



Supply Chain Adaptability as a Mechanism Linking Digital HRM Immersions and Performance: An AMO–DCV Framework

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ABSTRACT

Manufacturing supply chains in emerging economies face recurring turbulence from demand, input volatility, and tighter buyer compliance. In such conditions, workforce adaptability becomes central to sustaining operations. Grounded in AMO and DCV this study examines whether Digital Human resource management strengthens supply chain adaptability and performance in Pakistan's textile and apparel sector. Digital HRM is conceptualized as an immersive capability building system spanning training, onboarding, and real-time operational support. Survey data from 200 manufacturing firms were analyzed using partial least squares structural equation modeling. Results show a strong positive effect of Digital HRM immersions on supply chain adaptability, and a significant positive effect of adaptability on performance. Direct HRM performance path is insignificant, while adaptability fully mediates the relationship. Findings suggest Digital HRM immersions deliver value primarily by enabling adaptive supply chain reconfiguration in volatile contexts.



Introduction

Background and global context

In the modern competitive world, supply chains are facing undying turbulence due to demand volatility, geopolitical shocks, technological disruption, sustainability pressures, and quick changes in customer expectations. With the world turning into a global village, companies are rapidly realizing that efficiency is not the sole factor that will enable them to be competitive in the long run but their ability to be responsive and smart. This has made supply chain adaptability become a

strategic issue particularly in manufacturing sectors where companies have to restructure internal functions, supplier systems and consumer-based delivery systems in a very frequent manner.

At the same time, the global manufacturing workforce is transforming under the influence of Industry 4.0 technologies. Traditional human resource systems designed largely for administrative efficiency and information processing are proving insufficient for turbulent environments that demand rapid learning, adaptability, and real time coordination. Organizations are therefore experimenting with advanced digital HR immersions that build workforce adaptability. A prominent development in this area is the rise of Extended Reality (XR) including Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) as a tool for immersive training, onboarding, and on the job performance support.

Nevertheless, the development of industrial paradigms has come to a turning point with the advent of Industry 5.0 a vision that aims not only to continue to expand the technological achievements of Industry 4.0 but also to reestablish the human worker as the central node of a complex sociotechnical system (Lu et al., 2022). Previous industrial revolutions focused on automation, efficiency, and the creation of increased digital understanding, whereas Industry 5.0 shifts the direction towards the systems that are more oriented on people, sustainability, and resilience over time (Ivanov, 2023). According to this new paradigm, the value of human creativity, decision making, and wellbeing are predicted in the future, demanding symbiotic cooperation between human operators and smart machines.

Strategically, these Enabled HR practices function as mechanisms that foster acceptance and support effective adaption.

Grounded in **Ability Motivation Opportunity (AMO) theory**, XR-supported HRM practices has positive influence on performance by simultaneously enhancing employees' capabilities, motivation, and opportunities to contribute. From the **ability** dimension, extended reality (XR) technologies such as virtual and augmented reality provide immersive, experiential learning environments that improve skill development, knowledge retention, and task accuracy more effectively than conventional training methods. In terms of motivation, XR-supported HRM increases engagement and intrinsic motivation by offering interactive, realistic, and personalized work and learning experiences that enhance self-efficacy and job involvement. From an opportunity perspective, XR enables greater employee participation through virtual collaboration, real-time feedback, and safe experimentation, thereby expanding opportunities for employees to apply their skills and contribute meaningfully to work processes. Consistent with AMO theory, which posits that performance improves when employees are able, motivated, and provided with opportunities to perform (Appelbaum et al., 2000; Jiang et al., 2012), XR-supported HRM directly enhances individual and organizational performance by activating all three AMO mechanisms simultaneously.

According to the Dynamic Capabilities View (DCV), when firms are able to detect change in the environment, respond to opportunities presented by the environment, and reorganize resources in a short period of time, the firm is adaptable and able to perform better in turbulent situations. Fast reskilling, flexible deployment, cross functional workforce and decision readiness in internal procedures and social relations foundations are essential in manufacturing dynamic capabilities. The Digital Immersions (XR-supported HRM) mediated by supply chain adaptability as is used as a tool to reinforce get supply chains better adjusted and performance oriented. (Evans-Uzosike et al., 2022).

Although use of **Digital HRM Immersions i.e., XR-supported HRM** digitalization is growing worldwide, there is still a shortage of data on those processes in the emerging economies. A

specific context that is of particular importance is Pakistan because of its extensive manufacturing background and its vulnerability to persistent shocks of the supply chain which includes energy volatility, uncertainty in raw materials, compliance pressure and demand fluctuations. In Pakistan, the textile and apparel industry are the most appropriate industry to explore Supported HRM and supply chain adaptability. This industry is the most important manufacturing ecosystem in Pakistan, vertically integrated (cotton to garments), and it is characterized by high rates of exports. As a result, textile companies are faced with the issue of adaptability on three interrelated levels on a continuous basis:

Internal adaptability: reconfiguring production processes, layouts, and SOPs under energy, compliance, and automation changes.

Supplier adaptability: coping with volatility in cotton/yarn supply, chemicals, accessories, and input pricing.

Customer adaptability: responding to fast changing export orders, quality standards, and buyer compliance requirements.

Even with such pressures, the majority of studies on Pakistan still analyze HR technology with the prism of HRIS and automation as opposed to capability building logics. Equally supply chain studies in Pakistani textile have raised efficiency and risk management over the dynamic capability pathway whereby advanced HR practices boost adaptability and performance. Thus, there is also an obvious lack of knowledge on whether Digital immersions (XR supported HRM) could develop dynamic capabilities that improve internal, supplier, and customer adaptability, enhancing financial performance within the textile and apparel supply chain in Pakistan.

In this study, we conceptualize digital HRM immersion as a set of human resource management practices enabled through extended reality (XR) technologies, including virtual, augmented, and mixed reality, that create immersive, interactive, and experiential work environments for employees. XR-supported HRM represents the technological infrastructure, whereas digital HRM immersion captures the employee-level experiential intensity generated by these technologies. Consistent with the AMO framework, such immersive digital HRM practices enhance employees' abilities, motivation, and opportunities by facilitating experiential learning, real-time feedback, and collaborative engagement. From a dynamic capabilities perspective, these immersive HRM systems serve as micro foundations that enable organizations to sense, seize, and reconfigure resources, thereby fostering supply chain adaptability and, ultimately, superior performance outcomes. *Accordingly, we treat XR-supported HRM as the enabling mechanism through which digital HRM immersion is realized in this research.*

Problem Statement

The manufacturing industry of textile and apparel in Pakistan has a high turbulence environment, which is marked by volatility of raw materials, uncertainty of energy sources, increasing compliance of export buyers, high rate of product mixes, and sporadic global demand shocks. These forces are putting constant pressure on the textile companies to reorganize themselves, realign their suppliers and adapt to the changing needs of the customers. Under these circumstances, supplier chain adaptability is required in order to survive not to improve.

