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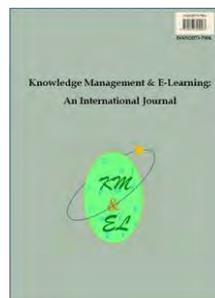
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## **Knowledge translation in the biomass industry: Examine the moderating effect of organizational collaborative environment**

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**Abstract:** Globalization, rapid technological advancement, and a dynamic market environment make organizations need to find effective ways to escalate their organizational performance. Anchored on the resource-based view (RBV) theory, this study investigates the impact of organizational innovation, knowledge management capabilities, and organizational learning on organizational performance in the Malaysian biomass industry. More importantly, this study also examines the moderating effect of collaborative knowledge, skills and abilities (KSAs) on organizational performance. This study employed census sampling and collected 130 samples. Cross-sectional data were collected using a structured questionnaire and tested using partial least square–structural equation modelling. Subsequently, the assessments of the reflective measurement model, structural model, reliability and validity were conducted. This study found that organizational learning is the most critical factor affecting organizational performance, followed by knowledge management capabilities and organizational innovation. Collaborative KSAs were found to moderate the relationship between organizational learning and organizational innovation on organizational performance. However, no moderating effect was identified on the relationship between knowledge management capabilities and organizational performance.

**Keywords:** Organizational innovation; Knowledge management capabilities; Organizational learning; Collaborative knowledge; Skills and abilities (KSAs); Organizational performance

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## 1. Introduction

Globalization, technological complexities, shorter product life cycles, customers' new demands, and the competitive market environment force organizations to find effective ways to escalate their organizational performance. Organizations need to establish competitive strategies to exploit external opportunities and respond proactively to threats and challenges to achieve a competitive advantage. The organizational performance of the biomass industry has gained tremendous attention due to the growing global energy demand (Rashidi et al., 2022), its significant influence on the agriculture sector, and Malaysia's economic performance (How et al., 2019).

Biomass refers to woody residue, oil palm biomass, agro-industrial waste, sago biomass, and municipal solid waste (How et al., 2019). These biomasses can produce high-value products such as biofuel, biochemical, bio-fertilizer, and eco-products (Lee, 2017). Biomass is a carbon-neutral fuel that will reduce greenhouse gas (GHG) emissions, the threats of climate change and solve the problem of rising fossil fuel costs and shortage of fossil energy in the future (Faizal et al., 2018; Lee, 2017; Saad et al., 2014). Besides that, biomass is a sustainable resource that can enhance waste management practices (Aberilla et al., 2019) and substitute coal to achieve a positive balance of trade (Norfadhilah et al., 2019). Alzahrin (2018) posits that biomass power plants in rural areas can provide electricity to rural folks in remote areas. Therefore, biomass resources are known as alternative energy sources, renewable energy, and valuable resources, not just waste.

On the other hand, the challenges of the biomass industry in developing countries (i.e., Malaysia) are the lack of technology experts, facing organizational issues, high capital

expenditure, limitations in getting financial assistance, and environmental issues related to deforestation (How et al., 2019; Rashidi et al., 2022). The increasing global energy demand has led to the development of biomass as a renewable energy source to mitigate climate change and fulfil the population's needs (Rashidi et al., 2022; Salleh et al., 2020). The high demand of foreign countries for biomass resources results in local biomass supply issues (Ho, 2015; How et al., 2019). How et al. (2019) found that other challenges in the biomass industry include the lack of local market support and long-term commitment from suppliers, using biomass to produce low-value products, logistics challenges, and limited historical data trends. Given the challenges in the biomass industry, there is a hastened need for biomass organizations to overcome the barriers to raising their organizational performance.

Malaysia plays a pivotal role in biomass production using palm oil waste. It is the world's second-largest palm oil producer after Indonesia and the leading exporter of palm oil (Salleh et al., 2020). Furthermore, Malaysia is the leading biodiesel producer, and palm biodiesel for transportation has been accepted by the Japanese Automobile Manufacturers Association (Rashidi et al., 2022). Malaysia has the potential to become a regional biomass hub in the Asia-Pacific region (How et al., 2019). ASEAN countries intend to reduce carbon emission intensity per unit of GDP by up to 45% in 2030 and achieve a 50% renewable energy target in 2050 (World Energy Council, 2018). The Malaysian government imposed the Renewable Energy (RE) Act 2011, the Green Technology Policy, and the National Biotechnology Policy (Lee, 2017) and developed the National Green Technology Masterplan 2017-2030 (Salleh et al., 2020) to promote the performance of biomass organizations. As such, biomass organizations must determine the significant factors influencing their organizational performance to realise these opportunities.

Indeed, improvements in organizational performance are possible through knowledge translation. Knowledge translation entails synthesis, dissemination, and implementation to enhance organizational performance (Schell et al., 2020). In the same vein, Simeone et al. (2017) claimed that knowledge translation involves knowledge processing, interpreting, and transformation, which transfer knowledge in specific forms that match the organizational needs. In an organization, the knowledge translation process usually follows a sequential pattern, where knowledge is processed through organizational learning, then interpreted through knowledge management capabilities and transformed through organizational innovation. The knowledge translated into the organization manifests itself through changes in its performance, and the newly acquired knowledge plays a predominant role in sustaining business competitiveness (Argote & Ingram, 2000; Lombardi et al., 2020). On the other hand, Von Krogh (2012) and Cobiauchi et al. (2021) asserted that knowledge translation processes are a collective social engagement between groups, functional units, and organizations with diverse characteristics.

Recent developments in knowledge management studies have shown the need to study the knowledge translation process (Gagnon et al., 2018; Park et al., 2018; Schell et al., 2020). Knowledge translation in organizations often exceeds the individual level and mainly involves group, departmental, and divisional levels. As such, the knowledge translation process requires a tactical knowledge of how to translate the knowledge effectively. This skill is even more critical when transferring subjective and experience-based knowledge that cannot be expressed verbally. Although many studies have been conducted to illustrate the benefits of knowledge translation (Von Krogh, 2012; Schell et al., 2020; Serino et al., 2020), very few studies have been conducted to examine the effectiveness of the knowledge translation process (Cobiauchi et al., 2021). To bridge this gap, this study has aimed to investigate the impact of organizational innovation, knowledge

management capabilities, and organizational learning on organizational performance in the Malaysian biomass industry. In addition, this paper has introduced a moderator into the conceptual framework: collaborative knowledge, skills and abilities (KSAs). This moderator has helped to examine the effectiveness of the knowledge translation process in affecting organizational performance. To achieve this research objective, the specific research question of this study is:

**RQ1:** Do organizational innovation, knowledge management capabilities, and organizational learning predict organizational performance?

**RQ2:** Do collaborative knowledge, skills, and abilities (KSAs) moderate the relationships between organizational innovation, knowledge management capabilities, and organizational learning with organizational performance?

## 2. Conceptual framework

### 2.1. Resource-based view

The resource-based view (RBV) theory is the predominant theory incorporated in this study to address the enabling factors (what types of resources and capabilities) will influence organizational performance. Every organization will have different specialised internal resources and capabilities that can distinguish itself from rivalries. Organizations must have valuable, rare, hard to imitate to achieve competitive advantage and non-substitutable resources (Barney, 2001; Lee et al., 2021). Organizations can use tangible and intangible resources as their strengths to exploit external opportunities and respond to external threats (Bhat & Sharma, 2021; Miles, 2012). Ismail et al. (2011) and Fianko et al. (2022) developed the claim that an organization can achieve outstanding performance by focusing on its intangible resources, such as intellectual capital, brand name, process, and product innovation. Tangible resources (finances, raw materials, machinery, organizational structure) could easily be imitated or acquired by competitors.

