Improvising for Learning: How and When Firm-Level HRM Systems Drive Team Exploratory and Exploitative Learning

Improvising for Learning: How and When Firm-level HRM Systems Drive Team Exploratory and Exploitative Learning

Amir Mehralian, Peyman Akhavan, Jongwook Pak, Justin Jansen

Abstract

Firms increasingly rely on teams to balance innovation and efficiency by simultaneously engaging in exploratory and exploitative learning. However, the cross-level mechanisms through which firm-level systems enable such ambidextrous capabilities at the team level remain insufficiently understood. This study develops and tests a multilevel contingency framework that explains how change-oriented human resource management (HRM) systems foster both forms of team learning through team improvisation—a dual-purpose capability that integrates real-time responsiveness with adaptive refinement. Drawing on multisource, time-lagged data from 205 new product development (NPD) teams nested within 75 pharmaceutical firms, we find that team improvisation mediates the cross-level relationship between change-oriented HRM systems and both exploratory and exploitative learning. Furthermore, this mediating effect is contingent upon the nature of intra-team knowledge sharing: tacit knowledge sharing amplifies the relationship between improvisation and exploratory learning, while explicit knowledge sharing enhances its link with exploitative learning. Our findings offer theoretical insight into how HRM systems cascade across organizational levels to shape team capabilities, advancing perspectives that conceptualize ambidexterity as an emergent property of behavioral routines rather than structural design. Situated within a politically and economically constrained environment, this study also underscores the heightened strategic value of HRM systems in enabling adaptability and innovation under institutional adversity.

Keywords: strategic HRM, team improvisation, team knowledge sharing, team exploration, team exploitation

1. Introduction

Firms increasingly rely on teams to drive creativity and innovation in dynamic and fast-changing environments (Edmondson & Harvey, 2018; Van der Vegt & Bunderson, 2005). Within this context, new product development (NPD) teams play a critical role in generating novel ideas, advancing technologies, and delivering timely solutions under conditions of uncertainty and constraint (Kostopoulos et al., 2015). These demands expose teams to an inherent learning tension: they must engage in exploratory learning, characterized by experimentation, variation, and the pursuit of novel capabilities, while also pursuing exploitative learning, which emphasizes refinement, efficiency, and the application of existing knowledge (March, 1991; Tempelaar & Rosenkranz, 2019). The capacity to engage in both learning activities—referred to as team ambidexterity—is considered essential for sustained innovation and effectiveness (Jansen et al., 2016; Zacher & Rosing, 2015).

Although both learning modes contribute to organizational adaptability and long-term competitive advantage (Ali, 2021), the conditions under which teams develop the capacity to simultaneously engage in exploratory and exploitative learning remain insufficiently understood. Much of the prior literature conceptualizes these learning activities as incompatible logics that require structural or temporal separation (Tushman & O'Reilly, 1996; Raisch & Birkinshaw, 2008). However, emerging perspectives suggest that teams may overcome this paradox by cultivating behavioral mechanisms that enable the concurrent pursuit of exploration and exploitation (Gibson & Birkinshaw, 2004; Jansen et al., 2016). These learning behaviors do not develop in isolation. Teams are embedded in broader organizational systems that shape their functioning through shared structures, resources, and

interaction norms (Argote & Miron-Spektor, 2011; Edmondson & Harvey, 2018). Among these systems, human resource management (HRM) systems play a central role by influencing how teams are staffed, supported, and incentivized to engage in adaptive learning processes over time (Collins & Smith, 2006; Jiang et al., 2012). While research increasingly acknowledges that HRM systems are locally enacted and behaviorally experienced (Lepak et al., 2006; Pak & Kim, 2018), the cross-level mechanisms through which firm-level HRM systems shape team-level learning outcomes remain underexplored (Shahzad et al., 2023; Papalexandris, 2024).

To address this gap, we develop a multilevel contingency framework explaining how change oriented HRM systems, referred to as bundled HRM practices that are designed to enhance the ability, motivation, and opportunity of employees to initiate and adapt to change (Lee et al., 2019), affect both exploratory and exploitative learning in teams through fostering team improvisation (Vera et al., 2016). Given that improvisation enables real-time, situated, and novel responses through the dynamic integration of existing knowledge and emerging cues (Miner et al., 2001; Vera & Crossan, 2005), we propose that its effectiveness for both exploratory and exploitative learning is contingent on the nature of intra-team knowledge sharing (Morgeson et al., 2010). In advancing our framework as shown in Figure 1), we offer at least two main contributions to research on strategic HRM and team ambidexterity, as well as team improvisation and learning.

Insert Figure 1 about here

First, we contribute to the literatures on strategic HRM and team ambidexterity by clarifying the cross-level behavioral mechanisms through which change-oriented HRM systems influence both team exploratory and exploitative learning (Xi et al., 2025). While prior research has linked HRM systems to innovation and learning outcomes at the organizational

and team levels (Collins & Smith, 2006; Jiang et al., 2012; Pak et al., 2023), limited attention has been paid to the team-level capabilities that mediate these effects (Jørgensen & Becker, 2017; Shahzad et al., 2023). We extend this understanding by conceptualizing team improvisation as a mediating mechanism that translates the strategic intent of firm-level HRM systems into concrete learning outcomes (Mathieu & Taylor, 2007; Ployhart & Moliterno, 2011). Furthermore, while prior work often treats exploration and exploitation as requiring separate structures, resources, or routines (He & Wong, 2004), we challenge this dichotomy by theorizing improvisation as a dual-purpose capability (Helfat & Winter, 2011; Kogut & Zander, 1992). Improvisation enables teams to generate situated responses that support both emergent idea generation (exploration) and adaptive refinement (exploitation) (Vera et al., 2016). Whereas earlier studies often positioned improvisation as a reactive or ad hoc response to uncertainty (e.g., Moorman & Miner, 1998), emergent research considers it as a repeated and reliable capacity that allows teams to generate real-time, situated responses to conflicting learning demands by emergent action and adaptive refinement (Vera & Crossan, 2005). By doing so, our study advances our understanding of how HRM systems enable team-level learning and helps to open the "black box" between system-level design and team-level exploration and exploitation (Shahzad et al., 2023). We further advance research on team dual learning by showing how team improvisation acts as a single, multipurpose capability that guides both exploratory and exploitative learning.

Second, we advance a contingency perspective by arguing that the effectiveness of team improvisation for both exploratory and exploitative learning depends on the nature of intra-team knowledge sharing (Morgeson et al., 2010). While prior studies have highlighted the potential of improvisation to support learning and adaptation (e.g., Vera & Crossan, 2005; Miner et al., 2001), they often treat improvisation as a context-free mechanism and have overlooked how different learning outcomes may be shaped by the nature of knowledge

sharing within teams. Specifically, team knowledge sharing—defined as the exchange of information, expertise, and ideas among team members—plays a critical role in fostering the creative processes essential for improvisation (Levinthal & Rerup, 2006; Caniëls et al., 2017). Team knowledge sharing can be categorized into two types: team tacit knowledge sharing (TTKS) and team explicit knowledge sharing (TEKS). We argue that TTKS strengthens the link to exploratory learning by fostering innovation and the generation of new knowledge. Moreover, TEKS enhances the link to exploitative learning by promoting structure, clarity, and disciplined execution. By identifying how TTKS and TEKS shape the outcomes of improvisation, we uncover the micro-level mechanisms explaining under what conditions team-level improvisation fosters exploratory and exploitative learning.

We test our framework using a time-lagged, multilevel research design involving 205 NPD teams nested within 75 firms in the Iranian pharmaceutical industry. This context is marked by chronic environmental turbulence due to long-standing international sanctions and trade restrictions. These conditions have compelled firms to strengthen internal innovation capacity, rely on local knowledge and resource improvisation, and promote team-based learning processes to sustain product development (Farzaneh et al., 2022). Accordingly, the Iranian setting offers a compelling political-economic context in which to examine how HRM systems shape learning behaviors under adversity (Budhwar et al., 2024).

2. Theoretical Overview and Hypotheses Development

2.1 Change oriented HRM Systems and the Emergence of Team Ambidexterity

The ability of firms to sustain competitive advantage increasingly depends on their capacity to engage in both exploratory and exploitative learning (O'Reilly & Tushman, 2013). While exploration enables the pursuit of novel opportunities and new capabilities, exploitation allows firms to refine existing competencies and enhance operational efficiency (Benner & Tushman, 2003; Lavie- et al., 2010). Both types of learning are essential, however, they are

grounded in conflicting logics (March, 1991). Specifically, exploration favors autonomy, flexibility, and long-term orientation, whereas exploitation emphasizes discipline, standardization, and short-term efficiency. Recent research reinforces the strategic importance of supporting both learning modes. For instance, Ali (2021) demonstrates that exploratory and exploitative learning each underpin distinct yet valuable strategic pathways of innovation that contribute to sustained competitive advantage. This underscores the need to understand not only how firms balance these competing demands, but also the mechanisms through which both forms of learning can be cultivated simultaneously. Their simultaneous pursuit of exploratory and exploitative learning however presents a fundamental paradox when responding to opposing demands (Smith & Lewis, 2011). Prior research has emphasized structural or temporal separation as potential solutions when addressing the paradox (Tushman & O'Reilly, 1996; Raisch & Birkinshaw, 2008), however, emergent perspectives have highlighted the importance of behavioral mechanisms that enable individuals and teams to enact divergent learning demands (Gibson & Birkinshaw, 2004; Kostopoulos & Bozionelos, 2011). In this sense, ambidextrous teams draw on psychological safety, shared mental models and cognitive flexibility to reconcile competing priorities in real time (Kostopoulos & Bozionelos, 2011; Schippers et al., 2015; Zacher & Rosing, 2015).

Importantly, teams do not operate in isolation. The strategic HRM literature underscores the pivotal role of HRM systems in shaping how collaboration is facilitated and how learning behaviors are cultivated over time (Collins & Smith, 2006; Jiang et al., 2012; Ostroff & Bowen, 2016). Specifically, bundles of complementary practices—such as selective staffing, developmental support, performance-based incentives, and participative decision-making—are theorized to enhance employees' ability, motivation, and opportunity (AMO) to act proactively (Blumberg & Pringle, 1982; Boon et al., 2019). Building on this AMO framework, scholars have conceptualized change-oriented HRM systems as

configurations of HRM practices specifically designed to foster initiative and adaptability in dynamic environments (Lee et al., 2019). These systems typically encompass ability-enhancing practices such as selective hiring for learning potential and cross-training to foster shared cognitive frameworks (Shalley & Gilson, 2004; Cannon-Bowers et al., 1993); motivation-enhancing practices such as rewards that reinforce proactivity and creative problem-solving (Eisenberger & Rhoades, 2001; Morrison & Phelps, 1999); and opportunity-enhancing practices that support autonomy and participative decision-making (Kehoe & Wright, 2013). Although implemented at the firm level, the influence of change-oriented HRM systems cascades throughout the organization by shaping how teams coordinate, adapt, and learn (Chuang et al., 2016; Hong et al., 2016). Integrating insights from research on change-oriented HRM systems (e.g., Lee et al., 2019) with studies on improvisation and learning (e.g., Vera & Crossan, 2005), we propose that improvisation serves as a mechanism through which teams activate the adaptive potential embedded in these HRM systems, thereby enhancing their capacity for both exploratory and exploitative learning.

2.2 Team Improvisation, Intra-team Knowledge Sharing and Team Learning

Team improvisation refers to a team's collective capacity to generate novel, real-time responses to emergent challenges by integrating action and design without relying on detailed pre-existing plans (Moorman & Miner, 1998; Vera & Crossan, 2005; Magni & Maruping, 2013). Unlike general flexibility or ad hoc problem-solving, improvisation draws on shared routines, mutual adjustment, and social coordination among team members (Miner et al., 2001; Cunha et al., 1999; Cunha et al., 2017). Improvising teams do not discard structure; rather, they creatively recombine existing routines and knowledge to respond coherently to unanticipated demands (Kamoche & Cunha, 2001). In dynamic, innovation-intensive contexts such as NPD, the ability to act spontaneously while maintaining coordination is especially critical (Brown & Eisenhardt, 1997; Leybourne & Sadler-Smith, 2006). Building

on this foundation, we adopt the emerging perspective of team improvisation as a multipurpose or dual-purpose integrative capability with both operational and dynamic functions (Vera et al., 2016). Rather than conceptualizing improvisation as a reactive or episodic behavior, this perspective highlights its grounding in patterned interactions, shared experience, and embedded team routines (Miner et al., 2001; Kogut & Zander, 1992). Improvisation enables teams to reconfigure knowledge, routines, and resources in real time, thereby supporting both adaptive action and generative learning (Vera et al., 2016; Audretsch et al., 2023). This dual capacity allows teams to experiment with novel ideas while simultaneously refining and capitalizing on existing practices. Accordingly, we argue that team improvisation functions as a critical mechanism for navigating the inherent tension between novelty and continuity, facilitating exploratory learning through emergent action and exploitative learning through adaptive refinement (Crossan et al., 2005).