The adaptability of manufacturing supply chains is however, fundamentally limited by the readiness of the workforce. Conventional HR systems and administrative digitalization (e.g., HRIS) are commonly used to maintain records and make routine HR choices, however, they cannot sufficiently create the learning velocity, versatility, and integrated execution required in periods of turmoil. Firms around the world are moving towards XR Supported HRM (VR/AR/MR

enabled training, onboarding, and operational support) as a more immersive capability building method that enhances skill development faster, boosts safety and SOP compliance and allows real time task execution. However, regardless of this trend, there is scanty empirical evidence in Pakistan regarding whether XR-supported HRM enhances the dynamic capabilities of manufacturing workforces, and whether the dynamic capabilities can be converted into better internal, supplier, and customer adaptability.

Thus, the main issue is that it is not clear whether and how Supported HRM can provide supply chain adaptability and performance in Pakistan textile and apparel industry, and whether this association is facilitated by dynamic capabilities (DCV) and AMO. In the absence of evidence, textile companies can invest insufficiently in Based HR practices or implement them without getting their strategic value.

Research objectives

The general aim of this research is to investigate the role of Enhanced HRM in achieving supply chain adaptability and effectiveness in the textile and apparel manufacturing industry in Pakistan with reference to DCV and AMO.

In particular, the research will focus on:

1. Establish the degree and type of XR-supported HRM practices such as training and development, onboarding /socialization, and operational/performance support in the textile and apparel companies of Pakistan.
2. Analyze how XR-supported HRM influences the adaptability of the supply chain of the Pakistani textile and apparel industry.
3. Evaluate the role of supply chain adaptability in performance enhancement in textile and apparel firms.
4. Test the hypothesis of supply chain adaptability mediating between HRM supported by XR and performance outcomes.
5. Test the direct impact of XR-supported HRM on the financial performance of companies in the chosen industry (as an auxiliary goal).

Research Questions

1. How far are the XR supported HRM practices implemented in textile and apparel companies of Pakistan?
2. Can XR-supported HRM contribute greatly to improving supply chain adaptability within this industry?
3. Is there a significant link between supply chain adaptability and performance in textile and apparel companies?
4. Does supply chain adaptability mediates relationship between XR supported HRM and performance?
5. Does HRM supported by XR have a substantial direct impact on supply chain performance of firms?

Scope of the study

Sectoral scope: The paper is dedicated to the textile and apparel manufacturing value chain in Pakistan since it is the most complicated and volatile supply chain in the country.

Geographic scope: The samples to be sampled will be based on four major textile clusters in Pakistan, i.e., Faisalabad, Lahore, Karachi and Multan, where the sample will represent upstream (cotton/spinning), midstream (weaving/processing) and downstream (garments/export) firms.

Conceptual scope: The model considers XR-supported HRM as the independent variable, supply chain adaptability as the mediator construct, and the financial performance as the dependent variable.

Methodological coverage: The research is based on a quantitative, cross-sectional design and hypotheses testing through the structural equation modeling.

Research contribution

This research will add value to the theory and practice by combining XR-supported HRM with DCV and supply chain adaptability in the Pakistani textile sector. In theory, it projects DCV into a relatively unexplored growing economy and demonstrates XRHRM as a competence creating channel instead of an automation instrument. In practice, it provides lessons to textile companies that want to have resilient supply chains by means of speedy reskilling, standardized implementation, and enhanced upstream/downstream adaptability.

Significance of the Study

Theoretical significance

Expanding DCV & AMO to XRHRM and supply chains:

The research contributes to the publication of AMO & Dynamic Capabilities View by placing XR-supported HRM as a technology-based HR capability that enhances workforce micro foundation of sensing, seizing, and reconfiguration. This extends AMO & DCV past conventional operational assets to immersive HR manufacturing supply chain practices.

Connecting XR literature and adaptability research:

The majority of XR research studies focus on training or learning outcomes separately. This paper connects XR-supported HRM with supply chain adaptability in the form of dynamic capabilities, which provides a consistent theoretical connection between immersive HR technologies and strategic supply chain performance.

Emerging economy contribution:

The developed economies still dominate the ongoing empirical XRHRM, AMO and DCV studies. Through studying Pakistan textiles, this study enhances external validity of DCV based ability development in volatile emerging locations.

Practical significance

Strategic HR transformation guidance:

The findings will guide textile executives and HR leaders on whether XR-supported HRM is not just a training novelty but a strategic investment for adaptability and resilience.

Operational adaptability improvement:

By distinguishing internal, supplier, and customer adaptability, the study provides actionable insight into where XR-supported HRM yields the strongest benefits within the textile supply chain.

Policy and cluster development relevance:

Since textiles are Pakistan's export backbone, results can inform government and industry bodies about workforce digitalization pathways that strengthen supply chain resilience at the cluster level (Faisalabad, Lahore, Karachi, Multan).

Literature Review

Although virtual reality (VR) systems have been used as research prototypes since the 1960s (Sutherland, 1965, 1968), it is only relatively new with the introduction of commercially available powerful hardware and software.

Nevertheless, at the heart of this human machine integration is extended reality (XR), a term that is a general device, which is Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). XR technologies provide experiences and context rich interactions that are unlimited by the barrier of traditional interfaces (Rauschnabel et al., 2022). Compared to traditional exhibits or educational resources, XR systems allow users to immerse themselves in realistic conditions, which means enabling them to explore, rehearse, and view real-world conditions in environments which are guarded, managed, and simple to replicate. These are particularly crucial in the professional environment where the stakes are high, the mistakes are expensive and the training requirements are quickly changing.

XR may also be used in manufacturing to simplify the process of training relevant and intricate assembly tasks or hazardous workplaces (Gong et al., 2021). It can be applied to high stakes decision making, training, and awareness of space in the fields of healthcare and aviation (Torrence and Dressel, 2022). XR is a new opportunity to boost team work, communication, and mutual understanding in the context of team activity (Wu et al., 2024). Notably, XR also opens the possibilities to solve such urgent social problems as diversity and inclusion by permitting users to assume various perspectives (Fox and Thornton, 2022).

Dynamic Capabilities View (DCV) as Grounded Theory

Dynamic Capabilities View describes why certain firms live and thrive in turbulent environments. Teece and Pisano (1997) conceptualized dynamic capabilities as capability of a firm to incorporate, develop and reorganize both internal and external competences in the face of rapid change. Subsequent literature makes it clear that dynamic capabilities are executed at higher order routines that facilitate adjustment to more than just normal operational capabilities (Teece, 2007; Eisenhardt and Martin, 2000; Winter, 2003).

