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Integrated e-learning for knowledge management and its impact on innovation performance among Jordanian manufacturing sector companies

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A B S T R A C T

E-learning in knowledge management was examined in this study, specifically on how it assists organizations in improving knowledge transfer and e-learning management, to increase performance and employee knowledge management. In this study, e-learning and knowledge management systems and technology were jointly implemented, and its impact on organizational performance was examined. Organizational management was also explored. The present study investigated the relationship between knowledge management (KM) and innovation performance (IP). The mediating effect of knowledge Management was deeply explored. Randomly selected managers from 57 Jordanian manufacturing companies were the study samples, and there were 470 managers involved in this study, from strategic, tactical, and operational levels. Questionnaires were used to gather data, and the questionnaire items covered the constructs of knowledge management, organizational learning (OL), knowledge-oriented leadership (KOL) and IP. A research model was proposed and was tested using structural equation modeling (SEM). The findings were as follows: KOL positively affected KM; KOL positively affected IP; OL negatively affected IP; KOL positively affected KM; OL positively affected KM; KM positively affected IP and KM mediated the relationship between KOL, OL and IP.

1. Introduction

E-learning, which was considered a radical concept about a decade ago, has become a vital component in the learning management system. In fact, organizations all over the world today consider e-learning a vital service, as can particularly be observed among higher education institutions. The World Wide Web has propelled the evolution of e-learning systems, leading to e-learning transformation as a whole. First introduced by New Stephen, e-learning is a resultant of the general trends in e-learning all combined, focusing on production of user content and interactive content access (Downes, 2005; Almajali et al., 2022b). Competitive pressures have obliged organizations to reevaluate their strategies and create their own competencies, and as a modern discipline of management, knowledge management (KM) has been greatly shaping the organizations' efforts in developing their products and services (Baxtere et al., 2009). KM essentially stresses the competency of organization in stimulating people to acquire and innovate novel knowledge and ideas to be applied in their decision making and to preserve the organization's competitive advantage (Karasneh & Al- Zoubi, 2018; Almajali & AL-Sous, 2021). Knowledge is now a prized asset and is vital for the sustainable competitive advantage of today's organizations (Nonaka et al., 2000). To this end, scholars of interest have been exploring the critical relationship between KM and organizational learning (OL) (Bagheri et al., 2015; Jiménez & Sanz, 2011; Liao & Wu, 2010).

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Notably, leadership entails a complex performance type which will only emerge following the occurrence of an event (Mumford, 2011). Equally, leadership is a multi-level and socially formed process (Gardner et al., 2010). It has been reported that the development of leadership style without guidance could lead to issues such as the lack of strategic communications and teamwork for performance development, and the lack of inclusive accountability to the learning practice and philosophy. As mentioned by Zacher and Rosing (2015) and Liao et al. (2017), leaders play an active role in bringing innovative ideas into the organization, aside from being the one who establishes the goals, and provides the support towards the innovation initiatives from subordinates. For these reasons, leadership style greatly affects corporate innovation.

Aureli et al. (2019) reported the importance of effective management of knowledge-based resources, especially among organizations that involve knowledge-intensive business processes like higher education institutions (HEIs). Paoloni et al. (2020) further added that effective management of knowledge-based resources in HEIs increases innovativeness and success, while facilitating HEIs in coping with the increased complexities of the educational environment, and also in expanding the economic growth by way of research and innovation. KM is thus vital in higher education (Rowley, 2000), and among scholars, there has been an increased interest towards the use of KM in the sector of education. Research in this domain has been carried out, but there are still gaps. According to Rehman and Iqbal (2020), HEIs possess knowledge-based resources that are highly complex. According to Fullwood and Rowley (2017), these resources must be effectively managed as they are integral for innovation performance. Somehow, KM systems in HEIs are still ineffectively managed, aside from being rather limited. Additionally, Ramjeavon and Rowley (2017) mentioned that much remains to be explored in this domain.

For employees, knowledge oriented leadership (KOL) improves learning through cognitive motivation, easier knowledge access, motivation towards knowledge expansion (Williams & Sullivan, 2011), reward for the sharing and use of knowledge, KM processes for employee mentoring, as well as mistakes acceptance (Sadler, 2003; Farrell & Coburn, 2017). In this regard, organizational learning (OL) is vital for both organizational performance and long-term effectiveness (Chadwick & Raver, 2015). In fact, scholars have been trying to understand why some organizations demonstrate superior learning capacities than others (Argote & Epple, 1990; Pisano et al., 2001). Accordingly, issues associated with OL practices like knowledge holding and knowledge transfer are increasingly important to both scholars and practitioners, especially because organizations have to lose employees through retirement, while also dealing with today's challenges involving new business structures and globalization. To this end, it would be valuable to empirically explore the elements facilitating the mechanisms of OL (Argote et al., 2011; Chadwick & Raver, 2015).

KM increases innovation performance and effectiveness. Chen and Huang (2009) indicated that the attributes of KOL improve the organization's KM. Through KM, organizations could increase their performance as KM promotes innovation performance. Grant (1996) relevantly introduced a model called knowledge-based model that comprises strategies that organizations could employ to successfully manage knowledge, to increase performance.

