



The Impact of Open Innovation and Knowledge Management on SME Performance in Yogyakarta

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ABSTRACT

This research examines the impact of knowledge management, open innovation, and innovation capabilities on the performance of SMEs in the Special Region of Yogyakarta. Although previous studies on open innovation in the Indonesian context have been conducted, specific results from this region still need to be included, and certain variables related to performance improvement in SMEs still need to be explored. Therefore, this study seeks to address these gaps, with 202 respondents contributing to the research. Data analysis was conducted using SPSS and PLS-SEM with the SmartPLS tool. The findings indicate that the variables of knowledge management, open innovation, and innovation capabilities have a positive impact on SME performance. This research aims to enrich the literature on open innovation and SME performance. The study also provides valuable insights for business practitioners and stakeholders on how to implement these variables to enhance business or company performance.

INTRODUCTION

The success of Small and Medium Enterprises (SMEs) depends on various factors, with innovation playing a crucial role in their growth. Integrating innovation fosters ongoing enhancement of products and services, generating enduring value for stakeholders and bolstering national economic growth and global competitiveness (Tobiassen & Pettersen, 2018). As Southeast Asia forms the Economic Union, putting pressure on SMEs in ASEAN to stay globally relevant, they must compete effectively to meet the diverse needs of consumers in Indonesia and across the region. SMEs should constantly develop new ideas, but some still do things the old way (Ahn et al., 2014). These closed ways might be risky because they only use what they already know and might miss out on great ideas from outside (Chesbrough, 2003). The success of SMEs in bringing new ideas to the market relies on the owner's proficiency in improving production, delivery, and related processes (OECD, 2005).

Chesbrough (2003) developed Open Innovation (OI) concepts to help companies get ideas, technology, knowledge, and skills from external sources. It prompts companies to assess their

performance and business strategies, which is helpful in crisis management situations (Chesbrough & Appleyard, 2007). Global collaboration, open discussions, protecting ideas, and testing new technologies can help organizations address critical conditions on a global scale (Rumanti et al., 2022). Using OI offers SMEs with strong knowledge capabilities a valuable opportunity (Yun et al., 2019). It is crucial for optimal performance, especially financially and operationally (Popa et al., 2017). SMEs achieve sustainable innovation through knowledge management (KM) and embrace OI concepts for organizational stability (Cassia et al., 2020). According to Samsir et al. (2017), KM improves SMEs' operations, profitability, and competitiveness by fostering a culture of knowledge sharing and treating knowledge as a manageable asset, enhancing overall company performance.

SMEs' performance is crucial for their success and sustainability in today's competitive environment, reflecting organizational goal achievement (Koohang et al., 2017). Innovation Capabilities (IC) represent a company's innovation ability, a key factor for SMEs' growth and performance success (Ukko et al., 2016). IC contributes to both inbound and outbound activities in OI practices (Gloet & Samson, 2016).

Prior research on OI in Indonesia has focused chiefly on manufacturing SMEs, examining OI's relationship with company performance (Hartono & Kusumawardhani, 2018). Few studies have specifically linked OI, KM, SME performance (OP), and IC in Yogyakarta. It addresses the gap, focusing on SMEs in Yogyakarta, a region with a rapid increase in SMEs. Data of BAPPEDA in Yogyakarta says there were 90,591 SMEs in 2023, a 48% increase from 2019. This growth significantly influences Yogyakarta's economy (Wahyunti et al., 2016). SMEs must adapt to economic fluctuations, highlighting the vital role of sustainable innovation for their competitiveness and survival. The study explores the relationship between IC, OI, KM, and OP in Yogyakarta, examining their impact on global and national sustainability and competitiveness of SMEs. Empirical studies have acknowledged KM's positive impact on company performance (Try et al., 2015). The study aims to guide SMEs in improving performance amidst global and national competition, offering new perspectives and building on prior research.