In the supply chains, DCV is applied to describe how the organizations refresh their workforce competencies and operational patterns to adjust to disruptions and market changes. Supply chain adaptation is thus seen as outcome capability based on ability and not structural but constant (Teece, 2007; Pisano and Teece, 2007).

Therefore, DCV offers a good foundation on which to analyze XR-supported HRM development of adaptive capacity flowing into supply chain adaptability and performance.

Digital Immersions (XR-supported human resource management)

Digital HRM immersions are conceptualized as HRM practices enabled through advanced digital technologies that create immersive and interactive employee experiences (Bondarouk & Brewster, 2016; Parry & Strohmeier, 2014). In this context, extended reality (XR) technologies—including virtual, augmented, and mixed reality—provide the technological infrastructure through which immersive HRM practices are delivered (Marler & Boudreau, 2017). While XR refers to the enabling technology, digital HRM immersion captures the experiential depth of HRM systems as perceived by employees. Accordingly, XR-enabled HRM is treated as the operational manifestation of digital HRM immersions in this study.

XR-supported human resource management (HRM) refers to the systematic integration of extended reality technologies into core HRM practices to enhance how organizations sense workforce capability needs, support skill development and performance execution, and continuously adjust human capital configurations in response to changing organizational and environmental demands.

Concept and global emergence

Extended Reality (XR) VR, AR, and MR have entered the sphere of enterprise applications, primarily in manufacturing worker systems. XR-supported HRM is a concept that defines human resource practices being presented or reinforced with the assistance of immersive and augmented environments, which allow workers to learn, find their places in work, and accomplish work tasks more efficiently. According to recent HR technology mapping, XR applications in HR are increasing at a fast pace but are not yet well tested in emerging economies (Ferreira, et al., 2021)

They are not competitors, the XR can be applied by the HR. **HR = “people strategy & management.”**

XR = “a tool that can support HR (especially training, onboarding, hiring).”

XR training and reskilling

The manufacturing research indicates the learning process is enhanced with XR training, procedural learning, safety training, and retaining skills due to the opportunity of having the realistic simulation repeated. It is thus considered a high value HR practice of industrial reskilling (Alam, 2021).

XR onboarding and socialization

XR is also used in the onboarding in the form of virtual site tours, realistic job preview, and role simulation. The approaches help to explain job expectations initially, to facilitate the new employee to know their job and the performance standard earlier, and also make the onboarding standard to ensure that new staff member have a uniform and quality induction process across sites, regions and teams. (Zhao et al., 2022)

XR operational / performance support

In addition to preemployment learning, XR enhances HRM after employees have gotten on the job as it provides immediate support on performance. It involves such tools as AR guided work instructions, stepwise visual hints, remote expert collaboration that may be called right at the moment of necessity. According to results of industrial AR implementation, real time digital overlays enable employees to finish assembly, maintenance tasks more precisely, reduce the rates of errors, as well as reduce mental load and decision fatigue when performing complicated tasks (Singh and Maheswaran 2024).

By doing so, XR-supported HRM extends HR role beyond single training events, to a continual type of assistance at the workplace. It allows the sustained skill reinforcement, quicker problem solving, and easier adoption of the knowledge as the tasks become complex, so that the employees retain the ability and confidence in their everyday practice but not only in the formal learning sessions.

XR supported HRM as DCV consistent capability input

According to the dynamic capabilities opinion (DCV), the value generating technologies enabled HR practices can be done when they serve to form the micro foundations of sensing opportunities and threats, they seize them by acting in a timely way, and continually remodel their resources and routines to keep pace with changing conditions. Supported HRM is not only a training based under such framing, but an infrastructure of building capabilities. By increasing the rate at which employees can acquire new processes as well as enhance the uniformity at which they implement tasks, XR boosts the capacity of the organization to observe the changes in the environment, react to them with well informed decisions as well as adjust standardized routines without losing their quality or speed. These benefits are particularly needed in turbulent times when processes need to be revised at a high rate and the cost of mistakes is increased. According to Teece (2007), companies can withstand disruption by updating routines and mobilizing skills more rapidly than their competitors, and the HRM with the usage of XR directly facilitates the said process by allowing companies to acquire skills quickly, practice in real time, and perform reliably across geographic boundaries and workgroups.

Supply Chain Adaptability (Mediator)

Adaptability as a capability outcome

Supply chain adaptability is an ability of a firm to vary its supply chain structures, the working processes and interorganizational relationships in the case of uncertainty or rapid change. It entails redefining sourcing policies, redesigning logistics supply chains, changing suppliers or partners, and reorganizing coordination practices in the way the chain will keep on operating despite shocks. Survey based on the dynamic capabilities view (DCV) is repeated on the concept of adaptability as the main channel of transformation of internal resources and capabilities of a firm into high performance in disruption. Differently put, the capabilities of visibility, collaboration, and adaptability are the most important to be able to allow the supply chain to react in practice and preserve continuity and allow recovery in fluctuating conditions (Huang et al., 2024)

Three-dimensional adaptability (internal, supplier, customer)

An important stream of empirical studies conceptualizes the adaptability in three interfaces as internal operations, supplier network, and customer network. To provide an illustration, Tse, Zhang, and colleagues (2022) distinguish between supply chain adaptability in internal, supplier, and customer dimensions and test their different performance outcomes.

The 3D perspective is consistent with the previous supply chain boundary models that distinguish between internal integration and supplier and customer alignment (Narasimhan and Kim, 2002; Flynn et al., 2010).

Internal adaptability: the restructuring of workflows, workforce distribution, production plans, and the SOPs.

Suppliers' adaptability: change of sourcing, supplier coordination, inventory policies, and upstream logistics.

Customer adaptability: movement of product mix, quantities, delivery priorities, downstream service systems.

Adaptability as mediator between XRHRM and performance

According to capability performance studies, digital skills and capabilities related to workforce are seldom effective in enhancing outcomes in a linear and direct manner. Rather, their actual contribution is more likely to manifest itself by providing adaptive behaviors within the supply chain. Research in this direction demonstrates that the tools, data infrastructure, and skills of employees result in improved performance when they allow firms to feel the changes earlier and respond faster and amend operations more efficiently, but not when they are generating gains independently and without any parallel change in supply chain behaviors (Um, 2017; Tse et al., 2022). In other words, capabilities are like enablers, but it is adaptability that transforms the enablers into results in cases of uncertainty.