While we propose that team improvisation offers the behavioral flexibility necessary to engage in both exploratory and exploitative learning, we also build on recent insights that highlight the often-overlooked role of knowledge asset interplay in fostering organizational ambidexterity (Ali et al., 2022). Specifically, we argue that the effectiveness of team improvisation is contingent upon the nature of knowledge sharing within teams (Chuang et al., 2016). In particular, the nature of team knowledge sharing provides the informational foundation that shapes how improvisational behaviors are enacted and interpreted in the learning process (Argote, 2011; Edmondson & Harvey, 2018). TTKS refers to the informal, experiential exchange of unarticulated insights, skills, and know-how that are difficult to codify and often transmitted through observation, shared experience, or storytelling (Nonaka, 1995; Vera et al., 2016). It fosters deep mutual understanding, intuitive coordination, and the transfer of contextualized knowledge that is not easily reduced to formal procedures (Levinthal & Rerup, 2006). As such, it supports creative problem-solving by enabling teams

to flexibly reinterpret and recombine experiential knowledge during action. In contrast, TEKS involves the formal exchange of codified information, such as documented processes, technical manuals, and standardized procedures (Nonaka, 1995; Caniëls et al., 2017). It enhances accuracy, replication, and process optimization by providing clear, structured guidance for action. By making knowledge explicit and accessible, TEKS facilitates consistency and convergence in team behaviors, supporting the efficient application of existing competencies. Taken together, improvisation constitutes a dual-purpose capability that provides the behavioral flexibility to respond dynamically to emergent learning demands. However, its effectiveness depends on the nature of intra-team knowledge sharing that constitutes the informational foundation for improvisational capabilities.

2.3 Change-oriented HRM Systems and Team Improvisation: A System-level Approach

We focus on change-oriented HRM systems—bundles of interrelated practices designed to enhance employees' ability, motivation, and opportunity (AMO) to adapt to change—given the growing evidence of their effectiveness in fostering team learning and adaptability (Lee et al., 2019; Tummers et al., 2015). These systems cultivate a learning-oriented team climate by selecting creative individuals, incentivizing proactive behaviors, and providing opportunities for experimentation and collaboration (Zhao et al., 2025). Rather than examining HR practices in isolation, we adopt a system perspective and conceptualize change-oriented HRM systems as a composite index that captures the total effects of component HR practices (Chuang et al., 2016; Combs et al., 2006; Van Beurden et al., 2025). Grounded in the AMO framework (Blumberg & Pringle, 1982), our approach posits that the performance effects arise mainly from the alignment across, and interaction of, individual HR practices that comprise HRM bundles (Becker & Gerhart, 1996; Becker & Huselid, 1998).

Ability-enhancing HR practices are a critical foundation for developing team improvisation in NPD settings. Such practices like selective staffing, targeted training, and

developmental support equip teams with the cognitive and technical capabilities needed to respond flexibly to emerging challenges (Hu et al., 2025). By hiring individuals with strong adaptability and innovative thinking, firms introduce diverse problem-solving styles that enhance a team's collective ability to navigate complexity (Chung & Pak, 2021; Shalley & Gilson, 2004; Vermeeren, 2017; Huang et al., 2014). Structured training and cross-training further promote shared cognitive frameworks and situational awareness, which are vital for effective real-time coordination (Cannon-Bowers et al., 1993; Sheehan et al., 2024). These practices also boost self-efficacy and psychological readiness to act under uncertainty (Mom et al., 2019; Cunha et al., 2020). Moreover, by enhancing communication skills and absorptive capacity, ability-enhancing HR practices ensure that teams can integrate external knowledge into adaptive responses, reinforcing their improvisational potential (Soo et al., 2017; Vera et al., 2016).

Motivation-enhancing HR practices are vital for fostering team members' willingness to engage in improvisation. Practices such as developmental performance appraisals and context-sensitive reward systems recognize and reinforce behaviors aligned with adaptability, initiative, and real-time problem solving (Nisula & Kianto, 2016; Jiang et al., 2013). For example, appraisals that emphasize change-oriented actions such as proposing quick adjustments or initiating time-sensitive solutions promote a sense of ownership and readiness to act under pressure (Fuller et al., 2006). Similarly, rewards that acknowledge on-the-spot contributions and agile responses reinforce a culture of responsiveness and psychological safety (Morrison & Phelps, 1999). These motivational signals encourage employees to take initiative, experiment, and remain flexible in dynamic conditions (Eisenberger & Rhoades, 2001; Gerhart & Rynes, 2003). By aligning motivational systems with the demands of improvisation, organizations create team environments where members are not only capable but also energized to adapt in the face of uncertainty (Jiang et al., 2012).

Opportunity-enhancing HR practices play a crucial role in enabling team improvisation by shaping the structural and relational conditions that support adaptive action. These practices—such as role enrichment, participative decision-making, and open communication—create a participative infrastructure that empowers team members to engage proactively with one another and their tasks (Ma et al., 2017; Lee et al., 2019). Cross-functional exposure and job rotation broaden employees' experience, equipping them with diverse skills and perspectives that foster flexibility in the face of emerging challenges (Kampkötter et al., 2018; Mumford & Gustafson, 1988). Empowering employees to make decisions fosters ownership and initiative, while autonomy enhances their capacity to act quickly and creatively in uncertain situations (Chung & Pak, 2021; Kehoe & Wright, 2013). Moreover, open communication channels facilitate real-time information sharing, strengthening coordination and responsiveness (Cannon-Bowers et al., 1993; Schepers et al., 2007). In dynamic environments such as NPD, these opportunity-enhancing practices collectively support the collaborative, fast-paced improvisation essential for innovation and adaptation (Vera & Crossan, 2005). Overall, we propose that change-oriented HRM systems shape team improvisation through the combined use of ability-, motivation-, and opportunity-enhancing HR practices.

Hypothesis 1. *There is a positive cross-level relationship between firm-level change-oriented HRM systems and team-level improvisation.*

2.4 Change-oriented HRM Systems, Team Improvisation, and Team Exploratory Learning

Improvisation has been widely recognized as a dynamic team capability that enables real-time responsiveness and learning under conditions of uncertainty (Moorman & Miner, 1998; Vera & Crossan, 2005). In the context of NPD teams, where ambiguity, time pressure, and shifting demands are routine, improvisation is particularly salient. It involves the spontaneous and creative recombination of existing knowledge, routines, and resources to address

problems as they arise, without reliance on pre-established plans (Cunha et al., 1999; Magni et al., 2009). This spontaneous action not only facilitates immediate problem-solving but also fosters an environment conducive to exploratory learning, which is characterized by experimentation, risk-taking, and the pursuit of novel ideas (March, 1991).

Improvisation creates the behavioral space for team members to step outside rigid routines, question prevailing assumptions, and pursue nonroutine solutions (Edmondson & Nembhard, 2009). It provides opportunities for knowledge recombination and creative interaction, allowing teams to integrate diverse perspectives and iterate rapidly in response to new insights or contextual shifts (Abrantes et al., 2018). In doing so, improvisation supports the generation of novel alternatives and the testing of unconventional pathways—central aspects of exploratory learning (Carmeli & Schaubroeck, 2007).

In the NPD context specifically, improvisation is a particularly relevant behavioral mechanism because it equips teams to navigate technological uncertainty, evolving customer expectations, and compressed development cycles (Brown & Eisenhardt, 1997). Rather than adhering strictly to formal plans, improvisational teams respond fluidly, allowing emergent knowledge and informal coordination to guide innovation efforts (Magni et al., 2013). This adaptability increases the team's capacity for learning through experimentation, discovering unfamiliar solutions, and adapting quickly to unforeseen opportunities. Taken together, these arguments suggest that team improvisation does more than simply enable teams to react—it cultivates a forward-looking, discovery-oriented mindset that drives exploratory learning. As improvisation allows for fluid adaptation and creative recombination, it provides a fertile ground for the emergence of novel insights and innovation-relevant knowledge.

Hypothesis 2a. *Team-level improvisation is positively related to team-level exploratory learning.*

Building on Hypotheses 1 and 2a, we propose that team improvisation functions as an integrative team-level capability that mediates the relationship between firm-level change-oriented HRM systems and team-level exploratory learning. Change-oriented HRM systems enhance team members' abilities through targeted training and developmental practices that build both technical expertise and adaptive problem-solving skills—critical for navigating complex and unpredictable environments (Jiang et al., 2012). These systems also strengthen motivation by aligning rewards, recognition, and performance management with proactive behavior, while fostering a psychologically safe climate that encourages experimentation and risk-taking (Kehoe & Wright, 2013). Furthermore, change-oriented HRM systems expand opportunities for adaptive behavior by promoting collaborative structures, role flexibility, and decentralized decision-making authority, thereby creating an enabling context for real-time coordination (Wang et al., 2022).

Team improvisation synthesizes these HRM-driven inputs by enabling teams to act spontaneously, recombine available knowledge under time pressure, and adapt fluidly to emergent demands (Vera & Crossan, 2005). As a behavioral expression of the capabilities nurtured through HRM systems, improvisation translates strategic intent into exploratory learning processes—such as generating novel alternatives, iterating solutions, and challenging established assumptions. Therefore, we argue that team improvisation is a key mechanism through which change-oriented HRM systems promote exploratory learning outcomes at the team level. Thus:

Hypothesis 2b. *The positive relationship between firm-level change-oriented HRM systems and team-level exploratory learning is mediated by team-level improvisation.*

2.5 Change-Oriented HRM Systems, Team Improvisation, and Team Exploitative Learning

While improvisation is often associated with creativity and novelty, it also plays a critical role in enhancing exploitative learning through the refinement and effective application of

existing knowledge and capabilities. In NPD teams, improvisation enables members to respond adaptively to immediate challenges such as process deviations, technical glitches, or resource constraints without deviating from core goals or routines (Kostopoulos & Bozionelos, 2011). These on-the-spot adjustments allow teams to fine-tune processes, apply proven methods more efficiently, and reinforce operational excellence (Winter, 2003; Helfat & Winter, 2011). For instance, when teams face recurring quality concerns or unexpected implementation delays, improvisational behavior allows them to reconfigure tasks or mobilize existing solutions in tailored ways that preserve efficiency and stability. This type of problem-solving deepens team members' practical expertise, enhances routine effectiveness, and fosters the generation of high-quality, repeatable outcomes—hallmarks of exploitative learning (Benner & Tushman, 2003; Cui et al., 2019). Thus, improvisation does not merely reflect spontaneity; rather, it contributes to disciplined responsiveness—enabling teams to repeatedly refine their functioning through adaptive use of familiar tools and knowledge (Vera & Crossan, 2005). Through this mechanism, teams convert experiential insights into incremental process improvements, leading to higher consistency, precision, and executional excellence—key markers of exploitative learning. In this sense, team improvisation enhances not only flexibility but also disciplined implementation. Thus, we propose:

Hypothesis 3a. *Team-level improvisation is positively related to team-level exploitative learning.*

Building on Hypotheses 1 and 3a, we propose that team improvisation mediates the relationship between firm-level change-oriented HRM systems and team-level exploitative learning. Change-oriented HRM systems cultivate a work environment that promotes adaptive responsiveness within existing strategic and operational boundaries. Through practices that enhance technical competence, psychological safety, and distributed decision-making, these

systems empower teams to respond flexibly and efficiently to process-related disruptions and operational demands (Lee et al., 2019).

When supported by such systems, teams equipped with improvisational capability can effectively manage routine deviations, reconfigure task sequences, or reapply existing knowledge in contextually relevant ways without diverging from core objectives (Vera et al., 2016; Jambekar & Pelc, 2007). Improvisation in this form supports real-time refinement, enabling teams to optimize ongoing processes, resolve recurring challenges, and reinforce reliable performance through adaptive fine-tuning. In this way, the operational function of improvisation becomes a behavioral mechanism that channels the enhanced abilities, motivation, and opportunity provided by change-oriented HRM systems into disciplined yet flexible action (Miner et al., 2001; Helfat & Winter, 2011). Thus, we argue that team improvisation plays a key mediating role by translating strategic HRM design into exploitative learning outcomes, supporting NPD teams in maintaining efficiency, consistency, and executional excellence amid everyday complexity.

