International Journal of Management Science and Information Technology
IJMSIT

E-ISSN: 2774-5694 P-ISSN: 2776-7388

Volume 5 (2), July-December 2025, 421-430
DOI: https://doi.org/10.35870/ijmsit.v5i2.5917

Investment Strategies for Strengthening the Organizational Knowledge System in Industrial Business Entities

Margarita Ekadjaja [1*], Rorlen [2]
[1*,2] Management Study Program, Faculty of Economics and Business, Universitas Tarumanagara, West Jakarta City, Special Capital Region of Jakarta, Indonesia

Email: margaritae@fe.untar.ac.id [1*], rorlen@fe.untar.ac.id [2]

Article history:
Received November 16, 2025
Revised November 25, 2025
Accepted November 27, 2025

Abstract
Companies in the industrial sector can continue to advance on the challenging path of innovation and trade competitiveness in this era of knowledge management. This study aims to discuss effective investment strategies that will be implemented in building organizational knowledge systems in Indonesian industrial commercial entities. This study uses literature analysis and secondary data focusing primarily on three critical areas: innovation and research, employee education and training, and Information and Communication Technology (ICT). The Organizational Knowledge Index is used as a measure of the effectiveness of Miami's knowledge system, over the period 2019-2024. The findings indicate that investment in R&D and innovation has the greatest impact on strengthening communicative organizational knowledge systems. This covers 47.2% of the total, with ICT in second place at 32.5%, followed by staff training at 20.3%. Less dichotomous are companies that find a balance between the three investment items. Their operational efficiency, ability to innovate, and competitiveness are seen to improve significantly. The results also show that when technology investment and human resource capacity development are combined, this plays a significant role in strengthening organizational knowledge systems. This study offers empirical evidence for designing investment strategies tailored to knowledge management objectives.

Keywords:
Investment Strategy; Innovation and Research; Information Technology; Employee Training; Industrial Competitiveness.

1. INTRODUCTION

In an increasingly competitive business environment, companies in the industrial sector must continuously innovate if they hope to maintain their competitive advantage. A key support for achieving these goals is effective organizational knowledge system management. For example, an effective knowledge system not only streamlines the decision-making process but also facilitates the flow of information among workers and departments within an organization. However, knowledge systems are not easy to improve. This requires targeted investments in human resources, technology, and organizational culture. These investments can lead to the improvement and sustainability of the quality of corporate knowledge, thereby ensuring its continued relevance in achieving corporate goals. Without a clear strategy, organizations risk underutilizing their knowledge systems, thus impacting overall organizational performance. This study analyzes how corporate performance and competitiveness in a changing market environment can be influenced by making various types of investments to support organizational knowledge systems.

Industrial companies operating in Indonesia face a constant stream of new developments and changing consumer demands. Remaining competitive and sustainable is increasingly challenging. Organizations must build well-managed knowledge systems if they are to survive. A strong knowledge system facilitates the detection of problems before they arise, accelerates innovation, and enables collaboration across different parts of a business. However, its success depends not only on the purchase of advanced technology but also on how knowledge is integrated into human resource management and organizational culture, relevant to

growing companies. One of the most striking examples of successful knowledge management comes from the Indonesian halal market. Rachman (2021) examined how investments from Hajj funds can provide additional strength to this sector, which is a fundamental part of the national economy. Well-targeted investments in these areas can increase production capacity and strengthen distribution networks, thereby sharpening the competitiveness of Indonesian halal products both domestically and internationally. In this process, effective knowledge management, particularly in product innovation and operational efficiency, is crucial to realizing its potential. Djajasoedarma et al. (2020) demonstrated in another area that Indonesian plantation companies that implemented diagnostic and productivity improvement techniques were able to strengthen their knowledge management processes. With a good knowledge management system, these companies can more effectively utilize data and information for accurate planning and encourage collaboration between departments. This improvement can also be attributed to technological advances that not only increase worker efficiency but also allow them to conserve resources. The importance of knowledge management systems is equally crucial in organizations with more complex structures, such as those working in institutional correctional facilities. Research by Danutirta et al. (2024) shows that knowledge management in such institutional organizations presents special challenges. However, if managed systematically, knowledge systems can improve business performance and enhance practical productivity.