With this reasoning, supply chain adaptability occupies the central position of the theoretical framework between the Supported HRM and performance. The XR-supported HRM can increase the learning pace and situational understanding, as well as the reliability of the executions of the employees which contributes to the organizational capacity to update routines, redistribute resources, and organize partnerships in response to changing conditions. Such adaptive reactions (e.g., the change of sourcing options, redesigning workflows or the rapid stabilization of disrupted processes) are the ones that eventually safeguard service levels, the continuity of operations and the satisfaction of stakeholders. Consequently, the role of adaptability is placed as the mediating variable: the XR-supported HRM result in the capabilities of the workforce required to perform a flexible action, and the adaptability of the supply chain converts the enhanced capabilities into the enhanced performance, such as responsiveness, quality, resilience, and general effectiveness of the operations.

Performance

Examples of performance are delivery reliability, responsiveness, service and quality that remain consistent, innovation, satisfaction of customers, and reputation. Such signs are indicative of adaptive success at a higher rate compared to short term accounting outcomes under turbulence, particularly in export-oriented manufacturing (Um, 2017; Skipworth et al., 2015).

The empirical evidence of supply chain work reveals that more adaptable firms achieve better nonfinancial results when they mitigate the effects of disruption and keep the level of customer service at an appropriate level (Tse et al., 2022).

DCV describes the process by which companies develop adaptive capability by renewing capabilities (Teece, 2007). Supported HRM allows improving training, onboarding, and real time performance support (Alam, 2021; Ferreira et al., 2021). Supply chain adaptability is a three-interface mechanism connecting the capabilities with the outcome (Tse et al., 2022). When adaptability is enhanced, performance is enhanced (Um, 2017).

HRM with XR Dynamic Capabilities.

The Supported HRM comprises the immersive training g, Based onboarding and real time AR operational guidance. The practices help speed up the experiential learning process, shorten the time of training new or modified SOPs, increase readiness to safety, and allow consistency in execution. These advantages create micro foundations in workforce dynamic capabilities, particularly quick learning, task deployment, better coordination, and making decisions in

uncertain situations. Thus, HRM based on XR should have a positive influence on dynamic capabilities. (Pillai, R., & Srivastava, K. B. L. (2024).

Dynamic capabilities enable companies to react to turbulence through early sensing of change, seizing an opportunity, and reconfiguring resources. In textiles:

The internal pliability enhances where the workforces are able to swiftly react to changeovers in production, automated upgrades, SOP compliance reforms, and productions based on utilizing energy, and the shifts in schedules.

The supplier adaptability is enhanced as the firms are able to restructure sourcing configurations, handle cotton/yarn volatility, switch to alternative suppliers and absorb the upstream shocks without significant disruption in operations.

The customer adaptability is also enhanced in cases of the ability to flex mixes of products, quantity quantities, quality requirements, and delivery schedules to fulfill fluctuating export buyer needs.

Pakistan Textile & Apparel Context and Research Gap

Pakistan textile and apparel industry is vertically integrated between cotton and clothing and controls the nationwide manufacturing job and exports. It is vulnerable to upstream cotton/yarn volatility, energy related shocks in production and heavy export buyer compliance alterations. These characteristics render strategic necessities of firms to be adaptive.

Nevertheless, much of the textile research on Pakistan has been studying the issues of supply chains in terms of efficiency, sustainability, or overall resilience, whereas the potential of the immersive workforce capability building (Supported HRM) as an empirical question has not been addressed. The research on XRHRM is growing globally, and the research on emerging economies, as well as on the textile industry in particular, is limited (Ferreira et al., 2021).

To the best of knowledge, no research within the textile and apparel industry in Pakistan has experimented the effect of XR-supported HRM on three-dimensional adaptable supply chain and consequently the performance under the DCV foundation.

Hypotheses Development

XR-supported HRM and Supply Chain Adaptability

The Digital HR Immersions i.e., XR Supported HRM can be defined as the application of VR/AR/MR in HR processes including immersive training, simulated onboarding, and real time task directions. The XR work being demonstrated in global HR demonstrates that learning speed, safety preparedness, and procedural accuracy are improved by XR and play a vital role in reconfiguring a manufacturing environment rapidly (Bhat & Kapoor, 2021)

Based on DCV, one of the major directions in which companies can respond to turbulence is workforce capability renewal, which involves changing operations and supply chain interfaces (Teece, Pisano and Shuen, 1997; Teece, 2007).

Because XR-supported HRM increases the adaptability of the workforce to change, it will have a positive contribution to the capacity of the firm to adapt its supply chain.

Internal adaptability indicates the capability of the firm to restructure internal processes, SOPs, routines, staffing and the manufacturing arrangement. The AR task guidance, as well as XR

training, allows redeploying the skills more rapidly and enables them to be performed consistently in case of an internal change in the processes Gupta & Kumar, 2022)

Supplier adaptability indicates the capability of a firm to restructure its backstream network, such as switching sourcing patterns, dealing with changes in the availability or prices of inputs and altering the routines of coordination with the suppliers. It may include changing or dual sourcing suppliers, renegotiating terms, redesigning order and delivery schedules, or enhancing collaboration to manage uncertainty. In the perceptions of DCV, such upstream adjustment is reliant on the speed, at which the workforce is able to acquire novel practices and the frequency, at which they are able to perform revised practices. By enabling employees to internalize change more quickly and deliver predictable performance, companies are in a better place to redefine supplier interfaces, sustain the flow continuity and stabilize relationships in a disruption (Teece, 2007; Wong et al., 2011).

Customer adaptability is the ability of a firm to redefine the product features, delivery time, service priority and overall response rate to changes in downstream demand. It involves the rapid processing of custom orders, the reprioritization of shipments, the alteration of last mile plans and the reallocation of customer communication schedules when preferences or volumes are varied. The Based training and onboarding enhance this adaptability to create a more adaptable workforce. By being able to rehearse customer driven changeovers in immersive environments and being provided with a guided assistance on the job, employees are more responsive to new demands, are less prone to errors during the reconfiguration process, and their service quality remains under stress. Consequently, Assisted HRM can assist companies to remain adaptable to unstable demand and secure the stable functioning of the downstream (Alam, 2021; Ferreira et al., 2021).

From above discussion we can put forward following hypothesis:

H1: XR-supported HRM has a positive effect on Supply Chain adaptability.

Supply Chain Adaptability and Performance

The performance measures the results in the form of reliability in deliveries, responsiveness, stability of services, innovation, customer satisfaction, and reputational position. These can be achieved in turbulent environments that are not fixed on the efficiency of the stature but rather on the ability of the firm to respond with swiftness and coherence to any change in conditions (Um, 2017). By shifting routines, priorities, and coordination mechanisms, organizations that are able to do so through unstable markets, suppliers, or logistics networks are in a better position to maintain the results of these qualitative outcomes. Empirical evidence indicates that supply chain adaptability increases performance since flexible companies maintain service quality, secure delivery reliability, and can still respond in case disruption leads to delays, shortages, or impulsive demand changes (Tse et al., 2012).

Firms that rapidly reconfigure internal operations sustain quality stability, reduce delay, and improve responsiveness (Um, 2017).