Hypothesis 3b. *The positive relationship between firm-level change-oriented HRM systems on team-level exploitative learning is mediated by team-level improvisation.*

2.6 The Moderating Role of Tacit and Explicit Knowledge Sharing

Tacit knowledge refers to knowledge that is often difficult to articulate or formalize (Nonaka & Takeuchi, 1995). While team improvisation facilitates real-time adaptability and experimentation, its effectiveness in driving exploratory learning is contingent on the level of TTKS within the team (Goffin & Koners, 2011). TTKS enables team members to share and integrate tacit knowledge, fostering a shared understanding and mutual anticipation of each other's informational needs (Mathieu et al., 2000). This alignment enhances the fluidity and cohesiveness of improvisational efforts, amplifying their impact on exploratory learning (Vera et al., 2016). Rather than serving as a direct driver of exploratory learning, TTKS

moderates the improvisation-learning relationship by providing the contextual conditions that enable teams to leverage their improvisational activities more effectively (Miner et al., 2001). Teams with high TTKS can bridge temporal gaps, integrate diverse perspectives, and develop collective improvisation, thereby increasing the depth and breadth of their exploratory learning outcomes (Vera & Crossan, 2005; Park & Kim, 2018).

In dynamic and uncertain environments, such as those faced by NPD teams, TTKS enhances the ability to navigate unfamiliar situations and develop innovative solutions (Hu & Randel, 2014). By facilitating the integration of multiple mental models and interdisciplinary collaboration, TTKS allows teams to make sense of complex problems and identify opportunities for innovation that might be missed when relying solely on formalized knowledge (Huang et al., 2016). For example, experienced team members can use their tacit knowledge to recognize patterns, foresee challenges, and generate creative solutions (Leonard & Sensiper, 1998). Darroch (2005) found that teams with higher TTKS exhibit superior innovative capabilities, as their shared tacit knowledge provides a richer foundation for exploration and problem-solving. Additionally, TTKS bridges gaps between diverse areas of expertise, fostering interdisciplinary collaboration and enabling the integration of distinct perspectives (Huang et al., 2014). This is especially critical in NPD teams, where combining knowledge from various domains can lead to novel product innovations (Goffin & Koners, 2011). Thus, TTKS creates an enabling environment that strengthens the positive relationship between team improvisation and exploratory learning, ensuring that improvisational efforts translate into meaningful innovation (Chang et al., 2021; Cohen & Levinthal, 1990).

Moreover, the social processes involved in tacit knowledge sharing, such as collaboration and informal communication, strengthen the conditions under which team-level improvisation translates into exploratory learning (Wong, 2004). While improvisation facilitates adaptability and experimentation, its effectiveness in driving exploratory learning

depends on the extent of TTKS within the team. TTKS enhances the integration of diverse individual insights and promotes a shared understanding, creating an environment where improvisation can yield more impactful exploratory outcomes (Tsai, 2001). For example, during the rapid development of the COVID-19 vaccine, NPD teams engaged in improvisation under extreme time pressures, and the extent of TTKS among team members determined their ability to effectively combine ideas and pursue innovative directions. Thus, we hypothesize:

> **Hypothesis 4a.** *TTKS moderates the positive relationship between team-level improvisation and team-level exploratory learning such that when TTKS is higher, the effect of team-level improvisation on team-level exploratory learning is stronger.*

We posit that TEKS significantly enhances the positive effects of team improvisation on team exploitative learning. TEKS refers to the extent to which knowledge is codified, documented, and easily communicated among employees, typically focusing on the firm's primary products, services, or core competencies (Nonaka, 2000). For example, a pharmaceutical company may have extensive documentation and guidelines on drug development, regulatory compliance, and clinical trials if those are its primary areas of focus. This shared knowledge is especially important within NPD teams because it provides a foundation for more informed and strategic improvisation, leading to improved exploitative learning outcomes (Liu et al., 2011). Exploitative learning involves refining and extending existing competencies and knowledge, which can be more effectively achieved when team members can draw upon a robust repository of explicit knowledge (Kostopoulos & Bozionelos, 2011). Research supports this interaction, indicating that teams with higher levels of knowledge sharing can better leverage their improvisational capabilities to adapt and optimize existing processes, thereby achieving greater efficiency in their operations (Alavi & Leidner, 2001).

In NPD teams, TEKS often leads to higher quality problem-solving and efficiency (Park & Kim, 2018; Stasser & Titus, 2003). When tackling complex problems, TEKS enables NPD teams to access valuable knowledge for refining existing products, optimizing processes, or enhancing technological capabilities (Hu & Randel, 2014). For example, during the development of a new medicine, access to codified knowledge on previous formulations and clinical trial results allows teams to quickly adjust and improve the medicine, enhancing both its efficacy and compliance with regulatory standards. Moreover, codified knowledge shared by TEKS enables NPD teams to respond to operational challenges with precision and informed judgment (Lu et al., 2012). This allows teams to improvise effectively when encountering unforeseen technical issues (Vera & Crossan, 2004), tweaking and adapting existing protocols rather than reinventing the wheel each time (Vera et al., 2016).

Drawing insights from the operational side of improvisation, we posit that TEKS enables teams to quickly assess and address operational challenges, often in real-time (Im & Rai, 2008). This transformation of spontaneous creative acts into purposeful strategies, supported by TEKS, leverages the extensive documented knowledge within the team (Kogut & Zander, 1992). This strategic shift ensures the full exploitation of the value of explicit knowledge within teams, turning improvisation into a systematic method for harnessing and utilizing a team's accumulated know-how (Winter, 2003). Furthermore, through the utilization of TEKS, teams can skillfully navigate the complexities of their tasks, enabling them to make informed adjustments that may result in process improvements, cost reductions, or enhancements in quality (Caniëls et al., 2017). This enables teams to effectively utilize their extensive documented knowledge to refine existing technologies and operations (Vera et al., 2016). This not only streamlines the innovation process but also helps NPD teams stay aligned with their core competencies, thereby optimizing resource allocation and maintaining efficiency through focused exploitative learning (Prahalad & Hamel, 1990).

Hypothesis 4b. *TEKS moderates the positive relationship between team-level improvisation and team exploitative learning such that when TEKS is higher, the effect of team-level improvisation on team-level exploitative learning is stronger*.

So far, we have established a theoretical basis for understanding the mediating mechanism of team improvisation and the moderating influence of TTKS and TEKS. In this context, our assumptions are that team improvisation acts as a mediator in the relationship between change-oriented HRM systems and team exploratory and exploitative learning (H2b and H3b). Additionally, we posit that TTKS and TEKS moderate the associations between team improvisation and team exploratory and exploitative learning, respectively (H4a and H4b). Drawing on this theoretical foundation, we propose an integrated moderated mediation model. Specifically, we anticipate TTKS and TEKS to moderate the indirect links between change-oriented HRM systems and team exploratory and exploitative learning through team improvisation. The rationale behind this premise is that, while recognizing the significant potential of HRM systems, prior research (e.g., Chuang et al., 2016) and meta-analyses (e.g., Jiang et al., 2012) indicate that the effectiveness of these systems is often constrained by contextual factors, revealing substantial unexplained variance in desired outcomes. This suggests the need for a more nuanced approach. Therefore, we put forth the following integrated moderated mediation hypotheses:

Hypothesis *5a.* *TTKS moderates the positive relationship between firm-level change-oriented HRM systems and team-level exploratory learning through team-level improvisation; as such, the indirect effect is higher when TTKS is high.*

Hypothesis **5b.** *TEKS moderates the positive relationship between firm-level change-oriented HRM systems and team-level exploitative learning through team-level improvisation; as such, the indirect effect is higher when TEKS is high.*

3. Method

3.1 Sample and Procedure

To test our hypotheses, we collected data from NPD teams within Iranian firms within the pharmaceutical industry that is considered to be strategically important, innovation-driven, and knowledge-intensive (Gilsing & Nooteboom, 2006). The industry's strong emphasis on R&D, regulatory compliance, and innovation aligns closely with exploratory and exploitative learning. NPD teams play a vital role in accelerating product development, reducing costs, and enhancing market performance (Jansen et al., 2016). In Iran, the pharmaceutical industry is mature and diverse, comprising public and private firms that produce both generic and innovative drugs (Mehralian et al., 2023). As such, we believe this sector provides a rich context for examining how change-oriented HRM systems and team improvisation shape learning outcomes (Pak et al., 2023).

Data were collected from publicly listed pharmaceutical firms between September 2022 and December 2023 (Iranian Food and Drug Administration database; IFDA, 2022). Due to the limited availability of archival data, we primarily gathered information from key informants within the sample firms who possessed in-depth operational knowledge. Using a survey-based approach, we initially reached out to 197 firms. Our selection criteria included firms with over 100 employees, as such firms are more likely to have established formal HRM systems (Collins & Smith, 2006). We further restricted our sample to firms with active in-house R&D departments (Pak et al., 2023) and those that had launched at least one new product annually during the three years preceding the study (Mehralian et al., 2023). This yielded a sample of 123 pharmaceutical firms. We contacted members of the top management teams (CEOs or their deputies), clarified the research objectives, and assured confidentiality. Ultimately, 75 of the 123 eligible companies, each with two or more NPD teams, agreed to

participate. The firms in this sample reported a total of 212 active NPD teams at the time of data collection.

Next, we collected data on independent and dependent variables across three separate points in time (Boon et al., 2025). In the first round, a survey was distributed among NPD leaders to gather data on firm-level HRM practices. Firm-level HRM systems are designed to drive innovation consistently across the organization, but their effectiveness often depends on how they are implemented and experienced at the team-level, where learning and innovation occur (Lin & Sanders, 2017). By capturing team-level perceptions, we accounted for variations in how these systems are applied to meet the unique demands of NPD teams. This approach aligns with the view that firm-level HR practices can have differentiated impacts across teams while retaining their overarching strategic intent (e.g., Chuang et al., 2016; Papalexandris, 2024). Therefore, our team-level measurement offers valuable insights into the local enactment of firm-level HRM systems without compromising their theoretical foundation as organization-wide constructs (Jiang et al., 2013). Specifically, we measured the company's HRM systems from various NPD team leaders instead of relying solely on firm HR managers. This approach is advantageous as it allows us to gain insights into how the HRM system is executed within the organization, going beyond formal policies (Wright et al., 2001). Additionally, by collecting input from multiple teams within each firm, we were able to assess the consistency of our HRM measurement through inter-rater reliability (Wright &Boswell, 2002). In the second round, which was conducted 6 months after the first, we invited NPD team members to rate team improvisation as well as their tacit and explicit knowledge sharing. Six months after the second round, a third survey was administered to team leaders, and focused on team-level exploratory and exploitative learning

Applying a response criterion of at least three completed responses from team members, one response from the associated team leader, and two or more complete team

records per participating firm (Hinds & Mortensen, 2005), our final sample comprised 925 team members and 205 team managers (one manager per team) across 75 pharmaceutical firms. In the final sample, our record shows that team managers had a mean age of 36.25 years, with a SD of 7.16. On average, team managers' tenure at the firm was 6.62 years (SD = 3.21), and they had been in their current position for around 4.86 years (SD = 0.86). The average number of teams participating per firm was 2.74, with a median of 3, a SD of 1.16, and a range spanning from 2 to 6 teams. The average number of members responding per team was 4.51 (SD = 3.14), with a median of 4, a SD of 1.49, and a range of 3 to 10. Among the 205 teams, the average team duration was 18.78 months (SD = 12.16). The demographic characteristics of the team members were as follows: 78% were male; 38% held a master's degree, and 7% held a PhD; their average age was 33.14 years (SD = 5.18); and their average tenure in the organization was 46.58 months (SD = 25.33). We measured the main study variables using multiple-item scales, which are detailed in the Appendix.

To assess nonresponse bias, we examined factors such as company size, R&D expenditures, and team size between firms that participated and those that did not, as well as between teams that responded and those that did not. The analysis of variance showed no significant differences between these groups. Moreover, comparisons between early and late respondents indicated no significant differences concerning the measures in this study.