The link between KM and organizational learning (OL) and innovation performance (PI) within the context of developing countries has been explored in various studies. In a study by Bagheri et al. (2015) involving developed countries, knowledge was regarded as a crucial asset as it could stimulate organizational change and innovation. At present, developing countries are facing challenges in the knowledge application process. The same could be said for Jordan as a developing country, and it has been factored by the failure of Jordanian industries in meeting the needs of customers and in surviving the international industries. This was evidenced by the industry recession and the affluence of international industries. Another challenge facing Jordan was the use of traditional and less innovative procedures among its manufacturing companies. Still, in comparison to its neighboring countries, Jordan has strong human capital with innovative capacities, as evidenced by the country's expansive improvement of economic status.

In this study, a managerial tool grounded upon KM was established, to address the modern work environment in Jordanian industry. A theoretical model was proposed, and the relationship between KM and innovation performance was scrutinized. The mediating effect of OL on the said relationship was explored. This study would be of value to industry managers in Jordan as it would provide them insights in preparing their organizations to survive and compete in the global market. It is likely that the present study pioneers the exploration of the relationship between KM and innovation performance among manufacturing sector companies in Jordan particularly. Accordingly, reviews on past literature are presented in the following section. Next, hypothesis development is detailed. The employed research methodology is described as well, followed by the discussion on the data analyses. The last part of this paper discusses the study contributions, conclusions and recommendations for future research, in addition to the discussion of the study's theoretical and managerial implications.

2. Literature review and hypotheses

2.1 Knowledge management

KM has been found to improve the capabilities of organizations in sustaining their competitive advantage (Nonaka & Von Krogh, 2009). In this regard, many scholars have expanded Nonaka's work (see: Andone, 2009; Bryant, 2005; Hsu et al.,2007; Huang et al.,2007; Karasneh, 2002; Karasneh & Al-Khalili, 2009; Lopez-Nicolas &, 2010; Patton, 2001; Uotila, 2017) and reported that KM is made up of processes and activities of various kinds. The five key processes of KM as discussed in Karasneh (2002) are creation, adoption, adaptation, embodiment and evaluation, and the author mentioned that knowledge should be either internally generated or externally adopted from best-practice organizations. Either way, it is necessary that

knowledge is adapted based on the organization's specific context. Camis ón and Forés (2010) and Balle et al. (2019) described knowledge as a resource that is important in value creation and in the preservation of competitive advantages in a turbulent environment.

2.2 Knowledge management and innovation performance

In KM literature, innovation is a critical factor in value creation and in maintaining competitive advantage, especially in the business environment today that is very dynamic and complex (Bagheri et al., 2015). In this regard, organizational knowledge creation theory has been proposed by Nonaka and Von Krogh (2009) to establish a comprehensive view of knowledge with the capacity to identify creativity, learning, innovation, and change within an organization. Notably, innovation dissemination is affected by the organization's ability in generating, utilizing and disseminating knowledge (Nonaka & Takeuchi, 1995; almajali et al., 2022). The use of KM stimulates new knowledge creation and also organizational learning which becomes key in gaining innovation related benefits (Zack et al., 2009). Appositely, organizational innovation involves the adoption, adaptation and dissemination of new knowledge, resulting in new knowledge formation. KM and organizational innovation combined generates sustainable competitive advantage (Bashir & Farooq, 2019; Gloet & Terziovski 2004). In the model, innovation performance is the fourth variable in the relationship chain, whereby KM is theorized to increase innovation performance.

The connection between KM and innovation performance is elaborated in the following section. The application of KM has been reported to foster innovation (Lifang & Ziling, 2011; Budiarta, 2015). As such, being the key and a strategic resource in the knowledge economy, KM is expected to increase the success and competency of innovation of an organization (Xie et al., 2018). Therefore, the hypothesis below has been proposed:

H1: Knowledge management positively affects innovation performance.

2.3 Organizational learning and Knowledge management

Success and growth of any organization are achieved through knowledge and learning (Chen & Dahlman, 2006; Chadwick & Raver, 2015), and so, the conversion of individual knowledge (e.g., personal experience, and personal understanding, etc.) into organizational knowledge is a crucial step for any organization. However, as stated by Rechberg and Syed (2013), such conversion can be very challenging as the process is a complex one. Hence, many organizations have opted to utilize KM to ease the process. KM comprises an organization's dynamic activities and practices in the processing and manipulation of its knowledge resources to create new knowledge that is integral to the organization (Obeso et al., 2020). As opposed to OL, KM relates to knowledge assets creation and usage, whereas OL involves learning process management in the organization (Mishra & Bhaskar, 2011). Worded another way, knowledge is a resource in KM, while OL which focuses on process, places KM as its initial step (Ngah et al., 2016). The hypothesis below was hence proposed:

H2: Organizational learning positively affects knowledge management.

2.4 Organizational Learning and Innovation performance

Many studies have explored the topics of organizational learning and innovation (Jiménez & Valle, 2011; Nonaka & Takeuchi, 1995). In their study, Karasneh and Al-zoubi (2018) found that people employ the available knowledge and share it in their organization, resulting in the formation of new knowledge. In knowledge usage, among the determining factors include the ability of people to comprehend, learn, use and innovate new knowledge. Through OL, new knowledge can be developed, acquired, transformed as well as exploited, resulting in improved organizational innovation (Jiménez & Sanz, 2011). However, despite the conceptualization of the link between OL and innovation, empirical proofs on such a link remain scarce (Jiménez & Sanz, 2011). Also, the organization's innovative behavior factors and organizational learning appear to be linked (Dukeov et al., 2020). Therefore, this study proposed the hypothesis below:

H3: Organizational learning positively influences innovation performance.