Organizations need to strengthen their resources and competencies, which include goodwill, intellectual capital, database, financial, technology, and operating techniques, to achieve competitive advantages (Bhat & Sharma, 2021; Miles, 2012). Barney (2001) and Fianko et al. (2022) propagated that the different attributes of resources and capabilities of organizations can differentiate them from their competitors. In other words, organizations can outperform competitors when they can discover which type of resources and capabilities need further attention and to be utilized intensively in the long term. In this study, the core resources refer to organizational innovation (OI), organizational learning (OL), knowledge management capabilities (KMC), and collaborative knowledge, skills, and abilities (KSAs). According to Teoh et al. (2020) and Lee et al. (2021), organizational innovation as a strategic resource includes differentiated strategies, process and product innovation, and new external relations. Organizational learning is a process whereby an organization consolidates the workforce's knowledge and integrates it into the business's knowledge system (Do et al., 2022). Grounded on the RBV, knowledge management involves collecting relevant resources and utilizing them to create new knowledge (Lee & Yew, 2022; Ullah et al., 2019). Lee et al. (2018) elicited that in collaborative KSAs, employees with diverse skills and experiences complement each phase of the business process to promote business growth. Therefore, the RBV theory was used to predict how

the organization use these resources to achieve extraordinary performance in an intense and competitive environment.

Nezameddin et al. (2018) posited that managers should deploy unique resources to implement value-creation strategies besides producing new products efficiently and effectively. With efficiency, an organization can improve its productivity, reduce the average cost per unit, achieve economies of scale, and earn higher profits. In essence, the strategy must be creative and not used by their competitors yet. Hence, the organization can achieve a competitive advantage and result in superior performance in the long run. Subsequently, the organization will be able to promote its unique selling point and product differentiation, satisfy customer needs, achieve business objectives, and eventually achieve its vision. On the contrary, organizations cannot gain a competitive advantage if their existing resources are easy to obtain, imitate, and substitutable by their current and potential competitors.

For a new business, it is crucial to maintain and create new resources internally rather than exploit the external factors discovered by direct competitors. These resources act as the core competencies that can promote the internal growth of an organization (Uhm et al., 2018). In contrast, they can gain new resources and capabilities through internal investment or external growth (Joshi et al., 2019). To achieve superior organizational performance in the long term, it is not practical to use the same strategies and resources for years. The organization may conduct a product portfolio analysis; strengths, weaknesses, opportunities, and threats (SWOT) analysis; and a Boston matrix to determine the best strategies that can be used in a dynamic environment. Indeed, using the same marketing mix in different product life cycle stages is unwise. The organization may benchmark the established organization regarding its management skills, marketing strategies, how much it spent on research and development (R&D) and investment in technology and make strategic decisions. Sheikh et al. (2018) and Gupta and Malhotra (2013) indicated that managers should be innovative when formulating strategies and producing products and services that can satisfy customer needs and wants over time.

The RBV theory has been widely used to highlight the firms' resources and capabilities in their organizational performance trajectory, allowing them to achieve competitive advantages and remarkable performances (Joshi et al., 2019; Parida et al., 2019; Sheikh et al., 2018). However, this theory has been criticised because it only focuses on the firm's resources and capabilities. It does not generalize the specific methods for using the resources to achieve sustainable and long-term competitive advantage. The RBV perspective does not indicate what attributes of resources can motivate factors to help the organization outperform its rivals and respond to external factors besides improving organizational performance. Essentially, not all firms have the same resources and capabilities (Ismail et al., 2011; Bhat & Sharma, 2021). This study has used organizational innovation, organizational learning, knowledge management capabilities, and collaborative KSAs as predictors of organizational performance to fill this gap. Some studies proposed that collaborative KSAs can moderate organizational performance in Malaysia's biomass industry (Lee et al., 2018; Sheikh et al., 2018). Collaborative KSAs are categorized as intangible resources for an organization. The underlying moderating effects of collaborative KSAs between organizational innovation, knowledge management capabilities, organizational learning, and organizational performance were explored in this study.

## 2.2. Organizational performance

In the era of globalization, all organizations strive to outperform competitors to sustain and survive in the long run, regardless of their business structure. Additionally, organizational performance can indicate an organization's competitive position in the industry. Huang et al. (2019) showed that organizational performance represents the performance of business activities. For instance, whether an organization can design effective strategies to earn higher sales revenue and good management on cost centres such as cost of production to produce quality products and services to make high profit.

Knowledge translation processes are embedded in organizational innovation and learning, knowledge management capabilities, and collaborative KSAs to achieve extraordinary performance. Knowledge translation occurs when employees collect and exchange relevant information through meetings and incorporate the new knowledge into operational activities (Schell et al., 2020). The new knowledge and skills can prevent product and service failures (Kim et al., 2013). Indeed, an organization that achieves superior performance is more likely to earn higher sales revenues, profits, and brand recognition, attract more angel investors, and have a higher chance of getting loan approval to finance the growth strategies. Any underperforming organization needs to investigate the root cause or the critical problem for its poor performance, revise the existing strategy, plan a new competitive strategy, or immediately take corrective action. Notably, Cho and Lee (2018) proposed that a successful business must understand customer needs, satisfy their demands, retain talented employees, have loyal and experienced employees, practice social responsibilities, be innovative, and respond to external forces.

Organizational performance can be measured using financial and non-financial measurements. Financial measures include profitability, profit growth, market share, return on asset (ROA), and equity (ROE). This type of measurement is objective-based and reliable, and the data is easily interpreted. However, this is solely based on historical performance and does not represent the current organizational performance. Non-financial measurements comprise customer satisfaction, productivity, and competitive position, besides the potential to have internal and external growth (Cho & Lee, 2018; Pang & Lu, 2018). Kuo (2011) posited that the quality and innovative products and services, employee attraction and retention, management and employee relations, and customer satisfaction could measure the performance of an organization. Ullah et al. (2019) argued that organizational performance could be assessed using financial and non-financial aspects, including market share, product and service quality, operational cost, and comparative performance concerning competitors and the industry.

Cho and Lee (2018) depicted that innovation has a significant relationship with organizational non-financial performance, while risk-taking and entrepreneurship education do not have any relationship with the organization's financial and non-financial performance. Based on the data collected from 279 high-tech small to medium-sized enterprises (SMEs), there is a positive relationship between innovation with research and development (R&D) and organizational performance (Rezaei & Ortt, 2018). Literature also indicated that organizational learning (Cattani & Kim, 2017; Kuo, 2011; Ouma et al., 2017; Zhu et al., 2019), organizational innovation (Jiang et al., 2019; Lisa, 2019; Kang et al., 2015; Ullah et al., 2019) and knowledge management capabilities (Azyabi, 2018; Chetty et al., 2021; Mubin & Latief, 2019) would affect organizational performance.