3.2 Measurement and Validation of Constructs

To ensure cultural and linguistic appropriateness, all survey instruments originally in English were translated into Persian using the translation/back-translation method (Brislin, 1980). Two bilingual researchers independently translated and back-translated the items to ensure conceptual equivalence. The translated version was reviewed by a panel of HRM scholars who are familiar with both the items and cultural contexts. Feedback from them led to minor

modifications to improve clarity. Responses were given on 5-point Likert-type scales ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Change-oriented HRM systems. Our measurement of change-oriented HRM systems at the team-level provides a nuanced understanding of how firm-level HR practices are operationalized and perceived within specific teams, such as NPD teams, while maintaining their conceptualization as firm-level constructs. We used a scale of 17 items which were validated by Lee et al. (2019) and employed a unitary HRM index derived from the complete range of HR practices. This index has been widely applied in strategic HRM studies, indicating that understanding the impact of HR practices is most effectively achieved by analyzing the entire system of HR practices rather than assessing individual HR practices separately (e.g., Liao et al., 2009). Additionally, the intercorrelations among the subscales measuring ability, motivation, and opportunity-enhancing HR practices were significant (Gittell et al., 2010), with values ranging from r = .72 to r = .76.

Team improvisation. Team improvisation was assessed using three items adapted from Vera et al. (2016) who highlighted that operating teams employ improvisation both for immediate problem-solving and for adapting to changing circumstances. Therefore, as noted by Vera et al. (2016), the survey items used in our study reflect the application of improvisation in addressing unforeseen challenges or seizing opportunities. We invited team members to rate improvisation because they are directly involved in the creative and extemporaneous processes that occur during daily tasks.

Team exploratory and exploitative learning: Team exploratory and exploitative learning were measured using the scales from Kostopoulos and Bozionelos (2011). We utilize distinct scales for each to ensure that they are orthogonal or independent of each other. To gauge exploratory and exploitative learning, team leaders were asked to rate their team members' involvement in specific activities over the past year. Furthermore, in line with our

conceptualization, the measures for both types of learning were developed through a principal component factor analysis conducted in STATA and employing varimax rotation. The measurement model fits the data well for exploratory learning: ($\chi 2/df = 1.76$, CFI = .98, GFI = .96, TLI= .92, RMSEA= .05) and exploitative learning: ($\chi 2/df = 1.91$, CFI = .96, GFI = .99, TLI = .93, RMSEA = .06). To ensure the robustness of our findings, we performed post-hoc analyses employing alternative operationalizations of team ambidexterity.

Team knowledge sharing. In line with the approach proposed by Huang et al. (2014), TTKS and TEKS were measured using three and two self-reported items, respectively. We invited team members to rate their knowledge-sharing behaviors.

Control variables. To address the possibility of confounding variables influencing our models, we included control variables at both the firm- and team-levels (Vera et al., 2016). At the firm-level, we considered several variables, including firm age (years of operations), firm size (number of employees), firm type (private or public), the size of the R&D unit, and firm R&D intensity. Firm R&D intensity was quantified as the ratio of expenditures on R&D to sales. At the team-level, we accounting for team size. This was done because team size can impact how team members interact with one another and the extent to which employees have opportunities to participate in group decision-making processes. We performed all analyses both with and without the control variables as a robustness check with the results remaining consistent across both approaches (Bernerth & Aguinis, 2016).

3.3 Levels of Analyses and Data Aggregation

In this study, we used team managers to rate firm-level HRM practices and team members to rate team improvisation, TTKS, and TEKS. To ensure alignment between the theoretical, measurement, and statistical levels of analysis, we examined whether the data supported aggregation into firm- and team-level constructs. For the 41 firms, the rwg (j) for HRM practices was 0.85. Among the 143 teams, the inter-rater agreement index (rwg (j)) was 0.84

for team improvisation, 0.88 for TTKS, and 0.86 for TEKS, indicating sufficient within-firm and within-team agreement (James et al., 1984). Additionally, a one-way analysis of variance revealed meaningful between-group variability, with ICC (1) values of 0.18 for HRM practices, 0.25 for team improvisation, 0.23 for TTKS, and 0.21 for TEKS, and ICC (2) values ranging from 0.72 to 0.76. These values fall within the accepted range in organizational research (Bliese, 2000) and support the appropriateness of aggregating ratings at both the firm and team-levels. Together, a multilevel analytical approach was necessary to avoid violating the assumption of independence of observations and to appropriately model cross-level relationships. Moreover, we investigated the distribution of outcome variables among teams. The results indicated significant variability across different firms for team exploratory and exploitative learning, resulting in ICC1 values of 0.14 and 0.16, respectively. Furthermore, the analysis of the null model revealed that 26% of the variance at the team-level can be attributed to factors at a higher level of analysis, specifically among firms. This underscores the necessity of employing a multilevel data analysis approach for further investigation**.** To determine the significance of the cross-level indirect effect we employed the Monte Carlo method (Preacher et al., 2010) to explore confidence intervals.

4. Findings

4.1 Validation of the measurement model

We conducted a series of confirmatory factor analyses to assess the discriminant validity of our measurement model. The results indicated that the proposed six-factor model, encompassing change-oriented HRM systems, team improvisation, TTKS, TEKS, team exploratory learning, and team exploitative learning, exhibited a significantly better fit with the data ($\chi2(539) = 1610.56$, $p < .001$; CFI = .92, IFI = .89, RMSEA = .08, SRMR = .08) when compared to all alternative models. For instance, the five-factor model, which combined team exploratory learning and team exploitative learning, displayed a poorer fit

with the data ($\chi2(547) = 2541.12$, $p < .001$; CFI = .75, IFI = .76, RMSEA = .12, SRMR = .15) and a significant difference ($\Delta\chi2 = 930.56$, $p < .001$). Similarly, the five-factor model, which combined TTKS and TEKS, revealed a poorer fit with the data ($\chi2(552) = 2722.14$, $p < .001$; CFI = .76, IFI = .78, RMSEA = .14, SRMR = .17) with a significant difference ($\Delta\chi2 = 1112.58$, $p < .001$). In addition, the two-factor model which combined HRM systems, team improvisation, team exploratory learning, and team exploitative learning, and TTKS and TEKS combined, revealed a poorer fit with the data ($\chi2(574) = 3841.23$, $p < .001$; CFI = .95, IFI = .88, RMSEA = .22, SRMR = .25) with a significant difference ($\Delta\chi2 = 2230.67$, $p < .001$). Finally, the one-factor model, where all variables were collapsed into a single factor, demonstrated an even worse fit ($\chi2(580) = 3974.54$, $p < .001$; CFI = .42, IFI = .38, RMSEA = .18, SRMR = .22) with a significant difference ($\Delta\chi2 = 2363.98$, $p < .001$). These findings confirm that the six variables in our conceptual model represented distinct constructs and were thus retained for subsequent analysis.

Table 1 presents the means, standard deviations, and correlations among all individual-level variables. As the table shows, change-oriented HRM systems exhibited positive relationships with team improvisation and exploratory and exploitative learning. These findings offer initial backing for our research hypotheses.

Insert Table 1 about here

4.2 Hypothesis Testing

We examined our research hypotheses using multilevel structural equation modelling (MSEM) through the utilization of Mplus 8. In contrast to traditional multilevel modelling, which may be less suitable for assessing cross-level mediation due to potential biases in estimating indirect effects (Preacher et al., 2010), MSEM provides a more robust approach. MSEM addresses this bias by distinguishing between between-group and within-group effects while also accounting for measurement errors (Preacher et al., 2010). Table 2

summarizes the results of our multilevel hypotheses. Before testing the main hypotheses, we initially ran null models, which included no explanatory variables, to determine if there was residual variance in the team-level model by Level 2 units. The findings indicate that additional variance could be accounted by organizational-level predictors for team exploratory learning, $\chi 2$ (40) = 235.256, $p < .001$), and for team exploitative learning, $\chi 2$ (40) = 218.56, $p < .001$). Therefore, using a multilevel modeling approach was justified. We then assessed whether incorporating control variables improved the models' fit. Upon adding the control variables, the chi-square values decreased for team exploratory learning, $\chi 2$ (40) = 47.15, $p < .001$), and for team exploitative learning, $\chi 2$ (40) = 56.47, $p < .001$), indicating that these models fitted the data better than the null models.

Insert Table 2 about here

As Figure 1 shows, our conceptual framework encompasses two cross-level fully mediated moderation relationships. According to Preacher et al. (2010), the indirect effect in cross-level mediation must be rigorously evaluated at the between-group level. Consequently, we implemented two cross-level full mediation models at this level. To form the interaction terms, we followed recommendation from Edwards and Lambert (2007) and grand centered change-oriented HRM systems and group centered TTKS, TEKS, and team improvisation, ensuring unbiased estimates of cross-level interactions. The results indicate that both fully mediated moderation models fitted the data well: for team exploratory learning, $\chi 2/df = 2.79$, $p < .001$; CFI = .99, IFI = .99, RMSEA = .04, and SRMR = .03; and for team exploitative learning, $\chi 2/df = 2.93$, $p < .001$; CFI = .98, IFI = .97, RMSEA = .05, and SRMR = .02.

Hypotheses 1, 2a, and 3a posit that there is a positive relationship between change-oriented HRM systems and team improvisation (hypothesis 1), and team improvisation is

positively related to team exploratory (hypothesis 2a) and team exploitative learning (hypothesis 3a). Upon examining the coefficients at the between-organizational level, we found that change-oriented HRM systems had a significant and positive impact on team improvisation ($\gamma = .47$, $p < .01$). Furthermore, team improvisation was positively and significantly associated with team exploratory learning ($\gamma = .46$, $p < .001$) and team exploitative learning ($\gamma = .37$, $p < .001$). Thus, Hypotheses 1, 2a, and 3a were confirmed.

In Hypotheses 2b and 3b, we proposed that team improvisation mediates the effect of change-oriented HRM systems on team exploratory and team exploitative learning. We found that the indirect effect of change-oriented HRM systems on team exploratory learning via team improvisation was significant ($r = .13$, $p < .01$). To test our meso-mediation hypotheses, we employed bootstrap confidence intervals. The results indicated that a 95% bias-corrected confidence interval, derived from 2,000 bootstrap samples, did not include zero ($.04 > - < .16$) for team exploratory learning. Consequently, it can be concluded that team improvisation partially mediates the effect of firm-level change-oriented HRM systems on team exploratory learning. Similarly, we uncovered that the indirect impact of firm-level change-oriented HRM systems on team exploitative learning via team improvisation was also statistically significant ($r = .11$, $p < .01$). The outcomes revealed that a 95% bias-corrected confidence interval, generated from 2,000 bootstrap samples, did not encompass zero ($.02 > - < .13$) for team exploitative learning. Considering these results, it can be inferred that team improvisation partially mediates the effect of firm-level change-oriented HRM systems on team exploitative learning. Consequently, Hypotheses 2b and 3b received empirical support.

Moving forward, in Hypothesis 4a, we examined the moderating influence of TTKS on the relationship between team improvisation and team exploratory learning. Our results revealed significant positive effect of TTKS on team exploratory learning ($\gamma = .43$, $p < .05$). Furthermore, the interaction between TTKS and team improvisation on team exploratory

learning ($\gamma = .12$, $p < .05$) was found to be significant, while there was non-significant interaction observed between TEKS and team improvisation on team exploratory learning ($\gamma = .02$, $p > .05$). Similarly, in Hypothesis 4b, we investigated the moderating effect of TEKS on the relationship between team improvisation and team exploitative learning. Our findings indicated significant positive effect of TEKS on team exploitative learning ($\gamma = .45$, $p < .05$). Additionally, the interaction between TEKS and team improvisation on team exploitative learning ($\gamma = .10$, $p < .05$) was found to be significant, whereas there was non-significant interaction detected between TTKS and team improvisation on team exploitative learning ($\gamma = .04$, $p > .05$). To illustrate the moderating effect of team knowledge sharing, we plotted these interactions at the between-group level. Figure 2 shows that when TTKS is high (1 SD above the mean), the influence of team improvisation on team exploratory learning was more pronounced ($p < .01$), whereas when TTKS is low (1 SD below the mean), the effect was comparatively weaker ($p < .05$). Similarly, Figure 3 illustrates that when TEKS is high (1 SD above the mean), the impact of team improvisation on team exploitative learning is more substantial ($p < .01$), whereas when TEKS is low (1 SD below the mean), the effect was less pronounced ($p < .05$). The difference in simple slopes, illustrated in Figure 2 (slope difference = 3.12, $p < .001$) and Figure 3 (slope difference = 2.83, $p < .001$), were statistically significant, providing support for Hypothesis 4a and Hypothesis 4b. Furthermore, the values of ΔR^2 were 0.03 for Hypothesis 4a and 0.02 for Hypothesis 4b, which fall within the typical range of 1% to 3% variance explained in outcomes (Cohen et al., 2003), indicating that TTKS and TEKS make a meaningful contribution to explaining variance in team exploratory and exploitative learning.