2.5 Knowledge-oriented leadership and Innovation performance

Leadership and innovation can affect performance and organizational success significantly (Samad, 2012), and among scholars, there have been debates concerning the ability of innovation and leadership in increasing performance and in fostering previous development (Montes et al., 2005). The innovation literature has reported that leadership style is key in stimulating innovation performance (Gürlek & Çemberci, 2020). Hence, without a leader, innovation may not occur even with the availability of the resources needed (Zhang & Guo, 2019). As an example, the late Steve Job has been regarded as the main factor of creative performance of Apple Inc., owing to his inspiring knowledge leadership (Isaacson, 2012). Therefore, as proposed by Shariq et al. (2019), KOL is appropriate for innovation performance improvement. This study hence proposed the hypothesis below:

H4: Knowledge-oriented leadership positively influences innovation performance.

2.6 Knowledge-oriented leadership and Knowledge management

Studies have shown that leadership is key to knowledge infrastructure competences (Koohang et al., 2017). Also, leadership eases KM applications in various organizational environments, HEIs included (Iqbal et al., 2019). The development of KM is not solely the efforts of organizations, and knowledge-based activity fostered by organizational characteristics like leadership,

technology, and knowledge culture, may affect the long-term performance of KM initiatives. Knowledge sharing as a leadership value has been found crucial to knowledge processes (Elrehail et al., 2018). As such, this study proposed the hypothesis below:

H5: Knowledge-oriented leadership positively influences knowledge management.

2.7 Knowledge-oriented leadership, Knowledge management, Innovation performance

Various leadership styles in organizational environments have been studied, and various outcomes have been reported. Studies that examined transformational leadership (Carmeli et al., 2014; Zuraik & Kelly, 2019) have reported that this type of leadership increases employees' self-efficacy as it considers employees, and provides intellectual stimulation and inspirational motivation to them (the employees). Transformational leaders motivate employees to ask challenging questions, present challenges, and scrutinize innovative ideas and approaches. Studies on transactional leadership (Sethibe & Steyn, 2016) found that this type of leadership affects innovation positively, as this type of leadership values and rewards creative ideas.

Meanwhile, in HEIs as knowledge-intensive organizations, knowledge-oriented leadership (KOL) may have stronger linkage to innovation. Also, KOL increases communication with employees and rewards original ideas, and people in the organization are motivated to discover and utilize new knowledge (Donate & de Pablo, 2015), making KOL appropriate for HEIs. In this regard, knowledge-based transformational and transactional leadership would stimulate people's discovery, communication, and usage of new innovative ideas through improving the people's creative self-ability, affective accountability, and career commitment (Shamim et al., 2019). Hence, the present study proposed the hypothesis below:

H6. Knowledge management mediates the relationship between Knowledge-oriented leadership and Innovation performance.

2.8 Organizational learning, Knowledge management, Innovation performance

The market today embraces knowledge, making innovation and learning vital elements to the ability of organization in generating value. Accordingly, knowledge-based business leaders today are concerned with the development of human capital and organizational learning (Pasamar et al., 2019). Studies have reported that leadership behaviors are key antecedents to learning (Chang, 2016; Smith & Tushman, 2005), but the nature of this relationship is still unclear, as empirical supports are still limited (Vera & Crossan, 2004; Prasad & Junni, 2016). In knowledge-based economies, organizations' innovation performance could be increased through a blend of behaviors created specific to organization (Shamim et al., 2019). Ibidunni (2020) relevantly indicated that the development and learning opportunities of employees to enhance their skills and knowledge are crucial in increasing organizational performance. Furthermore, highly knowledgeable and skilled employees contribute to the development of sustainable and healthy workplaces with the ability to deal with the challenges of working life and society in general (Garavan & McGuire, 2010). Pertinently, theory of knowledge generation by Nonaka and Takeuchi (1995) shows that leadership that values and prioritizes knowledge greatly contributes in the organization's knowledge creation and innovation. As reported in various studies, KOL affects knowledge-oriented outcomes positively. In their study, Naqshbandi and Jasimuddin (2018) found that KOL increases the abilities of KM, while Shamim et al. (2019) found positive impact of KOL on KM and innovation and indicated that knowledge behavior is increased by KOL through the increase of emotional commitment, and job dedication. In this study, KOL was examined as an antecedent of LO, while KM was examined as an outcome of innovation performance. The suppositions are as follows: KOL creates suitable conditions for LO and KM; LO and KM could increase innovation performance through innovative products, and LO and KM become the bridge between knowledge-oriented leadership and innovation performance. This study thus proposed the hypothesis below:

H7. Knowledge management positively and significantly mediates the relationship between Organizational learning and innovation performance.

3. Research methodology

3.1. Research model

A study model was accordingly proposed in this study. The proposed relationships between the study variables (independent, dependent, and mediating) are accordingly illustrated in Fig. 1.

