

Influence High-Performance Work Systems and Knowledge Management Process on Open Innovation, The Mediator Effect Knowledge Worker Productivity

Khaled Adnan Bataineh

Department of Business Administration Irbid National University, Irbid, Jordan

Email: dr.khaled.adnan @inu.edu.jo

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i9/17924> DOI:10.6007/IJARBSS/v13-i9/17924

Published Date: 18 September 2023

Abstract

As the 21st century has begun, increased globalization and competitiveness have negatively affected closed innovation. With the rise of the digital economy and sharing economy, new ventures can no longer afford to depend solely on internal research and development innovation processes (Sahibzada et al., 2021; Shahzadi, 2021). There is a disappearance of enterprise boundaries, which requires enterprises to gain innovation capabilities from outside, hence the concept of open innovation. By implementing open innovation, new ventures are able to lower their research and development costs (Haar et al., 2021), reduce product development time (Aljanabi, 2022), achieve higher coordination among organizations, and generate more revenue (Zhu et al., 2019), as well as overcome existing lack of managerial or technical knowledge (Aleksić et al., 2021). Therefore, scholars and practitioners have recently shifted attention from traditional closed internal innovation to open innovation (Naseer et al., 2021). Open innovation refers to the deliberate use of inflows and outflows of knowledge and expansion of external markets for fostering innovation (Aljanabi, 2022; Chesbrough, 2003). Previously, studies have primarily examined open innovation's outcomes, while few have examined its antecedents. However, promoting and encouraging open innovation requires examining the driving factors of open innovation.

For this reason, in an attempt to clarify the possible effects of these factors, the study explores the effects of high-performance work systems (HPWS) on open innovation under the mediating effects of the knowledge management process (KMP). Furthermore, knowledge worker productivity (KWP) is also examined for its role in moderating the relationship between the constructs to gain a deeper understanding. There are many motives for the paper to contribute significantly to the theory of HPWS, knowledge management, and open innovation.

As one of various factors or antecedents that affect open innovation, A recent literature review emphasizes the importance of using an organization's human resources and

knowledge capital to continually improve open innovation (Aleksić et al., 2021). Effective human resource management practices are essential to realizing human resources' potential as engines for sustainable competitive advantages. Over the past three decades, management literature has advocated implementing best practices in human resources management. The practice is also referred to as "high-performance work practices" (Aleksić et al., 2021). The most commonly used term, high-performance work system (HPWS), can be referred to as "a set of HR practices that enhance the motivation, ability, and opportunities of members so they can contribute to the performance of the organization". HPWS consists of three distinct bundles (AMO) abilities; motivations; opportunities to participate) because this framework has been highly acknowledged by prior research, Particularly Aleksić et al (2021), the framework identifies the dimensions that are essential for maximizing employee performance, Employees may perform better when they are capable, and sufficiently motivated, as well as whenever they are given the opportunity to express themselves at work (Aleksić et al., 2021).

Based on HRM principles, HPWS motivates employees to gain considerable knowledge, produce high-quality work, and contribute significantly to the organization (Hwang et al., 2021). The purpose of HPWS is to increase the skill, knowledge, commitment, and involvement of employees by combining different human resources practices, processes, and work structures (Chong and Yuen, 2022). HPWS is the primary driver for firms to shape and develop employees' skills, attitudes, and behavior which help them to effectively perform their work, successfully innovate and achieve organizational goals (Chen and Huang, 2009; Lei et al., 2021). HPWS supports open innovation, through employees' active learning, and high performance by making them capable of learning and exchanging knowledge with external sources. Although there is a broad acknowledgment on the importance of HPWS towards the firm's outcomes such as performance, thriving at work, and productivity, little empirical research has tested the potential effects of HPWS practices on open innovation. In particular, Than (2022) indicated that knowledge of the possible differential influences of HPWS on of open innovation has not yet been sufficiently examined in previous works. Accordingly, this paper attempts to explore and increase the understanding of the relationship between HPWS and open innovation.

According to KBV, an organization's knowledge – valuable, unique, inimitable, unsubstitutable, and rare – is one of the most important strategic resources for maintaining competitive advantages (Boamah et al., 2022b; Felin and Hesterly, 2007). It is therefore possible for an organization to successfully achieve incremental and breakthrough solutions in responding to competitors' actions and market demands if its ability to create, disseminate, and manage knowledge is coupled with its ability to combine it with other resources. (Ferreira et al., 2020; Buenechea-Elberdin et al., 2018). Knowledge management emphasizes the circulation of inside and outside knowledge in the company, while open innovation is just breaking the barriers of organizational boundaries, which is beneficial to the circulation of knowledge. Previous literature has emphasized the critical and important role of Knowledge management in promoting open innovation (Ghasemaghahi and Calic, 2020; Mishra et al., 2019; Wamba et al., 2017) by enhancing and enabling a firm's ability to deliver innovative business models that did not exist previously (Erevelles et al., 2016) as well as to provide new insights into the needs and desires of customers and potential opportunities in new markets, thus reaching innovations that are more compatible with market requirements (Cao et al., 2022; Niebel et al., 2019). According to Capurro et al (2022), Knowledge management is an important organizational capability to acquisition data from the outside and turn it into

internal knowledge and an organizational routine that helps intensify collective efforts to achieve open innovation (Anderson et al., 2014). Despite the significance of KMP for open innovation, little attention is paid to examining the association between KMP and innovation, crucially, open innovation. Shehzad et al (2022), believe that the limited literature on KMP and open innovation needs to be expanded.

Sahibzada et al (2020) emphasize that KMP indirectly affects open innovation (Abubakar et al., 2019; Iqbal et al., 2019); a number of further variables reflect the influence of KMP on open innovation (Kianto et al., 2019; Shin et al., 2022, Butt et al., 2019). In recent decades, research on KBV has stressed the importance of knowledge workers' productivity for open innovation. The relationship between KWP and open innovation has generally been shown to be positive (Ahmed et al., 2021; Mnezafati et al., 2021; Anser et al., 2022). The rationale offered to explain this positive direct relationship is that firms must continuously ability to optimize knowledge work to achieve knowledge-based productivity, Hence ,this study examines" Does KWP mediator KMP impact on open innovation.