Insert Figures 2 and 3 about here

Finally, in Hypotheses 5a and 5b, we explored the conditional indirect effect of firm-level change-oriented HRM systems on both team exploratory and exploitative learning through team improvisation. The Monte Carlo simulations indicated that the indirect effect varied as a function of TTKS (conditional indirect effect = .04, 95% CI = [.008, .091]). The indirect effect was significant when TTKS was high (+1SD indirect effect = .05, 95% CI = [.018, .097]), but not when TTKS was low (–1SD indirect effect = .02, 95% CI = [-.002, .051]). The indirect effect moderated by TEKS also was significant (conditional indirect effect = .02, 95% CI = [.003, .049]). It was significant when job TEKS was high (+1SD indirect effect = .05, 95% CI = [.011, .098]), but not when low (–1SD indirect effect = .01, 95% CI = [-.003, .043]). Therefore, Hypothesis 5a and Hypothesis 5b were confirmed.

4.3 Additional analysis: Team Learning to R&D Performance

In this research, our focus on the multilevel pathways through which change-oriented HRM influences exploratory and exploitative learning rests on two implicit assumptions. First, the theoretical distance in the HRM–innovation link at the firm level necessitates within-organizational processes that translate HRM signals into corresponding employee attitudes and behaviors. If so, this premise is best tested by a non-significant direct link between change-oriented HRM and R&D performance. Accordingly, we conducted an additional analysis which, consistent with our prediction, showed that change-oriented HRM is not significantly related to either exploratory innovation ($\beta = .08$, $p = .23$) or exploitative innovation ($\beta = .05$, $p = .19$). These findings reinforce our position to focus on unpacking the "black box" in HRM–performance research.

Second, a strong innovation climate forms through frequent formal and informal interactions across NPD teams (social learning theory; Bandura, 1977), enabling professionals to develop a shared mental model of R&D goals and a corresponding code of conduct (sensemaking; Weick, 1995). Prior research has also suggested that exploratory and exploitative learning are distinct yet mutually dependent team capabilities (e.g., He & Wong,

2004). In our context, this implies that both types of learning—individually and interactively (i.e., via their interaction term)—should be positively associated, when aggregated to the firm level, with R&D performance.

Given the well-established learning–innovation link in prior literature, we did not formally hypothesize these relationships (see dotted arrows in Figure 1). Nevertheless, we report relevant results to offer a more holistic view. This effort is particularly meaningful given the availability of objective R&D data. We collected these data from company annual reports and cross-verified them using the IFDA database (Iran FDA, 2022). Following prior empirical work (Kang & Kim, 2020), we operationalize firm R&D performance along two dimensions: exploratory innovation, measured by the number of new products launched between Time 1 and Time 3 that fall outside existing technical classifications (mean = 4.12; SD = 1.52); and exploitative innovation, based on new products launched in the same period that fall within classifications historically used by the focal firm (mean = 7.12; SD = 2.15). Our analyses indicate that, when aggregated to the firm level, exploratory and exploitative learning predict only their corresponding innovation outcomes: exploratory learning to exploratory innovation ($\beta = .26$, $p < .01$) and exploitative learning to exploitative innovation ($\beta = .28$, $p < .01$). Moreover, ambidexterity (i.e., the interaction term between the two team learning modes), when aggregated to the firm level, significantly enhances both exploratory ($\beta = .31$, $p < .01$) and exploitative innovation ($\beta = .36$, $p < .01$). Collectively, these findings underscore the importance of balancing both learning processes to drive firm-level innovation (cf. He & Wong, 2004).

5. Discussion

This study advances understanding of how firm-level change oriented HRM systems enable NPD teams to manage the persistent challenge of simultaneously pursuing exploratory and exploitative learning. While prior research has established the importance of team

ambidexterity for organizational innovation and performance (Lavie et al., 2010; Jansen et al., 2016), the cross-level behavioral mechanisms through which firm-level HRM systems may shape team-level exploratory and exploitative learning have remained underexplored (Wright & Nishii, 2013; Lepak et al., 2006). Our multilevel study reveals that change-oriented HRM systems support both types of learning by cultivating team improvisation as a dual-purpose capability. Moreover, we find that the cross-level mediating role of improvisation is contingent on the nature of knowledge sharing within teams. Tacit knowledge sharing strengthens the pathway from improvisation to exploratory learning, while explicit knowledge sharing enhances the relationship between improvisation and exploitative learning. Taken together, our findings offer a nuanced perspective about how firm-level HRM systems cascade across levels to activate team-level capabilities and learning behaviors. With that, we provide important implications for earlier research.

5.1 Theoretical implications

First, our findings offer several implications for prior research on the behavioral consequences of firm-level HRM systems across organizational levels. While prior research has linked HRM systems to innovation and performance at the organizational level (Collins & Smith, 2006; Jiang et al., 2012; Pak et al., 2023), the mechanisms through which these effects unfold within teams have remained theoretically underspecified (e.g., Chuang et al., 2016; Papalexandris, 2024). Our findings indicate that change oriented HRM systems, or those bundles of HR practices that are designed to enhance the ability, motivation, and opportunity of team members (Lee et al., 2019), shape team exploratory and exploitative learning by cultivating improvisation within teams. In this sense, our study implies that firm-level HRM systems indirectly affect learning outcomes of teams when supporting team members to flexibly integrate novel and existing knowledge in real time and to respond to complex and oftentimes conflicting demands (Magni & Maruping, 2013; Vera & Crossan,

2005). It highlights the behavioral consequences of change oriented HRM systems and further clarifies the micro foundations explaining the effectiveness of such firmwide systems across hierarchical levels (e.g., Hong et al., 2016). This is particularly important because both learning modes are foundational for divergent strategic pathways such as innovation and imitation that contribute to sustained competitive advantage (Ali, 2021). In line with multilevel perspectives on HRM (Ployhart & Moliterno, 2011; Ostroff & Bowen, 2016), our study points to a cascading process through which HR practices support complex behaviors across team members that become embedded in day-to-day team learning activities. While prior research has traditionally emphasized how HRM systems may promote alignment and clarity (Ostroff & Bowen, 2016), our findings suggest that they may also enable behavioral flexibility. As such, we extend Wright and Nishii's (2013) process model by illustrating how HRM practices are not only interpreted but also enacted in ways that support real-time integration of divergent learning logics. More broadly, our findings resonate with paradox theory (Smith & Lewis, 2011), showing that the inherent tension between exploration and exploitation can be managed through firm-level change-oriented HRM systems that embed improvisational capabilities into team learning processes.

Second, our findings carry important implications for the literature on team learning and ambidexterity by demonstrating that team improvisation can serve as a behavioral mechanism through which teams engage in both exploratory and exploitative learning. This challenges the dominant structural perspective in ambidexterity research, which holds that balancing these competing learning demands requires formal separation or sequential alternation (Tushman & O'Reilly, 1996; Lavie et al., 2010). Instead, our findings align with and extend a growing body of work that reconceptualizes ambidexterity as an emergent outcome of micro- and meso-level processes (Jansen et al., 2016; Mom et al., 2019). More specifically, we contribute to this perspective by showing that team improvisation functions

as a dual-purpose capability that enables teams to integrate design and execution in real time and to support both novelty and refinement through a shared behavioral repertoire (Vera et al., 2016; Ciuchta et al., 2021). In doing so, we extend prior work on improvisation in two important ways. To begin with, while early research emphasized improvisation as spontaneous, episodic, and innovation-oriented behavior (Moorman & Miner, 1998; Vera & Crossan, 2005), our study supports more recent theorizing that conceptualizes improvisation as a structured and repeatable capability that also enables continuity and adaptation (Audretsch et al., 2023). In addition, we move beyond prior studies that have focused primarily on team-level antecedents such as autonomy, shared cognition, or team experience (Vera & Crossan, 2005), to show that firm-level change oriented HRM systems play a key role in the emergence of improvisational capabilities. By demonstrating that improvisation mediates the cross-level relationship between HRM systems and both exploratory and exploitative learning, our findings illuminate how team-level learning processes are shaped by broader organizational design choices. Taken together, our study enriches process-based views of ambidexterity and advances the literature on team improvisation by clarifying how this capability is both enabled by firm-level systems and expressed through divergent learning processes. This contributes to a more dynamic understanding of how behavioral routines support responsiveness, resilience, and sustained learning in fast-paced organizational environments.

Third, our research extends and refines the literature on team learning by unpacking how tacit and explicit forms of knowledge sharing differentially condition the relationship between team improvisation and learning outcomes in NPD teams. While knowledge sharing has long been recognized as central to team innovation and performance (Hu & Randel, 2014; Wang & Noe, 2010), most existing studies treat knowledge sharing as a relatively uniform process. Recent scholarship has begun to differentiate between tacit and explicit

forms (e.g., Huang et al., 2014), yet their unique contingent effects on team-level learning processes have remained largely untested. By empirically demonstrating that tacit and explicit knowledge sharing operate as distinct contextual moderators, our study challenges the prevailing assumption that the effectiveness of knowledge sharing is unidimensional in team settings. We show that tacit knowledge sharing, which is rooted in informal, experiential, and often unarticulated exchanges, amplifies the effects of team improvisation on exploratory learning (Wang & Noe, 2010). Conversely, explicit knowledge sharing that is anchored in formal, codified, and structured knowledge transfers, strengthens the pathway from team improvisation to exploitative learning, facilitating process optimization and the refinement of established routines (Huang et al., 2014). These findings advance recent work by Ali et al. (2022), who argue that ambidexterity emerges from the dynamic interplay of knowledge assets and provide a nuance understanding of how the interplay between the nature of knowledge shared and team behavioral capabilities shapes the dual learning processes essential for innovation and adaptation in organizations (Edmondson & Harvey, 2018; Lavie et al., 2010).

Fourth, our study highlights the importance of grounding HRM research in its broader political-economic context (Budhwar et al., 2024). Iran's pharmaceutical industry presents a politically and economically distinctive setting because it is shaped by international sanctions, regulatory restrictions, and limited access to global supply chains (Mehralian et al., 2023). In the absence of stable access to external resources, firms turn to local improvisational problem solving, knowledge sharing, and HRM-driven learning routines as core enablers of new product development. As such, our research context offers a unique lens to examine how HRM systems function not merely as performance enablers but as strategic infrastructures under institutional constraint. Our findings suggest that the effects of change-oriented HRM systems on team improvisation and learning may be amplified in volatile,

resource-constrained environments. In such settings, HRM systems that promote behavioral flexibility, real-time adaptation, and internal knowledge integration become not optional, but essential to organizational survival. Such results can be interpreted from two different angles. Before all else, despite being conducted in an idiosyncratic institutional environment, the findings were consistent with the theoretical propositions. No observed patterns of peculiarity imply the reassurance of predictive power that HRM and organizational learning theories inherently hold. Hence, the use of data obtained from NPD teams operating in the Iranian pharmaceutical industry adds generalizability to the recognized theoretical positions (c.f., Pak et al., 2023). From this perspective, we also lay the ground for further comparative research into how macro-institutional contexts shape the mechanisms through which HRM systems influence learning and innovation outcomes. In line with Budhwar et al. (2024), we contribute to repositioning HRM as a field of political economy by showing how geopolitical and institutional adversity shape both the design and function of HRM systems. Rather than treating context as background, our study demonstrates that it actively conditions the relevance and efficacy of HRM mechanisms and highlights the need for theory-building that bridges structural and behavioral perspectives in international HRM. As such, our study calls for a more nuanced approach that recognizes the adaptive potential of HRM and team processes in driving learning and innovation across diverse organizational and national contexts (Budhwar & Debrah, 2009).

5.2 Managerial implications

Our findings offer several actionable implications for the design of HRM systems that support team improvisation and ambidextrous learning. To cultivate improvisation as a dual-purpose capability—supporting both adaptive refinement and generative experimentation—organizations should adopt policy interventions specifically designed to promote it around ability-, motivation-, and opportunity-enhancing dimensions (e.g., change-oriented HRM

systems; Lee et al., 2019). Central to this proposal is linking a strategic intent with HRM such that desired role behaviors are induced in day-to-day routines (Schuler & Jackson, 1987). Specifically, ability-enhancing practices that potentially enhance interpersonal learning include selecting innovative individuals who are high in adaptability and problem-solving skills (Hunter et al., 2012) and offering extensive training in cognitive agility and cross-functional collaboration (Glynn, 1996; Yao et al., 2023). These practices equip teams with essential skills needed to collaborate effectively and navigate emerging challenges without rigidity.