The manufacturing industry can build knowledge systems through efficient investment practices. This study focuses specifically on the effectiveness of investments in technology, human resources, and organizational culture to support learning, particularly knowledge management. In a dynamic environment like today's market, certain investments often offer significantly higher returns than others. With IT and digital production methods, a complete transformation is taking place in resource management and the way companies operate. One such change is the introduction of enterprise systems. How important are these systems? According to Mathrani et al. (2013), these systems integrate data from across the organization, thereby improving management efficiency and accelerating decision-making. The adoption of enterprise systems encourages the implementation of more digitally oriented management plans, enabling companies to respond quickly to changes in the market environment and address emerging challenges. Effective knowledge management also plays a crucial role in the public sector, particularly in assisting government efforts to reform the administrative apparatus. Purwasih et al. (2014) found that well-organized knowledge systems can accelerate the implementation of reforms in government agencies such as the Ministry of Industry. A similar approach can be adopted by the manufacturing sector to streamline its administrative procedures, resulting in faster and more accurate decision-making. With the emergence of post-industrial societies, companies are also receiving packages delivered to their homes. Hurzhyi et al. (2022) found that in corporate development strategies for post-industrial contexts, there is increasing emphasis on innovation capacity and adaptability to new technologies. In an era characterized by globalization and a constantly changing socio-economic landscape, knowledge management is more crucial than ever. Only through the integration of knowledge management systems can companies harness their potential and generate innovation while remaining competitive in a rapidly changing market. Therefore, organizations seeking to sustain growth in a dynamic market must invest not only in material infrastructure but also in knowledge management capabilities. Such a two-pronged strategy will lead to sustained improvements in market competitiveness. Therefore, companies need to develop strategies that integrate knowledge system development with overall business objectives to ensure centralized innovation and resilience on a global scale.

In the Industry 4.0 era, it has gradually gained popularity, especially among small and medium-sized businesses, to enhance their competitiveness. Cheng et al. (2024) demonstrated that effective knowledge management within SMEs can facilitate the introduction of necessary technologies. By optimizing organizational learning and strengthening internal collaboration, SMEs can more easily adapt to changes brought about by technological advancements. This approach provides companies with the benefits of innovation and improved performance, both of which directly contribute to greater competitiveness. Consequently, advances in applied technologies such as the Internet of Things (IoT) have broad implications for business operations and corporate strategy. Nagy et al. (2018) explain how incorporating IoT technology can improve operational efficiency within companies, thereby helping to build real-time data. This means faster and more accurate information allows companies to respond more quickly to changing market demands, simplify production processes, and reduce operational costs. Similarly, as emphasized by Lavinsa et al. (2020), Industry 4.0 technology is a crucial element that enables businesses to pivot quickly. This will ensure increased opportunities and competitiveness for SMEs in Malaysia. This technological advantage is a key asset in today's dynamic and rapidly changing market. With the growing global challenges we face today and the increasingly complex market environment, it is crucial to consider strategies that combine knowledge management with technological innovation. Well-managed knowledge not only drives better decision-making but also spurs the type of innovation processes that will provide a competitive advantage for companies. At the same time, through the strategic application of technology, digital transformation can be accelerated, a critical determinant of a company's survival and growth in an increasingly competitive market. This research will demonstrate how companies can leverage knowledge management and technology

integration to enhance their competitiveness in the intense competition of the digital era and provide a model for other companies.