### 2.3. Organizational innovation

Innovation is the crucial catalyst for organizational performance. Innovation refers to an organization's ability to utilize existing resources to create new ideas and produce new supplies, quality products, and operational processes. An organization can achieve a higher profit margin when it implements organizational innovation related to technology, behaviour, and business processes (Cho & Lee, 2018; Uz Kurt et al., 2013). Knowledge translation has been the predominant source of innovation in all types of business structures (Lombardi et al., 2020; Serino et al., 2020). In the Malaysian biomass industry, organizational innovation involves R&D using conversion technologies and process integration to produce biochemical and biofuel to penetrate global markets (How et al., 2019). Cobianchi et al. (2021) argued that the knowledge translation process among professionals is smoother because they have similar backgrounds, norms, and competencies. However, the employees' diverse experiences, qualifications, and ages may lead to mistrust, doubts, and resistance to sharing their knowledge and ideas (Cobianchi et al., 2021).

It is noteworthy that organizational innovation is required to discover new core competencies. Organizational innovation uses internal intellectual capital, sophisticated technologies, and new management practices to be flexible and responsive to the competitive marketplace. Organizational innovation positively and significantly influences organizational performance (Jiang et al., 2019; Kuo, 2011; Nguyen et al., 2018; Ullah et al., 2019). It plays a vital role in helping the organization to improve its efficiency, product and service quality at a lower unit cost. With the new products, advanced production processes, flexible internal structure, innovative strategies, and tangible assets such as digital technologies, the organization can respond innovatively to customer preferences (García-Sánchez et al., 2018).

Bonacina Roldan et al. (2018) illustrated that organizational innovation has a higher impact on small organizations. Compared with large organizations, they are more likely to be flexible and easier to reconstruct the internal practices and structure to implement any new strategies or new projects. Organizational innovation will allow the organization to diversify its existing products, services, production methods and management model to enhance its competitiveness. Secondly, the result shows positive reverse causation between sales growth and innovation. When an organization can earn higher sales revenue and profits, it can have more working capital that can be used to finance innovation activities and purchase advanced technologies.

In contrast, an organization with low sales growth and poor performance will lack resources to perform innovation activities, not be productive, and will find it difficult to survive in the competitive market. In another study, Huang (2017), Fartash et al. (2018), and Su and Tang (2016) depicted that organizational innovation has a positive relationship with organizational performance. The organization should focus on organizational innovation instead of a reduction in the cost of production. In conclusion, this study hypothesized that:

**H1:** Organizational innovation impacts organizational performance positively.

#### *2.4. Knowledge management capabilities*

Knowledge asset is a vital intangible asset for an organization. The organization encourages managers and employees to acquire, evaluate, share, and apply the new knowledge (Opele, 2022) to respond to external challenges and escalate the organization's intellectual capital and strategic advantage (Chetty et al., 2021; Lee & Yew, 2022). Knowledge translation occurs when new knowledge and skills are synthesized and transmitted through regular meetings and emails. Employees incorporate it into daily operations to develop innovative values and ideas and offer efficient services (Chetty et al., 2021; Ullah et al., 2019). Knowledge translation on international certification and benchmarking is crucial for the Malaysian biomass industry as they can make significant changes in the operation process and ensure their biomass products comply with the latest international standards (How et al., 2019). In the healthcare institution, knowledge translation activities among nurses occur through interaction and sharing sessions with their colleagues to bridge the knowledge gaps, improve the quality of care, and minimize errors (Shateri & Hayat, 2020).

Investment in knowledge management resources will contribute to a unique solution to resolve business issues, provide efficiency, simplify working practices, and improve business growth and sustainability. Hence, it is crucial to support senior managers in cultivating a conducive knowledge-sharing culture (Abuaddous et al., 2018). Akram et al. (2018) pointed out that knowledge management capabilities (KMCs) have a direct and positive relationship with perceived organizational performance (POP). An organization can invest in the knowledge management process besides utilizing its knowledge assets to create value for existing offerings and enhance competitiveness. Another study conducted by Hussein et al. (2018) indicate that the dimension of knowledge management orientation such as organizing memory, knowledge receptivity, and knowledge absorption, have a positive relationship with organizational performance. The organization should pinpoint the valuable knowledge and apply it internally to outperform its competitors.

Knowledge management capabilities directly and significantly influence an organization's innovation performance. If the organization can acquire the relevant knowledge and deploy it successfully, this will lead to positive outcomes. Interestingly, this relationship can be moderated by environmental dynamism and learning capability. Environment dynamism motivates the organization to apply new knowledge and respond to the complex business environment. Learning capabilities from different sources will result in intensive knowledge acquired by employees and the development of creative ideas and solutions (Chetty et al., 2021; Kamasak et al., 2016). According to Jyoti and Rani (2017), knowledge management positively correlates with organizational performance in the private telecommunication sector. Knowledge acquisition, knowledge approach, and knowledge sharing were used to measure knowledge management. Employees can acquire knowledge from casual meetings, brainstorming activities, and successful experts' suggestions to improve their performance. Regarding the knowledge approach, the organization must have an updated database and regularly update stakeholders about the organization's latest offerings and information. In addition, knowledge sharing can be practised by using internal communication channels, virtual platforms, and regular meetings. Consequently, these practices can ultimately improve organizational performance.

Knowledge management capabilities significantly positively affect organizational performance (Attia & Essam Eldin, 2018; Turulja & Bajgoric, 2018; Ullah et al., 2019).

Knowledge management capabilities in terms of human, technical, cultural, and structural aspects were used to form the statements in the questionnaire. An organization must regularly integrate new knowledge to compete with rivalries in the complex business environment (Attia & Salama, 2018). Gupta and Chopra (2018) depicted that knowledge management practices significantly influence an organization's financial performance. The summary of the literature review matrix proposed by Abuaddous et al. (2018) concluded a study that found that knowledge management, directly and indirectly, influences organizational performance. The organizational performance will be affected by the knowledge management process (Iqbal et al., 2019). The dimensions to measure the knowledge management process included knowledge acquisition, sharing, and utilization. Effective implementation of the knowledge management process will increase productivity and allow the organization's responsive to external threats (Iqbal et al., 2019). Organizations with a high level of intellectual capital and knowledge management practice perform better than their competitors (Hussinki et al., 2017). Ali et al. (2019) advocated that knowledge-sharing practices positively affect organizational performance (lower operation cost, more business growth, and greater competitive advantage). Based on the above discussion, this study hypothesized the following:

**H2:** Knowledge management capabilities impact organizational performance positively.

### *2.5. Organizational learning*

Knowledge translation is supported by intangible assets, which include human capital, branding, core competencies, and efficient internal processes (Lombardi et al., 2020). With organizational learning, knowledge translation can bridge the knowledge gap of employees when the knowledge is accessible and transferable (Cobianchi et al., 2021). On the other hand, knowledge translation via organizational learning involves benchmarking the successful countries in the biomass industry, such as Thailand, Austria, and Japan, learning their innovative approaches to optimizing biomass production capacity, and improving supply chain management (How et al., 2019). The learned knowledge can be translated and incorporated into the organization (Do et al., 2022). When the organization has cultivated a learning environment, regards learning as a necessity, and recognizes the creative ideas presented by employees, the employees tend to enlarge their knowledge base and view challenges as golden opportunities (Fonseca et al., 2019).

