Journal of Infrastructure, Policy and Development (2023) Volume 7 Issue 2.
DOI: 10.24294/jipd.v7i2.2227

ORIGINAL ARTICLE

Knowledge management and organizational learning to improve the organizational performance of mines in Indonesia

***Ismi Rajiani*[1,*], *Normuslim Normuslim*[2]**

[1] *Social Studies Department, Lambung Mangkurat University-Banjarmasin, Banjarmasin 70123, Indonesia*

[2] *Islamic Education, Government Institute for Islamic Studies-Palangka Raya Banjarmasin 73112, Indonesia*

ABSTRACT

The mining sector faces a complex dilemma as an economic development agent through social upliftment in places where mining corporations operate. Resource extraction is destructive and non-renewable, making it dirty and unsustainable. To ensure corporate sustainability, this paper examines the effects of knowledge management (KM), organizational learning (OL), and innovation capability (IC) on Indonesian coal mining's organizational performance (OP). We used factor and path analysis to examine the relationships between the above constructs. After forming a conceptual model, principal component analysis validated the factor structure of a collection of observed variables. Path analysis examined the theories. The hypothesized framework was confirmed, indicating a positive association between constructs. However, due to mining industry peculiarities, IC does not affect organizational performance (OP). This study supports the importance of utilizing people and their relevant skills to improve operational performance. The findings have implications for managers of coal mining enterprises, as they suggest that KM and OL are critical drivers of OP. Managers should focus on creating an environment that facilitates knowledge sharing and learning, as this will help improve their organizations' performance.

KEYWORDS

knowledge management; organizational learning; innovation capability; organisational performance; coal mining; Indonesia

ARTICLE INFO
Received: 6 June 2023
Accepted: 31 July 2023
Available online: 15 August 2023

*CORRESPONDING AUTHOR
Ismi Rajiani, Social Studies Department, Lambung Mangkurat University-Banjarmasin, Banjarmasin 70123, Indonesia; rajiani@ulm.ac.id

CITATION
Rajiani I, Normuslim N (2023). Knowledge management and organizational learning to improve the organizational performance of mines in Indonesia. *Journal of Infrastructure, Policy and Development* 7(2): 2227 doi: 10.24294/jipd.v7i2.2227

1. Introduction

The mining industry is a critical part of the global economy, but it also faces many challenges, including increasing competition, rising costs, and changing regulations (Basuki et al., 2021; Verrier et al., 2022). To remain competitive, mining companies need to find new ways to improve their performance (Kashan et al., 2022).

One way to improve performance is to manage knowledge better. Knowledge is a critical

resource for any organization, but it is often difficult to capture, share, and use effectively (Abrahamsson and Johansson, 2020). Mining companies that can effectively manage knowledge will be better able to innovate, make better decisions, and improve their overall performance (Ediriweera and Wiewiora, 2021).

The effective utilization of knowledge has been a defining characteristic of numerous prosperous enterprises (Al Sayegh et al., 2022). Organizations seeking to sustain their standing must recognize the importance of practical knowledge management (Sauer et al., 2022) and its positive impact on organizational efficacy (Hidary et al., 2023). Knowledge and learning management are vital components of organizational performance (Santhose and Lawrence, 2023). However, mining enterprises face challenges in effectively sharing and disseminating knowledge and insights, necessitating a comprehensive understanding of productive strategies and acknowledging inefficacious approaches (Olan et al., 2022).

The mining industry in Indonesia has undergone significant changes in recent years, leading to new expectations for mining companies to embrace broader responsibilities and connections beyond traditional service supply (Purnomo et al., 2021). This has prompted the adoption of the triple bottom line framework, where companies measure their social and environmental impacts in addition to their financial performance (profit, people, and planet). Mining corporations have had to adapt their activities to avoid conflicts with local communities (Libassi, 2022). As the industry continues to evolve, knowledge management and ongoing learning become essential components for improving organizational effectiveness.

While the mining management literature emphasizes the significance of innovation for productivity enhancement (Calzada et al., 2023), integrating innovation into the mining industry's operational ethos remains a challenge. Knowledge management holds the potential to address this challenge effectively (Wang et al., 2022). However, further research is needed to understand the relationship between innovation, learning, and knowledge management within the mining industry, particularly in Indonesia, which has just acknowledged the Extractive Industries Transparency Initiative (EITI) after a lengthy debate and rejection (Yanuardi et al., 2021). EITI is a global organization that combats the resource curse by enhancing the quality of governance in resource-rich countries through the transparent and accountable administration of their oil, gas, and mineral resources. This policy definitely affects how mining companies in Indonesia manage knowledge, organizational learning, and innovation capability to achieve organizational performance.

Our research aims to fill this gap by integrating the role of knowledge management, organizational learning, and innovation capability in coal mining firm performance. An integrated approach to attaining knowledge management, organizational learning, and organizational performance in the coal mining industry is a comprehensive method for managing knowledge within a coal mining organization. It involves identifying, creating, capturing, storing, sharing, and applying knowledge to enhance the performance of an organization. The integrated approach recognizes the interdependencies between knowledge management, organizational learning, innovation capability, and organizational performance. Thus, we propose the following hypotheses:

Hypothesis 1: Knowledge management positively affects coal mining firm performance.