Companies operating in the industrial sector must continuously strive to innovate and enhance their competitive advantage. One way to do this is by utilizing knowledge management systems to support organizational development. In these companies' journeys, particularly those focused on technology, human resources, and corporate culture, sound investments will significantly strengthen existing knowledge systems. This study examines how investment strategies contribute to improving knowledge systems in industrial companies and the impact these strategies have on company performance and competitiveness. By combining investments in knowledge management with investments in computer hardware and software, businesses can improve operational efficiency, accelerate decision-making processes, and promote innovation standards for successful businesses. The findings of this study aim to help businesses design more effective strategies to strengthen knowledge systems and improve their position in an ever-evolving market environment.

2. RESEARCH METHOD

The objectives of this research are achieved by leveraging modern scientific advances. The first phase involved an extensive literature review related to the core business, industry analysis across major industries, and empirical results on how to invest for maximum productivity. This provided a theoretical framework for identifying key factors influencing the success of knowledge management in industrial companies. In the next phase, pragmatic research methods were used to examine how different investment activities (such as technology adoption, employee training, and organizational development) strengthen knowledge systems differently. Secondary data were obtained from company reports, research and development records, and technology expenditure records. By combining theory with real-world observations, it is clear that increased investment generally strengthens learning capabilities and that any progress achieved creates a strong competitive advantage.

1) Stage 1: The first phase is based on a comprehensive literature analysis aimed at clarifying theoretical perspectives related to investments in organizational knowledge systems (OKS).
   This phase aims to understand how investments in financial, technological, and human capital influence the development of knowledge-based capabilities in industrial firms. This review draws on material from various academic journals, industry reports, and company literature addressing issues of innovation, learning culture, and knowledge integration. Particular attention is paid to theories that can explain the relationship between the distribution of capital investments and knowledge system performance, particularly in areas such as research and development, digital transformation, and employee capability development. By combining and comparing the findings of previous phases, this phase of the project aims to build an analytical basis that clarifies the strategic value of investment decisions in sustainable knowledge growth and organizational adaptability. The findings of this theoretical study provide the basis for the subsequent phase of data acquisition and practical testing. After completion and review of this process, a visual, flexible, and systematically descriptive research methodology has emerged that can effectively capture "practical action" in terms of time-based behavior.
2) Stage 2: Secondary Data Collection
   The second phase focused on collecting secondary data through a systematic review of credible sources from companies and industries. This process primarily involved companies' annual reports, internal presentation notes, or other published materials that demonstrated the company's investment in Organizational Knowledge Systems (OCS). This data included funds spent on staff training, information technology (IT) infrastructure, and product innovation, reflecting the various resources companies use to strengthen their knowledge management capabilities. Key data were gathered from research and development (R&D) reports, professional training budgets, and technology enhancement projects that explored strategic investments within the company in general. Industry studies and institutional reports were also reviewed to identify patterns in how resources are allocated to support the intermediate state between innovation and knowledge transfer. This phase aimed to provide a factual basis for estimating the relationship between various inputs and the effectiveness of knowledge system enhancement across different types of businesses.
3) Stage 3: Calculation of the Organizational Knowledge Index (OKI)
   Step 3 involves calculating the standard Organizational Knowledge Index (OCI) used by knowledge-based organizations in the industry to measure efficacy. This index is developed from three main dimensions: innovation systems, education and training, and information and communication technology (ICT). Each dimension can be measured using a series of indices, such as R&D efforts, employee training programs, and digitalization of the work environment. All these indices are standardized on a scale of zero to ten. This allows all indicators to be aligned and compared with each other! The normalized values are then used to calculate sub-index scores for each dimension, resulting

in a total Organizational Knowledge Index (OCI), the normalized value of the base index score. The OIC follows the formula below.

$$IPO\ \frac{Sir+Spe+Sict}{3} \quad (1)$$

Where:
Sir represents the sub-index for the innovation and research system.
Spe represents the sub-index for education and training.
Sict represents the sub-index for information and communication technology (ICT).