In this study, we examine the potential direct impact of HPWS on open innovation in practice. In addition, it examines their indirect effects through knowledge resources. This study aims to contribute several significant theoretical advances by providing practical support for these arguments. As a first step, this study seeks to extend the literature on HPWS by addressing the role of HPWS, since HPWS is a relatively new construct, and yet limited research has been conducted in the Jordanian context (Martinez-Sanchez and Vicente-Oliva, 2022). Moreover, despite the importance of HPWS, empirical research on HPWS still remains scarce (Haar et al., 2021). Furthermore, this study sheds light on how HPWS and open innovation are related. Literature has examined a variety of antecedents of open innovation, including leadership style Kianto et al (2021); institutional pressure Jiao et al (2021); information technology Jiao et al (2021a); dynamic capabilities Pundziene et al (2021); however, there has been no examination of how HPWS impacts open innovation. knowledge resources have not been examined as a mediating factor. To the best of my knowledge, for the first time, a study examines how KM process and KWP mediate the relationship between HPWS and open innovation. Additionally, such a study would introduce HPWS, KM, and open innovation into unexplored regions and cultures It is the Jordanian context

Literature Review and Hypothesis Development

Open Innovation

The first mention of open innovation can be found in Chesbrough (2003, p. 37) who defines it as "a paradigm which assumes that if firms want to advance their technology, they should use both internal and external ideas and paths to market". Increasingly, Business growth and performance are increasingly driven by open innovation. Open innovation can lead to a 59 percent higher rate of revenue growth for organizations than closed innovation (Lipp et al., 2022). This framework is a cognitive model for a firm's strategy that has the potential to generate a profitable outcome through innovation (Scuotto et al., 2017). In order to build robust collaborations with actors in their ecosystem, firms increasingly embed open innovation strategies into their organizations (Singh et al., 2021) Such collaborations are conducive to the movement of knowledge both externally and internally (Taghizadeh et al 2021). Open innovation involves integrating internal knowledge with external knowledge into an organization's organizational architecture and system, which are determined by its business model (Pundziene et al., 2022), The main idea of open innovation is to broaden the scope of innovation to include other businesses, entrepreneurs, research labs, etc (Aleksić et

al., 2021). Chesbrough (2017) Open innovation is classified into different types practices as inbound and outbound, ,The two types of open innovation are complementary, and aligning the two activities is conducive to the integrated innovation efforts of firms since open innovation is seen as a way of actively exploring opportunities to innovate both internally and externally (Hwang et al., 2021). With inbound open innovation, a company's knowledge base is enriched by looking beyond its own boundaries. Therefore, firms that engage in inbound open innovation are likely to reap benefits such as innovative ideas, knowledge combinations, and new market opportunities (Hwang et al., 2021), In contrast, open innovation originates from within the company and is exploited externally through patenting or contracting to gain monetary or nonmonetary benefits.

High-performance Work System

An HPWS is a set of HRM practices that are implemented by an organization, designed to enhance positive employee outcomes and advance and develop HRM (Bin Mahfodh and Obeidat, 2020). Mehralian et al (2021) define HPWS as “systems of human resource (HR) practices designed to enhance employees’ skills, commitment, and productivity”. Cao et al (2021) highlighted that HPWS enhances worker abilities, provides them with greater job autonomy and promotes motivation (Haar et al.,2021) . The components of the HPWS vary in different studies Haar et al (2021), Hence, Jiang et al (2012) developed a conceptual framework that supports the concept of high-performance practices as those that enhance abilities, motivations, and opportunities (AMO). This study also employed the AMO model for generating hypotheses, as previous research has highly praised it (Gemici Fu et al., 2013). HRM practices are viewed within this framework as interrelated bundles such that the inclusion of one practice often necessitates the inclusion of another (Gope et al., 2018). Accordingly, this framework pinpoints the elements that are essential to maximize worker performance Jiang et al (2012) simply because workforces perform better when they are capable of doing so (abilities); motivated from doing so (motivation), and encouraged to do so by the work environment (opportunities to participate) (Mehralian et al., 2021).

High-performance work system and open innovation

HPWS boosts staff effectiveness, ensuring that employees are effectively managed and motivated to contribute to innovation (Cao et al., 2021). From a learning perspective, Zheng et al (2020), HPWS can be used by employees to increase their capability to search and learn, allowing them to establish connections with external sources of knowledge. Consequently, open innovation is closely linked to HPWS. HPWS encourages collaboration and teamwork with employee participation to create a sense of synergy. Teamwork allows organizations to gain a better understanding of emerging trends and knowledge from outside the company, utilize one another's expertise and enhance the knowledge base of the company, as well as helping employees come up with new ideas and participate in decision-making processes (Haar et al., 2021). Information-sharing mechanisms that encourage communication and cooperation lead to increased innovation (Gemici and Zehir, 2021). HPWS increases employees' opportunities to learn from outside sources. A substantial degree of job security and opportunities for internal development motivate employees to contribute to the organization (Gemici and Zehir, 2021), as well as learning external information related to the organization. The training process, selection process, career development process, and pay determination process use detailed job descriptions, all of which aim at motivating and developing employees (Mehralian et al., 2021). By improving employees' motivation for

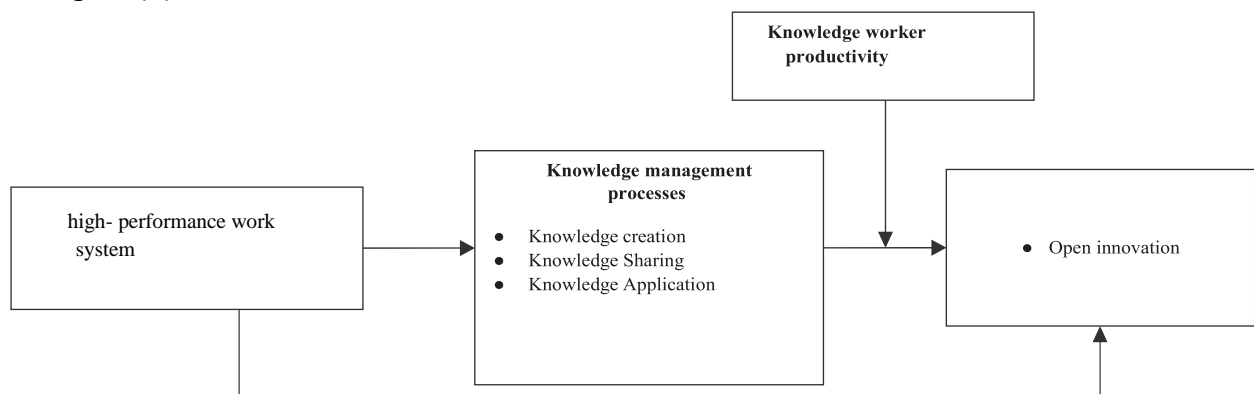
learning, these practices may increase the chances of employees interacting with external sources, thereby strengthening the bonds between employees and external sources. In order to ensure open innovation, it is essential to have skilled and knowledgeable employees. Therefore, HPWS creates an extensive competence pool through a variety of value-creating activities, including extensive training, carefully selected personnel, and reward systems based on knowledge and skills (Fu et al., 2013). A comprehensive training program helps employees become more adaptable to an increasingly competitive external environment and to the company's innovative efforts, by equipping them with the latest skills and knowledge. Similarly, carefully selected personnel, can recruit employees that possess the greatest knowledge and skills and are open to developing new products and services. Additionally, rewards based on knowledge and skill motivate employees to pursue innovative ideas while upgrading the organization's knowledge base and developing a diverse skill base. These practices, taken together, enhance an institution's ability to make use of existing knowledge while exploring and developing new information and capabilities (Jiao et al., 2021b). Finally, HPWS fosters the development of an enthusiastic and risk-taking mindset, as well as analytical and problem-solving skills that are necessary for open innovation. As a result, we hypothesize that (see figure. 1)

H1: HPWS is positively correlated with open innovation.