Hypothesis 2: Organizational learning positively influences coal mining firm performance.

Hypothesis 3: Innovation capability positively affects coal mining firm performance.

The novelty of this study lies in its focus on the integrated approach to achieving knowledge management, organizational learning, and organizational performance in the coal mining industry. Previous studies have focused on one or two of these dimensions, but to our knowledge, this study is the first to examine the relationships between all three dimensions.

The findings of this study will have significant implications for mining companies. By better understanding the relationships between knowledge management, organizational learning, and innovation capability, mining companies can develop more effective strategies for improving their performance.

2. Materials and methods

The current inquiry employed a cross-sectional methodology, utilizing purposive random sampling techniques. Employing a snowball sampling methodology via the authors' networks and social media platforms, a web-based survey was disseminated to the employees of the two largest coal operators, namely Adaro Energy Ltd. and Bukit Asam Prima Ltd., situated in South Kalimantan, Indonesia, spanning from 22 January to 24 April 2023. The survey aimed to elicit responses on various aspects of knowledge management, organizational learning, innovation capacity, and organizational performance.

The study conducted by Hair et al. (2020) posited specific regulations for ascertaining the minimum sample size based on the number of latent variables and observable variables. The present investigation employed 19 observable variables, surpassing the minimum threshold of 150 cases, with 210 valid responses received, indicating a commendable response rate of 84%. The study utilized a seven-point Likert scale to gauge the participants' expectations and expressions regarding their perceived experience on all indicators under investigation. The four items on perceptions surrounding knowledge management were adapted from Kokkaew et al. (2022), and they encompass the facets of knowledge acquisition (X1.1), knowledge creation (X1.2), knowledge storage and retrieval (X1.3), and knowledge transfer and utilization (X1.4). The five key indicators utilized for the quantification of organizational learning components were evaluated using the model proposed by Senge and von Ameln (2019), and they are system approach (X2.1), shared vision (X2.2), personal mastery (X2.3), mental models (X2.4), and team learning (X2.5). The capacity for innovation was assessed using four items adapted from Migdadi (2021) scholarly inquiry, and they comprise product innovation (Y1.1), process innovation (Y1.2), marketing innovation (Y1.3), and organizational innovation (Y1.4). The metric for evaluating organizational performance consisted of inquiries about organizational competitiveness (Y2.1), organizational customers (Y2.2), organizational growth (Y2.3), organizational profitability (Y2.4), organizational innovativeness (Y2.5), and employees numbers (Y2.6) as per the survey instrument employed by Kareem et al. (2021).

The robustness of the analyses was assessed through the computation of Cronbach's alpha coefficients, which must surpass a threshold of 0.60, as stipulated by Bonett and Wright (2014). The initial data analysis phase encompassed using descriptive statistics to describe the profile of research participants and their overall perception of variables. The subsequent phase of the examination entailed the use of factor analysis. This statistical technique streamlines the factors into shared components by preserving factors loading of 0.50 or greater within the model (Hair et al., 2020).

The likelihood of each direct and indirect effect pathway was examined as part of the hypothesis testing process. To satisfy the requisite conditions for a significant effect, the probability of each path must be precisely 0.05. The relationship among variables is depicted in **Figure 1.**

The figure implies a well-established positive correlation between knowledge management, organizational learning, and innovation capability with organizational performance. Effective

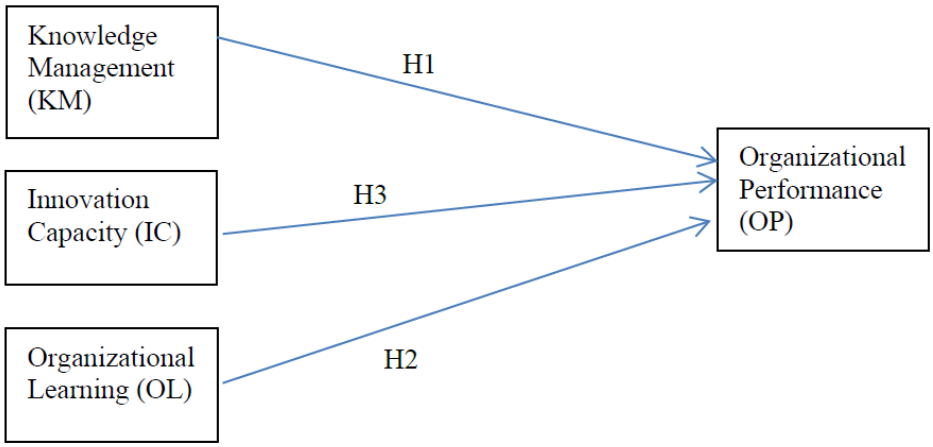

Figure 1. Research model.

knowledge management enhances decision-making, fosters innovation, and promotes collaboration. Organizational learning facilitates adaptation, identifies inefficiencies, and nurtures a culture of creativity. Meanwhile, innovation capability enables organizations to differentiate themselves, address customer needs, and improve efficiency. Collectively, organizations that prioritize these factors tend to exhibit higher overall performance, making it crucial for managers and leaders to invest in strategies that enhance these interrelated elements for sustained success in a competitive business landscape.