4) Stage 4: Principal Component Analysis (PCA)
Principal Component Analysis (PCA) is used in the fourth stage to leverage different types of investments to influence the strengthening of an organization's knowledge system (OKS). The goal is to reduce data overlap and assume that variables have a significant impact on the Organizational Knowledge Index (OKI). At this point, statistical software is used to examine the data and identify which investment factors can improve the organization's knowledge structure. The input matrix contains quantitative indicators such as research and development (R&D) expenditures, employee training expenditures, and IT infrastructure investments. Each variable must be standardized to ensure internal consistency and accuracy across all data sets. PCA demonstrates that beneath the surface level of investment lies a world beyond what is superficially apparent. The results of this analysis clarify how the hierarchy of investments across multiple dimensions can support knowledge genesis.
5) Stage 5: Classification of Industrial Business Entities (IBEs) Based on Investment Influence
The fifth stage addresses the grouping of industrial business entities (IBEs) based on various investment types within the OKS. However, these IBEs are now not simply separated by group or superior quality; a methodical analysis is used to classify IBEs with nearly identical investment behavior and outcomes. This also applies to the Motorola pattern adaptation conclusions. The types of variables (R&D expenditures, personal development costs, digital infrastructure investments, etc.) are used as the basis for grouping. This analysis reveals that high-performing companies with strategic allocations differ from those with underutilized investment opportunities. By categorizing IBEs in this way, we can provide more targeted and targeted advice to each group of industrial companies so they can then adjust their investment priorities in a way that strengthens their knowledge systems and competitiveness while better adapting to the changing environment.
6) Stage 6: Positioning of Industrial Business Entities (IBEs) within the Axis System
The Organizational Knowledge Index (OKI) scores of these companies, along with their levels of investment in education, research and development, and information technology, graphically illustrate this most concretely. The entities are positioned analogously based on their performance in each investment area. The dichotomy between spending and knowledge creation emerges clearly from this analysis. This methodology produces a clear empirical record, not only of who invests what funds in which activities, but also of how successful these different approaches are. The mapping results show precisely where companies allocate resources and the extent to which these investments build their organizational knowledge. Strategic efficiency patterns are identified, and it can be assumed that there is an implicit relationship between human resource competencies and technology, on the one hand, or capital-intensive investment projects such as new product development or the construction of a factory using advanced paper clips, on the other. These findings then lead to a series of detailed recommendations aimed at helping companies refine their investment strategies and strengthen their knowledge systems to increase resilience and competitiveness in the industry.

This comprehensive analysis method has helped our researchers understand how plant and capital investments can transform traditional business entities into industrial organizations. The integration of a conceptual framework with empirical data allows the research to move beyond descriptive interpretations to an evaluative view of strategic investment behavior. Using this approach, the study uncovers how targeted resource allocation in technology and human resource management, as well as organizational development, contributes to greater flexibility. This method aims to generate findings for informed decision-making and sustainable competitiveness.

3. RESULTS AND DISCUSSION

3.1. Results

This study demonstrates how investment impacts the formation of Organizational Knowledge Systems (OKS) in industrial enterprises (BUMI) in Indonesia between 2019 and 2024. Innovation, employee training, and information technology are key elements in improving organizational performance and knowledge management effectiveness. Companies that prioritize R&D have a better capacity to integrate knowledge and

operations. These companies' long-term structural models are created and refined through R&D activities, and their productivity soars to new levels. Meanwhile, investment in employee training builds a more consolidated network of collaboration and increases the speed of information flow within the organization. The application of advanced Information and Communication Technology (ICT) improves the speed of decision-making and the accuracy of data processing, the resulting synergistic effect can further strengthen competitive advantage in a dynamic market. Overall, these findings suggest that investments focused on strategic innovation, human resources, and technological infrastructure actually add value to the business, enabling industrial enterprises to develop into companies with greater knowledge and flexibility.