High-performance work system and knowledge management

It is recognized that knowledge is the most valuable resource for firms, as its efficient use is crucial for firms to survive and thrive under uncertain conditions Mennini et al (2022), KM is recognized as a system that fosters collaboration for capturing and sharing existing knowledge, facilitating the generation of new knowledge, and providing tools for its utilization, in order to achieve strategic goals, KM can be defined as the capture, storage, dissemination, exploitation and application of knowledge for the purpose of performance improvement (Al-Dmour et al., 2021; Mennini et al., 2022). Knowledge is shared among colleagues in an organization as it is created or captured. As a result, they apply it when the situation calls for it. According to more recent research on this subject, HR practices have been examined in a way that encourages organizations to create knowledge (Mennini et al., 2022), Innovation is based on knowledge. In the current turbulent and hostile environment, this is an important source of competitive advantage (Sahibzada et al., 2021a). In this sense, Scuotto et al (2017), stated that "HR systems should facilitate the acquisition of knowledge (or its creation), its integration, and its exploitation. Thus, HR systems themselves become strategic assets". Consequently, These new skills and knowledge should be developed through HR systems selected by organizations. Sahibzada et al (2021b) stated that , The role of HRM should be to foster knowledge sharing and organizational learning (via teamwork and internal networks, both explicit and tacit). Almeida et al.,(2021), found that some HR practices, such as teamwork and communities of practice, were positively associated with knowledge sharing since these practices increase trust and reinforce knowledge sharing.

Here Figure (1). Research model



HPWS are described by Chong et al (2022) The focus is on capability development (trained and skilled employees), motivation-enhancing practices (salary increases, career advancement, and group work), and opportunities-enhancing practices (engagement and collaboration), supporting knowledge creation, sharing, and application. HRM practices have been argued to be an important tool in the creation and development of new knowledge within organizations. Human resource management practices assist employees in absorbing, transferring, sharing and creating knowledge within organizations.

Aljanabi (2022), It has been shown that the individual practices of human resources are not influential on all knowledge management processes, however, when adopted collectively, these practices facilitate knowledge creation, sharing, and application. Ability-enhancing practice provides employees opportunities both internally and externally to cultivate their knowledge and skills (Than et al., 2021). Taking part in these programs motivates employees to share their expertise and knowledge, gaining new knowledge and implementing what they have learned in the workplace. Gope et al (2018, p. 650) established that HPWS “supports the KM capacity of organizations”, focusing particularly on knowledge creation and knowledge sharing. They noted that knowledge-intensive industries are more likely to benefit from this. More recently, Farooq Sahibzada et al (2021), found evidence supporting a connection between HRM practices and knowledge-processes behavior in SEMs. Finally, Shahzadi et al (2021), discovered, that the HR practices in a system have a significant and positive relationship with knowledge sharing, In HPWS, employees will be encouraged to create and share knowledge through teamwork, participation, training and performance appraisal systems geared towards development. As a result, they will be able to develop their own internal capabilities as well as create competitive advantage for their business (Singh et al., 2019). Therefore, the following hypothesis can be proposed

H2: HPWS is positively correlated with knowledge management process.

Knowledge management and open innovation

Open innovation needs KM process , As a matter of fact, companies must be capable of acquiring information from external sources, so that they may compensate for a lack of expertise internal to the company (Abualoush et al., 2022). The organization should be able to recognize what type of knowledge it needs from external sources, for example, new technological advances, new management practices, opportunities in the market, and new advances in manufacturing and processes, as well as the ability to acquire the necessary knowledge. In the view of scholars, the concept of knowledge creation relates to all of the

different ways in which organizations creation knowledge, and creation new knowledge in order to innovate (Qandah et al., 2021). The generation of knowledge relies on interactions between members of an organization, in the form of social networks. Without the support of management and an organizational culture that accepts and encourages new ideas, new knowledge cannot be developed (Al-Dmour et al., 2021). For Mota Veiga et al (2022), KM fosters the exchange of information that is essential for innovation, while enhancing open innovation performance in organizations via the creation of new insights and skills. KM, then, can be defined as a process of creation, sharing, integrating, and applying knowledge (MNezafati et al., 2021). Companies acquire knowledge in two ways, either through the creation of entirely new knowledge or the creation of new knowledge by collaboration among individuals and businesses.

For open innovation spillovers to take full effect, organizations must transform outside knowledge into valuable internal knowledge. The knowledge gained from a collaboration between companies – through technology sharing, employee mobility, and long-term relationships with suppliers, only contributes to open innovation when it is internalized, becoming business-specific skills (Jiao et al., 2021a). Thus, for Gold et al. (2001), applying spillover knowledge effectively can accelerate the development of new products, enhance their functionality, and make them more widely adopted, ultimately contributing to open innovation (Cao et al., 2021) we can suggest the following hypothesis

H3: Knowledge management is positively correlated with open innovation.

KM mediating between HPWS and open innovation.

According to Zheng et al (2020), HPWS enables organizations to develop an effective infrastructure and environment that facilitates workers' acquisition, assimilation, and sharing of knowledge, which leads to better innovation. Additionally, HR practices enhance workers' ability to come up with new ideas (Jiang et al., 2012). Similarly, Than et al (2021), Highlighted HPWS' contribution to developing a supportive culture for knowledge sharing, which can improve performance in firms. The importance of KM processes in organizations has been highlighted, and recent studies have used the AMO framework to explain how knowledge is formed and transferred within organizations (Mehraliaet al., 2021). In light of this premise, Jha (2021) asserted that organizations' ability to produce innovative outcomes is influenced by how much knowledge they have accumulated. Cao et al.,(2021), asserted that employees can utilize knowledge more effectively if they are capable of acquiring and assimilating the knowledge. On the other hand, Zheng et al (2021) pointed out that the concept of KM, a concept based on knowledge flows, is closely related to the concept of knowledge flows in open innovation. Accordingly, we hypothesise that knowledge flows have a positive impact on open innovation.

