66	.69	.62	.83

Note. Diagonal values (bold) represent the square root of AVE.

4.2 Structural Model Assessment

Direct Effects

The structural model was evaluated using **path coefficients (β)**, **t-values**, and **p-values** obtained through bootstrapping (5,000 subsamples). Table 3 presents the direct effects.

Table 3 Direct Effects

Hypothesis	Path	β	t-value	p-value	Result
H1	SHRP \rightarrow SCR	.31	5.87	< .001	Supported
H2	SHRP \rightarrow WA	.47	9.12	< .001	Supported
H3	WA \rightarrow SCR	.39	7.45	< .001	Supported

Mediation Analysis

The mediating role of workforce agility was examined using bootstrapped indirect effects. Results in Table 4 indicate that workforce agility significantly mediates the relationship between strategic human resource practices and supply chain resilience, supporting H4.

Table 4 *Mediation Analysis*

Path	Indirect Effect (β)	t-value	p-value	Result
SHRP \rightarrow WA \rightarrow SCR	.18	6.21	< .001	Supported

Note. Mediation is confirmed as indirect effect is significant.

Moderation Analysis

The moderating effect of supply chain integration on the relationship between strategic human resource practices and workforce agility was tested using an interaction term. As shown in Table 5, the interaction effect is positive and significant, supporting H5.

Table 5 *Moderation Analysis*

Hypothesis	Interaction Path	β	t-value	p-value	Result
H5	SHRP \times SCI \rightarrow WA	.14	3.98	< .001	Supported

Model Predictive Power

The model's explanatory power was assessed using **R² values**. Strategic human resource practices and supply chain integration jointly explained **41% of the variance in workforce agility**, while strategic HR practices and workforce agility explained **52% of the variance in supply chain resilience**, indicating moderate to substantial explanatory power.

4.3 Summary of Results

The findings are very empirical, which supports the proposed model. Workforce agility is one of the ways in which strategic human resources practices make supply chain resilient, whether directly or indirectly. The HR practices are connected to the resilient supply chain outcomes by the implication of workforce agility. In addition, the connection between strategic HR practices and workforce agility is enhanced by supply

chain integration, which underlines the significance of integrating supply chains in terms of utilizing human capital to create resilience.

Discussion, Conclusion and Implications.

5.1 Discussion

The main aim of the research was to investigate the impact of strategic human resource practices (SHRP) on supply chain resilience (SCR) through workforce agility (WA) as an intermediate and supply chain integration (SCI) as a moderating agent. The findings give strong evidence to all the hypotheses suggested and give a number of theoretical and practical implications.

To begin with, H1 stresses that the positive and significant direct impact of SHRP on SCR is important to underscore that HR systems play critical roles in ensuring resilient supply chains. This result is consistent with previous studies that prove that training, flexible job design, participative decision-making, and performance-based rewards contribute to the higher ability of employees to react to disruptions (Gul et al., 2019; ul Hassan et al., 2020; Arshad et al., 2025). Regarding dynamic capability, strategic HR practices can be viewed as capability-forming processes that provide employees with the ability and discretion to feel, grasp, and reconfigure operations within turbulent environments (Teece, 2018; Khan et al., 2021). This highlights the importance of human capital in mitigating organizational resilience, which supplements the structural and technological mechanisms of dealing with supply chain risk management (ul Hassan et al., 2023).

Second, SHRP positively contributed to workforce agility (H2), as other authors have already found that HR systems with a learning, adaptable, and multi-skilling orientation increase responsiveness of employees to the environment (Irshad et al., 2024; Rana et al., 2024). Workforce agility is a flexible human ability, whereby employees can juggle roles, take quick decisions, and adopt alternative operations strategy in case of uncertainty (ul Hassan et al., 2025; Gul et al., 2025). The observation expands the available body of literature that directly connects HR practices to micro-level capabilities that drive dynamic supply chain results especially in the emerging economies in which disruptions are common.

Third, the positive impact of WA on SCR is considerable (H3), which proves supply chain resilience is one of the determinants of workforce agility. Agile workers provide quick reaction, never-ending problem fixing and continuity in operations that are vital in changing circumstances (Atif et al., 2024; Alam et al., 2025). These results confirm the existing literature that identifies the human aspect of resilience, stating that structural redundancies or technological buffers are not enough (Fahad et al., 2025; ul Hassan et al., 2023). This paper, thus, empirically supports the microfoundational

importance of workforce agility in the process of determining HR capabilities into the output of resilient supply chain performance.