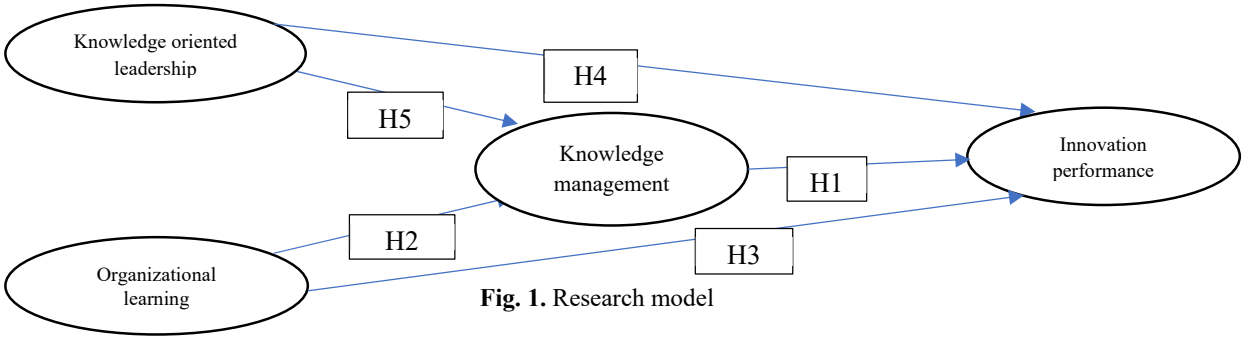

Fig. 1. Research model

3.2 Sample

Manufacturing sector was the study focus, as this sector was seen as appropriate for the applications and practices of KM (Corfield et al., 2013; Karasneh & Al-Zoubi, 2018). The study population comprised managers in strategic, tactical, and operational management levels in the ASE listed manufacturing companies involved in various businesses including food, pharmaceutical, chemical, food, petrochemicals, iron and steel. The managers were selected randomly.

3.3 Instruments

Survey questionnaire was the study's main tool for gathering the data. The questionnaire comprised two parts, whereby the first part contains items that gauge the respondents' demographic information (i.e., gender, education level, position, and years of experience), while the second part contains items that represent the study variables (i.e., Knowledge-oriented leadership, Organizational learning, Knowledge management, and Innovation performance).

The details of the second part of the questionnaire are as follows: Knowledge-oriented leadership was represented by 6 items based on Khawaja et al. (2021) and Donate, and Guadamillas (2011); Organizational learning was represented by 4 items based on Kale et al. (2000) and Soomro et al. (2021); Knowledge management was represented by 7 items; and Innovation performance was represented by 6 items based on Windrum (2008). All items in the second part of the questionnaire were equipped with a five-point Likert scale, with the scale of 1 denoting "strongly disagree" to the scale of 5 denoting "strongly agree."

Prior to the actual survey, the questionnaire was sent to four academic staff for finalization. Then, it was pre-tested involving 30 participants to ascertain its validity and reliability.

3.4 Procedure

The data gathering process involved 550 respondents and took place between May 2021 and February 2022. The questionnaire was emailed to the respondents and follow up was carried out from time to time. The researcher would contact the executives of the surveyed companies through WhatsApp to encourage participation from the respondents (managers of varied levels). In the end, 470 out of the 550 emailed questionnaires were completed and returned. Clearly, the response rate was high at 85%, and this could be attributed to the eagerness of the involved executives in tackling their problem. Accordingly, a non-response bias test was performed on the early and late respondents, and results showed non-response bias was insignificant.

3.5 Data analysis and results

Data obtained from the completed questionnaire were analyzed using the Statistical Package for Social Sciences (SPSS) program. The results showed the following: the majority were male at 60.2%; the respondents were 35.9 years old, on average; the respondents had 10.1 years of working experience, on average; and Masters' degree was the respondents' minimum qualification.

The impact of KOL and OL on IP, and the mediating impact of KM on the link between KOL, OL and IP among Jordanian manufacturing sector were examined. Structural equation modeling (SEM) was used. The initial specified model of this study was evaluated, and Table 1 shows the results of the various types of goodness of fit indices. Also, this study examined the standardized regression weights for the research indicators, and the results show a low loading of several indicators towards their latent variables as follows: KOL1 = 0.221, KM2 = 0.341, and IP2 = 0.422.

Meanwhile, the initial fit indices appeared to be moderately fit for the sample data, and so, they had to be excluded from further analysis for not achieving the loadings value of 0.50 as proposed by Newkirk and Lederer (2006). The measurement model was then altered to have appropriate fit, and the details are displayed in Table 1. For the final model, there was no change made to x^2/df and RMSEA. After the low factor loading items were eliminated, the new modified values were as follows: IFI = 0.83, TLI = 0.89, and CFI = 0.93. Hence, better data fit was achieved.

Table 1
Measurement model fit indices

Model	χ^2	Df	P	x^2/df	IFI	TLI	CFI	RMSEA
Initial Estimation	1121.111	436	0.00	2.57	0.73	0.71	0.72	0.109
Final model	447.422	233	0.00	1.92	0.83	0.89	0.93	0.07

4. Discussion

The present study empirically examined a causal chain model of knowledge management (KM) in relation to innovation performance, through KOL and OL. The path coefficient and t-value of each proposed path can accordingly be viewed in Table 2. The present study proposed and tested four hypotheses, and the results supported three of them.