According to Jiang et al (2021) study, By getting more employees to seek out AMO, employees will be able to share their knowledge with others and this will benefit the organization as a whole. Therefore, employee knowledge sharing has a significant impact on the performance of the organization since employee knowledge, tacit as well as explicit. In addition, Researchers have found that knowledge sharing has a significant impact on team performance (Haar et al., 2021) as well as on firm performance (Gope et al.,2018). By implementing AMO practices, we propose that knowledge will be shared between employees, resulting in greater creativity and critical thinking among employees in project-based organizations. Therefore, we propose

H4: KM mediating between HPWS and open innovation

Knowledge worker mediating between KM and open innovation

Drucker first conceptualized the term knowledge worker (1969, p. 264), which refers to someone with knowledge and the ability to use that knowledge. A KWP is regarded as a highly qualified professional who combines theoretical and analytical skills in order to improve products or services (Shin et al., 2022; Veiga, et al., 2021). In the global economy, as more organizations automate work, more knowledge workers are in demand (Shin et al., 2022). KWP involves intellectual and cognitive activities that result in creating and applying new knowledge. KWP involves the creation, creation, use, and transmission of knowledge, rather than following standard work practices (Mennini et al., 2022). Research on KM has tended to focus on processes involving knowledge creation, sharing, and application. In an organization, knowledge is created and shared cyclically among colleagues. As needed, it is applied to specific situations (Gemici and Zehir, 2021). Upon learning new information, or creating new knowledge through the application of existing knowledge, knowledgeable individuals can then update, discuss then share this knowledge with others. In other words, KM processes aim to communicate knowledge between KWP at the appropriate time so they can perform their tasks effectively (Anser et al., 2022). Consequently, it is expected that the KM process will positively impact KWP (Ahmed et al., 2020). We can suggest the following hypothesis

H5: Knowledge management process is positively correlated with the knowledge worker productivity

Shujahat et al (2017), pointed out, KWP are crucial to the success of knowledge-based organizations today, just as manual workers were essential in the previous century. KWP is measured by their ability to create innovative knowledge in a timely manner (Butt et al., 2019), as well as the promotion of open innovation. Consequently, KWP refers to utilizing knowledge by highly creative and talented employees to innovate continually. We can suggest the following hypothesis

H6: knowledge worker mediating between KM and open innovation.

Methodology**Sample and Procedure**

The paper used the survey method based on using questionnaires to collect data. To select participants, the study was applied to small and medium companies in Jordan (SEMs), where most of the companies are in Jordan, and the study was applied to about 70 companies, listed on the Amman Stock Exchange, it was possible to communicate with them and apply the study for research purposes, respondents to our study need to be key members of management teams or administration department heads, As well as frequently exchanging strategic information within their organization, R&D, accounting, operations, marketing, and sales must have a thorough understanding of their firm (Al-Smadi et al., 2020).

Demographic Variables

The current survey includes 6.4% male and 39.6% female employees. With years of experience, 61.2% of participants were between the ages of 21 and 30. 35.4% of the contributors were only 5 years old. 30.9% were between the ages of 5 and 10 and the rest were over the age of 10. At the education level, 64.4% of participants have a bachelor's degree. 18.0% have a high school diploma or less. 17.6% have a graduate degree. Finally,

61.2% of the participants worked at a lower management level. 28.3% for middle management. 5.0% for top management.

Relationship Chart

revealing the bond and guide of specified variable has multiple links with both categories as shown in Figure 2.

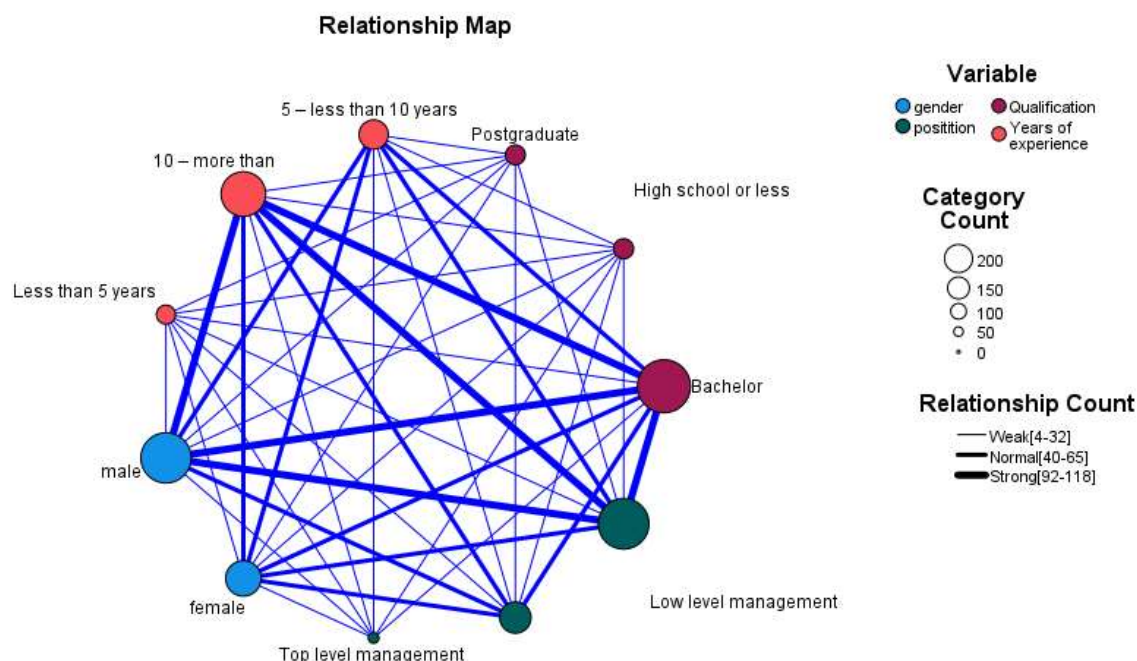


Fig. 2: Relationship chart for demographics information
Source: IBM SPSS statistics 28 relationship map (2020)

Data analysis and Results

Assessment of the measurement model

We used the casual productive Prophetic Structural Equation Modeling (SEM) fashion of the SmartPLS 3 Software to estimate and estimate the direct and commerce connections between the variables under disquisition. This fashion is also known as the Partial least Squares Structural Equation Modeling (PLS-SEM). Covariance grounded SEM (CB – SEM) works with the query of supported factor scores Hair et al (2019) friction – grounded SEM, or PLS-SEM uses supported fixed idle scores and strives to optimize prognostications of endogenous structures rather than model fit (Hair et al., 2019). PLS-SEM can handle complex structural model quadratic models and small sample sizes and isn't strict about data normalcy. PLS-SEM advocates a prophetic-centric gospel that allows experimenters to assess the prophetic quality of results Henseler et al (2015) Figure 1 shows the external cargo of the scale element, the beta estimate of the internal model, and R² inside the blue circle. Figure 3 shows the significant position of each scale item in the external model and the significant position of the connection between the variables in the internal model.