3. Results

The demographic profiles of the respondents were analyzed to understand the characteristics of the sample. The data shows that most respondents were male (80%), which is consistent with the fact that the coal mining industry is male-dominated. Additionally, a significant proportion of the respondents were above 35 years old (55%), suggesting that the sample comprises experienced workers. The respondents' educational attainment was also analyzed, and the data shows that a considerable proportion had pursued tertiary education (66%), with a majority having completed an associate degree. This suggests that the respondents have a strong foundation in knowledge and skills, which is essential in the coal mining industry. The length of current employment was also analyzed, and the data shows that a significant proportion of the respondents had been gainfully employed in the coal mining industry for a decade (60%). This suggests that the respondents have a wealth of experience in the industry, which can be valuable for the study.

Additionally, 39.04% of the employees had been affiliated with their respective organizations for five years, suggesting that the sample comprises experienced workers. Finally, only two participants

(constituting 0.95% of the sample) had rendered their services to the organization for less than five years, which suggests that the sample needs to be composed of recent graduates. The demographic profiles of the respondents provide valuable insights into the characteristics of the sample. This information can be used to ensure that the study results are generalizable to the broader population of coal mining workers. **Table 1** exhibits the arithmetic average of every variable.

Table 1. Variable means.

Items	Mean	Std. deviation
knowledge acquisition	3.838	1.976
knowledge creation	4.614	1.722
knowledge storage and retrieval	3.666	1.895
knowledge transfer and utilization	4.981	1.835
Overall average KM	*4.275*	*1.857*
system approach	6.428	0.976
shared vision	6.319	1.039
personal mastery	4.852	1.745
mental models	6.109	1.265
team learning	3.866	1.902
Overall average of OL	5.515	1.487
product innovation	4.533	1.746
process innovation	5.171	1.939
marketing innovation	3.881	2.033
organizational innovation	4.895	1.845
Overall average of IC	*4.620*	*1.891*
competitiveness	4.819	1.765
customers	6.390	1.048
growth	6.038	1.368
profitability	4.585	1.745
innovativeness	4.804	1.767
employees	3.509	1.833
Overall average of OP	*5.024*	*1.588*

Mean and standard deviation are essential statistical measures that shed light on a dataset's distribution and variability. The mean, also known as the average, represents the central tendency of a set of data. It is computed by summing all the values in a dataset and dividing by the number of data points. The mean is frequently used to provide a sense of the average or central value of a set of observations, as it represents the typical value of the data. A dataset's standard deviation measures its dispersion or variability. It quantifies the degree to which each data point deviates from the norm. A larger standard deviation denotes greater variability, whereas a smaller standard deviation indicates that the data points are more tightly concentrated around the mean. To evaluate the quality of the provided data, we must consider each object's mean and standard deviation (McGrath et al., 2022).

KM, defined as the process of creating, capturing, sharing, and using knowledge within an organization, shows mean values for knowledge acquisition (3.838), knowledge creation (4.614), knowledge storage and retrieval (3.666), and knowledge transfer and utilization (4.981). The mean values fall within a reasonable range, indicating that respondents' attitudes towards these aspects of knowledge management are moderately positive. The average KM score (4.275) indicates a

middling to moderate perception of knowledge management in general. Standard deviations for these KM items range between 1.722 and 1.976, indicating moderate response variability.

OL, defined as the process of acquiring new knowledge and insights and then applying that knowledge to improve organizational performance, shows mean values for system approach (6.428), shared vision (6.319), personal mastery (4.852), mental models (6.109), and team learning (3.866), indicating a variety of responses. System approach and shared vision score relatively well, whereas personal mastery and team learning score poorly. The aggregate mean of OL (5.515) indicates a moderate view of organizational learning in general. Standard deviations for OL items range between 1.039 and 1.902, indicating moderate response variability.

IC, defined as the ability of an organization to generate and implement new ideas, denotes mean scores for product innovation (4.533), process innovation (5.171), and organizational innovation (4.895), indicating moderate perceptions of innovation in these domains. However, innovation in marketing obtains a lower mean score (3.881), indicating less favourable perceptions in this domain. The average IC score of 4.620 indicates a moderate perception of innovation capability in general. The IC item standard deviations range from 1.746–2.033, indicating a moderate to relatively high response variability.

OP, defined as the overall effectiveness, efficiency, and achievement of goals by an organization, indicates the mean scores for competitiveness (4.819), consumers (6.39), growth (6.038), profitability (4.585), and innovativeness (4.804), indicating moderately positive perceptions in these areas. However, the average employee score (3.509) indicates a relatively reduced perception of workforce enhancement. The aggregate mean of OP (5.024) indicates a moderate view of organizational performance in general. Standard deviations for OP items range between 1.048 and 1.833, indicating a moderate to relatively high response variability. The supplied data reveals moderate mean scores for most items, indicating moderate perceptions of the studied constructs. However, the standard deviations vary across topics, indicating that respondents' perceptions are not uniform. There is no fixed universal threshold for an "acceptable" standard deviation score, as what may be considered acceptable can vary based on the specific field of study, the nature of the data, and the research objectives. In social studies, it is common to have a standard deviation ranging from low to high, and to reduce disparity, the number of sample size should be increased (Wang et al., 2013).