Specifically, the results showed significant impact of KM on IP (P = 0.021), and so, H1 was supported. This is in agreement with the principals of knowledge-based theory (Grant, 1996), that KM will enhance innovation performance. It is also consistent with Chen and Huang (2009) and Santoro et al. (2018) who reported that KM improves innovation performance. Next, the results showed significant positive effect of OL on KM (P = 0.005), demonstrating support for H2. Hence, strong organizational learning will solidify KM implementation, and so, organizational learning is crucial in assuring the effective and efficient implementation of KM.

The results showed insignificant impact of OL on IP (P = 0.145), and therefore, H3 was not supported. As for H4 on the impact of KOL on innovation performance, the results showed significant positive effect of KOL (P = 0.027), and thus, H4 was supported. Shujahat et al. (2019) relevantly mentioned that consistent innovation allows organization to survive and maintain its success, and this is particularly relevant in the environment of business today that is highly volatile. Also, the results of H5 demonstrated the significant positive impact of KOL on knowledge management (P = 0.001), in line with Shamim and Abbasi (2012) who stated that KOL and KM behavior could be promoted via various HR tools.

The results showed a mediating impact of KM on the link between KOL, OL and IP. Hence, both H6 and H7 were supported. It was found that KOL affects innovativeness by way of KM behavior, which denotes the mediation of KM in this relationship. KOL was also shown to improve innovative performance even when KM behavior was not displayed by the employees, implying partial mediation of KM behavior. However, it was found that the impact of KOL on innovativeness comes mostly from KM behavior. The details are provided in Table 3. Relevantly, the mediation of KM on the relationship between OL and innovation performance has been reported in studies including Shipton et al. (2005), Farooq et al. (2016), Chen and Huang (2009), and Lopez-Cabrales et al. (2009). Thus, in achieving effective organization, HR should stimulate innovative behavior among employees through knowledge formation and transfer (Luiza, 2016).

Notably, past studies involving IP have been neglecting the core effect of KOL and OL on KM, leaving a gap in the literature. Hence, to address this problem, the interrelationships existing between these variables were explored in the present study.

Table 2
Summary of Proposed Results

Research's proposed paths	Coefficients value (std. estim)	t-value C.R	p-value	Empirical Evidence
P1: Knowledge management→innovation performance	0.155	4.111	0.021	Supported
P2: Organizational learning→ knowledge management	0.122	3.007	0.005	Supported
P3: Organizational learning→ innovation performance	0.506	4.101	0.145	Not Supported
P4: Knowledge oriented learning→innovation performance	0.407	3.228	0.027	Supported
P5: Knowledge oriented learning→knowledge management	0.311	3.651	0.001	Supported

Note. KM: Knowledge management; IP: Innovation performance; OL: Organizational performance; KOL: Knowledge-oriented learning

Table 3
Mediating Effect of knowledge management

Hypotheses	From	mediation	To	Direct effect	Indirect effect	Total effect	Mediating
H6	KOL	KM	IP	0.003	0.022	0.025	Supported
H7	OL	KM	IP	0.001	0.041	0.042	supported

5. Implication

The present study explored knowledge management as a mediator between knowledge-oriented leadership, organizational learning and innovation performance. This exploration adds to the literature of knowledge management in general. In fact, the present study may just be the pioneer in the exploration of such interrelations, particularly among developing countries like Jordan. As such, this study has sparked new interest among relevant scholars to further investigate KM in developing countries. In addition, this study is of value to managers as it provides understanding to managers of the value of organizational learning in the context of knowledge management. Learning is important to organizations in their achievement of innovation performance, as it facilitates them in gaining competitive advantage. Based on the study outcomes, the respondents did try to promote KM, but with inaccurate knowledge adaptation.

6. Conclusion, Limitations and Recommendations

Knowledge-based theory was employed in this study to establish a study model. Data were obtained from selected managers in selected manufacturing companies. The results of the study showed the positive impact of the following: KOL on KM; KOM on IP; OL on KM; and KM on IP. On the other hand, a negative impact was found of OL on OP. Meanwhile, KM was found to mediate the relationship between KOL and OL, and IP.

The value of knowledge management with organizational learning and innovation performance was explored in this study, involving 470 respondents as the study samples. The hypotheses were proposed and tested with structural equation modeling.

From the obtained results, the researcher concluded the possibility of improving innovation performance by way of knowledge management in organizational learning and knowledge oriented leadership.

References

Almajali, D., & AL-Sous, N. (2021). Antecedents of online shopping behavior amidst fear of Covid-19 Pandemic in Jordan: An Empirical study. *International Journal of Data and Network Science*, *5*(4), 837-846.

Almajali, D., Al-Okaily, M., Barakat, S., Al-Zegaier, H., & Dahalin, Z. M. (2022). Students' Perceptions of the Sustainability of Distance Learning Systems in the Post-COVID-19: A Qualitative Perspective. *Sustainability*, *14*(12), 7353.

Almajali, D., lfityani, A., Maali, H., & Almajali, H. (2022b). Critical success factors for assessing the effectiveness of E-CRM systems in online shopping: the mediating role of user satisfaction. *Uncertain Supply Chain Management*, *10*(3), 667-678.

Andone, II (2009) Measuring the performance of corporate knowledge management system. *Informatica Economica, 13*(4), 24–31.