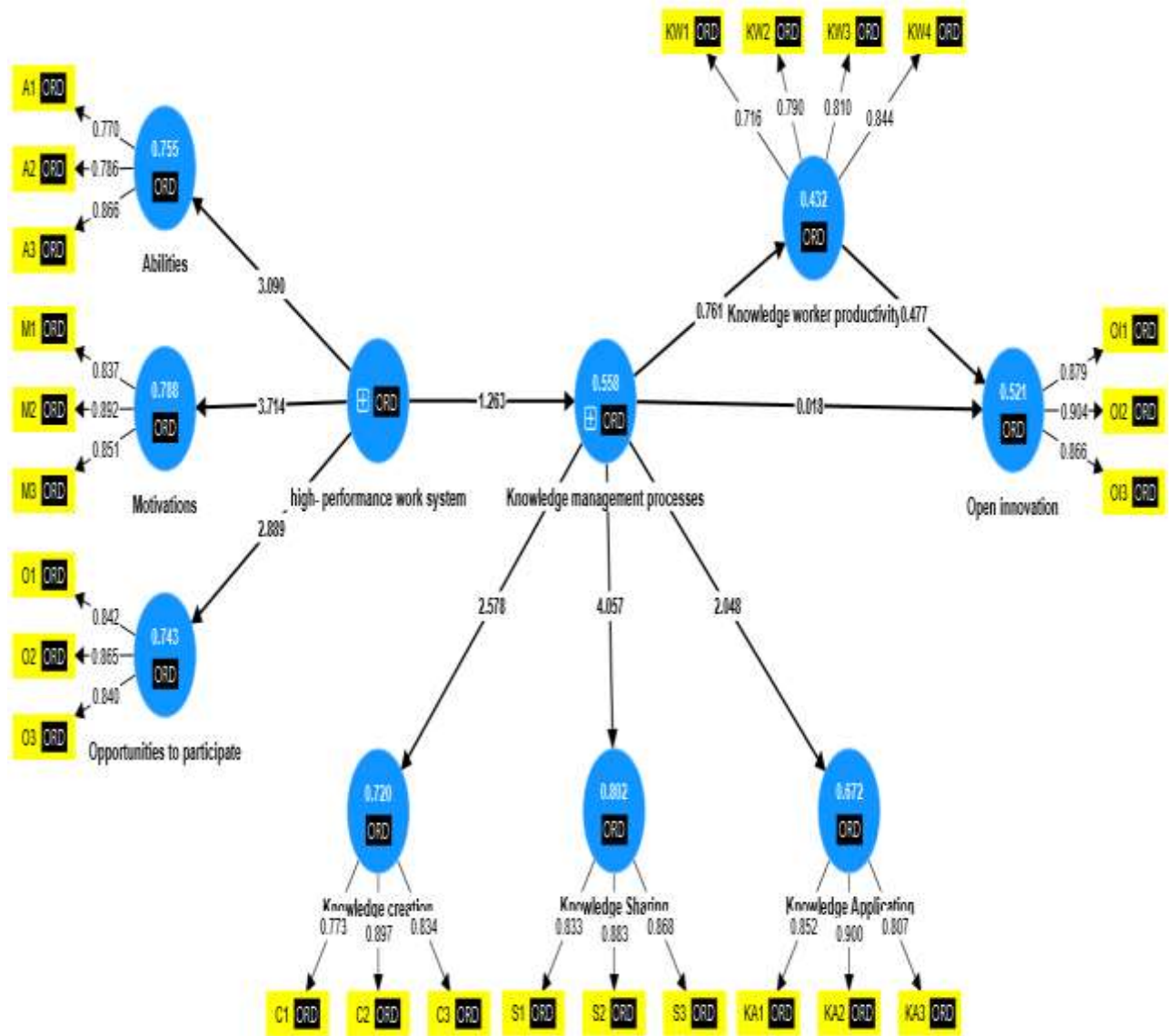


Figure 3: Measurement model estimates (R^2), (f^2)

Source: IBM SPSS statistics (2020)

Utmost of the external model loads shown in Figure 1 is above the 0.7 thresholds, with each t – value being Cronbach’s nascent (α) > 0.70, combined trustability (CR) > 0.70, Table 1 shows the values for mean excerpt friction (Adieu) > 0.50. In addition, Table 1 shows that the Fornell- Larcker criteria were met because the Adieu forecourt of each variable was lesser than the cross-correlation.

Table 1

Reliability, validity, CR, AVE

Instruments	α	CR	AVE	R ²
Abilities	0.734	0.849	0.654	
Knowledge Application	0.813	0.890	0.729	
Knowledge Sharing	0.826	0.896	0.743	
Knowledge creation	0.784	0.874	0.699	
Knowledge management processes	0.888	0.910	0.529	0.558
Knowledge worker productivity	0.800	0.870	0.626	0.432
Motivations	0.824	0.895	0.740	
Open innovation	0.859	0.914	0.780	0.521
Opportunities to participate	0.807	0.886	0.721	
high- performance work system	0.891	0.912	0.537	

Source: IBM SPSS statistics (2020)

Table 2

Discriminant validity

Instruments	1	2	3	4	5	6	7	8	9	10
	0.80									
1. Abilities	8									
	0.57	0.85								
2. Knowledge Application	2	4								
	0.52	0.60	0.86							
3. Knowledge Sharing	8	2	2							
	0.52	0.50	0.67	0.83						
4. Knowledge creation	2	8	8	6						
5. Knowledge management processes	0.63	0.82	0.89	0.84	0.72					
	2	0	6	9	8					
6. Knowledge worker productivity	0.53	0.58	0.55	0.54	0.65	0.79				
	7	9	5	2	7	1				
7. Motivations	0.68	0.54	0.52	0.53	0.62	0.51	0.86			
	0	2	5	5	4	9	0			
8. Open innovation	0.43	0.42	0.46	0.50	0.54	0.71	0.46	0.88		
	3	6	2	2	1	6	0	3		
9. Opportunities to participate	0.62	0.54	0.59	0.66	0.69	0.54	0.62	0.46	0.84	
	1	0	4	0	8	5	9	4	9	
10 high-performance work system	0.86	0.63	0.63	0.65	0.74	0.61	0.88	0.51	0.73	0.86
	9	1	0	8	7	1	8	9	3	2

Note: Square root of AVE in bold

Source: IBM SPSS statistics (2020)

In the former section, the trustability and validity of the model were determined. Table 3 shows the estimation factors of the structural model. The observed direct impact of high-performance work system (HPWS) on open invention is positive and significant ($\beta = .408$, $\rho = .000$). The direct impact of HPWS on the knowledge management process is positive and important ($\beta = .753$, $\rho = .000$). The direct impact of information operation processes on open invention is positive and important ($\beta = .542$, $\rho = .000$). The mitigation effect of the knowledge operation process on the relationship between HPWS and open invention was positive and significant ($\beta = .039$, $\rho = .048$). The mitigation effect of data workers on the association between knowledge operation processes and open invention was positive and significant ($\beta = 0.418$, $\rho = 0.000$). See Table 3. The friction described in the R² model is 0.521, which

translates to 49.8 for open invention in Table 1. The R² of our study showed a large effect. It makes sense to estimate the effect size f² to assess whether statistically significant goods are also virtually applicable. According to Cohen (1988) and Müller, Schuberth, and Henseler (2018).