Organizational learning refers to creating and acquiring new knowledge and applying it in the organization (Canessa-Terrazas et al., 2017). Siddique (2018) delineated that organizational learning will influence organizational performance positively. However, organizational learning is not able to resolve all business-related issues. The organization must have a strategic-orientated human resource management function, appropriate leadership style, and effective methods to acquire new knowledge and skills to achieve a competitive edge and superior performance. Organizations can redesign their organizational structures to foster learning, employees' participation in decision-making, experimentation, and risk-taking culture. With a conducive learning culture, employees can create and learn new knowledge, have better interpersonal relationships with their superiors and colleagues, practice an efficient working system, and ultimately improve the organization's competencies. The organization will respond to its competitor's actions by acquiring and developing new knowledge. Additionally, supply chain agility will not mediate between organizational learning and performance (Khan & Wisner, 2019).

Similarly, Mohammad (2019) proposed that organizational learning significantly affects organizational performance. Organizational learning is essential in the relationship between strategic change and organizational performance. Kadhim et al. (2018) found that organizational learning will positively affect an organization's competitive advantage. As Khunsoonthornkit and Panjakajornsak (2018) stated, organizational learning has a positive relationship with the performance of a research organization. Organizational learning involves exchanging opinions with colleagues and external stakeholders, establishing learning awareness, and developing a sustainable solution to business challenges. Kim et al. (2017) proposed that the relationship between organizational learning will improve an organization's financial performance. Learning activities in the organization will enhance knowledge performance and eventually increase the financial performance of an organization. Through dialogue and inquiry, this will encourage valuable feedback from the employees; meanwhile, team learning will allow team members to discuss and learn the most efficient methods to implement any new strategy. The information system in the organization should be user-friendly to allow employees to access and gather relevant knowledge. In addition, connection to the environment will enable the organization to acquire new knowledge from external parties. Empowerment will encourage the employees to learn how to make decisions pertaining to their tasks or projects. Consequently, these practices will contribute to better organizational performance. Based on the above reasoning, this study proposed the following hypothesis:

**H3:** Organizational learning impacts organizational performance positively.

### 2.6. Collaborative KSAs

In the context of the R&D of healthcare institutions, the experts are required to synergize their skills, abilities, and best practices (Opele, 2022). Knowledge translation embedded in the intra-organizational collaborative environment is advantageous as it supports employees in acquiring new knowledge resulting in higher organizational performance (Lombardi et al., 2020; Serino et al., 2020). Collaborative KSAs are comprised of processes that can reduce and remove potential risks, duplicated efforts, and redundant costs among the suppliers and manufacturers of the biomass industry (How et al., 2019).

Lee et al. (2018) postulated KSAs as being an organization's competencies and internal strengths. Collaborative KSAs refer to the knowledge, skills, and abilities required during risk mitigation, conflict resolution, and the creation of shared values and expertise in a collaborative working environment. It is an ability to pull together people from different backgrounds to work cohesively and pursue common goals to complete an interdependent task (Lombardi et al., 2020; Nemiro, 2000). If team members can establish collaborative KSAs successfully, this will lead to positive outcomes, such as creativity, and they will ultimately achieve better organizational performances. With collaborative KSAs, employees can exchange ideas based on their expertise and complement and support each other to enhance organizational performance. However, poor coordination and conflicts between functional departments, the lack of a responsive strategy, confusing organizational structure, and poor branding and marketing strategy will negatively impact organizational performance. Therefore, organizations should emphasize the importance of collaborative KSAs and cultivate a collaborative culture to improve organizational performance in the long term (Cetin et al., 2016). Many researchers have argued that a robust collaborative environment will enhance organizational performance. Lee et al. (2018) showed that the performance of the Global Business Service industry in Malaysia improved when the

collaborative KSAs among the employees were enhanced. Similarly, good collaborative KSAs are likely to result in higher team performance (Hwang, 2018; Körner et al., 2016; Fay et al., 2015).

Despite that, some researchers proposed that collaborative KSAs positively affect performance (Lombardi et al., 2020; Serino et al., 2020). The researcher argued that collaborative KSAs magnify the effect of collaboration breadth and depth on new knowledge exploration (Xu & Zhou, 2019). Besides that, collaborative KSAs appeared to enhance group performance, where a high level of collaboration intensified the relationship between cognitive diversity and creativity (Younis, 2018). As such, this study argued that collaborative KSAs would moderate the relationships between organizational innovation, knowledge management capabilities, and organizational learning on organizational performance. This study hypothesized the following:

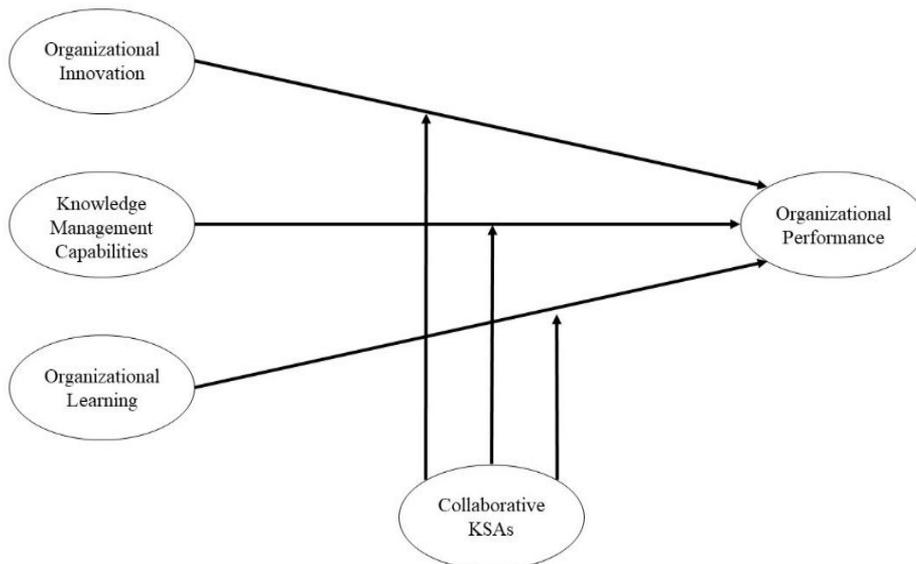
**H4:** Collaborative KSAs positively moderate the relationship between organizational innovation and organizational performance.

**H5:** Collaborative KSAs positively moderate the relationship between knowledge management capabilities and organizational performance.

**H6:** Collaborative KSAs positively moderate the relationship between organizational learning and organizational performance.

### 3. Research model and hypothesis development

This study has proposed the following research model (see Fig. 1) to examine the impact of organizational innovation, knowledge management capabilities and organizational learning on organizational performance. In addition, this model will examine the role of collaborative KSAs in enhancing these relationships.