Upstream adaptability helps firms manage input shocks and maintain continuity, improving delivery predictability and customer satisfaction (Tse et al., 2022).

Downstream adaptability enables firms to respond to demand volatility and customization needs, strengthening service stability and buyer satisfaction (Tse et al., 2022; Um, 2017).

So, we make following hypothesis:

H2: Supply Chain adaptability has a positive effect on performance.

Direct Impact of XR-supported HRM on Performance:

Drawing on the dynamic capability view (DCV), XR-XR Supported HRM can be understood as a direct contributor to performance because it strengthens how firms sense capability needs, seize development opportunities, and reconfigure skills and routines as conditions change. XR-supported simulations and immersive assessments improve sensing by making skill gaps and process breakdowns visible in realistic task settings, rather than relying only on self-reports or abstract tests. This visibility allows HR and line managers to target development precisely, which translates into quicker improvements in task accuracy, compliance, and service quality. XR also supports seizing by accelerating learning transfer: employees practice high-risk or high-complexity activities repeatedly in safe environments, receive immediate feedback, and reach operational proficiency sooner, reducing downtime and performance variability across teams. Finally, XR enables reconfiguration by supporting continuous updating of competencies and work practices; organizations can revise training modules and role expectations rapidly and redeploy talent with less disruption when new technologies, policies, or customer requirements emerge. From a DCV perspective, the performance gains associated with XR-XR Supported HRM are therefore not only efficiency-based but capability-based, reflecting an enhanced capacity to refresh human capital and sustain superior performance in dynamic environments.

H2: XR-supported HRM has a direct and positive effect on **performance**.

Mediating Role of Supply Chain Adaptability

Adaptability performance research grounded in DCV shows that advanced workforce or digital capabilities influence outcomes primarily through adaptive supply chain behavior rather than by direct effects (Tse et al., 2022).

Since supported HRM strengthens workforce readiness and execution consistency, and adaptability converts that readiness into supply chain reconfiguration outcomes, adaptability is expected to mediate XRHRM's influence on performance.

H4: Supply Chain adaptability mediates the relationship between XR-supported HRM and performance.

Research Methodology

Research Methodology

This study employs a quantitative, explanatory research design to investigate the causal relationships between extended reality-supported human resource management (XRHRM), supply chain adaptability, and performance. A cross-sectional survey strategy was adopted, which is appropriate for theory testing and mediation analysis in organizational and supply chain research. The study is anchored in a positivist research paradigm and follows a deductive approach, whereby hypotheses derived from the Dynamic Capabilities View are empirically examined using firm level data.

Population and Sampling

The population comprises manufacturing firms operating in Pakistan, with particular emphasis on the textile and apparel industry due to its supply chain complexity and exposure to environmental turbulence. Firms representing upstream, midstream, and downstream supply chain activities were included to capture multiple adaptability interfaces.

A **purposive sampling technique** was used to identify firms and respondents with direct involvement in HR and supply chain decision making. This approach is appropriate where specialized knowledge is required and has been widely applied in supply chain capability research. The sampling frame was developed from officially registered manufacturing firm databases maintained by national regulatory authorities, ensuring data credibility and sectoral coverage.

Data were collected from 200 manufacturing firms, exceeding the minimum sample size requirements for partial least squares structural equation modeling (PLSSEM) and providing adequate statistical power for mediation testing.

Data Collection Procedure

Primary data were collected using a structured, self-administered questionnaire distributed electronically via email and online survey platforms. Respondents included HR managers, supply chain managers, operations managers, and senior executives. Prior to full deployment, the questionnaire was reviewed by subject experts to ensure clarity and contextual relevance.

To enhance response quality, participation was voluntary, anonymity was assured, and respondents were informed that there were no right or wrong answers. Follow up reminders were used to improve the response rate while minimizing nonresponse bias.

Measurement of Constructs

Digital HRM immersion was operationalized using measures capturing XR-supported HRM practices, reflecting the extent to which virtual, augmented, and mixed reality technologies are embedded in core HRM activities. Consistent with prior digital HRM research, these practices include immersive digital training and development, virtual onboarding and socialization, simulated task environments, and real-time interactive feedback mechanisms. Although the measurement items explicitly reference XR-enabled HRM applications, they collectively capture the depth of immersive employee experiences generated by digital HRM systems. Accordingly, XR-supported HRM practices were modeled as reflective indicators of the higher-order construct of digital HRM immersion. This operationalization aligns with the AMO framework by assessing how immersive digital HRM practices enhance employees' abilities, motivation, and opportunities, and with the dynamic capabilities view by capturing HRM-enabled micro foundations that support organizational adaptability and performance.

All study constructs were measured using multiitem reflective scales adapted from established literature to ensure content validity. Supported HRM was operationalized as a higher order construct comprising Based training and development, supported onboarding and socialization, and enabled operational support.

Supply chain adaptability was modeled as a multidimensional construct encompassing internal adaptability, supplier adaptability, and customer adaptability, reflecting adaptive responses across key supply chain interfaces. Performance was measured using indicators related to responsiveness, service reliability, operational stability, and innovation, which are particularly relevant under conditions of environmental uncertainty.

All items were measured on a **five-point Likert scale**, ranging from strongly disagree (1) to strongly agree (5).

Common Method Bias

Several procedural and statistical remedies were implemented to mitigate common method bias. Procedurally, respondent anonymity was guaranteed, and independent, mediator, and dependent

variables were placed in separate sections of the questionnaire to reduce consistency and evaluation bias. Clear and concise item wording was used to minimize ambiguity.

Statistically, common method bias was assessed during the measurement model evaluation. The results indicate that no single construct accounted for the majority of variance, and collinearity diagnostics remained within acceptable thresholds, suggesting that common method bias is unlikely to threaten the validity of the findings.

Ethical Considerations

Ethical standards were strictly observed throughout the study. Participation was voluntary, informed consent was obtained, and no personally identifiable information was collected. All responses were analyzed in aggregate form and used exclusively for academic research purposes.