Table 3
Direct Effects

Relationships	β	T	ρ	LO	UP	Decision
Knowledge management processes -> Knowledge worker productivity	0.659	15.908	0.000	-	-	Accepted
Knowledge management processes -> Open innovation	0.542	10.161	0.000	-	-	Accepted
Knowledge worker productivity -> Open innovation	0.634	10.473	0.000	-	-	Accepted
high- performance work system -> Knowledge management processes	0.753	28.409	0.000	-	-	Accepted
high- performance work system -> Knowledge worker productivity	0.496	12.437	0.000	-	-	Accepted
high- performance work system -> Open innovation	0.408	8.901	0.000	-	-	Accepted
Interaction effect						
Knowledge management processes -> Knowledge worker productivity -> Open innovation	0.418	8.751	0.000	0.325	0.513	Accepted
High-performance work system -> Knowledge management processes -> Knowledge worker productivity	0.496	12.437	0.000	0.410	0.569	Accepted
high- performance work system -> Knowledge management processes -> Knowledge worker productivity -> Open innovation	0.315	7.862	0.000	0.238	0.396	Accepted
high- performance work system -> Knowledge management processes -> Open innovation	0.093	1.922	0.048	0.004	0.191	Accepted

Note: β , beta value; ρ , p-value; T, T-value

Source: IBM SPSS statistics (2020)

See Table 3. The friction described in the R² model is 0.521, which translates to 49.8 for open invention in Table 1 Falk and Miller (1992) set a standard for R² values and claimed that the recommended minimal position was 0. Ten. The R² of our study showed a large effect. It makes sense to estimate the effect size f² to assess whether statistically significant goods are also virtually applicable. According to Cohen (1988); Müller et al (2015), values above 0.35, 0.15, and 0.02 are considered strong, moderate, and weak, independently. The f² value of the effect of all suppositions is meaningful. Thus, you'll find empirical support for all supposition.

Table 4

f square Direct effects

Relationships	f square (f^2)
Direct effects	
Knowledge worker productivity -> Open innovation	0.47
Knowledge management processes -> Open innovation	0.18
Knowledge management processes -> Knowledge worker productivity	0.76

Note: f^2 , effect size

Source: IBM SPSS statistics (2020)

Discussion

For companies in emerging countries, competition pressures and rapidly changing technologies and customer needs result in increasing levels of complexity and uncertainty (Cao et al., 2020). The competitive advantage of an organization is increasingly dependent on the success of knowledge management (Al-Smadi et al., 2023; Ahmed et al., 2022). A company's knowledge management and effectiveness are significantly influenced by its employees' motivation, willingness, and ability to create, apply, and share knowledge (Abualoush et al., 2018). An organization's KM process depends heavily on its employees, so enhancing KM activities through changing their attitudes and behaviors towards KM seems to be one of the most effective solutions (Abualoush et al., 2022). Following specific issues, the evaluation of the hypotheses in this paper has contributed significantly to both theoretical and practical initiatives regarding high-performance work systems, open innovation - intangible assets like KM and KWP.

Theoretical Implication

The literature presents that open innovation research is flourishing primarily because of its theoretical significance and practical importance. Nonetheless, for firms, the most challenging and crucial question in management and strategy fields remains the factors that support and nurture open innovation (Butt et al., 2019). According to Cao et al. (2021), a number of works have examined the link between HPWS and innovation, particularly open innovation. This link has not yet been fully explored in terms of causal mechanisms and insights. By developing a proposal research model, this study contributes to addressing these issues by examining the potential mechanisms that mediate KM process between open innovation and high-involvement HRM practices. As a result of this study, the mediating effect of KM was verified and AMO practices were found to be an optimal choice for firms, particularly in developing countries such as Jordan, for fostering open innovation directly or indirectly through its influence on KM and KWP (Bin Mahfodh et al., 2020).

There is no doubt that HPWS have huge benefits and are important to innovation (Gemici and Zehir, 2019), however, there are very few studies investigating how HPWS can improve open innovation (Abualoush et al., 2022). Jiao et al (2021) stated that "several scholars proposed the relationship between HRM and KM capability based on the literature. However, stronger empirical confirmation is required." Moreover, according to Mota Veiga et al., (2022), "open innovation can be conceptualized as an HRM-related outcome, whereby HRM

practices exert their influence on open innovation, possibly through various mediators and depending on different boundary conditions.” Given such situations, establishing a theoretical link between HPWS and open innovation through the mediating of KM behaviors (Jiang et al., 2012), in this study, significant contributions are made to the theoretical development of a conceptual model that clearly explains the relationships among HPWS, knowledge resources and open innovation in an integrated model.

In order to cultivate creativity and innovation in a company, KM is viewed as a key resource (Prieto et al., 2012). Nevertheless, a limited number of empirical studies have examined the impact of KM processes and knowledge worker on open innovation (Pundziene et al., 2021). KM processes and open innovation relations are examined empirically in this study to bridge this research gap. Knowledge creation, sharing, and application all have positive effects on open innovation according to the empirical findings. Knowledge sharing, therefore, appears to be a more effective means of improving open innovation in firms. Particularly, the study found that open innovation is influenced by knowledge creation and application, but to a lesser extent than knowledge sharing (Bin Mahfodh et al., 2020). Based on Lei et al.'s (2019) findings, it demonstrates that KWP are major drivers of open innovation, helping companies move into existing markets and profit from emerging markets.

Practical Implication

First, prior studies that examine the relationship between HPWS and KM processes tended to focus on Western countries, overlooking the context of developing countries (Haar et al., 2021). This results in a lack of empirical evidence about the relationship between HPWS practices and KM processes in developing countries like Jordan (Abualoush et al., 2018). As a result of this study's findings, we found that HPWS significantly impacted KM processes in developing countries based on empirical evidence. Additionally, this paper also provides insight into the relationships between specific models of AMO practices, KM processes, KWP, and open innovation. It implies that supporting and encouraging open innovation is crucial. Organizations need to pay special attention to AMO practices, as well as other appropriate supports, to foster employee willingness and engagement to share implicit knowledge (experience, expertise, uncommon insights and understandings, etc.) as well as explicit knowledge (such as official reports, policies, and procedures, handbooks, and formal documents). Essentially, the paper argues that managers need to recognize the value of KM processes in facilitating the link between HPWS and open innovation. It is important that they apply HPWS practices in their organizations to improve employees' KM and open innovation, including assessing how well candidates cooperate and work as a team during the recruitment process; focusing on building teamwork and interpersonal relationships during training; promoting employees within the company; and assessing employees according to their ability to work with others (Kianto et al., 2019; Bekhet et al., 2017).

Second, in developing countries like Jordan, most organizations and businesses are SEMs (small- and medium-sized), and therefore do not have sufficient capital and resources, making it impossible to invest heavily in technology to increase open innovation capacities (Abualoush, 2022). Because these circumstances are more prevalent in developing countries, it is more important to examine factors that are less expensive and can positively influence open innovation (Shujahat et al., 2017). As a result of this study, it is evident that leaders and managers can use KM processes to foster innovation and build blocks for an organization's success in this knowledge-intensive era. According to prior research, competitive advantage and open innovation are largely determined by the quality of KWP within an organization and

the efficiency of KM processes (Sahibzada et al., 2021). Consequently, emphasizing HPW practices in the process of promoting employee knowledge may be the least costly and most effective strategy for Jordanian companies.