The operationalization and validation of the study's instrument are presented in **Table 2**. To evaluate the instrument's validity, Principal Component Analysis (PCA) was utilized, and the factor loadings of each item were determined. As suggested by Hair et al. (2020), it is essential to observe that all factor loadings exceeded the threshold value of 0.50. This indicates that the items on the instrument accurately measure the intended constructs, demonstrating the measurement approach's validity. In addition, the instrument's reliability was assessed using Cronbach's alpha coefficient for each observed variable. The Cronbach's alpha values for all variables exceeded the established threshold values, indicating the instrument's high internal consistency and reliability. This indicates that the items within each construct are highly correlated and consistently measure the same underlying concept, enhancing the instrument's overall reliability. The results presented in **Table 2** provide evidence supporting the instrument's validity and reliability.

The successful fulfilment of validity and reliability criteria suggests that the instrument measures

the intended constructs accurately and provides a solid basis for conducting additional analyses and deriving meaningful conclusions from the data.

Table 2. Validity and reliability measurement.

Construct	Items	Factors loading	Cronbach alpha
Knowledge management	1. The organization has a method for collecting knowledge that is essential and advantageous to its operations.	0.804	0.867
	2. The organization has a method for producing new knowledge by mobilizing and converting tacit knowledge.	0.845	0.867
	3. The organization has a procedure facilitates storing and retrieving acquired or created information.	0.832	0.865
	4. The organization has a process that facilitates the application and dissemination of knowledge within the organization and uses this knowledge to the organization's advantage.	0.846	0.867
Organizational learning	1. My organization is a cohesive unit, wherein any action I undertake has the potential to impact the entirety of said entity.	0.883	0.8689
	2. All entities, be they individuals or teams, that comprise my organization collectively strive towards a common objective we aspire to attain.	0.810	0.870
	3. I maintain a constant creative tension in my professional and personal endeavours.	0.870	0.8675
	4. Within the confines of my organization, the practical promotion of novel concepts may be achieved through the subtle manipulation of underlying cognitive processes and established protocols.	0.821	0.870
	5. It is within our capacity to articulate our thoughts and notions without inhibition.	0.721	0.873
Innovation capability ($\alpha = 0.715$)	1. The enterprise can assimilate novel knowledge or technologies to innovate fresh products.	0.714	0.872
	2. The enterprise exhibits quick reactions to novel methodologies implemented by peer organizations.	0.751	0.875
	3. The enterprise demonstrates a commendable understanding of diverse market segments.	0.724	0.872
	4. The enterprise displays notable integration and command	0.828	0.868
Organizational performance	1. Our company is more fiercely competitive.	0.854	0.868
	2. More people use our company.	0.841	0.869
	3. Our company is expanding more quickly.	0.761	0.873
	4. Our business is more successful.	0.839	0.868
	5. Our organization is more innovative.	0.841	0.869
	6. There are more employees at our company.	0.774	0.866

Table 3 presents the condensed outcome of the path analysis. According to the tabulated data, it can be inferred that two paths hold significant value.

Table 3. Summary of path relationship among constructs.

Constructs	Estimate	t-test	Sig.	Conclusion
KM → OP	0.383	2.334	0.04	Significant
OL → OP	0.251	2.113	0.05	Significant
IC → OP	0.042	1.206	0.10	Not significant

The t-test value of 2.333 and the corresponding significance level of 0.04 provide empirical support for the initial hypothesis that knowledge management positively impacts the performance of coal mining firms. According to the statistical analysis, the t-test value for organizational learning is also 2.333 at a significance level of 0.05. This finding supports the second hypothesis, indicating a positive correlation between organizational learning and coal mining firms' performance. Notably, the observed significance level for innovation capacity concerning organizational performance is 0.10, which exceeds the conventional threshold of 0.05. The data do not support the third hypothesis, which postulates a positive effect of innovation capability on the performance of coal mining firms. This adverse finding provides valuable insights into the intricate relationship between knowledge management, organizational learning, innovation capacity, and organizational performance in the context of the coal mining industry. It may be necessary to conduct additional research and investigation to comprehend better the mechanisms influencing organizational performance in this industry.

The participants in this study have recognized the significant progress made in KM implementation within mining organizations. This progress encompasses various facets, such as knowledge acquisition, creation, storage, retrieval, transfer, and utilization. Employees in the surveyed organizations acknowledge the importance of organizational learning, particularly in dynamic and unpredictable economic and political climates, as it enables businesses to adapt and thrive.

However, it is concerning that team learning received a relatively low rating. Thus, organizations should prioritize enhancing their knowledge management strategies to address this issue. Furthermore, respondents have noticed recent implementations of novel methodologies, particularly in process innovation, showcasing substantial progress in enhancing operational efficiency within the coal industry. Nevertheless, marketing innovation needs to catch up, presenting an opportunity for growth and development. Overall, the surveyed organizations demonstrate satisfactory organizational performance, with commendable figures in customer acquisition. However, the lowest score in the workforce metric indicates the need for a proportional increase in personnel to improve organizational performance further.