LITERATURE REVIEW

Innovation Capabilities (IC) and Open Innovation (OI)

Innovation is a company's ability to use all its resources to create new capabilities and value (Greco et al., 2016). SMEs benefit from OI, which involves sourcing ideas, technology, knowledge, and skills from external sources (Chesbrough & Appleyard, 2007). OI is crucial as it drives innovation within SMEs and external sources and is pivotal in organizational survival and growth (West et al., 2014). OI has two types: inbound, where companies integrate new resources with external collaborators to expand in current markets or explore new opportunities (Ahn et al., 2014), and outbound, a method for technology exploitation and commercialization.

IC is a strategy and vision supporting innovation activities in SMEs, aiming for optimal organizational performance by integrating key capabilities and resources (Ukko et al., 2016). This study aims to demonstrate the independent influence of IC and OI. IC reflects SMEs' ability to continuously transform knowledge and ideas into new products, processes, and systems (Ying & Li, 2012). OI serves as a means for SMEs to enhance IC, particularly in technology and amidst increasing competition, providing and maintaining competitive advantages and implementing corporate strategies (Pérez et al., 2018). This practice helps SMEs shape IC and manage various capabilities for successful innovation.

H1: Innovation Capabilities have a positive influence on Open Innovation.

Knowledge Management and Innovation Capabilities

According to Zaim (2006), KM encompasses activities, processes, or tools related to developing, storing, sharing, and utilizing knowledge for a company's competitive advantage. KM aims to boost innovation and responsiveness (Abubakar et al., 2019). OI is a significant link to entrepreneurs' capabilities, although SMEs adopting this method may face complex challenges, which IC can alleviate (Yun et al., 2019). Prior research on 78 SMEs in Spain found that advancing technology and building relationships are crucial for generating new ideas within SMEs (Ibarra et al., 2020). Effective KM is vital for advancing IC, including surpassing competitors, maintaining customer relationships, gaining employee trust, generating ideas, and cost efficiency. Both explicit and tacit knowledge are crucial for innovation, with employees' willingness to contribute and collect knowledge enhancing IC practices (Podrug et al., 2017).

H2: Knowledge Management has a positive influence on Innovation Capabilities.

Knowledge Management and Open Innovation

Knowledge, comprising experiences, values, contextual information, and expertise, evolves as a framework within organizational routines, processes, practices, and standards (Michaelkoenig & Kennethneveroski, 2011). Hence, KM is an ongoing process facilitating efficient innovation through accumulated knowledge and business experience within an organization (Bryson et al., 2010), particularly relevant for SMEs seeking competitiveness. Väyrynen et al. (2017) emphasize KM's pivotal role in external learning, particularly in OI practices, highlighting the need for companies to continually update and leverage collective knowledge through collaborations or networks with external partners. KM and OI share a closely intertwined relationship, generating significant value for SMEs by enabling the utilization of both internal and external knowledge to expedite innovation (West et al., 2014). Despite OI's dual role as a competitive advantage and necessity, Wagner (2013) suggests that not all networks and collaborations contribute equally to a company's IC. The most valuable networks stem from knowledge exchange spread within these connections.

H3: Knowledge Management positively influences Open Innovation.

Knowledge Management and SMEs Performance

The knowledge-based resources perspective elucidates the relationship between KM and OP. KM is a management tool supporting organizational goals, demonstrating competitive advantages, and enhancing SMEs' Performance (Megantoro, 2014). This theory emphasizes the strategic significance of knowledge as a company resource, which is often difficult for others to imitate and serves as a competitive advantage. Studies have explored the relationship between KM and SME performance. Several studies, including empirical research by Al-Hakim and Hassan (2013) and López-Nicolás and Merono-Cerdan (2011), highlight the direct influence of KM strategies on SME performance, emphasizing the pivotal role of effective KM practices for SMEs' growth and competitiveness. Research by Hussinki et al. (2017) underscores the importance of managing knowledge for organizational growth and thriving, indicating its instrumental role in SMEs' Performance. Additionally, the literature suggests that SMEs with effective KM practices, such as those outlined by Nisa et al. (2016) in the strategic role of human resources in KM activities, experience positive benefits akin to larger enterprises, as quality human resources play a crucial role in supporting business activities and determining policy direction for SMEs Performance.