Limitation

The study was conducted in a specific research context, namely small and medium firms (SEMs) in Jordan. For validation of the findings and generalization of the research model of this study, future researchers could include organizations both within and outside Jordan. In spite of the fact that this is a cross-sectional study, common method variance has been minimized. A longitudinal research setting, however, may be used in the future. A qualitative study can be added to this quantitative study in the future. Other than the survey questionnaire used in this study, other research strategies include case studies, action research, experimentation, and grounded theory. This study's findings may be enhanced by additional research.

References

- Abualoush, S. H. (2022). The effect of absorptive capacity on innovation: the mediator role of human capital, telecommunications companies (Orange, Zain and Umnia) in Jordan. *International Journal of Business Information Systems*, 40(1), 39-59.
- Abualoush, S., Bataineh, K., & Alrowwad, A. A. (2018). The role of knowledge management process and intellectual capital as intermediary variables between knowledge management infrastructure and organization performance. *Interdisciplinary Journal of Information, Knowledge, and Management*, 13, 279.
- Al-Smadi, A. W., Al-Smadi, R. W., Al-Afeef, M. A., Al-Afeef, M. A. M., & Kalbouneh, N. Y. (2023). Consequences to the Stock Market Caused by Currency Fluctuations: Jordanian Evidence. *International Journal of Professional Business Review*, 8(4), e01275-e01275.
- Al-Smadi, R. W., Al-Smadi, A. W., & Ali, O. A. (2020). The Impacts of Sustainability Practices Disclosure on Financial Performance: Jordan Commercial Banks.. *TEST, Engineering & Management*, 83, 10218 - 10234
- Bekhet, H. A., Yasmin, T., & Al-Smadi, R. W. (2017). Dynamic linkages among financial development, economic growth, energy consumption, CO2 emissions and gross fixed capital formation patterns in Malaysia. *International Journal of Business and Globalisation*, 18(4), 493-523.
- Abualoush, S., Obeidat, A. M., Abusweilema, M. A., & Khasawneh, M. M. (2022). How does entrepreneurial leadership promote innovative work behaviour? Through mediating role of knowledge sharing and moderating role of person-job fit. *International Journal of Innovation Management*, 26(01), 2250011.
- Ahmed, Q., Sumbal, M. S., Akhtar, M. N., and Tariq, H. (2021), "Abusive supervision and the knowledge worker productivity: the mediating role of knowledge management processes", *Journal of Knowledge Management*, Vol. 25 No. 10, pp. 2506-2522.
- Al-Dmour, A., Zaidan, H., and Al Natour, A.R. (2021), "The impact knowledge management processes on business performance via the role of accounting information quality as a mediating factor", *VINE Journal of Information and Knowledge Management Systems*, Vol. ahead-of-print No. ahead-of-print.
- Aleksic, D., Ranguis, K., and Gomezel, S. A. (2021), "Microfoundations of SME open innovation: the role of help, knowledge sharing and hiding", *European Journal of Innovation Management*, Vol. ahead-of-print No.

- Aljanabi, A. R. A. (2022), "The role of innovation capability in the relationship between marketing capability and new product development: evidence from the telecommunication sector", *European Journal of Innovation Management*, Vol. 25 No. 1, pp. 73-94.
- Almeida, M. I. R. D., and Fischmann, A. A. (2021), "A model to analyze the knowledge management risks in open innovation: proposition and application with the case of GOL Airlines", *Journal of Knowledge Management*, Vol. 26 No. 3, pp. 681-721
- Anser, M. K., Yousaf, Z., Yasir, M., Sharif, M., Nasir, M. H., Rasheed, M. I., Waheed, J., Hussain, H., and Majid, A. (2022), "How to unleash innovative work behavior of SMEs' workers through knowledge sharing? Accessing functional flexibility as a mediator", *European Journal of Innovation Management*, Vol. 25 No. 1, pp. 233-248
- Bin Mahfodh, A. B. S., & Obeidat, A. M. (2020). Knowledge Sharing Tools and their Impact on Enhancing Organizational Performance. *Sciences*, 10(9), 91-112.
- Butt, M. A., Nawaz, F., Hussain, S. (2019) Individual knowledge management engagement, knowledge-worker productivity, and innovation performance in knowledge-based organizations: the implications for knowledge processes and knowledge-based systems. *Comput Math Organ Theory* 25, 336–356.
- Cao, T. T., Le, P. B., and Nguyen, N. T. M. (2021), "Impacts of high-involvement HRM practices on organizational innovation capability: the mediating mechanism of tacit and explicit knowledge sharing", *International Journal of Innovation Science*, Vol. ahead-of-print No. ahead-of-print
- Chesbrough, H. (2003), "The logic of open innovation: managing intellectual property", *California Management Review*, Vol. 45 No. 3, pp. 33-58
- Chesbrough, H. (2017), "The future of open innovation: the future of open innovation is more extensive, more collaborative, and more engaged with a wider variety of participants", *Research-Technology Management*, Vol. 60No. 1, pp. 35-38.
- Chong, C. W., & Yuen, Y. Y. (2022). The impacts of KM-centred strategies and practices on innovation: A survey study of R&D firms in Malaysia. *Interdisciplinary Journal of Information, Knowledge, and Management*, 17, 67-86.
- Drucker, P. F. (1969), *The Age of Discontinuity*, Butterworth-Heinemann, Oxford.
- Drucker, P. F. (1994), "The theory of the business", *Harvard Business Review*, Sept-Oct, Vol. 80, pp. 95-104.
- Drucker, P.F. (2002), "The discipline of innovation", *Harvard Business Review*, Vol. 80, pp. 95-104.
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.
- Sahibzada, U., Xu, Y., Afshan, G., and Khalid, R. (2021), "Knowledge-oriented leadership towards organizational performance: symmetrical and asymmetrical approach", *Business Process Management Journal*, Vol. 27 No. 6, pp. 1720-1746
- Fu, N., Flood, P. C., Bosak, J., Morris, T., and O'Regan, P. (2013), "Exploring the performance effect of HPWS on professional service supply chain management", *Supply Chain Management: An International Journal*, Vol. 18 No. 3, pp. 292-307
- Gemici, E., and Zehir, C. (2021), "High-performance work systems, learning orientation and innovativeness: the antecedent role of environmental turbulence", *European Journal of Innovation Management*, Vol. ahead-of-print No. ahead-of-print
- Gope, S., Elia, G., and Passiante, G. (2018), "The effect of HRM practices on knowledge management capacity: a comparative study in Indian IT industry", *Journal of Knowledge Management*, Vol. 22 No. 3, pp. 649-677.