The study's findings indicate an improvement in the coal industry's innovation capability, particularly in process innovation. However, there is potential for improvement in marketing innovation, suggesting that this is an area where businesses can concentrate their efforts to strengthen their competitive position. Despite this, the lowest rating for workforce augmentation indicates the need for a cautious balance between efficiency measures and workforce management in the face of changing market dynamics resulting from global efforts to reduce coal consumption.

While previous research has indicated a positive correlation between innovation potential and various organizational performance metrics, this study's findings suggest that this correlation may

not hold for coal mining companies. The findings indicate that the innovative potential of coal mining companies does not necessarily translate into increased competitiveness or workforce expansion.

4. Discussion

The findings of this study indicate a high level of importance attributed to Knowledge Management (KM) processes, encompassing knowledge acquisition, creation, storage and retrieval, and knowledge transfer and utilization, from the perspectives of employees within mining companies in South Kalimantan, Indonesia. This observation contradicts Basuki et al. (2021) and Verrier et al. (2022) that the mining industry tends to exhibit a significant embedded culture resistant to knowledge adoption. Moreover, the study reveals that these KM processes exert statistically significant impacts on various dimensions of organizational performance. These findings align with prior research conducted in different contexts, as evidenced by studies conducted by Abbas (2020), Chaithanapat et al. (2022), and AlQershi et al. (2023).

The study further uncovers compelling empirical evidence of a statistically significant positive relationship between organizational learning (OL) and organizational performance. Organizations that diligently cultivate their learning processes are poised to enhance their performance. This finding aligns with prior research by Simanjuntak and Hasibuan (2023) and Hidary et al. (2023), thus reinforcing the notion that the development of OL, encompassing elements such as a system approach, shared vision, personal mastery, mental models, and team learning, significantly impacts knowledge, beliefs, and behaviours within an organization. This, in turn, fosters business growth and innovation as new learning is systematically integrated into organizational routines. Despite their significant economic impact on regional development, corporations face negative public perception as they are perceived as primary contributors to environmental degradation. Indonesia's recent membership in the Extractive Industries Transparency Initiative has led mining companies to adopt environmental management systems to improve their social standing and comply with government regulations. These systems prioritize eco-friendly practices to mitigate adverse extraction effects and minimize energy and material consumption. Historical events have taught companies in Indonesia that mining operations have caused severe ecological disasters, resulting in substantial penalties imposed by the government and significant recuperation expenses for affected individuals. For instance, PT Lapindo Brantas, an oil and gas enterprise, was responsible for a mud flood in East Java. At the same time, Grasberg's mining company contaminated drinking water with arsenic substances in Papua. PT Newmont Minahasa Raya was linked to pollution in Buyat Bay with heavy metals. These incidents highlight the mining sector's direct impact on the environment and its potential for harm. Consequently, following Ediriweera and Wiewiora's (2021) recommendations, mining industries focus on fostering a learning culture within their organizations to deliver better value for money and address environmental concerns.

The Extractive Industries Transparency Initiative (EITI), proposed by former UK Prime Minister Tony Blair, represents a comprehensive approach to support developing nations in mitigating the resource curse. This initiative aims to enhance the analysis of revenue allocation and utilization from oil, gas, and mining activities through collaborative efforts involving multiple stakeholders. Initially, the Indonesian government exhibited limited enthusiasm for engaging in the EITI, but the

World Bank's requirement of EITI compliance for granting fresh loans expedited its implementation in Indonesia. Consequently, corporations have integrated organizational learning into their daily operations under various pressures, including coercive, mimetic, and normative influences. Coercive pressure arises from governmental intervention, mimetic pressure helps avoid errors seen in other organizations, and normative forces result from expert and academic perspectives. In the context of developing nations, compliance with governmental directives is frequently enforced through coercive means (Satispi et al., 2023).

Using OL to attain sustainable performance in other parts of Indonesia can be attributed to coercive pressure. However, the research was conducted in Banjarese, Indonesia. Most Banjarese Indonesians adhere to the Islamic faith and consider Islam their chosen way of life. As a result, Islam permeates various dimensions of human experience, particularly with values and behaviours. Within the teachings of Islam, the divine law is characterized by its rigidity and immutability. It is challenging to encounter instances where individuals from the Banjarese Indonesian community deviate from the unwavering principles outlined in the Quran (Hidayat et al., 2022). The Holy Qur'an contains several verses that address the concept of learning. These verses include the assurance from God that those who acquire knowledge will be elevated to higher positions, the initial revelation emphasizing the significance of reading and learning, the strong recommendation to pursue knowledge actively, and the encouragement to continuously reflect upon the creation and comprehend the divine signs (Ahmad, 2010; Normuslim, 2021). Despite the absence of well-planned and published LO initiatives observed during the researcher's direct observations and investigations within the companies, it becomes evident that participants' companies and employees acknowledge the practice that might be due to religious belief.