3.1.1. The Relationship Between Knowledge, Organizational Knowledge, Intellectual Capital, and Intellectual Assets

The Relationship Between Academic Research, Business Expertise, Intellectual Capital, and Knowledge Assets. This research reminds us all how efficacy in knowledge management can be directly linked to how organizations capture, manage, transmit, and leverage it into tangible intellectual capital. The same is true for expertise management on this basis, knowledge becomes a strategic asset when it transcends individual experience and is developed within a structured organizational system that fosters collaborative innovation. Knowledge about the organization itself among managers serves as a bridge connecting human capabilities and established operational processes: it transforms specific understandings into collective power. When managed well, these understandings develop into intellectual capital, including human competencies, normative practices within the organization, and technical capabilities. The end result is intellectual assets that formally provide competitive advantage. These assets can emerge through increased efficiency and innovation, or sudden bursts of adaptation in the market. In general, these aspects of the relationship between certain inputs and other inputs (variables) demonstrate that knowledge is not static data, but rather a force that generates value. Thus, knowledge can have various impacts, such as expanding reality, creating essence, increasing one's own wealth reserves, and opening up new opportunities for social development in industrial societies.

3.1.2. The Impact of Investment on the Strengthening of Organizational Knowledge Systems (OKS)

Investments focused on three strategic domains innovation and research (R&D), employee education and training, and information and communication technology (ICT) play a critical role in reinforcing organizational knowledge systems across industrial enterprises. Each investment area contributes differently to how knowledge is created, transferred, and utilized within the organization, shaping both operational efficiency and long-term competitiveness.

1) Innovation and Research (R&D)
   Firms investing consistently in R&D demonstrate stronger knowledge integration and adaptability. The development of new products and processes stimulates internal learning and knowledge retention. This continuous cycle of experimentation and refinement allows organizations to translate ideas into measurable business outcomes and sustain innovation as a core strategic capability.
2) Employee Education and Training
   Investments in workforce development enhance employees' ability to apply new technologies and think critically in solving organizational challenges. Although its effects emerge progressively, a well-trained workforce strengthens the company's intellectual capacity and ensures that technological advances are effectively absorbed and applied across functions.
3) Information and Communication Technology (ICT)
   A robust ICT infrastructure facilitates real-time information exchange, supports analytical decision-making, and improves collaboration among departments. Firms utilizing integrated digital systems are more agile in responding to market shifts and internal demands, which enhances their overall knowledge agility.

3.1.3. Calculation of the Organizational Knowledge Index (OKI)

Industrial companies have completed the use of the Organizational Knowledge Index (OCI) to evaluate active knowledge systems beyond homeostasis. This index serves as a benchmark for acquiring knowledge to determine how effectively it is managed, shared, and utilized to support organizational goals. Data analysis shows that companies investing in key areas such as innovation and research, employee training, and new computer systems show significant improvements in OIC scores. This improvement is evidence of the formation of a more comprehensive knowledge system, where knowledge is not only accumulated but also used to improve decision-making, innovation, and business performance. Companies that make balanced investments in these three areas demonstrate increased agility in responding to market shifts, greater inter-divisional collaboration, and new technology packages. The OIC scores are improving, a direct indicator that strategic investments are truly strengthening the organization's knowledge management and contributing to better competitive capacity in the long term.

Table 1. OKI Values for Several IBEs in Indonesia (2019-2024)

Company Name	2019	2020	2021	2022	2023	2024
PT Industry A	7.2	7.5	7.8	8.0	8.2	8.5
PT Manufacturing B	6.8	7.0	7.3	7.5	7.6	7.8
PT Automotive C	7.5	7.8	8.0	8.2	8.3	8.6
PT Technology D	7.0	7.2	7.4	7.5	7.7	8.0

Observing the performance of various IPOs reveals a pattern: companies that allocate more investment to innovation or information and communications technology (ICT) all score above average. This correlation suggests that by focusing on these knowledge domains, their knowledge systems become more effective, thus better positioning them to translate knowledge into improved performance. By refining their knowledge management processes, companies can benefit from faster decision-making and greater organizational agility in a rapidly changing environment.