**Fig. 1.** Research model

## 4. Research method

### 4.1. Data collection method

The research population in this study refers to Malaysia's biomass industry organizations. The unit of analysis of this study focused on the individual who plays a strategic role (C-level executive) within a biomass organization in Malaysia. The sampling process started with the determination of the sampling frame. According to Malaysia External Trade Development Corporation (MATRADE) (2018), 228 biomass companies and related companies are operating in Malaysia. After the sampling frame was determined, this study used the voluntary response sampling method to collect the data. The voluntary response sampling method collects data from persons who volunteer to take the research survey. The data collection process consists of two parts: (1) finalizing the participation list and (2) organization visitation and data collection. To begin, an invitation email was sent to all the Chief Executive Officers (CEOs) of the biomass organizations in Malaysia in the sampling frame to seek their intention to participate in this research survey. Finalizing the organization participation list took around two months to complete the first part. In the second part, the researcher visited the organizations based on the appointment scheduled. The researcher explained the background of this research to the CEO and ensured data privacy before delivering the questionnaire form to the CEO. The CEO was given sufficient time to complete the questionnaire, which was collected once completed. The data collection took about three months to complete. A total of 130 responses were collected and used in the data analysis. A power analysis was conducted to estimate the required sample size (Chin & Newstead, 1999; Faul et al., 2007). The output from G\*Power 3.1.9.2 showed that the minimum sample needed in this study was 98 indicating the sample size's adequacy.

### 4.2. Measurement of variables

A total of 44 questions were asked in the questionnaire form. Section A consisted of 12 items that measured the respondent's demographic profile. Section B presented the remaining 32 items measuring the key variables. All items used in this research used five-point Likert scales, adapted from various literature. Table 1 below shows the complete item list.

### 4.3. Data analysis and results

The common method variance (CMV) issues were analyzed using Harmon single-factor analysis and confirmatory factor analysis (Podsakoff et al., 2003). Firstly, Harman's one-factor test was conducted. The unrotated factor solution test result revealed that the explained variance of 45.71% was below the threshold of 50%, as suggested by Podsakoff et al. (2003). After that, a confirmatory factor analysis was conducted by modelling all the items as indicators for a single factor. The output illustrated in Table 2 shows that the single-factor model demonstrated a poor data fit. As a result, we confirmed that CMV was not an issue in our data.

**Table 1**  
Construct operationalization

Constructs	Items code	Item
Organizational innovation (Kuo, 2011; Uz Kurt et al., 2013)	OI1	Our organization values technological innovations that will enhance market competitiveness.
	OI2	Our organization often changes the way we make or deliver products or services.
	OI3	Our organization often improves or revises existing products or services.
	OI4	Our organization establishes reward policies for new ideas and innovations proposed by employees.
	OI5	Our organization develops products or services that offer greater advantages to consumers.
	OI6	Our organization develops products or services that better meet the needs of customers.
	OI7	Our organization often adds new products or services to the existing ranges.
	OI8	Our organization develops products or services requiring consumers to alter their behaviours substantially.
Knowledge management capabilities (Chung et al., 2007; Kuo, 2011)	KM1	Our organization utilizes various channels to facilitate employees' learning.
	KM2	Our organization utilizes various channels to receive employees' suggestions to improve existing business practices.
	KM3	Our organization encourages employees to acquire new knowledge through learning.
	KM4	Our organization provides a knowledge base that employees can utilize.
	KM5	Our organization uses formal and informal discussion groups to assist in knowledge sharing.
	KM6	Our organization encourages employees to create new knowledge through research and development (R&D).
	KM7	Our organization encourages employees to apply new knowledge to accomplish new tasks.
Organizational learning (Kohtamäki et al., 2012; Kuo, 2011)	OL1	Our employees are actively improving their professional competencies.
	OL2	Our employees set work-related goals and try to accomplish them.
	OL3	Our employees are encouraged to learn from their experiences.
	OL4	Our management and employees are continually encouraged to share their thoughts, goals, and ideas.
	OL5	Our employees are actively exploring the current market and related new product information.
Organizational performance (Kim et al., 2013; Kuo, 2011)	OP1	Our organization has higher long-run profitability than our direct competitors.
	OP2	Our organization has a higher growth prospect in sales than our direct competitors.
	OP3	Our employees have higher job satisfaction than those of our direct competitors.
	OP4	Our employees' productivity is higher than our direct competitors.
	OP5	Our organization has better goodwill than our direct competitors.
	OP6	Our organization can provide customers with high-quality products.
	OP7	Our customers are satisfied with our organization's service quality and efficiency.
	OP8	Our organization provides well-designed wellness programs to retain employees.
Collaborating KSAs (Lee et al., 2018)	COL1	I collaborate with others in my team.
	COL2	What I have learned from group collaboration can be put into immediate practice.
	COL3	I have the knowledge to share information with other team members to enhance our collaboration.
	COL4	I have the skill to obtain information and make a contribution to team collaboration.

**Table 2**  
Fit indices for the measurement model

Fit Index	Values	Recommended values	Source
$df$	152		
$\chi^2$	776.366		
$\chi^2/df$	5.108	$\leq 3.00$	Gefen (2000)
GFI	0.617	$\geq 0.90$	Hoyle (1995)
AGFI	0.521	$\geq 0.80$	Chau and Hu (2001)
CFI	0.622	$\geq 0.90$	Bagozzi and Yi (1988)
RMSEA	0.178	$\leq 0.08$	Browne and Cudeck (1993)
NNFI (TLI)	0.575	$\geq 0.90$	Bagozzi and Yi (1988)

4.3.1. Assessment of the measurement model

The internal consistency reliability was examined using composite reliability. Hair et al. (2017) state that adequate internal consistency is achieved when the composite reliability (CR) is at least 0.7. The output from the data analysis showed that all the key constructs achieved a composite reliability value of at least 0.898. Therefore, we can conclude that internal consistency has been achieved in this study. On the other hand, the convergent validity in this study was tested using the average variance extracted (AVE). Adequate convergent validity is achieved when the AVE is at least 0.5 (Hair et al., 2019). We confirmed that convergent validity was attained in this study, where all the constructs obtained an AVE value of more than 0.5. Table 3 summarizes the measurement analysis result.

Similarly, the discriminant validity was examined using the Heterotrait-Monotrait (HTMT) ratio of correlations approach. According to Henseler et al. (2015) and Hair et al. (2019), discriminant validity is achieved when the HTMT value is less than the HTMT.85 value of 0.85. Table 4 revealed that all the HTMT values obtained were below 0.85. Thus, we can conclude that discriminant validity was achieved in this study. The results showed that the data set was reliable and achieved the convergent and discriminant validity criteria.

**Table 3**  
Construct operationalization

Constructs	Items code	Loadings	Average Variance Extracted	Composite Reliability
Threshold value		≥ 0.7	> 0.5	> 0.7
Organizational innovation	OI1	0.784	0.656	0.905
	OI3	0.852		
	OI4	0.773		
	OI5	0.842		
	OI6	0.796		
Knowledge management capabilities	KM1	0.758	0.638	0.898
	KM3	0.776		
	KM4	0.863		
	KM5	0.816		
	KM7	0.715		
Organizational learning	OL3	0.853	0.749	0.899
	OL4	0.922		
	OL5	0.819		
Organizational performance	OP1	0.780	0.607	0.903
	OP2	0.744		
	OP4	0.739		
	OP6	0.799		
	OP7	0.808		
Collaborating KSAs	OP8	0.803	0.743	0.920
	COL1	0.852		
	COL2	0.899		
	COL3	0.839		
	COL4	0.856		

Note. OI2, OI7, OI8, KM2, KM6, OL1, OL2, OP3, and OP5, were dropped due to their loadings being below 0.7.