Contrary to the conclusions drawn by Robertson et al. (2023), Phuong et al. (2022), and Migdadi (2021), it has been observed that the impact of innovation capability on coal mining performance in Indonesian samples could be more positive. This observation suggests that the coal mining industry possesses distinctive qualities when contrasted with other sectors. It is evident that due to the peatland nature of the area, as per the findings of Arisanty et al. (2020), the coal obtained from the deposits could be more suitable for immediate utilization. Companies must implement appropriate methodologies to provide customers with optimal quality. This involves the management of internal, upstream, and downstream quality while also considering the crucial matter of sustainability.

It is widely acknowledged that the mining industry is a conservative sector, exhibiting significant resistance to change due to its capital-intensive nature and the high expense of modifying established practices. In addition, the mining industry is governed by stringent regulations that impose numerous restrictions on company operations. In this context, innovation is viewed as a hazardous undertaking, prompting businesses to approach it with caution. The reluctance to invest in innovation originates from the uncertainty surrounding its potential success, which is exacerbated by the length of time needed to realize its benefits. This reluctance is especially pronounced in the Indonesian coal mining industry, where a handful of dominant firms compete for market supremacy, heightening the fear of losing market share and further impeding innovative efforts. As a result of these factors, the impact of innovation capability on organizational performance in the Indonesian coal mining industry is constrained. Companies that prioritize innovation are not necessarily more successful than those that do not. However, it is essential to emphasize the enduring significance of innovation. Innovation can still prove invaluable to businesses if they approach it with a realistic

understanding of the associated risks and difficulties. Companies should invest in innovation with discretion, ensuring its viability before committing resources. Several factors contribute to the moderate impact of innovation capability on organizational performance in the context of Indonesian coal extraction. Firstly, the industry's hierarchical structure encourages top-down decision-making and inhibits the organic emergence of novel ideas at lower organizational levels. Second, the male-dominated culture of the industry presents gender biases that prevent women from undertaking leadership positions, thereby hindering their ability to drive innovation. Thirdly, the industry's risk aversion fosters a conservative environment that discourages businesses from taking significant risks on unproven ideas. A few companies in the Indonesian coal mining industry have been able to innovate despite these formidable obstacles. Their accomplishments are primarily the result of fostering a culture of innovation within their organizations, encouraging employees to share their ideas and take calculated risks. In addition, these organizations are exceptional at attracting and retaining innovative, talented, and passionate individuals. In conclusion, the influence of innovation capability on organizational performance in the Indonesian coal mining sector is limited. The inherent conservatism of the industry, combined with structural and cultural obstacles, impedes the widespread efficacy of innovative efforts. Nonetheless, some businesses have demonstrated successful innovation by nurturing a culture that encourages idea sharing and risk-taking while attracting and retaining skilled and motivated employees. Recognizing the constraints and opportunities, mining companies can adopt a strategic approach to innovation in order to maximize its potential benefits.

In conclusion, the findings of this study highlight the significance of recognizing the unique characteristics of coal mining companies in determining their performance outcomes. The absence of an unambiguous relationship between innovation potential and organizational performance metrics underscores the need for additional research and tailored approaches to support the competitiveness and growth of coal mining businesses. Furthermore, it is noteworthy that pragmatic problem-solving rather than focusing on technological or market opportunities has primarily driven innovation in the mining industry. Notably, the primary impetus for innovation in this sector is the desire to curtail operating expenses (Calzada et al., 2023). The pivotal function creation assumes in cost reduction can be attributed to mining commodities' homogeneous and invariable characteristics. Irrespective of the intricacies of the technical procedures employed in the phases of exploration, exploitation, and post-exploitation, the outcome remains unaltered: copper retains its inherent properties, as does gold. Given the absence of leeway for product differentiation, mining enterprises typically engage in competition predicated on pricing rather than product attributes. The implication is that the industry's innovation is contingent upon the integration of technologies across the supply chain's multiple stages. As a result, process innovations rather than product innovations are typical of the industry. The study findings supported this idea: marketing innovation received the lowest rating, technology innovation came in second, and product innovation received the highest rating.

In contrast to industries such as IT or pharmaceuticals, the mining sector engages in process innovation due to limited opportunities for product innovation and producers' or miners' inability to control pricing mechanisms. The outcome of this phenomenon has been that innovation is predominantly propelled by the imperative of reducing expenses and adhering to regulatory requirements. Of paramount significance, the provenance of said innovations tends to be both diverse and multifaceted. The sector's capacity for innovation is facilitated by integrating

technology within its machinery, services, and other inputs. The current landscape presents pressing concerns and progressively arduous circumstances, including reduced ore quality, heightened obstacles in locating and utilizing deposits, decreased efficiency, and diminished market values. These factors are the impetus for implementing digital and specialized technologies throughout the value chain. The mining sector, typically regarded as a conventional and cautious industry in terms of novelty, is currently at a pivotal juncture owing to its multifaceted predicaments. Owing to the distinctive attributes of the sector, the integration of originality is a formidable task. Henceforth, it is incumbent upon mining enterprises to explore alternative avenues for addressing extant challenges and effecting a paradigm shift in mining methodologies, thereby augmenting efficacy, profitability, and capacity to adhere to more stringent regulatory frameworks. At this juncture, the introduction of KM and OL becomes salient. Increasingly, entities recognize that a considerable and predominantly unexplored resource is dispersed throughout their organization: knowledge. The emergence of KM and OL has been driven not only by the imperative to achieve cost-efficiency and managerial effectiveness in various domains such as problem-solving, decision-making, and innovation but also by the need to systematically capture, catalogue, preserve, and disseminate the wealth of expertise and knowledge that constitutes the organizational memory, which often exists in an unstructured form within the organization.