H4: Knowledge Management has a significant impact on SMEs Performance.

Open Innovation and SMEs Performance

Innovation is crucial for SMEs in Indonesia to thrive amid competition and technological progress, offering them a distinct competitive edge (Price et al., 2013). The OI approach benefits SMEs by

seeking external resources and internal expertise in adapting to a dynamic business environment. Ahmad et al. (2018) highlighted that OI significantly fosters new ideas and collaborative efforts for SMEs in Pakistan. Italian SME studies found that OI positively impacts knowledge utilization, highlighting SMEs' need for external resources and internal expertise (Crema et al., 2014). Research by Popa et al. (2017) supports the idea that OI practices positively contribute to SMEs' performance in Spain. Collaborative initiatives are crucial for SMEs in enhancing IC (Bianchi et al., 2010). However, SMEs face independent product and technology development challenges, highlighting the importance of collaborating with external partners for necessary knowledge leverage. Effectively managing KM, practicing OI, and optimizing SME performance requires a strategic approach. Utilizing external resources, collaboration, and OI practices is crucial for SMEs to be competitive.

H5: Open innovation has a significant impact on SMEs Performance.

METHODS

A quantitative study utilizes primary data from online questionnaires to examine the development of SME performance through open innovation activities. A 5-point Likert scale, measuring attitudes and perceptions, is employed in a questionnaire covering variables such as knowledge management, innovation capabilities, open innovation, and SME performance. The study focuses on SMEs in Yogyakarta. The sample consists of individuals holding functional positions within these SMEs, preferably managers or executives. Convenience sampling is used to efficiently collect data, resulting in 202 responses for further analysis.

The study employs both descriptive and analytical statistics. Descriptive statistics present information that enables the research findings to be utilized by others who may require this information (Sodik & Siyoto, 2015). PLS-SEM with SmartPLS 3 is utilized for statistical analysis. Pilot tests were conducted using SPSS to ensure the reliability and validity of questionnaire questions. SPSS was chosen for the pilot test analysis due to its capability to provide accurate and easily understandable data for researchers, facilitating decisions regarding item elimination if necessary. The pilot test led to eliminating certain items to enhance the validity. PLS-SEM is a statistical method with a confirmatory approach for evaluating structural theories and hypothesis testing (Bryne, 2010). It effectively addresses challenges such as multicollinearity, small sample sizes, and missing data. PLS-SEM analysis comprises the measurement model test and the structural model test.

RESULTS AND DISCUSSION

Table 1 illustrates the descriptive analysis outcomes concerning the characteristics of the research participants, encompassing gender, age, education, current job position, total work experience, and monthly income. The participants in this study are primarily male (51%), aged 40 years or older (36.1%), holding a bachelor's degree (63.9%), currently occupying the role of business owner (61.4%), possessing a total work experience of 2-5 years (25.7%), and earning a monthly income ranging from 2 to 10 million (65.8%).

Table 1. Respondents Characteristics

Category	Frequency	%
Gender		
Male	103	51.0
Female	99	49.0
Age		
≤ 20 years	2	1.0
21–25 years	54	26.7
26–30 years	29	14.4
31–35 years	22	10.9
36–40 years	22	10.9
≥ 40 years	73	36.1
Education		
High School or Equivalent	34	16.8
Diploma (D3)	18	8.9
Bachelor's Degree (S1)	129	63.9
Master's Degree (S2)	14	6.9
Other	7	3.5
Position		
Business Owner	124	61.4
Manager	15	7.4
Senior Staff	24	11.9
Other	39	19.3
Total Work Experience		
< 1 Year	26	12.9
1 - 2 years old	38	18.8
2 - 5 years	52	25.7
5 - 10 Years	34	16.8
> 10 Years	52	25.7
Income per Month		
Rp 2.000.000 - Rp 10.000.000	133	65.8
Rp 10.000.001 - Rp 50.000.000	41	20.3
Rp 50.000.001 - Rp 100.000.000	19	9.4
Rp 100.000.001 - Rp 500.000.000	6	3.0
Rp 500.000.001 - Rp 1.000.000.000	1	.5
≥ Rp1.000.000.000	2	1.0