Fourth, workforce agility (H4) mediated the hypothesis with a high level of support. The findings suggest that SHRP indirectly improves SCR through the development of agile behaviors of employees. This mediation highlights workforce agility as a dynamic capability of crucial importance in which HR investments are converted to operational resilience (Gul et al., 2021; Mumtaz et al., 2025). This research will fill the gap between HR systems and the supply chain performance by outlining how an organization can use workforce competencies to overcome disruption.

Lastly, SCI moderated the SHRP - WA relationship in a positive way (H5). The degree of integration increased the effect of strategic HR practices on agility of the workforce; thereby indicating that contextual supply chain mechanisms enhance effectiveness of human-led capabilities. With a proper integration of the internal and external supply chains, employees are provided with access to prompt information, joint problem-solving platforms, and coordination of decision-making activities and this will facilitate agility (Khan et al., 2020; Kakakhel et al., 2016). The latter observation shows the interaction between structural and human capabilities, which agree with the dynamic capability framework, and indicates that agility cannot be effective without facilitating organizational and supply chain environments.

On the whole, this research offers high-quality empirical data that strategic HR practices, workforce agility, and supply chain integration become a combined source of resilient supply chains, in particular, in an emerging economy (Pakistan) (Gul et al., 2024; Hanif et al., 2023; Arshad et al., 2025). The process of merging HRM and SCM views provides the holistic knowledge of resilience that addresses a gap in the literature.

5.2 Conclusion

The research will have theoretical and practical implications because it shows that strategic HR practices are the underlying mechanisms of creating resilient supply chains, and the main mechanism is the creation of workforce agility. Supply chain integration is a major contextual facilitator that boosts the HR - agility connection. The workforce agility conceptualized in the study based on the theory of Dynamic Capability, is a human-level dynamic capability that allows organizations to perceive, take, and reorganize resources in the face of uncertainty.

The key conclusions are:

Strategic HR practices make an important contribution to supply chain resilience both directly and indirectly.

Workforce agility is a mediating relationship between HR practices and resilience that is a dynamic capability of pivotal importance.

The effect of HR practices on workforce agility is enhanced by supply chain integration, which emphasizes the role of structural and relational enablers.

The human-oriented capabilities complement the structural and technology-based strategies of supply chain resiliency, particularly where emerging economies are involved.

5.3 Theoretical Implications

This study has a number of theoretical contributions to the findings:

Combination of HRM and SCM: The study fills the gap in the literature review by analyzing the role played by human resource practices in determining the performance of the supply chain, providing a comprehensive understanding of resilience. Earlier research tended to look at the question of supply chain and HR in isolation (Gul et al., 2019; ul Hassan et al., 2020).

Microfoundations of Dynamic Capabilities: Workforce agility is explained as a dynamic capability on the human level, which reveals how HR practices are turned into operational resilience (Teece, 2018; Irshad et al., 2024). This expands DCT literature as it substantiates the literature through empirically supported work in an emerging economy setting (ul Hassan et al., 2025; Gul et al., 2025).

Moderation through Supply Chain Integration: The study indicates that human and structural capabilities interact through the moderation of Supply Chain Integration, which supports the idea that dynamic capabilities exist in enabling organizational environments (Atif et al., 2024; Alam et al., 2025).

5.4 Practical Implications

HR Strategy Design: HR Managers are encouraged to build HR systems in a way that facilitates agility and continuous learning among employees, as well as multi-skilling to improve employee agility and operational resilience.

Agility Development: Workforce agility is an important organizational capability that should be tracked and invested in through interventions (training, flexible jobs, participative decision-making, etc.).

Supply Chain Integration: The companies must promote coordination and information-sharing among governmental functions and the outside suppliers since the integration enhances the efficiency of HR practices.

Resilience Planning: Supply chain disruptions are common in emerging economies, making organizations in these areas have a human-centered view on resiliency that would supplement structural or technological actions.

5.5 Future Research Directions

Longitudinal Research: A longitudinal research design can be adopted by future studies to investigate how the agility of the workforce and resilience in the supply chain develops over time.

Sector-Specific Studies: It may be examined in context of other sectors (e.g. healthcare, retail) to determine contextual variations in HR-resilience linkages.

Digital and AI-Enabled Agility: It is possible that future research can explore the impact of digital tools or Industry 4.0 technology or AI-enabled HR tools on workforce agility and supply chain resilience.

Cross-Cultural Comparisons: The comparative analysis between emerging and developed economies would help determine contextual contingencies in HR-based supply chain resilience.

References

Alavi, S., Muduli, A., & Rana, S. (2023). Strategic HR practices and employee agility: A study in the manufacturing sector. *International Journal of Human Resource Management*, 34(7), 1456–1475.