Conceptual framework

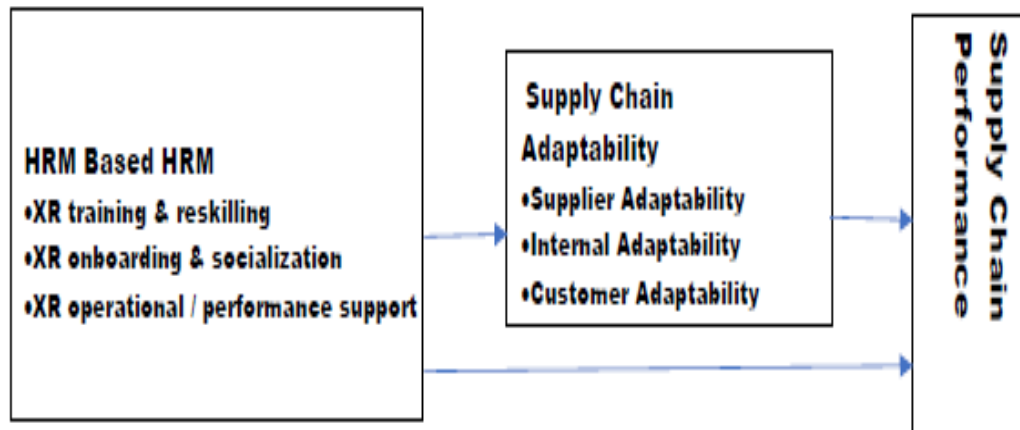


Table 1: Measurement Scales

Construct	Role	Dimensions	
XR Supported HRM	Independent Variable	(1) XR Training & Development (2) XR Onboarding & Socialization (3) XR Operational Support	Aydin et al., 2024; Chang et al., 2023
Supply Chain Adaptability	Second stage mediator / DV	(A) Internal Adaptability (B) Supplier Adaptability (C) Customer Adaptability	(Yang et al., 2020); (Yang et al., 2022)
Performance	Final DV	Service stability, responsiveness, innovation, satisfaction, reliability, competitive standing	(Yang et al., 2020)

Data Analysis and Robustness Checks

Data analysis was conducted using partial least squares structural equation modeling (PLSSEM) with SmartPLS software. PLSSEM was selected due to its suitability for complex models, prediction-oriented objectives, and mediation analysis.

A two-step analytical procedure was followed. First, the measurement model was evaluated by assessing internal consistency reliability, convergent validity, and discriminant validity. Second, the structural model was examined using bootstrapping to estimate path coefficients, effect sizes, coefficients of determination (R^2), and indirect effects.

To ensure robustness, multicollinearity diagnostics were assessed using variance inflation factors, and effect size measures were examined to confirm the substantive relevance of the relationships. Model fit indices further supported the adequacy of the proposed model.

Measurement Model analysis:

Psychometric analysis

Table 2: Reliability and Validity

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
SCA	0.924	0.926	0.952	0.868
XRHRM	0.936	0.936	0.959	0.886

The findings indicate that there is high quality of measurement of the two constructs. The value of alpha (0.924) of SCA and XRHRM (0.936) is considerably high (above the usual 0.70 standard) indicating a high level of internal consistency between the items. Similarly, the composite reliability (rho_a and rho_c) of the two variables is more than 0.90, which proves that the indicators are reliable measures of their constructs. Lastly, the values of AVE are good (0.868 with SCA and 0.886 with XRHRM), indicating that each of the constructs explains significantly more than a half of the variance in the indicators. In general, the reliability and convergent validity of the measures is very strong (Ringle et al., 2023).

Table 3: Discriminant Validity (Heterotraitmonotrait ratio (HTMT2) List

Construct	Heterotraitmonotrait ratio 2 (HTMT)
SCNFP <> SCA	0.380
XRHRM <> SCA	0.320
XRHRM <> SCNFP	0.250

The ratios of the HTMT2 are 0.380 in case with SCNFPSCA, 0.320 in case with XRHRMSCA and 0.250 in case with XRHRMSCNFP. These values are much lower than the standard levels (0.85 or, to be more exact, 0.90) which means that the constructs are very distinct, in their turn. That is, every variable measures a distinct construct, and discriminant validity is highly achieved in the model. (Hair et al., 2019)

Table 4: Model fit indices:

Fit Indices	Saturated model	Estimated model
SRMR	0.034	0.034
d_ULS	0.031	0.031
d_G	0.090	0.090
Chi-square	169.757	169.757
NFI	0.930	0.930

The statistics of the fits indicate that the model fits the data. The SRMR of 0.034 is much lower than typical 0.08 cutoff which shows minimal residual variations between the observed and the predicted correlations. d_ULS (0.031) and d_G (0.090) are both small and this works in favor of the assumption that the total difference between the model and the data is minimal. The NFI of 0.930 falls above a 0.90 criterion indicating a strong positive change to a null model. One is also provided with the value of the chi-square (169.757), which is not as highlighted as the other indices in PLSSEM. Lastly, that the saturated and estimated models are at the same value implies that there is not a significant loss of fit in passing to the full structural model of the measurement model. Generally, the findings suggest a good model.

Table 5: Quality Criteria: (R Square)

	Square
SCA	0.821
SCP	0.593

The Square values indicate the extent of variance of each construct that is explained by its predictors. In the case of SCA the R² of 0.821 indicates that approximately 82.1 percent of the variation in SCA can be explained by XRHRM and this gives it an extremely strong explanatory power. In the case of SCNFP, the R² (value of 0.593) implies that the model (primarily XRHRM with the help of SCA) explains about 59.3 percent of the variance, which is a good and acceptable predictive power. All in all, the model gives a very good explanation of SCA and offers a rather good explanation of SCNFP.

Table 6: Quality Criteria (f²)

	SCA	SCNFP	XRHRM
SCA		0.192	
SCP			
XRHRM	4.583	0.006	

The f² values indicate the strength of individual predictor in explaining its target construct. It is the case that XRHRM influences SCA (f² = 4.583), which implies that it is a significant determinant of SCA in the model. The impact of SCA on SCNFP (f² = 0.192) is mediocre hence has a significant effect on enhancing SCNFP. By contrast, the impact of XRHRM on SCNFP is nearly negligible (f² = 0.006), which means that it does not contribute much explanatory power at all. On the whole, the influence of XRHRM on SCA is significant, whereas the direct predictor of SCNFP is more crucial in SCA.

The outcomes of the VIF indicate that the issue of multicollinearity is not very significant in this model. All values are less than the general cutoff of 5.0 indicating that the predictors are not too overlapping. Some of these indicators like XROP (4.704), XRON (4.047), ISCA (4.032), and CSCA (3.978) are quite high and thus, they share a relative amount of variability, yet, they are within acceptable levels. The others such as SSCA (2.972) XRTD (3.676) and notably SCNFP (1.000) all show that there is no high collinearity. All in all, the predictors are independent enough to estimate path effects effectively.

Table 7: Collinearity statistics

	VIF
CSCA	3.978
ISCA	4.032

SCP	1.000
SSCA	2.972
XRON	4.047
XROP	4.704
XRTD	3.676

The VIF results suggest that multicollinearity is not a serious concern in this model. All values fall below the common cutoff of 5.0, which means the predictors are not excessively overlapping. A few indicators—such as XROP (4.704), XRON (4.047), ISCA (4.032), and CSCA (3.978)—are relatively high, showing some moderate shared variance, but still remain within acceptable limits. The rest, including SSCA (2.972), XRTD (3.676), and especially SCNFP (1.000), indicate low collinearity. Overall, the predictors are sufficiently independent for reliable estimation of path effects.