Source: Data Processed, 2023

Measurement Model: Validity and Reliability Data

Table 2 summarizes the measurement model analysis outcomes, confirming convergent validity and data reliability. The loading values, post-elimination, meet the specified criteria (loading factor ≥ 0.708) (Hair et al., 2021), signifying improved convergent validity. AVE values for all variables surpass the 0.50 threshold, indicating satisfactory convergent validity (Hair et al., 2021). Reliability tests affirm that each variable meets the criteria, with consistently high Cronbach's Alpha (CA) and Composite Reliability (CR) values exceeding 0.7 (Hair et al., 2021), ensuring the reliability of our findings.

Table 3 displays discriminant validity using the Fornell-Larcker criterion, where square root AVE values for each variable significantly exceed the correlation with other variables, meeting Fornell & Larcker's measurement criteria (Fornell & Larcker, 1981). Moreover, **Table 4** exhibits discriminant validity from the Heterotrait-monotrait (HTMT) test, with all variables having acceptable HTMT values below 0.85 (<0.85) (Hair et al., 2021; Henseler et al., 2015). It confirms that the variables in the study have consistent and distinctive indicators, ensuring their discriminant validity.

Table 2. Measurement Model: Convergent Validity and Data Reliability

Variables	Item	Loadings	CA	CR	AVE
Innovation Capabilities	IC1	0,783	0,826	0,885	0,658
	IC2	0,790			
	IC5	0,839			
	IC6	0,831			
Open Innovation	IOI5	0,760	0,911	0,926	0,583
	IOOI1	0,726			
	IOOI4	0,725			
	IOOI5	0,814			
	IOOI6	0,762			
	IOOI7	0,775			
	IOOI8	0,752			
	IOOI9	0,817			
	IOOI10	0,735			
Knowledge Management	KM6	0,815	0,935	0,945	0,631
	KM7	0,724			
	KM8	0,767			
	KM9	0,851			
	KM10	0,800			
	KM11	0,777			
	KM12	0,826			
	KM13	0,767			
	KM14	0,737			
Organizational Performance	OP1	0,804	0,938	0,946	0,616
	OP2	0,805			
	OP3	0,758			
	OP5	0,850			
	OP7	0,812			
	OP8	0,763			
	OP9	0,747			
	OP10	0,853			
	OP11	0,756			
	OP12	0,731			
	OP13	0,744			

Source: Data Processed, 2023

Table 3. Discriminant Validity: Fornell & Larcker's

Variables	IC	KM	OI	OP
IC	0,811			
KM	0,710	0,795		
OI	0,735	0,770	0,764	
OP	0,689	0,729	0,691	0,785

Source: Data Processed, 2023

Table 4. Discriminant Validity: The HTMT

Variables	IC	KM	OI	OP
IC				
KM	0,802			
OI	0,827	0,820		
OP	0,775	0,765	0,727	

Source: Data Processed, 2023

Structural Model Analysis

Table 5 shows collinearity test outcomes with Variance Inflation Factor (VIF) values, revealing no significant multicollinearity issues (Hair et al., 2021). VIF values below the 5 (VIF < 5) threshold for all variables assure the absence of critical multicollinearity concerns. Additionally, **Table 6** reports the results of the coefficient of determination (R²) and predictive relevance (Q²) tests, confirming that the model effectively explains variations and is predictive and well-fitted to the data.