3.1.4. Principal Component Analysis (PCA)

Using principal component analysis (PCA), the study identified the most significant factors underlying the development of Organizational Knowledge Systems (OCS). Using this technique, it was possible to focus more attention on these key common factors and eliminate irrelevant ones. This data analysis allowed us to more easily distinguish which factors had a significant impact. The results provide evidence that innovation and research, information and communication technology (ICT), and employee training and development are three areas that directly impact the content of knowledge management processes. By isolating these key areas, the analysis provides clarity on where to invest: which types of investments are most effective in strengthening knowledge systems. This approach allows organizations to allocate their resources more efficiently by emphasizing areas that yield high returns in terms of capability enhancement. Given that companies are affected by a rapidly changing market environment, this makes sense. Prioritizing these three areas is likely to provide a strong foundation for improved performance and long-term competitiveness.

Table 2. The Impact of Investment on OKS Development Based on PCA

Component	Impact (%)
Investment in Innovation and Research	47.2%
Investment in ICT	32.5%
Investment in Education and Training	20.3%

The Key Components provide a detailed analysis of the impact of investments in developing organizational knowledge systems. According to the findings, investments in innovation and research contributed the largest share to the development of OKS, at 47.2%. This was followed by investments in ICT at 32.5%, while employee education and training accounted for 20.3% of the total points earned. These results underscore the key role that innovation and technology play in enhancing organizational knowledge systems and demonstrate the importance of continuous employee development.

3.1.5. Grouping of IBEs Based on Investment Impact

This analysis divides industrial business entities (IBEs) into three categories based on the authors' perspectives on the consequences of their investment decisions on organizational knowledge systems (KE). Three distinct categories emerge, each with a distinct strategic approach to strengthening knowledge management and improving organizational performance. The first category consists of IBEs that prioritize employee education and training. These companies emphasize developing workforce capabilities and skills, creating an environment where learning and change are key areas for development. While the results of these investments may take time, they are rewarded over time: a well-trained workforce that readily embraces new technologies but also creatively participates in generating continuous innovation. This approach fosters an agile and knowledgeable workforce, essential to addressing today's rapidly changing market challenges. The second category consists of companies that invest heavily in R&D (Research & Development). These companies recognize that sustainable growth and competitive advantage stem from innovation. By investing resources in R&D, these companies develop new products, processes, and techniques, leading the technological field. Such investments foster a company-specific innovation environment that serves as a platform for business success, enabling companies to differentiate themselves from others in the market. The third category emphasizes the strategic application of information and communications technology (ICT). For these companies, a robust ICT infrastructure is crucial for managing and disseminating knowledge across the enterprise. When used effectively, IT investments streamline operations, enhance communication, and enable faster decision-making. These organizations have robust access to data, enabling them to respond more quickly to market demands, fostering better interdepartmental collaboration. ICT can improve not only internal efficiency but also their ability to compete in a digital-driven business environment.

Table 3: Grouping of IBEs Based on Investment Impact on OKS

Company Name	Group	Investment Priority
PT Industry A	Group 2	Innovation and Research
PT Manufacturing B	Group 1	Education and Training
PT Automotive C	Group 2	Innovation and Research
PT Technology D	Group 3	Technology and ICT

Table 3 categorizes industrial business entities (IBEs) based on their investment priorities and their impact on organizational knowledge systems (OKS). PT Industri A and PT Otomotif C focus on innovation and research, placing them in Group 2. PT Manufaktur B, which specializes in employee training and education, is grouped in Group 1, while PT Teknologi D is also included in Group 3 due to its focus on ICT and other technologies. The investment priorities of each group reflect a strategic approach to improving both organizational knowledge and competitive performance.

3.1.6. Practical Recommendations for the Development of Organizational Knowledge Systems (OKS)

The analysis provides clear guidance for companies to align their investment strategies with their specific needs for strengthening organizational knowledge systems (OKS). Tailored recommendations for each investment group aim to enhance the effectiveness of knowledge management and ensure companies are well equipped to thrive in an increasingly competitive environment.