**Table 4**  
HTMT Analysis

	1. Knowledge management capabilities	2. Collaborative KSAs	3. Organizational innovation	4. Organizational learning
2. Collaborative KSAs	0.809 CI.85 [0.728-0.881]			
3. Organizational innovation	0.842 CI.85 [0.758-0.907]	0.658 CI.85 [0.544-0.754]		
4. Organizational learning	0.788 CI.85 [0.684-0.869]	0.546 CI.85 [0.373-0.691]	0.562 CI.85 [0.413-0.691]	
5. Organizational performance	0.727 CI.85 [0.619-0.815]	0.585 CI.85 [0.449-0.693]	0.593 CI.85 [0.476-0.699]	0.739 CI.85 [0.638-0.818]

#### 4.3.2. Assessment of the structural model

The coefficient of determination ( $R^2$ ) was computed to measure the model's predictive accuracy. The data analyzed showed that  $R^2 = 0.499$ , which means that knowledge management capabilities, organizational learning, and organizational performance can explain 49.9% of the variance of organizational performance. The  $R^2 = 0.499$  also indicated that the model possessed moderate predictive accuracy (Hair et al., 2019). To further assess the path coefficients, bootstrapping with 5000 samples was used. The relative impact of a predictor construct on an endogenous construct was analyzed using Cohen's  $f^2$ . Cohen (1988) indicated that  $f^2$  values of 0.35, 0.15, and 0.02 are considered large, medium, and small effect sizes.

The results showed that organizational learning had the most substantial positive relationship with organizational performance ( $\beta = 0.366$ ,  $t = 3.727$ ,  $f^2 = 0.150$ ). Organizational learning represents the organization's capability to handle the fast-changing business environment. A company with solid organizational learning capability allows the company to interpret the business environment correctly and helps the company to develop the best strategy to overcome business challenges (Oh, 2019). Making efforts to learn to allow knowledge creation and adaptation is critical to responding to the dynamic business environment and improving organizational performance. As a result, H1 was supported.

Similarly, knowledge management capabilities appeared to be the second most robust positive variable influencing organizational performance ( $\beta = 0.289$ ,  $t = 2.540$ ,  $f^2 = 0.055$ ). Knowledge is a strategic resource that will create an organization's economic, intellectual, social, and cultural values. Knowledge management involves the organization's capability to manage valuable intangible resources through the work process and technological infrastructure. The organization with systematic knowledge management capabilities allows members to effectively use, create, share, store, and retrieve their intangible resources anywhere and anytime. The objective of a knowledge management capability is to prepare the organization to adapt to the dynamic business environment by reusing previous experiences and recreating new operation activities (Ting et al., 2021). Employees can utilize these capabilities to create knowledge and value for the company and later improve the organization's performance. Therefore, the analysis result showed that H2 was supported in this study.

Lastly, organizational innovation seemed to be the least positive influencing factor in organizational performance ( $\beta = 0.158$ ,  $t = 1.980$ ,  $f^2 = 0.023$ ). Organizational innovations

require more communication and interaction among the members within the organization in three areas: product development, technology usage, and behaviour adoption (Aboramadan et al., 2020). At the same time, organizational innovation is reflected in the organization’s readiness to generate new ideas, develop new products and services, and adopt new processes to improve overall efficiency and profitability. In this study, it has been argued that organizational innovation happens due to organizational learning and proper knowledge management capability. Innovation occurs in adopting accumulated learning outcomes from a systematic and structured knowledge management system. So that the knowledge can be individually or collectively shared within the learning subject to facilitate the emergence of organizational innovation; therefore, organizational innovation emerges when the environment promotes organizational learning and can manage the knowledge systematically. Therefore, these statistical results confirmed that H3 was supported in this study. Table 5 summarizes the structural model analysis results.

**Table 5**  
Structural model analysis results

Hypothesis	Relationship	Std. Beta	Std. Error	t-value	Decision	f <sup>2</sup>	95% CI LL	95% CI UL
H1	Organizational Innovation → Organizational Performance	0.158	0.086	1.836**	Supported	0.023	0.012	0.289
H2	Knowledge Management Capabilities → Organizational Performance	0.289	0.114	2.540***	Supported	0.055	0.122	0.485
H3	Organizational Learning → Organizational Performance	0.366	0.098	3.727***	Supported	0.150	0.195	0.520

Note. \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$  (one-tailed)

#### 4.3.3. Assessment of the moderating effect

The product indicator approach was used in this study to examine the moderating effect of collaborating KSAs on the structural equation model. The moderating effects are confirmed if the impact of the interaction terms (latent variable scores of the exogenous variable and moderator multiplied) is significant by running bootstrapping procedures with 5000 samples. The analysis showed that the effect of the interaction terms (collaborative KSAs × organizational innovation; collaborative KSAs × organizational learning) on organizational performance was significant ( $\beta = 0.284, t = 2.401$ ;  $\beta = 0.214, t = 1.801$ ). As such, collaborative KSAs were found to moderate the relationship between organizational innovation and organizational learning on organizational performance. Organizational learning produced knowledge resources that later became the key element to developing organizational innovation. These resources are accumulated at the individual, group, and organizational levels. Collaborative KSAs foster collaborative learning, which enhances the learning process through working together and engaging learners in actively processing and synthesizing information. Collaborative KSAs work as an enzyme to speed up organizational learning from an energized and informed workforce. Therefore, members with high collaborative KSAs will help promote learning and innovation, ultimately improving organizational performance.

However, the moderating effect of collaborative KSAs on the relationship between knowledge management capabilities and organizational performance was insignificant ( $\beta = 0.116, t = 0.891$ ). Knowledge management involves work processes and activities to

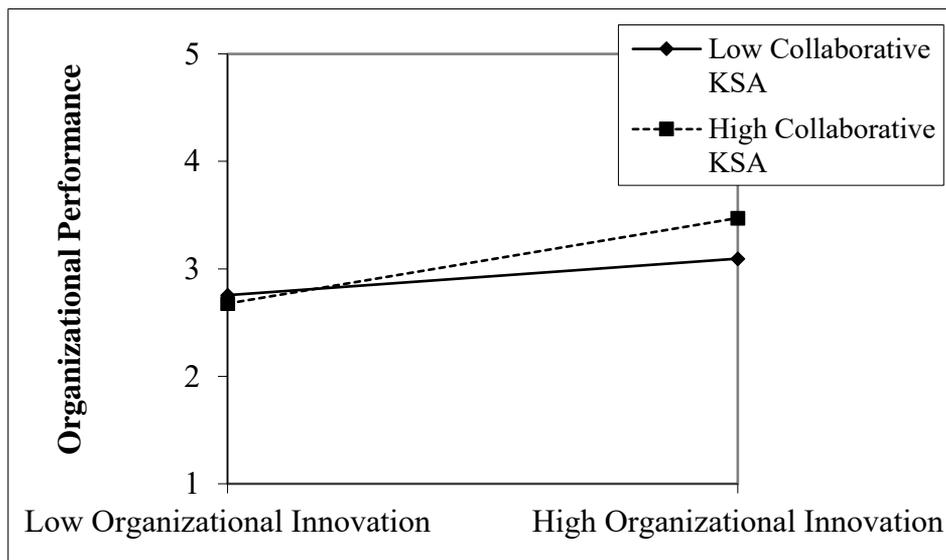
manage the organization’s valuable intangible resources. Knowledge management refers to organizational capabilities to acquire, create, and use intangible resources effectively. It usually involves the organization’s infrastructures, such as technological, structural, and cultural infrastructures, to optimize the usage of their knowledge base (Intezari et al., 2017). Therefore, human factors such as collaborative KSAs seem to have less impact here, where knowledge management capabilities are primarily related to the ability to establish the knowledge management infrastructure.