Table 5. The Collinearity Test

Variables	IC	KM	OI	OP
IC			2,015	
KM	1,000		2,015	2,459
OI				2,459
OP				

Source: Data Processed, 2023

Table 6. R-Square and Q-Square

Variables	R ²	R ² Adjusted	RMSE	MAE	Q ² _predict
Innovation Capabilities	0,504	0,501	0,717	0,530	0,500
Open Innovation	0,665	0,662	0,790	0,661	0,387
Organizational Performance	0,573	0,568	0,702	0,513	0,520

Source: Data Processed, 2023

Hypothesis Testing

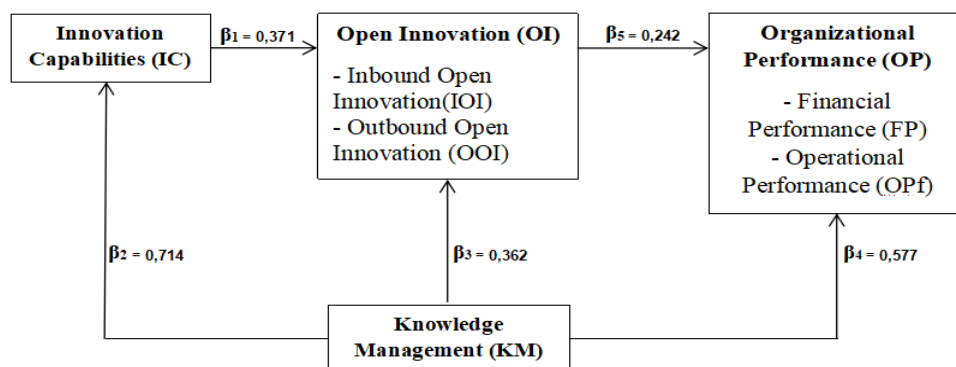
Table 7 presents hypothesis testing results, assessing t-statistics and p-values. Valid hypotheses have t-values > 1.96, and significance is achieved with p-values < 0.05 (Hair et al., 2021). All hypotheses meet these criteria, as summarized in **Figure 1**, adapted from Wang et al. (2020) and Rumanti et al. (2022).

Table 7. Hypothesis Testing

Hypotheses	β	T value	P Value	Conclusion
IC → OI	0,371	4,399	0,000	H1 Supported
KM → IC	0,714	18,074	0,000	H2 Supported
KM → OI	0,362	4,656	0,000	H3 Supported
KM → OP	0,577	9,680	0,000	H4 Supported
OI → OP	0,242	4,227	0,000	H5 Supported

Source: Data Processed, 2023

Figure 1 Research Model



Adapted from Wang et al. (2020) and Rumanti et al. (2022).

DISCUSSION

Innovation Capabilities and Open Innovation

Innovation capabilities positively influence open innovation (t-value = 4.399 > 1.96; p-value = 0.000 < 0.05), supporting H1. It aligns with Adamides & Karacapilidis (2020), indicating that organizations using OI strategies thrive. In this study, the link between IC and OI assesses how businesses, including companies and SMEs, recognize the necessity to innovate and adapt to future market trends. However, SMEs face challenges in obtaining external information due to a lack of core competencies in knowledge and financial resources; OI enhances competitiveness by utilizing new knowledge or technology from external sources (Crema et al., 2014). Meanwhile, research suggests that collaboration, even with consumers, fosters good relations and is crucial for organizational sustainability and survival (Tobiassen & Pettersen, 2018). Consequently, many SMEs adopt OI practices as a standard approach for organizational sustainability and survival (Huizingh, 2011). Thus, SMEs are expected to maximize their IC to enhance the optimal implementation of OI.

Knowledge Management and Innovation Capabilities

Knowledge management positively influences innovation capabilities (t-value = 18.074 > 1.96; p-value = 0.000 < 0.05), open innovation (t-value = 4.656 > 1.96, p-value = 0.000 < 0.05), and organizational performance (t-value = 9.680 > 1.96, p-value = 0.000 < 0.05), supporting H2, H3, H4. Optimal KM in SMEs enhances valuable knowledge, fostering innovation, business development, and long-term competitive advantage (Gkypali et al., 2017; Tran et al., 2022). Lam et al. (2021) study in a Vietnamese IT company highlights that effective KM involves trust, collaboration, and knowledge exchange, fostering organizational innovation. Effective KM enhances competitiveness, customer focus, employee relations and development, cost reduction, and business innovation (Duan, 2017). Mehrabani & Shajari (2012) suggest that the KM process enhances SMEs' capabilities, guiding continuous innovation. Implementing KM processes within SMEs can significantly enhance their innovation capacity, benefiting individuals and the company.