- Gold, A. H., Malhotra, A., and Segars, A. H. (2001), "Knowledge management: an organisational capabilities perspective", *Journal of Management Information Systems*, Vol. 18 No. 1, pp. 185-214.
- Haar, J., Ghafoor, A., O'Kane, C., Daellenbach, U., Ruckstuhl, K., and Davenport, S. (2021), "High-performance work systems and manager creativity behaviours: what role do contextual factors play?", *Evidence-based HRM*, Vol. 9 No. 4, pp. 391-409
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2-24.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New challenges to international marketing* (pp. 277-319). Emerald Group Publishing Limited.
- Hwang, B.-N., Lai, Y.-P., and Wang, C. (2021), "Open innovation and organizational ambidexterity", *European Journal of Innovation Management*, Vol. ahead-of-print No. ahead-of-print.
- Jha, S. (2022), "Employee voice behavior: A moderated mediation analysis of high-performance work system", *International Journal of Productivity and Performance Management*, Vol. 71 No. 7, pp. 3100-3117.
- Jiang, K., Lepak, D. P., Hu, J., and Baer, J. C. (2012), "How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms", *Academy of Management Journal*, Vol. 55 No. 6, pp. 1264-1294.
- Jiao, H., Yang, J., and Cui, Y. (2021a), "Institutional pressure and open innovation: the moderating effect of digital knowledge and experience based knowledge", *Journal of Knowledge Management*, Vol. ahead-of-print No. ahead-of-print
- Jiao, H., Yang, J., Jiang, C., and Yu, J. (2021b), "Openness and technological innovation: the moderating effect of information technology adoption and political ties", *International Journal of Emerging Markets*, Vol. ahead-of-print No. ahead-of-print.
- Kianto, A., Shujahat, M., Hussain, S., Nawaz, F., and Ali, M. (2019), "The impact of knowledge management on knowledge worker productivity", *Baltic Journal of Management*, Vol. 14 No. 2, pp. 178-197
- Lipp, A., Marshall, A., and Dencik, J. (2022), "Open innovation: a growth powerhouse when integrated with dynamic digital technologies", *Strategy & Leadership*, Vol. 50 No. 1, pp. 32-39
- Martinez-Sanchez, A., and Vicente-Oliva, S. (2022), "Supporting agile innovation and knowledge by managing human resource flexibility", *International Journal of Innovation Science*, Vol. ahead-of-print No. ahead-of-print.
- Mehralian, G., Moradi, M., and Babapour, J. (2021), "How do high-performance work systems affect innovation performance? The organizational learning perspective", *Personnel Review*, Vol. ahead-of-print No. ahead-of-print
- Mennini, F. S., Magni, D., Daniele, L. M., and Favato, G. (2022), "Knowledge management in turbulent times: time-based scenario analysis of vaccinations against COVID-19", *Journal of Knowledge Management*, Vol. 26 No. 11, pp. 71-88
- Mnezafati, N., Razaghi, S., Moradi, H., Shokouhyar, S., and Jafari, S. (2021), "Promoting knowledge sharing performance in a knowledge management system: do knowledge

- workers' behavior patterns matter?", *VINE Journal of Information and Knowledge Management Systems*, Vol. ahead-of-print No. ahead-of-print.
- Prieto, I. M., & Santana, P. P. M. (2012). Building ambidexterity: The role of human resource practices in the performance of firms from Spain. *Human Resource Management*, 51(2), 189-211
- Pundziene, A., Nikou, S., and Bouwman, H. (2022), "The nexus between dynamic capabilities and competitive firm performance: the mediating role of open innovation", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 152-177
- Qandah, R., Suifan, T. S., Masa'deh, R., and Obeidat, B. Y. (2021), "The impact of knowledge management capabilities on innovation in entrepreneurial companies in Jordan", *International Journal of Organizational Analysis*, Vol. 29 No. 4, pp. 989-1014.
- Sahibzada, U. F., Latif, K. F., and Xu, Y. (2021)a, "Symmetric and asymmetric modeling of knowledge management enablers to knowledge management processes and knowledge worker productivity in higher education institutes", *Journal of Enterprise Information Management*, Vol. ahead-of-print No. ahead-of-print
- Sahibzada, U., Xu, Y., Afshan, G., and Khalid, R. (2021)b, "Knowledge-oriented leadership towards organizational performance: symmetrical and asymmetrical approach", *Business Process Management Journal*, Vol. 27 No. 6, pp. 1720-1746
- Scuotto, V., Del Giudice, M., Bresciani, S., and Meissner, D. (2017), "Knowledge-driven preferences in informal inbound open innovation modes. an explorative view on small to medium enterprises", *Journal of KnowledgeManagement*, Vol. 21 No. 3, pp. 640-655.
- Shahzadi, A., Li, S., Sahibzada, U. F., Malik, M., Khalid, R., and Afshan, G. (2021), "The dynamic relationship of knowledge management processes and project success: modeling the mediating role of knowledge worker satisfaction", *Business Process Management Journal*, Vol. 27 No. 6, pp. 1657-1676
- Wang, Z., Ren, S., and Meng, L. (2022), "High-performance work systems and thriving at work: the role of cognitive appraisal and servant leadership", *Personnel Review*, Vol. 51 No. 7, pp. 1749-1771
- Than, S. T., Le, P. B., Le, T. P., and Nguyen, D. T. N. (2022), "Stimulating product and process innovation through HRM practices: the mediating effect of knowledge management capability", *Evidence-based HRM*, Vol. ahead-of-print No. ahead-of-print
- Shin, M. M., Lee, J., and Chung, J.-H. (2022), "Knowledge workers' existential affirmation and innovativeness: a Kierkegaardian redescription of Drucker", *European Journal of Innovation Management*, Vol. 25 No. 2, pp. 390-412
- Shujahat, M., Sousa, M. J., Hussain, S., Nawaz, F., Wang, M., & Umer, M. (2017). Translating the impact of knowledge management processes into knowledge-based innovation: The neglected and mediating role of knowledge-worker productivity. *Journal of Business Research*. Volume 94, pp 442-450
- Singh, S. K., Gupta, S., Busso, D., and Kamboj, S. (2019), "Top management knowledge value, knowledge sharing practices, open innovation and organizational performance", *Journal of Business Research*.
- Taghizadeh, S. K., Nikbin, D., Alam, M. M. D., Rahman, S. A., and Nadarajah, G. (2021), "Technological capabilities, open innovation and perceived operational performance in SMEs: the moderating role of environmental dynamism", *Journal of Knowledge Management*, Vol. 25 No. 6, pp. 1486-1507
- Than, S. T., Le, P. B., and Le, T. T. (2021), "The impacts of high-commitment HRM practices on exploitative and exploratory innovation: the mediating role of knowledge

- sharing", VINE journal of Information and Knowledge Management Systems, Vol. ahead-of-print No
- Zheng, F., Jiao, H., Gu, J., Moon, H.-C., and Yin, W. (2021), "The impact of knowledge flows on asset specificity from the perspective of open innovation", Journal of Knowledge Management, Vol. 26 No. 3, pp. 548-573
- Zheng, J., Liu, H., and Zhou, J. (2020), "High-performance work systems and open innovation: moderating role of IT capability", Industrial Management & Data Systems, Vol. 120 No. 8, pp. 1441-1457
- Veiga, M. P., Fernandes, C., and Ambrosio, F. (2022), "Knowledge spillover, knowledge management and innovation of the Portuguese hotel industry in times of crisis", Journal of Hospitality and Tourism Insights, Vol. ahead-of-print No. ahead-of-print.