In conclusion, H4 and H6 were accepted, and H5 was rejected. Interaction plots were plotted to demonstrate the significant moderating effects (see Fig. 2 and Fig. 3). Table 6 presents the summary of the hypothesis testing for the moderation analysis. Fig. 4 illustrates the overview of the structural equation model estimation and moderation effect.

**Table 6**  
Analysis of the moderation effects

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	95% CI LL	95% CI UL
H4	Organizational Innovation × Collaborative KSAs → Organizational Performance	0.284	0.118	2.401***	Supported	0.068	0.383
H5	Knowledge Management Capabilities × Collaborative KSAs → Organizational Performance	0.116	0.130	0.891	Not supported	0.031	0.297
H6	Organizational Learning × Collaborative KSAs → Organizational Performance	0.214	0.119	1.801**	Supported	0.073	0.364

Note. \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$  (one-tailed)



**Fig. 2.** Moderation effects of collaborative KSAs on organizational innovation and organizational performance

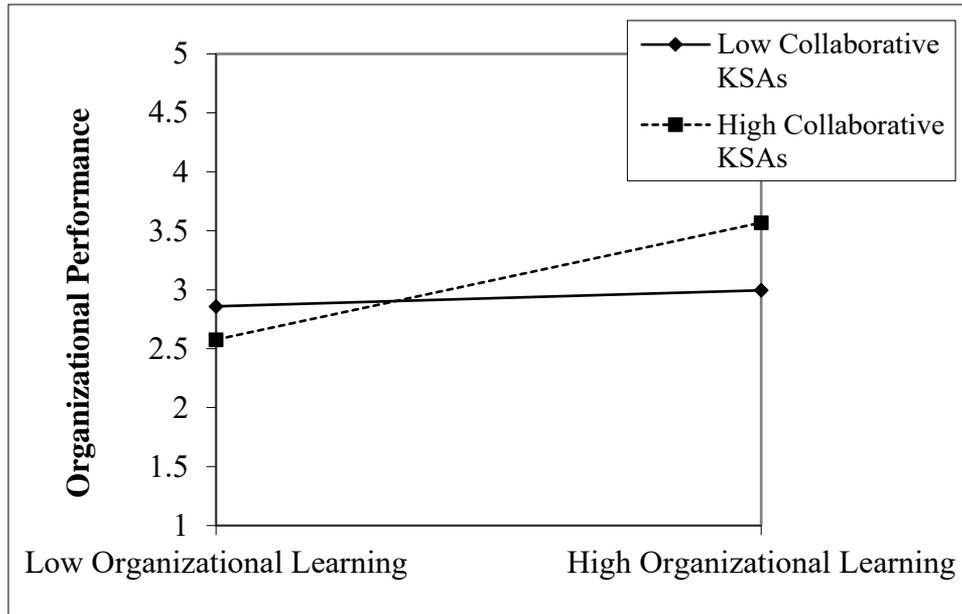


Fig. 3. Moderation effects of collaborative KSAs on organizational learning and organizational performance

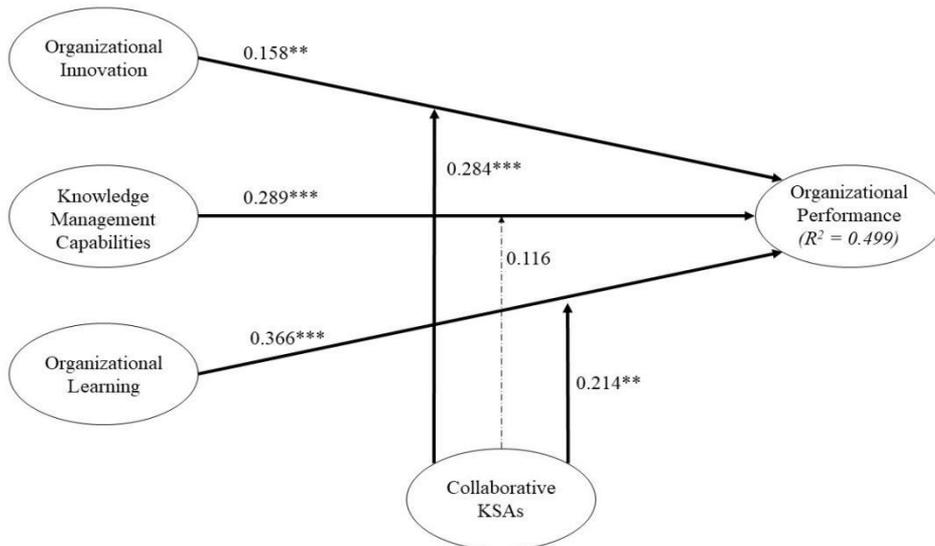


Fig. 4. Summary of the structural equation model estimation and moderation effect. The dotted line represents a non-significant effect. Significant at \*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

## **5. Discussion**

### *5.1. Impact of organizational learning on organizational performance*

This study has demonstrated that organizational learning is the primary driver of organizational performance. The findings of this study showed a strong positive correlation between organizational learning and organizational performance. The results add to our understanding that an organization is ridden with diversity and multiple conflicts and dilemmas. Organizational learning offers a good synergy, synthesizing conflicting ideas and knowledge and eventually contributing to better organizational performance. Literature examining the relationship between organizational learning and performance asserts consistent findings (Brockman et al., 2017; Camps et al., 2016; Jain & Moreno, 2015). Basten and Haamann (2018) argued that organizational learning is gaining importance in the complex and dynamic business environment. Organizational learning allows new knowledge development to enable organizations to respond swiftly to unforeseen circumstances operating in the unpredicted environment. The findings of this study also reinforced organizational learning-related theories such as single-loop and double-loop learning, organizational knowledge creation theory, five building blocks, etc. Organizational learning connects organizational resources with performance improvement for competitive organizational abilities (Lau et al., 2019).

### *5.2. Impact of knowledge management capabilities on organizational performance*

Strong evidence of the correlation between knowledge management capabilities and organizational performance was found in this study. The empirical result suggested that knowledge management capabilities positively affect organizational performance. The regression analysis results illustrated that knowledge management capabilities appeared to be the second most crucial factor affecting organizational performance. There is consistency between this study with the literature (Adnan et al., 2018; Azyabi, 2018). Knowledge management capabilities are a process of knowledge acquisition, sharing, and utilization. A dynamic mechanism indicates strong knowledge management capabilities implemented to manage all the processes, leading to improved efficiency and organizational performance. Knowledge management capabilities are perceived as the mechanism to promote change that removes restrictions and restructures the new development to realize the operational and strategic objectives (Abualoush et al., 2018). This result agrees with the study from Zaim et al. (2019), which concluded that knowledge management capabilities play a critical role in converting the organization's capability to generate new values. Knowledge management capabilities are the most critical resources to provide competitiveness and significantly influence its performance. Iqbal et al. (2019) proved that knowledge management capabilities positively affect intellectual capital and enhance organizational performance. As a result, the findings from this study add to the knowledge management literature that knowledge management capabilities are one of the core capabilities in the organization to affect performance.