Aranda, C., Arellano, J., & Davila, A. (2017). Organizational learning in target setting. *Academy of Management Journal*, *60*(3), 1189-1211.

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

Argote, L., Beckman, S. L., & Epple, D. (1990). The persistence and transfer of learning in industrial settings. *Management science*, *36*(2), 140-154.

Aureli, S., Giampaoli, D., Ciambotti, M. and Bontis, N. (2019), "Key factors that improve knowledge intensive business processes which lead to competitive advantage", *Business Process Management Journal, 25*(1), 126-143.

Bagheri, R., Hamidizadeh, M., & Sabbagh, P. (2015). The mediator role of KM process for creative organizational learning case study: Knowledge based companies. *VINE, 45*(3), 420-445. https://doi.org/10.1108/VINE-06-2014-0039

Balle, A. R., Steffen, M. O., Curado, C., & Oliveira, M. (2019). Interorganizational knowledge sharing in a science and technology park: the use of knowledge sharing mechanisms. *Journal of Knowledge Management*.

Bashir, M., & Farooq, R. (2019). The synergetic effect of knowledge management and business model innovation on firm competence: A systematic review. International Journal of Innovation Science, Preprint, https://doi.org/10.1108/IJIS-10-2018-0103.

Baxter, D., Roy, R., Doultsinou, A., Gao, J., & Kalta, M. (2009). A knowledge management framework to support product-service systems design. *International Journal of Computer Integrated Manufacturing, 22*(12), 1073- 1088. https://doi.org/10.1080/09511920903207464.

Bryant, S. E. (2005). The impact of peer mentoring on organizational knowledge creation and sharing: An empirical study in a software firm. *Group & Organization Management, 30*(3), 319–338. https://doi.org/10.1177/1059601103258439.

Budiarta, K. (2015). The role of knowledge management, human capital, and innovative strategy toward the higher education institution's performance in Indonesia. In *Information and Knowledge Management, 5*(5), 14-20 .

Camisón, C., & Forés, B. (2010). Knowledge absorptive capacity: New insights for its conceptualization and measurement. *Journal of Business Research*, *63*(7), 707-715.

Carmeli, A., Sheaffer, Z., Binyamin, G., Reiter-Palmon, R., & Shimoni, T. (2014). Transformational leadership and creative problem-solving: The mediating role of psychological safety and reflexivity. *The Journal of Creative Behavior*, *48*(2), 115-135.

Chadwick, I. & Raver, J. (2015). Motivating organizations to learn: Goal orientation and its influence on organizational learning. *Journal of Management, 41*(3), 957– 986.

Chang, A. , Hung, A., Cheung, W., Lee, C., Chan, S., Philips, H., ... & Ng, T. (2016). Comparison of planning quality and efficiency between conventional and knowledge-based algorithms in nasopharyngeal cancer patients using intensity modulated radiation therapy. *International Journal of Radiation Oncology* Biology* Physics*, *95*(3), 981-990.

Chen, C., & Huang, W. (2009). Strategic human resource practices and innovation performance – the mediating role of knowledge management capacity. *Journal of Business Research, 62* (1), 104-114.

Chen, J., & Huang, W. (2009). Strategic human resource practices and innovation performance – the mediating role of knowledge management capacity. *Journal of Business Research, 62* (1), 104-114.

Corfield, A., Paton, R., & Little, S. (2013). Does knowledge management work in NGOs? A longitudinal study. *International Journal of Public Administration, 36*(3), 179-188.

Donate, J. and de Pablo, S. (2015). The role of knowledge-oriented leadership in knowledge management practices and innovation. *Journal of Business Research, 68* (2), 360-370.

Donate, J., & Guadamillas, F. (2011). Organizational Factors to Support Knowledge Management and Innovation. *Journal of Knowledge Management, 15*, 890-914. http://dx.doi.org/10.1108/13673271111179271

Downes, S. (2005). E-learning 2.0. ACM e-Learn Magazine, from http://elearnmag.org/subpage.cfm?section=articles&article= 29-1

Dukeov, I., Jaschenko, V., Apsalone, M., & Heilmann, P. (2020). Openness and staff training as antecedents of administration and management innovation: a cross-country study.

Elrehail, H., Emeagwali, O. L., Alsaad, A., & Alzghoul, A. (2018). The impact of transformational and authentic leadership on innovation in higher education: The contingent role of knowledge sharing. *Telematics and Informatics*, *35*(1), 55-67.

Farooq, M., Ullah, I., & Hameed, M. (2016). HR practices and organizational innovation: the mediating role of knowledge management effectiveness. *Journal of Social and Development Sciences, 7*(3), 50-67.

Farrell, C., & Coburn, E. (2017). Absorptive capacity: a conceptual framework for understanding district Central office learning. *Journal of Educational Change, 18*(2), 135-159.

Fullwood, R., & Rowley, J. (2017). An investigation of factors affecting knowledge sharing amongst UK academics. *Journal of Knowledge Management*.

Garavan, N., & McGuire, D. (2010). Human resource development and society: Human resource development's role in embedding corporate social responsibility, *sustainability, and ethics in organizations. Advances in Developing Human Resources, 12*(5), 487–507. http://dx.doi.org/10.1177/1523422310394757

Gardner, H. (2010). Multiple intelligences. *New York.-1993*.