Motivation-enhancing practices, in particular, require sophisticated design. We recommend the use of developmental rather than administrative performance appraisals—those that emphasize feedback, learning, and the encouragement of adaptive and collaborative behaviors under uncertainty (Cai et al., 2023; Li et al., 2011). In doing so, actions such as experimentation, learning, and contribution to team resilience and adaptability should be recognized. In parallel, although some scholars have suggested that combining individual and collective performance-related pay may harness the motivational strengths of both systems, the empirical evidence remains inconclusive. For example, Barnes et al. (2011) found that hybrid incentive structures can create social dilemmas, prompting team members to prioritize individual over collective goals, thereby undermining cooperation and accuracy. Similarly, De Spiegelaere et al. (2018) reported that individual incentives may weaken innovative behavior, with limited support for the notion that combining them with collective schemes yields additive benefits. A recent review by Wood et al. (2023) further reinforces this skepticism, concluding that hybrid systems often underperform relative to pure collective approaches. Adding to this complexity, Homburg et al. (2024) reveal a nuanced trade-off: individual incentives encourage advice-seeking but suppress advice-giving, whereas team incentives foster advice-giving but reduce the motivation to seek advice. Even within the same domain of knowledge exchange,

different incentive structures appear to operate at cross purposes, complicating attempts to balance them effectively.

Rather than endorsing mixed incentive schemes, we highlight this issue as an area of ongoing tension. On the one hand, hybrid systems offer an appealing logic by promising to reconcile competing behavioral demands. On the other hand, they risk perpetuating oversimplified assumptions that conflicting behaviors—such as individual initiative and collective cooperation—can be simultaneously and equally incentivized. The implication is not to abandon incentives, but to treat their design as inherently context-sensitive—dependent on the specific learning goals, task interdependence, and coordination needs within teams.

When collaboration, knowledge sharing, and accuracy are paramount, collective incentives may offer greater alignment. Conversely, when speed and individual initiative are critical, individual incentives might prove effective—though often at the expense of cooperation. Rather than relying on a simplistic "best of both worlds" approach, managers should consider complementing financial incentives with non-financial mechanisms, such as developmental appraisals, recognition for collaborative behaviors, and participative decision-making structures that promote psychological safety and mutual accountability. Through such layered systems, organizations may better support the dual demands of exploratory and exploitative learning—without assuming that any single incentive scheme can resolve their underlying tensions.

As for the opportunity-enhancing dimension, organizations should create bounded environments for experimentation—such as innovation sprints, prototyping labs, or cross-functional task forces—where improvisation is explicitly supported (e.g., agile practices; Junker et al., 2022). These settings allow teams to experiment, iterate, and adjust proactively in response to new demands. Because improvisation involves interpersonal risks, such as deviating from scripts or proposing uncertain ideas, it is essential that HRM systems also

reinforce psychological safety (Mansour et al., 2022). Practices such as peer evaluations that reward voice, and leader development programs that model openness, can send powerful signals that experimentation and dissent are not only acceptable but valued.

Lastly, our findings emphasize the importance of HRM systems that support both tacit and explicit knowledge sharing (e.g., intellectual capital-enhancing HR architecture; Pak et al., 2023). Tacit knowledge flows, facilitated through practices such as mentoring, shadowing, and job rotation, help build mutual understanding and intuitive coordination—conditions that enhance exploratory learning (Goffin & Koners, 2011). Explicit knowledge sharing, in contrast, is supported through documentation systems and formal onboarding, which enable consistency and process optimization, reinforcing exploitative learning (Liu et al., 2011). Encouraging both forms of knowledge sharing allows teams to combine collective memory with contextual responsiveness, reinforcing the dual contribution of improvisation to team learning. Taken together, these recommendations show how HR professionals can create systems that embed improvisation into everyday team functioning and help teams navigate competing demands in dynamic environments.

5.3 Limitations and Future Research

Our study has limitations that offer future research opportunities. First, the generalizability of our findings may be constrained by the research context. Our data are drawn from NPD teams within the Iranian pharmaceutical industry, which is considered to be a knowledge-intensive and resource-constrained industry with its own institutional and cultural specificities. While this setting offers valuable insights into HRM and learning processes under constraint, future research should examine whether our findings hold across other industries, organizational forms, and national contexts. Comparative studies in diverse institutional environments could further clarify the boundary conditions and external validity of our model (Meyer & Peng, 2016). Second, the cross-sectional nature of parts of our data limits our ability to make strong

causal claims. Although we employed a time-lagged, multi-source design to reduce common method bias, unmeasured confounding variables or reverse causality may still influence our results. Longitudinal studies and field experiments could help unpack the temporal dynamics by which HRM systems, improvisation, and knowledge sharing shape exploratory and exploitative learning within teams (Ployhart & Moliterno, 2011). Third, we measured team improvisation and knowledge sharing as aggregate team-level constructs, yet future research could examine how individual differences (e.g., cognitive flexibility, expertise diversity), leadership behaviors, or subgroup dynamics interact with HRM practices to influence team learning. Qualitative or mixed-methods approaches could also provide richer insights into how improvisational routines and knowledge flows emerge and evolve within teams. Fourth, our study focused on NPD teams, which are typically characterized by higher levels of autonomy, creativity, and task interdependence. Future work could extend our framework to more routinized or operational teams or explore sector-specific contingencies (such as regulation, technological turbulence, or digitalization) that might shape the relationship between HRM, improvisation, and learning outcomes. Finally, future research could build on our findings to explore interventions or HRM system redesigns that explicitly target the development of improvisational capability and differentiated knowledge sharing (c.f., Lee et al., 2019). Field-based experiments, action research, or longitudinal intervention studies could shed light on how to best foster these capabilities over time, and under what organizational conditions they are most valuable. Relatedly, although the system approach we have taken in this research is, indeed, relatively well regarded in the strategic HRM literature (Becker & Gerhart, 1996; Becker & Huselid, 1998), it has been contested by recent studies that raise concerns over the system effects or questions the internal fit premise (Chung & Pak, 2021; Kang et al., 2025). In this light, future endeavors are proposed to unveil specific linkages between component HR practices and organizational learning processes. In doing so,

a theoretical exposition could be refined (i.e., the why), informing, to a greater degree of sophistication, practitioners of targeted policy interventions (i.e., the how).

References

Abrantes, A. C. M., Passos, A. M., Cunha, M. P. e., & Santos, C. M. (2018). Bringing team improvisation to team adaptation: The combined role of shared temporal cognitions and team learning behaviors fostering team performance. Journal of Business Research, 84, 59-71.

Açıkgöz, A., Acikgoz, F., Günsel, A., & Latham, G. P. (2023). The relationship between imperfect information and performance speed: The mediation of improvisation in new product development teams. Technovation, 121, 102636.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Quarterly, 25(1), 107-136.

Ali, M. (2021). Imitation or innovation: To what extent do exploitative learning and exploratory learning foster imitation strategy and innovation strategy for sustained competitive advantage?. Technological Forecasting and Social Change, *165*, 120527.

Argote, L., & Miron-Spektor, E. (2011). Organizational learning: From experience to knowledge. Organization Science, 22(5), 1123-1137.

Audretsch, D. B., Belitski, M., Bui, H. T., & Herzig, M. (2023). Improvisation and innovation in teams: The jazz effect. British Journal of Management, 34(1), 150-170.

Bandura, A. (1977). Social Learning Theory. Oxford, England: Prentice-Hall.

Barnes, C. M., Hollenbeck, J. R., Jundt, D. K., DeRue, D. S., & Harmon, S. J. (2011). Mixing individual incentives and group incentives: Best of both worlds or social dilemma?. Journal of Management, *37*(6), 1611-1635.

Becker, B. A., & Gerhart, B. (1996). The impact of human resources management on organizational performance: progress and prospects. Academy of Management Journal 39(4), 779–801.

Becker, B. A., & Huselid, M. A. (1998). High performance work systems and firm performance: a synthesis of research and managerial implications. Research in Personnel and Human Resources Management, 16, 53-101.

Benner, M. J., & Tushman, M. L. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. Academy of Management Review, 28(2), 238-256.

Bernerth, J. B., & Aguinis, H. (2016). A critical review and best-practice recommendations for control variable usage. Personnel Psychology, *69*(1), 229-283.

Blumberg, M. & Pringle, C.D. (1982) The missing opportunity in organizational research: some implications for a theory of work performance. Academy of Management Review, 7, 560–569.

Boon, C., Jiang, K., & Eckardt, R. (2025). The role of time in strategic human resource management research: A review and research agenda. Journal of Management, *51*(1), 172-211.

Boon, C., Den Hartog, D. N., & Lepak, D. P. (2019). A systematic review of human resource management systems and their measurement. Journal of Management, *45*(6), 2498-2537.

Brislin, R. W. (1980). Translation and content analysis of oral and written materials. In H. C. Triandis & J. W. Berry (Eds.), Handbook of cross-cultural psychology (Vol. 2, pp. 389-444). Allyn & Bacon.

Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. Administrative Science Quarterly, 42(1), 1-34.

Brown, S. L., & Eisenhardt, K. M. (1998). Competing on the edge: Strategy as structured chaos. Harvard Business School Press.

Budhwar, P., Wood, G., Chowdhury, S., Aguinis, H., Breslin, D., Collings, D. G., ... & Suddaby, R. (2024). Articulating scholarship in human resource management: Guidance for researchers. Human Resource Management Journal, 34(3), 830-863.

Budhwar, P., & Debrah, Y. A. (2009). Future research on human resource management systems in Asia. Asia Pacific Journal of Management, *26*, 197-218.

Cai, L.L., Xiao, Z.R., & Ji, X.F. (2023). Impact of supervisor developmental feedback on employee innovative behavior: Roles of psychological safety and face orientation Journal of Managerial Psychology, 38(1), 73-87.

Carmeli, A., Levi, A., & Peccei, R. (2021). Resilience and creative problem-solving capacities in project teams: A relational view. International Journal of Project Management, 39(5), 546-556.

Caniëls, M. C., Neghina, C., & Schaetsaert, N. (2017). Ambidexterity of employees: The role of empowerment and knowledge sharing. Journal of Knowledge Management, 21(5), 1098-1119.

Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision-making. In N. J. Castellan (Ed.), Individual and group decision making: Current issues (pp. 221-246). Lawrence Erlbaum.

Cabrera, E. F., & Cabrera, A. (2005). Fostering knowledge sharing through people management practices. *The international journal of human resource management*, *16*(5), 720-735.

Chuang, A., Jackson, S. E., & Jiang, Y. (2016). Can knowledge-intensive teamwork be managed? Examining the roles of HRM systems, leadership, and tacit knowledge. Journal of Management, 42(2), 524-554.

Chung, G.H., & Pak, J (2021). Is there internal fit among ability-, motivation-, and opportunity-enhancing HR practices? Evidence from South Korea. Review of Managerial Science, 15, 2049-2074.

Ciuchta, M. P., O'Toole, J., & Miner, A. S. (2021). The organizational improvisation landscape: Taking stock and looking forward. Journal of Management, 47(1), 288-316.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128-152.

Combs, J., Liu, Y., Hall, A., & Ketchen, D. (2006). How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance. Personnel Psychology, 59(3), 501-528.

Collins, C. J., & Smith, K. G. (2006). Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. Academy of Management Journal, 49(3), 544-560.

Crossan, M., Cunha, M. P. E., Vera, D., & Cunha, J. (2005). Time and organizational improvisation. Academy of Management Review, 30(1), 129-145.

Cui, V., Ding, W. W., & Yanadori, Y. (2019). Exploration versus exploitation in technology firms: The role of compensation structure for R&D workforce. Research Policy, 48(6), 1534-1549.

Cunha, M. P., Gomes, E., Mellahi, K., Miner, A. S., & Rego, A. (2020). Strategic agility through improvisational capabilities: Implications for a paradox-sensitive HRM. Human Resource Management Review, 30(1), 100695.

Cunha, M. P., & Gomes, E. (2003). Order and disorder in product innovation models. Creativity and Innovation Management, 12(3), 174-187.

Edmondson, A. C., & Nembhard, I. M. (2009). Product development and learning in project teams: The challenges are the benefits. Journal of Product Innovation Management, 26(2), 123-138.

Edmondson, A. C., & Harvey, J. F. (2018). Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organizations. Human Resource Management Review, *28*(4), 347-360.

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. Psychological Methods, 12(1), 1-22.

Eisenberger, R., & Rhoades, L. (2001). Incremental effects of reward on creativity. Journal of Personality and Social Psychology, 81(4), 728-741.