Knowledge Management and Open Innovation

The strategic implementation of KM in SMEs enhances openness in applying OI concepts. It influences organizational innovation by leveraging internal and external knowledge, allowing leaders to establish policies and instructions for market competitiveness (Singh et al., 2021). OI in SMEs involves internal collaboration and external research, which is essential for product innovation and market competitiveness. Furukawa (2015) highlights that OI fosters holistic organizational governance and redefines business models through collaborative knowledge creation. Practical knowledge application and absorption are critical in the competitive dynamics of companies, driving OI activities. Given the strategic importance of knowledge for companies, management should focus on enhancing KM capabilities and network connectivity within the entrepreneurial ecosystem to maintain a competitive advantage (Ferreira et al., 2023). To optimize the benefits of knowledge flow for innovation, companies must continually develop KM capabilities, internalize knowledge, and disseminate it for learning and skill development. The success of innovation implementation in business is closely tied to the effectiveness and success of KM.

Knowledge Management and Organizational Performance

Implementing KM in SMEs contributes to their performance through development and research activities. SME performance can be evaluated based on the effective utilization of these resources for product creation or trade, thereby adding value to SMEs (Masa'deh et al., 2017). Mazdeh & Hesamamiri (2014) emphasize that KM is crucial for enhancing SME performance. However, this

performance hinges on efficient management, utilization of available knowledge-based resources, and the successful implementation of KM processes. Recognized as a strategic resource, KM is vital in improving SME performance through knowledge creation, acquisition, storage, sharing, and utilization. It enhances learning, decision-making, productivity, and profitability. Similarly, Martelo-Landroguez & Cepeda-Carrion (2016) echo these findings, emphasizing KM as a vital strategic resource that improves SME performance through various knowledge-related processes. Finally, this study highlights that the superior the implementation of KM, the more favorable the future performance of SMEs.

Open Innovation and Organizational Performance

Open innovation positively influences organizational performance ($t\text{-value} = 4.227 > 1.96$, $p\text{-value} = 0.000 < 0.05$), supporting H5. Implementing OI has a positive impact on enhancing SME performance, divided into inbound and outbound open innovation. Inbound involves identifying and internalizing external ideas, while outbound commercializes internally developed ideas externally (Biscotti et al., 2018). In dynamic markets, organizations have no choice but to embrace openness, with varying abilities to benefit from OI. Studies argue that its positive impact influences various elements of organizational performance (Biscotti et al., 2018; Wang et al., 2015). Building solid relationships with external channels enhances the effectiveness of incoming OI for improved organizational performance. Parida et al. (2012) explain that OI involves assimilating external knowledge to develop technologies to advance companies or SMEs. Ahn et al. (2014) suggest that when introducing innovations, old processes must be eliminated for effective implementation, as adopting OI entails significant cultural and workflow changes for SMEs. Thus, OI strategically improves business performance on an operational scale for SMEs.

CONCLUSION

This research enhances understanding of factors improving SME performance, especially in Yogyakarta. With all hypotheses accepted, the model explores relationships between knowledge transfer, innovation capability, and open innovation on SMEs' performance. The study shows that OI drives SME progress by integrating KM processes and performance to enhance IC. KM significantly impacts IC, OI, and OP, with the most decisive influence between KM and IC. Thus, improving KM is directly proportional to SME success opportunities. The study broadens the topic and serves as a valuable reference for SMEs seeking to enhance business performance through continuous innovation. The research provides practical guidance for managers, advocating the implementation of IC, KM, and OI to enhance SME operational performance. Future research should expand on these variables, serving as a reference for SMEs aiming to enhance performance and innovation. This study acknowledges limitations in respondent distribution in SMEs in Yogyakarta, which are attributed to time constraints and limited access. Thus, the study suggests increasing the number of respondents and adding classifications for SMEs or companies to obtain a more comprehensive understanding and validity for future research.

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