Gloet, M., & Terziovski, M. (2004). Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management, 15*(5), 402-409. https://doi.org/10.1108/17410380410540390

Grant, R. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*(2), 109-122.

Gürlek, M., & Çemberci, M. (2019). The effects of environmental innovation types on cost and differentiation advantages: the role of competitive intensity. *Paper presented at International Social Innovation Congress*, October 16-17.

Hsu, R., Lawson, D., & Liang, T. (2007). Factors affecting knowledge management adoption of Taiwan small and medium-sized enterprises. *International Journal of Management and Enterprise Development (IJMED), 4*(1), 30–51. https://doi.org/10.1504/IJMED.2007.011454

Huang, M, Chen, M., & Yieh, K. (2007). Comparing with your main competitor: The single most important task of knowledge management performance measurement. *Journal of Information Science, 33*(4), 416-434.

Ibidunni, A., Kolawole, A., Olokundun, M., & Ogbari, M. E. (2020). Knowledge transfer and innovation performance of small and medium enterprises (SMEs): An informal economy analysis. *Heliyon*, *6*(8), e04740.

Iqbal, A. (2021). Innovation speed and quality in higher education institutions: the role of knowledge management enablers and knowledge sharing process. *Journal of Knowledge Management*, 25(9), 2334-2360.

Isaacson, E., & Keller, H. B. (2012). *Analysis of numerical methods*. Courier Corporation.

Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of Business Research, 64*(4), 408-417. https://doi.org/10.1016/j.jbusres.2010.09.010.

Kale, P., Singh, H., & Perlmutter, H. (2000). Learning and protection of proprietary assets in strategic alliances: Building relational capital. *Strategic management journal, 21*(3), 217-237.

Karasneh, A & Al-kalili, S. (2009). Knowledge management components: Analytical study at Jordanian Ministry of Education. *Jordan Journal of Business Administration, 5*(3), 293-326. Retrieved from https://journals.ju.edu.jo/JJBA/article/view/362

Karasneh, A. & Al-Zoubi, M. (2018). Factors affecting knowledge sharing in special education – A Jordanian study. *Knowledge and Process Management, 26*(1), 41-50. https://doi.org/10.1002/kpm.1588

Karasneh, A. (2002). An integrated model of knowledge management systems. Doctoral Thesis. Exeter, UK: University of Exeter. Retrieved from https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.246392

Khawaja, S. Mohan, P., Jabbour, R., Bampouri, T., Bowsher, G., Hassan, A. M., ... & Mikhail, G. W. (2021). COVID-19 and its impact on the cardiovascular system. *Open heart, 8*(1), e001472.

Koohang, A., Paliszkiewicz, J., & Goluchowski, J. (2017). The impact of leadership on trust, knowledge management, and organizational performance: A research model. *Industrial Management & Data Systems*, *117*(3), 521-537.

Liao, S. H., & Wu, C. C. (2010). System perspective of knowledge management, organizational learning, and organizational innovation. *Expert Systems with Applications, 37*(2), 1096-1103. https://doi.org/10.1016/j.eswa.2009.06.109.

Liao, Y., Deschamps, F., Loures, E. D. F. R., & Ramos, L. F. P. (2017). Past, present and future of Industry 4.0-a systematic literature review and research agenda proposal. *International journal of production research*, *55*(12), 3609-3629.

Lifang, L., & Ziling, Q. (2011). On knowledge management in higher education. Proceedings of International Conference on Product Innovation Management (ICPIM) (pp.177-179). China: IEEE.

Lopez-A., Luño, A., & Cabrera, R. (2009). Knowledge as a mediator between HRM practices and innovative activity. *Human Resource Management, 48*(4), 485-503.

Lopez-C., & Acosta, P. (2010). Analyzing ICT adoption and use effects on knowledge creation: An empirical investigation in SMEs. *International Journal of Information Management, 30*(6), 521-528.

Luiza, F. (2016). The role of intellectual capital in achieving the competitive advantage of economic institutions in the knowledge economy: cement company case study. Unpublished Doctorate Thesis, Mohammad Khader University, Baskra.

Mishra, B., & Bhaskar, A. U. (2011). Knowledge Management Process in Two Learning Organisations. *Journal of Knowledge Management, 15*(2).

Montes, F. Moreno, A. & Morales, V. (2005). Influence of support leadership and teamwork cohesion on organizational learning, innovation and performance: an empirical examination. *Technovation*, *25*(10), 1159-1172.

Mumford, M. D. (Ed.). (2011). *Handbook of organizational creativity*. Academic Press.

Naqshbandi, M., & Jasimuddin, S. (2018). Knowledge-oriented leadership and open innovation: role of knowledge management capability in France-based multinationals. *International Business Review, 27* (3), 701-713.

Newkirk, H., & Lederer, A. (2006). The Effectiveness of Strategic Information Systems Planning under Environmental Uncertainty. *Information & Management, 43,* 481-501.

Ngah, R., Tai, T., & Bontis, N. (2016). Knowledge management capabilities and organizational performance in Roads and Transport Authority of Dubai: The mediating role of learning organization. *Knowledge and Process Management, 23*(3), 184-193. https://doi.org/10.1002/kpm.1504

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

Nonaka, I. and Takeuchi, H. (1995), The Knowledge-Creating Company, Oxford University Press, Oxford.