Farzaneh, M., Wilden, R., Afshari, L., & Mehralian, G. (2022). Dynamic capabilities and innovation ambidexterity: The roles of intellectual capital and innovation orientation. Journal of Business Research, *148*, 47-59.

Fuller, J. B., Marler, L. E., & Hester, K. (2006). Promoting felt responsibility for constructive change and proactive behavior: Exploring aspects of an elaborated model of work design. Journal of Organizational Behavior, 27(8), 1089-1120.

Gerhart, B., & Rynes, S. (2003). Compensation: Theory, evidence, and strategic implications. Sage.

Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. Academy of Management Journal, 47(2), 209-226.

Gilson, L. L., Mathieu, J. E., Shalley, C. E., & Ruddy, T. M. (2005). Creativity and standardization: Complementary or conflicting drivers of team effectiveness? Academy of Management Journal, 48(3), 521-531.

Gilsing, V., & Nooteboom, B. (2006). Exploration and exploitation in innovation systems: The case of pharmaceutical biotechnology. Research Policy, 35(1), 1-23.

Gittell, J. H., Seidner, R., & Wimbush, J. (2010). A relational model of how high-performance work systems work. Organization Science, 21(2), 490-506.

Glynn, M. A. (1996). Innovative genius: A framework for relating individual and organizational intelligences to innovation. Academy of Management Review, 21, 1081-1111.

Goffin, K., & Koners, U. (2011). Tacit knowledge, lessons learnt, and new product development. Journal of Product Innovation Management, 28(2), 300-318.

Haas, M. R. (2010). The double-edged swords of autonomy and external knowledge: Analyzing team effectiveness in a multinational organization. Academy of Management Journal, 53(5), 989-1008.

He, Z. L., & Wong, P. K. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization science*, *15*(4), 481-494.

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (n)ever-changing world. Strategic Management Journal, 32(11), 1243-1250.

Homburg, C., Schyma (née Morguet), T. R., Hohenberg, S., Atefi, Y., & Ruhnau, R.-C. M. (2024). “Coopetition” in the presence of team and individual incentives: Evidence from the advice network of a sales organization. Journal of the Academy of Marketing Science, 52(2), 306-328.

Hong, Y., Liao, H., Raub, S., & Han, J. H. (2016). What it takes to get proactive: An integrative multilevel model of the antecedents of personal initiative. Journal of Applied Psychology, 101(5), 687.

Hu, L., & Randel, A. E. (2014). Knowledge sharing in teams: Social capital, extrinsic incentives, and team innovation. Group & Organization Management, 39(2), 213-243.

Hu, D., Oh, I. S., & Agolli, A. (2025). A Meta-Analysis of Employee HR Attributions and Their Relationships With Employee-Perceived High-Performance Work Systems and Employee Outcomes. Human Resource Management. In press.

Hunter, S. T., Cushenbery, L., & Friedrich, T. (2012). Hiring an innovative workforce: A necessary yet uniquely challenging endeavor. Human Resource Management Review, 22(4), 303-322.

IFDA. (2022). Iran medicine records. Iranian Food and Drug Administration. https://www.fda.gov.ir/

Jambekar, A. B., & Pelc, K. I. (2007). Improvisation model for team performance enhancement in a manufacturing environment. Team Performance Management, 13(7/8), 259-274.

James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. Journal of Applied Psychology, 69(1), 85-98.

Jansen, J. J. P., George, G., Van den Bosch, F. A. J., & Volberda, H. W. (2008). Senior team attributes and organizational ambidexterity: The moderating role of transformational leadership. Journal of Management Studies, 45(5), 982-1007.

Jansen, J. J., Kostopoulos, K. C., Mihalache, O. R., & Papalexandris, A. (2016). A socio-psychological perspective on team ambidexterity: The contingency role of supportive leadership behaviours. Journal of Management Studies, 53(6), 939-965.

Jiang, K., Lepak, D. P., Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. Academy of Management Journal, 55(6), 1264-1294.

Jiang, K., Takeuchi, R., & Lepak, D. P. (2013). Where do we go from here? New perspectives on the black box in strategic human resource management research. *Journal of Management Studies*, *50*(8), 1448-1480.

Jørgensen, F., & Becker, K. (2017). The role of HRM in facilitating team ambidexterity. Human Resource Management Journal, 27(2), 264-280.

Junker T. L., Bakker A. B., Gorgievski M. J., & Derks D. (2022). Agile work practices and employee proactivity: A multilevel study. Human Relations, 75(12), 2189-2217.

Kang, J., & Kim, S. J. (2020). Performance implications of incremental transition and discontinuous jump between exploration and exploitation. Strategic Management Journal, 41(6), 1083-1111.

Kang, S. C., & Snell, S. A. (2009). Intellectual capital architectures and ambidextrous learning: A framework for human resource management. Journal of Management Studies, 46(1), 65-92.

Kang, S., Han, J. H., Oh, I.-S., Van Iddekinge, C., & Li, J. (2025). Do human resource systems indeed have “system” effects? The dual internal fit model of a high-performance work system. Journal of Applied Psychology, 110(4), 575–597.

Kehoe, R. R., & Wright, P. M. (2013). The impact of high-performance human resource practices on employees’ attitudes and behaviors. Journal of Management, 39(2), 366-391.

Ko, W. W., & Liu, G. (2019). How information technology assimilation promotes exploratory and exploitative innovation in the small- and medium-sized firm context: The role of contextual ambidexterity and knowledge base. Journal of Product Innovation Management, 36(4), 442-466.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science, 3(3), 383-397.

Koryak, O., Lockett, A., Hayton, J., Nicolaou, N., & Mole, K. (2018). Disentangling the antecedents of ambidexterity: Exploration and exploitation. Research Policy, 47(2), 413-427.

Kostopoulos, K. C., & Bozionelos, N. (2011). Team exploratory and exploitative learning: Psychological safety, task conflict, and team performance. Group & Organization Management, 36(3), 385-415.

Kostopoulos, K. C., Bozionelos, N., & Syrigos, E. (2015). Ambidexterity and unit performance: Intellectual capital antecedents and cross-level moderating effects of human resource practices. Human Resource Management, *54*(S1), s111-s132.

Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and exploitation within and across organizations. Academy of Management Annals, 4(1), 109-155.

Lee, H. W., Pak, J., Kim, S., & Li, L. Z. (2019). Effects of human resource management systems on employee proactivity and group innovation. Journal of Management, 45(2), 819-846.

Lei, H., Khamkhoutlavong, M., & Le, P. B. (2021). Fostering exploitative and exploratory innovation through HRM practices and knowledge management capability: the moderating effect of knowledge-centered culture. *Journal of Knowledge Management*, *25*(8), 1926-1946.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. Strategic Management Journal, 14(S2), 95-112.

Levinthal, D., & Rerup, C. (2006). Crossing an apparent chasm: Bridging mindful and less-mindful perspectives on organizational learning. Organization Science, *17*(4), 502-513.

Li, N., Harris, T. B., Boswell, W. R., & Xie, Z. (2011). The role of organizational insiders' developmental feedback and proactive personality on newcomers' performance: An interactionist perspective. Journal of Applied Psychology, 96(6), 1317-1327.

Lin, C. H., & Sanders, K. (2017). HRM and innovation: A multi-level organisational learning perspective. Human Resource Management Journal, 27(2), 300-317.

Liu, Y., Keller, R. T., & Shih, H. A. (2011). The impact of team-member exchange, differentiation, team commitment, and knowledge sharing on R&D project team performance. R&D Management, 41(3), 274-287.

London, M., & Sessa, V. I. (2007). The development of group interaction patterns: How groups become adaptive, generative, and transformative learners. Human Resource Development Review, 6(4), 353-376.

Ma, Z., Long, L., Zhang, Y., Zhang, J., & Lam, C. K. (2017). Why do high-performance human resource practices matter for team creativity? The mediating role of collective efficacy and knowledge sharing. Asia Pacific Journal of Management, 34(3), 565-586.

Magni, M., Maruping, L. M., Hoegl, M., & Proserpio, L. (2013). Managing the unexpected across space: Improvisation, dispersion, and performance in NPD teams. Journal of Product Innovation Management, 30(5), 1009-1026.

Mansour, S., Nogues, S., & Tremblay, D. G. (2021). Psychosocial safety climate as a mediator between high-performance work practices and service recovery performance: An international study in the airline industry. The International Journal of Human Resource Management, 33(21), 4215-4250.

March, J. G. (1991). Exploration and exploitation in organizational learning. Organization Science, 2(1), 71-87.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. Journal of Applied Psychology, 85(2), 273-283.

Mathieu, J. E., & Taylor, S. R. (2007). A framework for testing meso-mediational relationships in Organizational Behavior. Journal of Organizational Behavior, 28(2), 141-172.

Meyer, K. E., & Peng, M. W. (2016). Theoretical foundations of emerging economy business research. Journal of International Business Studies, 47(1), 3–22.

Mehralian, G., Sheikhi, S., Zatzick, C., & Babapour, J. (2023). The dynamic capability view in exploring the relationship between high-performance work systems and innovation performance. The International Journal of Human Resource Management, 34(18), 3555-3584.

Miner, A. S., Bassoff, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. Administrative Science Quarterly, 46(2), 304-337.

Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. Academy of Management Journal, 42(4), 403-419.

Moorman, C., & Miner, A. S. (1998). Organizational improvisation and organizational memory. Academy of Management Review, 23(4), 698-723.

Mom, T. J., Chang, Y. Y., Cholakova, M., & Jansen, J. J. (2019). A multilevel integrated framework of firm HR practices, individual ambidexterity, and organizational ambidexterity. Journal of Management, 45(7), 3009-3034.

Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of Management*, 36(1), 5–39.

Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. Psychological Bulletin, 103(1), 27-43.

Nisula, A. M., & Kianto, A. (2016). The role of knowledge management practices in supporting employee capacity for improvisation. The International Journal of Human Resource Management, 27(17), 1920-1937.

Nonaka, I., & Takeuchi, H. (1995). The knowledge-creating company: How Japanese companies create the dynamics of innovation. Oxford University Press.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and leadership: A unified model of dynamic knowledge creation. Long Range Planning, 33(1), 5-34.

Nonaka, I., & Von Krogh, G. (2009). Perspective—Tacit knowledge and knowledge conversion: Controversy and advancement in organizational knowledge creation theory. Organization Science, *20*(3), 635-652.

Nyberg, A. J., Maltarich, M. A., Abdulsalam, D. D., Essman, S. M., & Cragun, O. (2018). Collective pay for performance: A cross-disciplinary review and meta-analysis. Journal of Management, *44*(6), 2433-2472.

Ostroff, C., & Bowen, D. E. (2016). Reflections on the 2014 decade award: is there strength in the construct of HR system strength?. Academy of Management Review, *41*(2), 196-214.

O'Reilly, C. A. III, & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. Academy of Management Perspectives, 27(4), 324-338.

Pak, J., Heidarian Ghaleh, H., & Mehralian, G. (2023). How does human resource management balance exploration and exploitation? The differential effects of intellectual capital-enhancing HR practices on ambidexterity and firm innovation. Human Resource Management, 62(4), 933-952.

Pak, J., & Kim, S. (2018). Team manager's implementation, high performance work systems intensity, and performance: a multilevel investigation. Journal of management, 44(7), 2690-2715.

Papalexandris, A. (2024). Unraveling the Relationship Between High-Performance Work Systems and Team Performance: The Contingent Role of Competitive Team Climate. Human Resource Management Journal. In press.

Patel, P. C., Messersmith, J. G., & Lepak, D. P. (2013). Walking the tightrope: An assessment of the relationship between high-performance work systems and organizational ambidexterity. Academy of Management Journal, 56(5), 1420-1442.

Pearsall, M. J., Christian, M. S., & Ellis, A. P. J. (2010). Motivating interdependent teams: Individual rewards, shared rewards, or something in between? Journal of Applied Psychology, 95(1), 183–191.

Ployhart, R. E., & Moliterno, T. P. (2011). Emergence of the human capital resource: A multilevel model. Academy of management review, 36(1), 127-150.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. Harvard Business Review, 68(3), 79-91.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. Psychological Methods, 15(3), 209-233.

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. Journal of Management, 34(3), 375-409.

Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organizational ambidexterity: Balancing exploitation and exploration for sustained performance. Organization Science, 20(4), 685-695.

Sethi, R., & Sethi, A. (2009). Can quality-oriented firms develop innovative new products? Journal of Product Innovation Management, 26(2), 206-221.