5. Conclusion and recommendations

In the era of knowledge workers, organizations have undergone significant restructuring to eliminate redundancies and adopt leaner processes. However, they now face intensified global competition and a more discerning consumer base, necessitating constant cost reduction and market expansion innovation. Recognizing the untapped potential of knowledge dispersed throughout an organization, KM has emerged as an essential instrument. The coal mining industry's distinctive characteristics may limit the direct applicability of technological and managerial innovations from other domains. These unique factors influence organizational performance, deviating from patterns seen in other sectors. Consequently, coal mining companies face distinct challenges and dynamics, necessitating tailored approaches to achieve success. While this research contributes to the KM field in Asia, particularly Indonesia, its preliminary nature and reliance on limited data should be acknowledged. Quantitative and qualitative research must be expanded for statistical analysis and model development to be robust and comprehensive. In addition, the findings may be more pertinent to the mining industry in Indonesia due to cultural similarities within the Asian context. Nonetheless, this study highlights the significance of KM processes as influential factors that can improve organizational performance, highlighting the need for management to comprehend and implement KM initiatives.

Author contributions

Conceptualization, IR and NM; methodology, IR; software, NN; validation, IR, and NN; formal analysis, IR; investigation, NN; resources, NN; data curation, IR; writing—original draft preparation, IR; writing—review and editing, NN; visualization, NN; supervision, IR; project administration. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors reported no conflict of interest.

References

Abbas J (2020). Impact of total quality management on corporate sustainability through the mediating effect of knowledge management. *Journal of Cleaner Production* 244: 118806. doi: 10.1016/j.jclepro.2019.118806

Abrahamsson L, Johansson J (2020). Can new technology challenge macho-masculinities? In the case of the mining industry. *Mineral Economics* 34(2): 263–275. doi: 10.1007/s13563-020-00221-8

Ahmad A (2010). Commentary of Senge's fifth discipline from an Islamic perspective. *International Journal of Learning and Change* 4(1): 7–20. doi: 10.1504/ijlc.2010.030168

Al Sayegh AJ, Ahmad SZ, AlFaqeeh KM, et al. (2022). Factors affecting e-government adoption in the UAE public sector organizations: The knowledge management perspective. *Journal of Knowledge Management* 27(3): 717–737. doi: 10.1108/jkm-09-2021-0681

AlQershi NA, Ali GA, Al-Rejal HA, et al. (2022). The power of strategic knowledge management in the relationship between innovation and the performance of large manufacturing firms in Malaysia. *International Journal of Innovation Science* 15(1): 19–41. doi: 10.1108/ijis-01-2021-0019

Arisanty D, Jędrasiak K, Rajiani I, Grabara J (2020). The destructive impact of burned peatlands to physical and chemical properties of soil. *Acta Montanistica Slovaca* 25(2): 213–223. doi: 10.46544/AMS.v25i2.8

Basuki B, Rajiani I, Widyanti R (2021). Boosting sustainability performance through supply chain quality management in the mining industry. *Polish Journal of Management Studies* 24(2): 41–54. doi: 10.17512/pjms.2021.24.2.03

Bonett DG, Wright TA (2014). Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning. *Journal of Organizational Behavior* 36(1): 3–15. doi: 10.1002/job.1960

Calzada Olvera B, Iizuka M (2023). The mining sector: Profit-seeking strategies, innovation patterns, and commodity prices. *Industrial and Corporate Change* dtad020. doi: 10.1093/icc/dtad020

Chaithanapat P, Punnakitikashem P, Khin Khin Oo NC, Rakthin S (2022). Relationships among knowledge-oriented leadership, customer knowledge management, innovation quality and firm performance in SMEs. *Journal of Innovation & Knowledge* 7(1): 100162. doi: 10.1016/j.jik.2022.100162

Ediriweera A, Wiewiora A (2021). Barriers and enablers of technology adoption in the mining industry. *Resources Policy* 73: 102188. doi: 10.1016/j.resourpol.2021.102188

Hair JF, Howard MC, Nitzl C (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research* 109: 101–110. doi: 10.1016/j.jbusres.2019.11.069

Hidayat AS, Rajiani I, Arisanty D (2022). Sustainability of floodplain wetland fisheries of rural Indonesia: Does culture enhance livelihood resilience? *Sustainability* 14(21): 14461. doi: 10.3390/su142114461

Kareem HM, Dauwed M, Meri A, et al. (2021). The role of accounting information system and knowledge management to enhancing organizational performance in Iraqi SMEs. *Sustainability* 13(22): 12706. doi: 10.3390/su132212706