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

Obeso, M., Hernández-Linares, R., López-Fernández, M. C., & Serrano-Bedia, A. M. (2020). Knowledge management processes and organizational performance: the mediating role of organizational learning. *Journal of Knowledge Management*.

Paoloni, M., Coluccia, D., Fontana, S., & Solimene, S. (2019). Knowledge management, intellectual capital and entrepreneurship: a structured literature review. *Journal of Knowledge Management, 24*(8), 1797-1818.

Pasamar, S., Diaz-Fernandez, M., & de La Rosa-Navarro, M. D. (2019). Human capital: the link between leadership and organizational learning. *European Journal of Management and Business Economics, 28*(1).

Patton, M. Q. (2001). Evaluation, knowledge management, best practices, and high quality lessons learned. *American Journal of Evaluation*, *22*(3), 329-336.

Pisano, G. Bohmer, R., & Edmondson, A. (2001). Organizational differences in rates of learning: Evidence from the adoption of minimally invasive cardiac surgery. *Management science*, *47*(6), 752-768.

Prasad, B., & Junni, P. (2016). CEO transformational and transactional leadership and organizational innovation: The moderating role of environmental dynamism. *Management Decision, 54*(7), 1542-1568.

Rechberg, I., & Syed, J. (2013). Ethical issues in knowledge management: conflict of knowledge ownership. *Journal of Knowledge Management*, *17*(6), 828-847.

Rehman, U. & Iqbal, A. (2020). Nexus of knowledge-oriented leadership, knowledge management, innovation and organizational performance in higher education. *Business Process Management Journal, 26*(6), 1731-1758.

Rowley, J. (2000). Is higher education ready for knowledge management?. *International Journal of Educational Management, 14* (7), 325-333.

Sadler, P. (2003). *Leadership*, Kogan-Page, London.

Samad, S. (2012). The influence of innovation and transformational leadership on organizational performance. *Procedia-Social and Behavioral Sciences, 57*, 486-493.

Santoro, G., Vrontis, D., Thrassou, A., & Dezi, L. (2018). The internet of things: building a knowledge management system for open innovation and knowledge management capacity. *Technological Forecasting and Social Change, 136*, 347-354.

Sethibe, T., & Steyn, R. (2016). Innovation and organisational performance: A critical review of the instruments used to measure organisational performance. *The Southern African Journal of Entrepreneurship and Small Business Management*, *8*(1), 12.

Shamim, S., & Abbasi, A.S. (2012). Interethnic culture orientation of business managers in Pakistan.

Shamim, S., & Yu, H. (2019). Impact of knowledge oriented leadership on knowledge management behavior through employee work attitudes. *The International Journal of Human Resource Management, 30*(16), 2387-2417.

Shariq, S., Mukhtar, U. and Anwar, S. (2019),"Mediating and moderating impact of goal orientation and emotional intelligence on the relationship of knowledge oriented leadership and knowledge sharing", *Journal of Knowledge Management, 23* (2), 332-350.

Shipton, H., Fay, D., West, M., Patterson, M., & Birdi, K. (2005). Managing people to promote innovation. *Creativity and Innovation Management, 14*(2), 118-128.

Shujahat, M., Sousa, M.J., Hussain, S., Nawaz, F., Wang, M., & Umer, M. (2019). Translating the impact of knowledge management processes into knowledge-based innovation: the neglected and mediating role of knowledge-worker productivity. *Journal of Business Research, 94*, 442-450.

Smith, W. K., & Tushman, M. L. (2005). Managing strategic contradictions: A top management model for managing innovation streams. *Organization science*, *16*(5), 522-536.

Soomro, B. A., Lakhan, G. R., & Shah, N. (2021). Knowledge, attitudes and practices towards the spread of COVID-19: a health counseling initiative among potential entrepreneurs of FUUAST. *Health Education*, *121*(6), 670-682.

Uotila, J. (2017). Exploratory and Exploitative Adaptation in Turbulent and Complex Landscapes, *European Management Review, 15*(4), 505-519.

Vera, D., & Crossan, M. (2004). Theatrical improvisation: Lessons for organizations. *Organization Studies*, *25*(5), 727-749.

Williams, P., & Sullivan, H. (2011). Lessons in leadership for learning and knowledge management in multi-organisational settings. *International Journal of Leadership in Public Services, 7*(1), 6-20.

Windrum, P. (2008). Innovation and entrepreneurship in public services. *Innovation in public sector services: Entrepreneurship, creativity and management*, 3-20.

Xie, X., Zou, H., & Qi, G. (2018). Knowledge absorptive capacity and innovation performance in high-tech companies: A multi-mediating analysis. *Journal of business research*, *88*, 289-297.

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

Zack, M., McKeen, J., & Singh, S. (2009). Knowledge management and organizational performance: An exploratory survey. *Journal of Knowledge Management, 13*(6), 392-409

Zhang, L., & Guo, H. (2019). Enabling knowledge diversity to benefit cross-functional project teams: Joint roles of knowledge leadership and transactive memory system. *Information and Management, 56*(8), 103156.

Zuraik, A., & Kelly, L. (2018). The role of CEO transformational leadership and innovation climate in exploration and exploitation. *European Journal of Innovation Management*, *22*(1), 84-104.