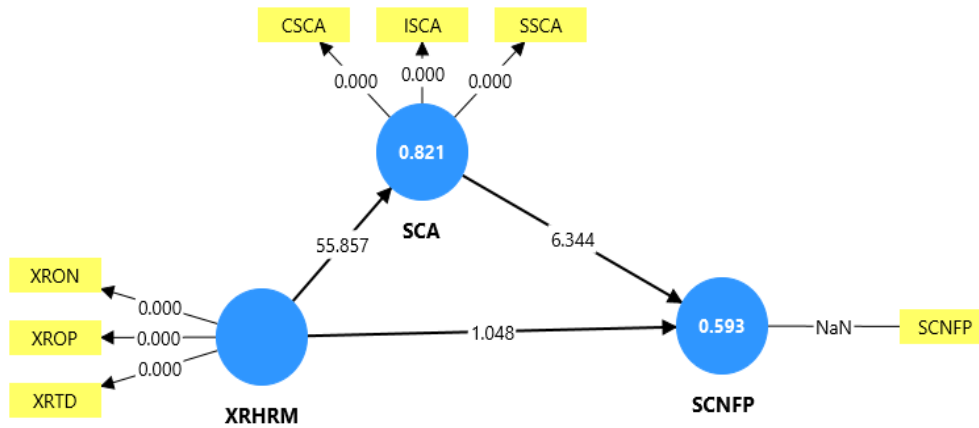
Table 8: Correlation table

	CSCA	ISCA	SCP	SSCA	XRON	XROP	XRTD
CSCA	1.000						
ISCA	0.844	1.000					
SCP	0.731	0.725	1.000				
SSCA	0.780	0.784	0.692	1.000			
XRON	0.836	0.827	0.687	0.728	1.000		
XROP	0.827	0.818	0.666	0.755	0.851	1.000	
XRTD	0.785	0.823	0.675	0.745	0.804	0.834	1.000

All the constructs have a positive correlation, with the coefficients being moderate to strong, as demonstrated in the correlation matrix. The three dimensions of SCA (CSCA, ISCA, SSCA) are very interrelated ($R = 0.780.84$), as they denote components of the same greater ability. The dimensions of the XRHRM (XRON, XROP, XRTD) are highly related to each other, also indicating that they move together as constituents of the XRHRM (approximately, 0.800.85).

SCNFP correlates moderately to strongly with both dimensions of SCA and XRHRM dimensions. This means that improved XRHRM and enhanced SCA would be correlated with an increased SCNFP. No correlation is above 0.90 and therefore the relationships are strong yet not that high that can imply that the variables are redundant to each other. On the whole, the pattern suggests meaningful relations between constructs and at the same time, provides evidence that they are different.

Hypothesis testing



(XRHRM= Digital immersions, SCNFP= Supply chain performance, SCA= Supply chain adaptability)

Table 9: Hypothesis testing

Path	Coefficient	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
H1	XRHRM → SCA	0.906	0.906	0.016	55.857	0.000
H2	SCA → SCNFP	0.660	0.656	0.104	6.344	0.000
H3	XRHRM → SCNFP	0.120	0.124	0.115	1.048	0.295

Indirect path

Path	Coefficient	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
H4	XRHRM → SCNFP (indirect)	0.598	0.594	0.093	6.452	0.000

Interpretation:

Direct relationships (H1–H3)

H1: XRHRM → SCA

- The path coefficient is **0.906**, which is very strong and positive.
- The **value (55.857)** is far above the usual cutoff (≈ 1.96), and the **p value is 0.000**.
- Interpretation:** XRHRM has a powerful and statistically significant effect on SCA. In practical terms, when XRHRM increases, SCA increases substantially.
- Conclusion: H1 is supported.**

H2: SCA → SCNFP

- The coefficient is **0.660**, also a strong positive effect.

- The **t value (6.344)** is well above the threshold, with **p = 0.000**.
- **Interpretation:** SCA significantly improves SCNFP. So stronger SCA is associated with better SCNFP outcomes.
- **Conclusion: H2 is supported.**

H3: XRHRM → SCNFP

- The coefficient is only **0.120**, which is weak.
- The **t value (1.048)** is below the critical value, and the **pvalue (0.295)** is not significant.
- **Interpretation:** XRHRM does not have a meaningful direct impact on SCNFP. Any effect it might have is too small and statistically unreliable.
- **Conclusion: H3 is not supported.**

Indirect / mediation effect (H4)

H4: XRHRM → SCA → SCNFP

- The indirect coefficient is **0.598**, which is strong.
- The **t value (6.452)** confirms significance, and **p = 0.000**.
- **Interpretation:** XRHRM influences SCNFP **through** SCA. This means XRHRM first strengthens SCA, and that stronger SCA then leads to better SCNFP.
- **Conclusion: H4 is supported.**

Overall meaning of the pattern

XRHRM strongly improves SCA (H1).

SCA strongly improves SCNFP (H2).

XRHRM does not directly improve SCNFP (H3 is insignificant).

XRHRM does improve SCNFP indirectly via SCA (H4 significant).

So, SCA acts as a key mediator. The outcome implies complete mediation: XRHRM increases SCNFP through the mediation of SCA and not through the direct influence on SCNFP.

The results of the model reveal that XRHRM is a high level of predictor of SCA. The significance and the effect are positive and statistically significant ($b = 0.906$, $t = 55.857$, $p < 0.001$), which proves H1. It also indicates that SCA plays an important role in SCNFP ($b = 0.660$, $t = 6.344$, $p < 0.001$) which supports the H2. Contrarily, XRHRM does not exhibit any significant direct impact on SCNFP. The margin is minor and not relevant ($b = 0.120$, $t = 1.048$, $p = 0.295$), therefore, H3 cannot be supported. The most remarkable, however, is the indirect relationship which means that XRHRM has an impact on SCNFP via SCA and the mediated effect of XRHRM on SCNFP is not only positive but significant ($b = 0.598$, $t = 6.452$, $p < 0.001$). This helps with H4 and implies that SCA is a mediator meaning that XRHRM increases SCNFP primarily by improving SCA and not directly working on SCNFP.