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? Journal of Management, 30(6), 933-958.

Shahzad, K., Hong, Y., Jiang, Y., & Niaz, H. (2023). Knowledge-intensive HRM systems and performance of knowledge-intensive teams: Mediating role of team knowledge processes. Group and Organization Management, 48(4), 1430-1466.

Schippers, M. C., West, M. A., & Dawson, J. F. (2015). Team reflexivity and innovation: The moderating role of team context. Journal of Management, 41(3), 769-788.

Schuler, R. S., & Jackson, S.E. (1987). Linking competitive strategies with human resource management practices, Academy of Management Executive, 1(3), 207-219.

Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of management Review*, *36*(2), 381-403.

Soo, C., Tian, A. W., Teo, S. T., & Cordery, J. (2017). Intellectual capital-enhancing HR, absorptive capacity, and innovation. Human Resource Management, 56(3), 431-454.

Stasser, G., & Birchmeier, Z. (2003). Group creativity and collective choice. In P. B. Paulus & B. A. Nijstad (Eds.), Group creativity: Innovation through collaboration (pp. 85-109). Oxford University Press.

Takeuchi, R., Chen, Z., & Lepak, D. P. (2009). Through the looking glass of a social system: Cross-level effects of high-performance work systems on employees' attitudes. Personnel Psychology, 62(1), 1-29.

Tempelaar, M. P., & Rosenkranz, N. A. (2019). Switching hats: The effect of role transition on individual ambidexterity. Journal of Management, 45(4), 1517-1539.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. Academy of Management Journal, 44(5), 996-1004.

Tummers, L., Kruyen, P. M., Vijverberg, D. M., & Voesenek, T. J. (2015). Connecting HRM and change management: The importance of proactivity and vitality. Journal of Organizational Change Management, 28(4), 627-640.

Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. California Management Review, 38(4), 8-30.

Van Der Vegt, G. S., & Bunderson, J. S. (2005). Learning and performance in multidisciplinary teams: The importance of collective team identification. Academy of Management Journal, *48*(3), 532-547.

Van Beurden, J., Van de Voorde, K., Van Veldhoven, M., & Jiang, K. (2025). Do managers and employees see eye to eye? A dyadic perspective on high-performance work practices and their impact on performance. Journal of Business Research, *190*, 115190.

Vera, D., & Crossan, M. (2004). Strategic leadership and organizational learning. Academy of Management Review, 29(2), 222-240.

Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. Organization Science, 16(3), 203-224.

Vera, D., Nemanich, L., Vélez-Castrillón, S., & Werner, S. (2016). Knowledge-based and contextual factors associated with R&D teams' improvisation capability. Journal of Management, 42(7), 1874-1903.

Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. Human Resource Management Review, 20(2), 115-131.

Wang, P., Chen, X., & Lawler, J. J. (2022). Unraveling the relationship between high-performance work systems and firm performance: A mediation analysis. Human Resource Management, 61(2), 181-197.

Wang, X. Y., Lyu, J. Q., & Cheng, D. J. (2023). Effects of high-performance work system on team ambidexterity in China: A dual path model based on emergence perspective. Asia Pacific Business Review, 29(1), 184-205.

Weick, K. E. (1995). Sensemaking in organizations. Thousands Oaks, CA: SAGE Publications

Winter, S. G. (2003). Understanding dynamic capabilities. Strategic Management Journal, 24(10), 991-995.

Wright, P. M., & Boswell, W. R. (2002). Desegregating HRM: A review and synthesis of micro and macro human resource management research. Journal of Management, 28(3), 247-276.

Wright, P. M., Dunford, B. B., & Snell, S. A. (2001). Human resources and the resource based view of the firm. Journal of Management, 27(6), 701-721.

Wright, P., & Nishii, L. 2013. Strategic HRM and organizational behaviour: Integrating multiple levels of analysis. In D. E. Guest, J. Paauwe, & P

Wong, S. S. (2004). Distal and local group learning: Performance trade-offs and tensions. Organization Science, 15(6), 645-656.

Wood, S., Leoni, S., & Ladley, D. (2023). Comparisons of the effects of individual and collective performance-related pay on performance: A review. Human Resource Management Review, 33(4), 1-23.

Xi, M., Chen, Y., & Jiang, K. (2025). All Roads Lead to Rome? A Contingent Configurational Perspective of HRM Systems and Organizational Effectiveness. Personnel Psychology.

Yao, J., Marescaux, E., Ma, L., & Storme, M. (2023). A contingency approach to HRM and firm innovation: The role of national cultures. Human Resource Management, 62(5), 685-699.

Zhao, D., Tang, N., Lim, V. K., & Hai, S. (2025). AMO-Enhancing HRMPs and Employee Well-Being Dimensions: A Three-Level Meta-Analysis. Asia Pacific Journal of Human Resources, 63(2), e70013.

Zacher, H., & Rosing, K. (2015). Ambidextrous leadership and team innovation. Leadership & Organization Development Journal, *36*(1), 54-68.

TABLE 1 Means, Standard deviation, and Correlations.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
Firm- level variables														
1. Firm age	26.41	15.42	-											
2. Firm size	417.35	182.32	.08	-										
3. Firm type (public, private)	1.12	0.28	.12*	.13*	-									
4. R&D unit size	23.5	14.5	.12*	.14*	.05	-								
5. R&D intensity	.03	.02	-.18*	.15*	.05	.25**	-							
Team-level variables														
6. Team size	4.60	1.19	.09	.13*	.07	.14*	0.05	-						
7. Change-oriented HRM systems	4.39	.71	-.08	.24**	.03	.09	.11	.06	-					
8. Team improvisation	3.76	.73	.03	.07	.06	.12*	.28**	.14**	.48**	-				
9. TTKS	3.56	.47	-.05	.11*	.05	.09	.13*	.07	.37**	.39**	-			
10. TEKS	3.81	.26	-.03	.08	.06	.09	.15**	.10	.40**	.36**	.29**	-		
11. Exploratory learning	3.88	.79	.06	.12	.04	.13*	.24**	.05	.36**	.48**	.42**	.26**	-	
12. Exploitative learning	3.92	.85	.04	.08	.06	.09	.21**	.09	.45**	.44**	.28**	.39**	.24**	-

Note. N = 205 teams in 75 firms. TTKS stands for team tacit knowledge sharing; TEKS stands for team explicit knowledge sharing. * $p < .05$, ** $p < .01$.

TABLE 2 Multilevel Results

Path	Estimate	SE	LLCI	ULCI
Top-down direct and indirect effects				
Change-oriented HRM → Team Improvisation	0.47	0.05	0.15	0.60
Team Improvisation → Exploratory learning	0.46	0.08	0.17	0.62
Change-oriented HRM → Team Improvisation → Exploratory learning	0.13	0.05	0.04	0.16
Team Improvisation → Exploitative learning	0.37	0.9	0.13	0.49
Change-oriented HRM → Team Improvisation → Exploitative learning	0.11	0.06	0.02	0.13
The moderating effect of TTKS				
TTKS → Exploratory learning	0.43	0.06	0.12	0.54
TTKS × Team Improvisation → Exploratory learning	0.12	0.04	0.05	0.19
TTKS × Team Improvisation → Exploitative learning	0.04	0.04	-0.02	0.11
The moderating effect of TEKS				
TEKS → Exploitative learning	0.45	0.08	0.15	0.59
TEKS × Team Improvisation → Exploitative learning	0.10	0.04	0.03	0.12
TTKS × Team Improvisation → Exploratory learning	0.02	0.04	-0.03	0.09

Note: n = 205 at the team-level, n = 75 at the firm-level. LLCI = lower level of the 95% confidence interval; ULCI = upper level of the 95% confidence interval; TTKS = team tacit knowledge sharing; TEKS = team explicit knowledge sharing. [a] Standardized estimates are reported. p = .000 for each estimate.

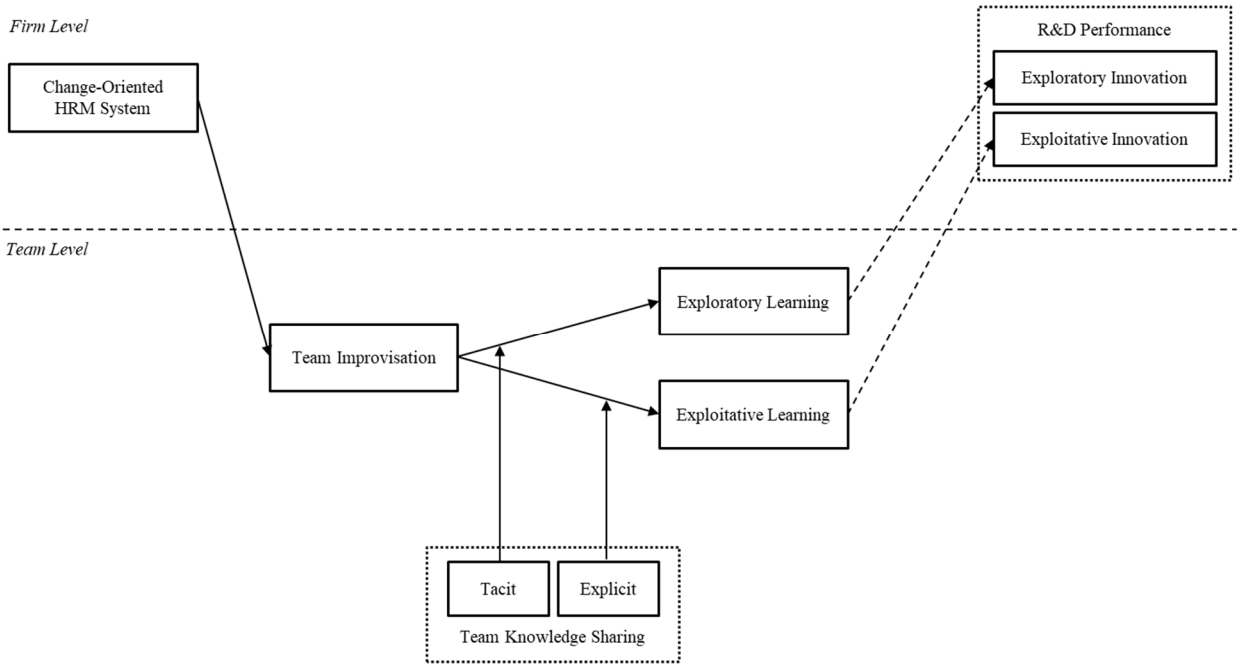

FIGURE 1 Research conceptual model.

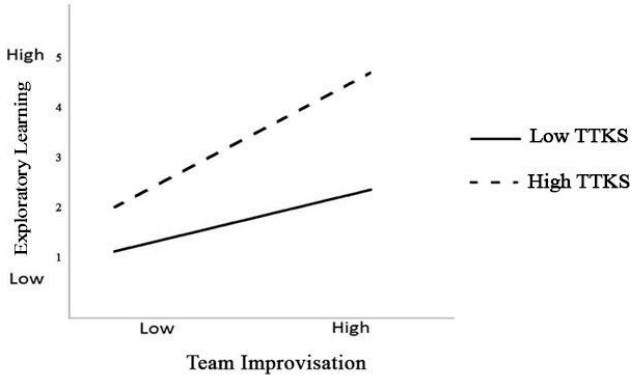

FIGURE 2 Interactive moderating effect of TTKS and team improvisation

***Note**:* TTKS stands for team tacit knowledge sharing.

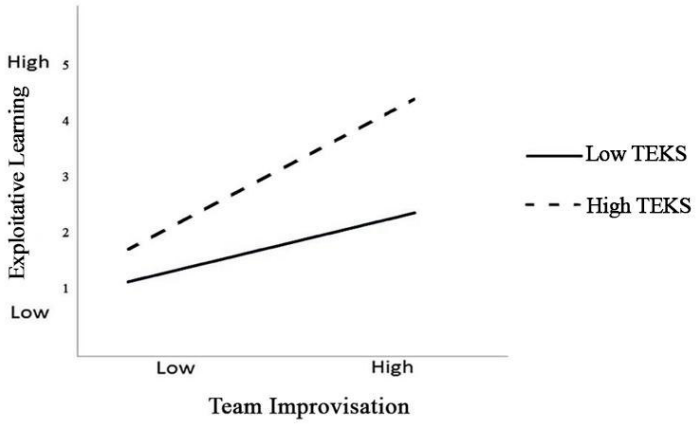

FIGURE 3 Interactive moderating effect of TEKS and team improvisation

***Note**:* TEKS stands for team explicit knowledge sharing.