### *5.3. Impact of organizational innovations on organizational performance*

This study provides empirical evidence that organizational innovation was positively related to organizational performance. The findings in the present study are consistent with

the literature, which showed that organizational innovation and performance are positively correlated (Ferreira et al., 2019; Gatautis et al., 2019). This study has explained that organizational innovation appeared to be the third most inflectional factor in organizational performance. Organizational innovation represents an organization's ability to develop and improve its services and products and successfully introduce them to the market. Organizational innovation is perceived as the main competitive advantage an organization must maintain in today's competitive and fast-changing business environment. Organizational performance is improved when organizational innovation increases market competitiveness and acquires more market share. Organizational innovation encourages new business models, new operation strategies, and product innovation which helps to improve organizational performance (Migdadi, 2021). Zhang et al.'s (2019) findings confirm that organizational innovation could help the organization maintain a sustainable position and outperform its competitors in a competitive environment. Similarly, Marcon et al. (2019) stated that innovation capabilities can increase organizational performance. In addition, innovative skills and capabilities help the organization acquire valuable resources that configure sustainability and lead to high performance (Nousopoulou et al., 2022). This study discovered important outcomes indicating that organizational innovation helps organizations improve performance through process innovation and development.

#### *5.4. The moderating impact of collaborative KSAs*

Collaborative KSAs were found to positively moderate the relationship between organizational innovation and organizational performance. It is convincing to argue that organizational innovation improves performance in many ways. However, this improvement is impossible without the cooperation among the employees who work cohesively to achieve the designated goals and objectives. As such, collaborative KSAs play a significant role in breaking down any barriers that possibly pose deterrents to any collaboration. Barriers resulting from diversity in background, expertise, values, and culture commonly appear in a team working environment that suppresses team performance. Thus, high collaborative KSAs work as the linchpin in mitigating collaboration problems when promoting organizational innovation to improve organizational performance. The findings are aligned with the literature that collaborative KSAs play a pivotal role in culturing the organization's innovation capabilities to improve performance (Shehzad et al., 2021). Much literature suggests that collaborative KSAs significantly affect the knowledge management process and organizational performance (Barbosa et al., 2022; Lee et al., 2018; Zhang et al., 2019). It has served as a core factor to stimulate the antecedents to organizational performance.

Similarly, this study suggested that collaborative KSAs positively moderate the relationship between organizational learning and performance. It has been conclusively shown that learning entities in an organization consist of individuals, groups, and organizations (Jyothibabu et al., 2011). The data gathered in Antunes and Pinheiro's (2020) study suggested that organizational learning happens at all levels of management, individuals and work groups that require great collaboration among KSAs to ensure that the information can be easily accessible and available at all times. Numerous studies have proven that knowledge creation and adaption highly depend on the collaboration of KSAs among the members, leading to incremental changes in organizational performance (Oh, 2019; Patky, 2020; Purwanto et al., 2021). Therefore, this study's findings suggest that organizational learning occurs when individuals with different talents are formed into a group and integrated, eventually comprising the organizational learning system. This

study's findings align with literature where personal knowledge can contribute directly to group action through knowledge sharing and finally become organizational action through knowledge translation. Hence, the strength of the relationship between the learning entities and organizational performance is vital. Collaborative KSAs could reduce the tensions due to the configuration problem between individual, group, and organizational levels of learning. Collaborative KSAs transform the learning process into a communicative and collaborative task in which members commonly identify and address the organization's needs (Cummings & Worley, 2015).

Contrary to the expectations, this study did not find a significant moderating effect of collaborative KSAs on the relationship between knowledge management capabilities and organizational performance. It is thought that knowledge management capabilities refer to the ability of the process to acquire, store, disseminate, and implement organizational knowledge. High knowledge management capabilities enable the organization to capture, reconcile, and transfer knowledge efficiently and securely. The literature argued that there are three key infrastructure capabilities: technology, structure, and culture, essential to ensure effective knowledge management in organizations (Zaied et al., 2012). Technology infrastructure refers to the technologies that enable the exchange of knowledge electronically, including hardware and software. Similarly, the structure comprises the rules, policies, procedures, processes, hierarchy of reporting relationships, incentive systems, and departmental boundaries that determine the knowledge flow within the organization. Culture refers to which knowledge is to be shared, with whom it can be shared, and when it should be shared. It can be observed that human interaction is not particularly necessary in the three capabilities discussed above. Consequently, this could explain the findings in this study that collaborative KSAs were not a moderator in the relationship between knowledge management capabilities and organizational performance.

## **6. Contribution to research and practice**

From the academic perspective, the outcome of this study provides in-depth information on the knowledge transfer processes that are imperative in building and sustaining competitive advantages and dynamic capabilities that enhance the organizational performance of the biomass industry in Malaysia. This research enriches the resource-based view (RBV) theory and presents theoretical and empirical findings on organizational innovation, organizational learning, and knowledge management capabilities affecting organizational performance. This study has also examined how the knowledge translation process can be involved in a collaborative environment by examining the moderating effects of collaborative KSAs.

Regarding the practitioner perspective, this study revealed insightful information that biomass organizations can use to develop strategies to improve their performance. This study implies that an effective knowledge translation should begin with organizational learning. The organization's leader should focus on promoting a good organizational learning culture. The environment and the enthusiasm of that organization encourage and determine the use of knowledge processes and infrastructure. Eventually, all the knowledge created should be handled effectively, leading to the second important variable discussed in this study: knowledge management capabilities. It is crucial to have flexible knowledge infrastructures that ensure the company's knowledge process is smooth and reliable. Besides that, the organization should strive for organizational innovation to improve the

efficiency of the production process. All the relationships could be enhanced if staff members are equipped with solid collaborative KSAs.

## 7. Conclusion, limitations, and suggestions for future research

This study has developed a conceptual model grounded on the literature that seeks to advance the RBV theory on knowledge management in the biomass industry. The conceptual model and the empirical findings enhance our knowledge of how organizational innovation, knowledge management capabilities, and organizational learning could influence organizational performance. Our study has presented some interesting findings that the role of collaborative KSAs is proven to be influential in moderating the relationships of the critical variables on organizational performance.

Although the findings are expected to contribute to improved theoretical insights and offer suggestions for improved practices, this study has limitations. The first limitation is the unit of analysis in this study. This study was carried out among biomass organizations in Malaysia. Therefore, the findings might not be able to be generalized in other industries. Similarly, this study did not consider the impact of different organizations' sizes and maturity. Organization sizes and maturity might potentially impact the knowledge transfer process capability. Thirdly, it was difficult to carry out the present research with its financial measures due to the difficulties in obtaining the latest and valid financial data, such as annual reports and secondary data, which was outdated. Besides that, some organizations would not disclose their financial data as well.

Therefore, we encourage future research on knowledge management to replicate this study in other settings. Hopefully, we can gather more empirical data to further justify the underlying model and theory. Also, future studies are encouraged to perform detailed research on organization size and maturity that could affect the original relationships. Future research should continue to explore the best measurement to reflect organizational performance.

## Author Statement

The authors declare that there is no conflict of interest.

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