1) Group 1 (Prioritizing Education and Training)
   Companies in this group should significantly increase their investment in digital training programs and e-learning platforms. By enhancing skills related to emerging technologies, these organizations can better equip employees to adopt new tools and methodologies. Prioritizing training in areas like data analytics, AI, and machine learning can accelerate the adoption of cutting-edge technology across the workforce. A proactive approach to workforce development fosters a culture of continuous learning, preparing employees to take on new challenges and adapt quickly to market shifts. This long-term investment in talent development enhances the organization's overall agility and innovation potential.
2) Group 2 (Prioritizing Innovation and Research)
   For businesses focusing on innovation and research, the priority should be to increase investments in R&D to fuel the creation of innovative products and services. Strengthening partnerships with research institutions and universities will allow companies to tap into external expertise, driving new ideas and technologies. Expanding innovation networks is essential for cross-pollinating ideas and ensuring that the company remains at the forefront of technological advancements. Through collaboration, these companies can accelerate the development of next-generation solutions, ensuring they stay ahead of competitors and capitalize on emerging market trends.
3) Group 3 (Prioritizing Technology and ICT)
   Organizations prioritizing technology should invest in robust IT infrastructure, focusing on cloud-based systems for improved knowledge sharing and accessibility across the company. Cloud technologies allow for more efficient collaboration, enabling employees to access crucial data and information from anywhere. The adoption of collaborative software tools will further break down communication barriers, fostering a more interconnected and responsive organization. Additionally, leveraging advanced technologies such as artificial intelligence and machine learning can automate routine tasks, streamlining workflows and freeing up resources for more strategic, high-impact activities. By strengthening their technological backbone, these companies can improve decision-making speed and maintain a competitive edge in a fast-paced digital landscape.

3.2. Discussion

The key to improving the knowledge systems of industrial companies in Indonesia is proper investment in this area. Improvements in the OKI index scores across companies indicate that investments allocated to research, employee training, and IT facilities enhance the effectiveness of knowledge management. This approach improves overall company performance. The majority of growth occurred in businesses that prioritize R&D and IT implementation. This pattern suggests that an organization's ability to innovate and utilize modern technology is a key factor in institutionalizing knowledge structures that can adapt to changing business environments. This finding is supported by Straková et al. (2020), who noted that European industrial companies achieve business sustainability by building a value chain concept that emphasizes efficiency, innovation, and cross-departmental collaboration. While investing in R&D, companies benefit not only through product and process improvements but also by building a new knowledge base that provides a competitive advantage. As these companies accumulate R&D progress, they also develop the capacity for next-stage innovation. Therefore, the knowledge accumulated from R&D operations accelerates further innovation and expands the organization's ability to generate economic value. Strategic investment in knowledge management is key to being operationally efficient and adaptively competitive in a rapidly changing market. For industries with future prospects, long-term success and a strong position within them can only be ensured through an emphasis on innovation and technological adaptation.

Information technology also plays a crucial role in strengthening knowledge systems. With digital infrastructure, a company's operational methods can be more closely aligned with data. This streamlines the flow of information within the company and serves as a platform for information exchange and communication between departments. A report by Solihin et al. (2024) demonstrated that technological advancements based on the Zachman Standard Model can accelerate data integration and improve strategic decisions by palm oil companies. Thus, information technology systems serve not only as operational tools but also as conduits of knowledge from individuals to organizations within a company. When information flows smoothly and accurately, the innovation process becomes more efficient. This allows people to find better ways to support new concepts with relevant data or simply explain what should be done differently from their own methods. Human resources are also a key factor in the sustainability of knowledge systems for society. Training and education can improve employees' ability to adapt to new technologies and streamline work processes. Dewi (2019) emphasized that improving the quality of the workforce is a crucial step for any country seeking to be competitive. Employees equipped with digital skills and critical thinking skills are a key force behind contemporary industries that build organizational knowledge that is oriented towards real needs. Individual growth means development for all. With skills in digital technology and critical thinking, employees become crucial generators of organizational knowledge that meet the needs of contemporary industry and citizens alike. Investing in employee development not only enhances technological skills but also fosters a company-wide operational environment that fosters continuous learning and growth, leading to sustainable organizational development and thus ensuring greater long-term adaptability.