Kashan AJ, Lay J, Wiewiora A, Bradley L (2022). The innovation process in mining: Integrating insights from innovation and change management. *Resources Policy* 76: 102575. doi: 10.1016/j.resourpol.2022.102575

Kokkaew N, Jokkaw N, Peansupap V, Wipulanusat W (2022). Impacts of human resource management and knowledge management on non-financial organizational performance: Evidence of Thai infrastructure construction firms. *Ain Shams Engineering Journal* 13(6): 101750. doi: 10.1016/j.asej.2022.101750

Libassi M (2022). Contested subterranean territory: Gold mining and competing claims to Indonesia's underground. *Political Geography* 98: 102675. doi: 10.1016/j.polgeo.2022.102675

McGrath S, Katzenschlager S, Zimmer AJ, et al. (2022). Standard error estimation in meta-analysis

of studies reporting medians. *Statistical Methods in Medical Research* 32(2): 373–388. doi: 10.1177/09622802221139233

Migdadi MM (2021). Impact of knowledge management processes on organizational performance: The mediating role of absorptive capacity. *Business Process Management Journal 28*(1): 293–322. doi: 10.1108/bpmj-02-2021-0111

Hidary M, Panahifar S, Hosseini SH, et al. (2023). Organizational learning: The link between knowledge management processes and organizational performance (Case study: Technology-based medium enterprise). *International Journal of Learning and Intellectual Capital*; in press. doi: 10.1504/ijlic.2023.10055403

Normuslim N (2021). Multicultural education in Indonesia: An Islamic perspective. *Journal of Educational Sciences: Theory & Practice* 21(4): 194–210.

Olan F, Ogiemwonyi Arakpogun E, Suklan J, et al. (2022). Artificial intelligence and knowledge sharing: Contributing factors to organizational performance. *Journal of Business Research* 145: 605–615. doi: 10.1016/j.jbusres.2022.03.008

Phuong LN, Tuan KC, Duc NN, Thi UN (2022). The impact of absorption capability, innovation capability, and branding capability on firm performance—An empirical study on Vietnamese retail firms. *Sustainability* 14(11): 6422. doi: 10.3390/su14116422

Purnomo M, Utomo MR, Pertiwi VIA, et al. (2021). Resistance to mining and adaptation of Indonesian farmer's households to economic vulnerability of small-scale sand mining activities. *Local Environment* 26(12): 1498–1511. doi: 10.1080/13549839.2021.1990234

Robertson J, Caruana A, Ferreira C (2023). Innovation performance: The effect of knowledge-based dynamic capabilities in cross-country innovation ecosystems. *International Business Review* 32(2): 101866. doi: 10.1016/j.ibusrev.2021.101866

Santhose SS, Lawrence LN (2023). Understanding the implementations and limitations in knowledge management and knowledge sharing using a systematic literature review. *Current Psychology*. doi: 10.1007/s12144-022-04115-6

Satispi E, Rajiani I, Murod M, Andriansyah A (2023). Human resources information system (HRIS) to enhance civil servants' innovation outcomes: Compulsory or complimentary? *Administrative Sciences* 13(2): 32. doi: 10.3390/admsci13020032

Sauer PC, Silva ME, Schleper M C (2022). Supply chains' sustainability trajectories and resilience: A learning perspective in turbulent environments. *International Journal of Operations & Production Management* 42(8): 1109–1145. doi: 10.1108/ijopm-12-2021-0759

Senge P, von Ameln F (2019). We are not in control—Embrace uncertainty and trust in what emerges. Peter Senge on the legacy and future of change management. *Gruppe. Interaktion. Organization. Zeitschrift Für Angewandte Organisationspsychologie (GIO)* 50(2): 123–127. doi: 10.1007/s11612-019-00460-6

Simanjuntak JM, Heriyanto, Hasibuan N (2023). Continuous assessment of Peter Senge's learning organization model for improving the quality of Christian higher education in Indonesia. *Teaching Theology & Religion* 26(1): 15–28. doi: 10.1111/teth.12630

Verrier B, Smith C, Yahyaei M, et al. (2022). Beyond the social license to operate: The whole system approaches for a socially responsible mining industry. *Energy Research & Social Science* 83: 102343. doi: 10.1016/j.erss.2021.102343

Wang C, Zheng Y, Chang HH (2013). Does standard deviation matter? Using "Standard Deviation" to quantify security of multistage testing. *Psychometrika* 79(1): 154–174. doi: 10.1007/s11336-013-9356-y

Wang X, Zhang C, Deng J, et al. (2022). Analysis of factors influencing miners' unsafe behaviors in intelligent mines using a novel hybrid MCDM model. *International Journal of Environmental Research and Public Health* 19(12): 7368. doi: 10.3390/ijerph19127368

Yanuardi Y, Vijge MJ, Biermann F (2021). Improving governance quality through global standard setting? Experiences from the extractive industries transparency initiative in Indonesia. *The Extractive Industries and Society* 8(3): 100905. doi: 10.1016/j.exis.2021.100905