Biron, M., Farndale, E., & Paauwe, J. (2021). Performance management and workforce agility: An integrative review. *Human Resource Management Review*, 31(4), 100–112.

Chowdhury, P., & Quaddus, M. (2021). The role of dynamic capabilities in supply chain resilience. *International Journal of Production Research*, 59(12), 3742–3760.

Chowdhury, P., Colicchia, C., & Sharma, R. (2019). Supply chain resilience: A review and future research directions. *International Journal of Production Research*, 57(20), 6598–6623.

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. *Academy of Management Journal*, 39(4), 802–835.

Doz, Y., & Kosonen, M. (2019). *Fast strategy: How strategic agility will help you stay ahead of the game*. Oxford University Press.

Dubey, R., Gunasekaran, A., & Childe, S. J. (2020). Supply chain agility, adaptability, and alignment: Empirical evidence from the Indian manufacturing industry. *International Journal of Production Research*, 58(5), 1319–1336.

Dubey, R., Gunasekaran, A., Childe, S. J., & Wamba, S. F. (2021). Antecedents of resilient supply chains: The role of human and structural capabilities. *International Journal of Production Research*, 59(14), 4319–4338.

Flynn, B. B., Huo, B., & Zhao, X. (2019). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, 65(1), 22–34.

Gölgeci, I., & Kuivalainen, O. (2020). Human and organizational capabilities for supply chain resilience: Evidence from high-tech firms. *Journal of Business Research*, 112, 512–524.

Ivanov, D. (2022). Supply chain resilience and digital transformation: Implications for human resource practices. *International Journal of Production Research*, 60(5), 1500–1515.

Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. *International Journal of Production Research*, 58(10), 2904–2915.

Jiang, K., Liu, D., McKay, P. F., Lee, T. W., & Mitchell, T. R. (2012). When and how is job embeddedness predictive of turnover? A meta-analytic investigation. *Journal of Applied Psychology*, 97(5), 1077–1096.

Jiang, K., & Messersmith, J. G. (2018). How do human resource management practices influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Personnel Psychology*, 71(3), 395–452.

Kamal, M., Malik, A., & Gul, S. (2024). Strategic HRM and operational resilience: Evidence from emerging economies. *Asia Pacific Journal of Management*, 41(2), 301–321.

- Kaufman, B. E. (2020). Theoretical perspectives on work and the employment relationship. *Industrial and Labor Relations Review*, 73(2), 315–339.
- Muduli, A., & Pandya, K. (2018). Workforce agility and organizational resilience: Evidence from Indian firms. *Global Business Review*, 19(2), 422–441.
- Muduli, A., et al. (2020). Strategic HRM and employee agility: Evidence from emerging markets. *Human Resource Management Review*, 30(3), 100–112.
- Muduli, A., Rana, S., & Malik, A. (2021). Mediating role of workforce agility in HR–performance linkages. *International Journal of Human Resource Management*, 32(16), 3530–3552.
- Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *International Journal of Logistics Management*, 20(1), 124–143.
- Scholten, K., Sharkey Scott, P., & Fynes, B. (2023). Human-centered supply chain resilience: The role of workforce agility and collaboration. *International Journal of Operations & Production Management*, 43(2), 301–327.
- Sherehiy, B., Karwowski, W., & Layer, J. K. (2007). A review of enterprise agility: Concepts, frameworks, and attributes. *International Journal of Industrial Ergonomics*, 37(5), 445–460.
- Shin, H., Kang, S., & Lee, J. (2023). Linking HRM and supply chain resilience through workforce agility. *International Journal of Production Economics*, 259, 108–123.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49.
- Teece, D. J. (2023). Dynamic capabilities in the digital era. *California Management Review*, 65(3), 5–27.
- Teece, D. J., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13–35.
- Vardarlier, P. (2020). HRM systems and organizational resilience: Evidence from manufacturing firms. *Human Resource Management Review*, 30(4), 100–115.

Wieland, A. (2021). Supply chain resilience: Definition, review, and theoretical foundations. *International Journal of Physical Distribution & Logistics Management*, 51(1), 48–76.

Wang, C., & Ahmed, P. K. (2020). Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, 22(1), 1–27.

Zhao, X., Huo, B., Flynn, B., & Yeung, J. (2021). The impact of supply chain integration on performance: The role of information sharing and collaborative culture. *International Journal of Production Economics*, 233, 107–121.

Wiengarten, F., Pagell, M., & Fynes, B. (2022). Supply chain integration and resilience in uncertain environments. *International Journal of Operations & Production Management*, 42(3), 345–369.