Discussion on hypothesis testing

The model of measurement is reliable and has high construct validity. The internal consistency is good, with Cronbach alpha values equal to 0.924 (SCA) and 0.936 (XRHRM), which is more than the recommended minimum value of 0.70 when it comes to reflective measures (Hair et al., 2022). This strength is supported by the composite reliability results ($\rho_a = 0.926$ and 0.936 ; $\rho_c = 0.952$ and 0.959 of SCA and XRHRM, respectively), which proves that indicators are stable and consistent in performance as recommended in the guidelines of the PLSSEM (Hair et al., 2022; Henseler et al., 2016). Convergent validity also is well established because AVE values are high both in SCA (0.868) and XRHRM (0.886) which means that each of the constructs explains most of the variance in indicators, which is in line with the $AVE > 0.50$ rule (Hair et al., 2022). The HTMT2 ratios confirm the presence of discriminant validity as they are well within the rigid cutoffs (SCNFPSCA = 0.380, XRHRMSCA = 0.320, XRHRMSCNFP = 0.250) and reflect the distinctiveness of constructs in accordance with the HTMT criterion suggested by Henseler, Ringle, and Sarstedt (2015).

The model is also solid since collinearity diagnostics are also reassuring. The values of all the VIFs are under 5, meaning that it did not have any problematic multicollinearity and matches the accepted PLSSEM threshold (Hair et al., 2022). Arguably, some of these indicators (e.g., XROP = 4.704, XRON = 4.047, ISCA = 4.032, CSCA = 3.978) overlap moderately, although they do not exceed acceptable limits and do not jeopardize the accuracy of the estimation (Hair et al., 2022). Correlation matrix follows a similar trend with correlation values being positive and significant. Correlations between SCA dimensions (0.7800.844) or XRHRM dimensions (0.8040.851) are very strong, with some theoretical coherence, whereas correlations with SCNFP are moderate to strong ([?] $0.6660.731$), suggesting that there are strong linkages between these variables without overlaps. Notably, none of the correlations is above 0.90, which indicates construct separateness as the standard of reflective models (Hair et al., 2022).

The results of the structural model have a clear support on the hypothesized relationships. The positive effect of XRHRM on SCA is very strong ($\beta = 0.906$, $t = 55.857$, $p < 0.001$), and the positive effect of SCA on SCNFP is significant ($\beta = 0.660$, $t = 6.344$, $p < 0.001$) that should confirm H1 and H2. Nonetheless, the direct connection between XRHRM and SCNFP is insignificant and weak ($\beta = 0.120$, $t = 1.048$, $p = 0.295$) and H3 is rejected. On the contrary, the indirect impact of XRHRM on SCNFP via SCA is robust and substantial ($\beta = 0.598$, $t = 6.452$, $p < 0.001$), which supports H4 and shows that SCA is a major mediating variable, which is expected in the context of mediation testing of PLSSEM (Hair et al., 2022; Henseler et al., 2016). The results of effect size also support this conclusion: XRHRM has an exceptionally large contribution to SCA ($f^2 = 4.583$), SCA has a moderate contribution to SCNFP ($f^2 = 0.192$), and the direct contribution of XRHRM to SCP is minimal ($f^2 = 0.006$) in accordance with the interpretation of effect size offered by Cohen (1988) often used in studies of SEM.

The explanatory and predictive performance of the model is good as well. The values of R^2 suggest that XRHRM is a significant contributor to the variance in SCA ($R^2 = 0.821$) and the joint effects in the model have a significant contribution to the variance in SCNFP ($R^2 = 0.593$), which is a strong indicator of predictive relevance (Hair et al., 2022). Lastly, the global model fit scores indicate that the overall fit is acceptable: SRMR is low (0.034), which is below the specified $SRMR < 0.08$, and NFI is above the suggested 0.90 threshold (Hair et al., 2022; Henseler et al., 2016). The fact that the values of the saturated and estimated models are similar indicates that the introduction of structural paths does not decrease the quality of the fit. On the whole, these findings confirm the measurement properties and add a good proof to the fact that XRHRM is going to increase SCNFP on the basis of strengthening SCA, and not in a direct way.

Implications, Conclusion and Scope for Future Research

This paper discussed the influence of XRHRM in determining the supply chain results using supply chain adaptability (SCA). The outcome demonstrates an apparent cause and effect. There is a significant positive effect of XRHRM on SCA and vice versa. The relationship between XRHRM, SCNFP is insignificant, whereas the direct linkage through SCA is significant and powerful. This trend implies that XRHRM has a positive contribution on performance by creating the adaptability and not directly influencing the performance. Pragmatically, it may seem that HRM related digital and expanded practices enhance the capacity of the supply chain to be adaptable, responsive, and reconfigured, and such adaptable potentials, in turn, are converted into superior nonfinancial results.

This interpretation is also supported by the explanatory power of the model. XRHRM explains a large percentage of the variance in SCA and SCA explains a large percentage of the variance in SCP. The proposed framework also fits the observed data according to the fit indicators. In general, the results indicate adaptability as the performance relevant operational path by which XRHRM is made.

Theoretical Implications

To begin with, the research underpins the idea of capability-based reasoning, as it demonstrates that XRHRM is an enabling resource, which must be transformed into an operational capability prior to performance accrual. Full mediation depicts a clear indication that resources cannot be enough on their own unless they enhance higher order supply chain capabilities. (Al Humdan et al., 2024)

Second, the findings broaden the existing study on supply chain adaptability by positioning XRHRM among the profiles of its antecedents. Adaptability is commonly associated with technology or process design; this fact demonstrates that HR systems based on workforce and supplied with the digital support are equally central to the formation of the adaptable supply chains (Gligor et al., 2015).

Third, the negligible XR supported HRM performance relationship contributes to the understanding of the inconclusive results in the previous studies. According to it, HR based benefits will be more likely to be manifested indirectly, in terms of capability building, than direct performance outcomes.

Managerial Implications

XRHRM should be regarded as an adaptability building strategy by managers who want to enhance the performance of the supply chain. The strong benefits of adaptability are likely to be attained in investments in workforce digital preparedness, adaptable HR frameworks, and cross functional ability training.

Simultaneously, the HR reforms must be intentionally connected with adaptability-oriented initiatives. As XRHRM does not directly increase SCNFP, companies must turn HR gains into quicker decision making, more adaptable coordination, and adaptable supply practices. Adaptability as a performance bridge can be monitored to make sure that HR investments result in supply chain value.

Conclusion

The results substantiate that XR supported HRM enhances supply chain adaptability, and adaptability leads to supply chain performance. The relationship between XR supported HRM and SCP is completely mediated by adaptability since it does not influence it directly. This implies that the emergence of performance improvements is best achieved when XR supported HRM is used to develop adaptable supply chain capabilities.

Future Research

The future researches can build on this by:

- Performing the model test using financial performance measures or both performance measures to determine the presence of the same mediated pathway.
- The moderators can be looked at including environmental uncertainty, digital maturity, or sector type that could change the digital HRM immersions, adaptability and performance relationship.
- To measure the ways adaptability develops throughout time as a result of XRHRM initiatives, longitudinal designs were used.
- The alternative ways to investigate the associations between XRHRM and performance include exploring alternative capability mediators (e.g., resilience or innovation capability).

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