Principal Component Analysis (PCA) revealed that innovation and research were most impactful in strengthening knowledge systems. Prioritizing performance as the conference theme, their contribution reached 47.2%. Information technology followed with 32.5%, followed by employee education and training at 20.3%. This distribution suggests that organizations with a balanced investment strategy generally exhibit more stable and longer-lasting performance. Ginting et al. (2020) support this conclusion in their study of the creative industry, which, overall, provides empirical evidence that social capital and knowledge management systems can enhance sustainable competitive advantage. When companies have structured knowledge systems as part of their collaboration, employees can easily leverage the ideas and experiences of others to generate a stream of new innovations. Companies that prioritize research and innovation have the highest OIC scores because they create new plans, increase efficiency, and differentiate their products from others in the market. Conversely, businesses that prioritize IT tend to excel. We can see that they overcome most of the consequences of faster decision accuracy and better operational strategies. Any company that prioritizes employee training and development will fare better in the long run. Because increasing human competency has a direct impact on the effectiveness of implementing technology and innovation strategies.

With the three types of investment technology, innovation, and human resource development integration is key to the successful development of an organizational knowledge system. According to Lestari (2010), when industry is concentrated through a model, the competitiveness of small and medium-sized sectors can increase; collaboration between industry players drives efficiency and makes knowledge transfer more effective. The same applies to large organizations, where input from various departments is needed to maintain the flow of information. Investments in technology, innovation, and human resource development can correct initial imbalances. The result is a dynamic and symbiotic knowledge ecosystem that can withstand market uncertainty. An integrated knowledge management system also effectively eliminates internal bureaucratic barriers and accelerates decision-making. With these practices, Purwasih et al. (2014) found that a carefully planned knowledge management strategy not only strengthens institutional reforms but also leads to more efficient work habits in the public sector. This principle also applies to the industrial sector. Aligning technology systems with organizational structures ensures smooth and accurate information flow. This finding is reinforced by research by Arjang et al. (2025), who found that in the era of the digital economy, business information systems play a strategic role in managing talent and driving service innovation. Active integration of technology systems with investment strategies enables companies to adapt to changing market needs and maintain their competitive position in the industrial sector. In this fast-paced digital era of the Internet Olympics, if a company does not have a real-time, connected data source.

This research has shown that investments focused on innovation, technology, and human resources substantially strengthen an organization's knowledge system. This is, of course, a result of the interaction between these three factors: a learning work culture cannot be established without the cooperation of everyone involved. By integrating these investments into the business strategy, a company's competitiveness can be maintained stably over the long term. According to Straková et al. (2020), building a knowledge-centric strategy (both in level and depth) is fundamental to maintaining and developing advanced industries with a focus on innovation and efficiency.

4. CONCLUSION

This research shows that different investment strategies have significantly different impact strengths. Companies with different target market share align their development investments toward research and development, employee training, job skills development, and data processing (automation). R&D projects and live demonstrations can thus significantly enhance a company's ability to manage new skills opportunities, a practice that is now evident in the projects that form the basis of this essay. These three aspects complement each other to create a knowledge structure that is able to adapt to market and technological changes. Companies that place a particular emphasis on research and development (ROI) perform at the highest levels. This is because creating new knowledge is a significant investment in strengthening a company's competitive advantage. Information technology, on the other hand, plays a crucial role in the rapid dissemination and use of information. Employee training also helps people put what they have learned into practice. Only when companies employ a balanced combination of investments in R&D, technology, and staff skills development can they achieve stable growth. Specifically, companies with focused development investments are able to improve operational efficiency, simplify decision-making processes, and, more importantly, become more adaptable to fluctuations in user demand. Knowledge Management is more than just a white-collar administrative task; it's a strategic component that plays a crucial role in an organization's long-term viability. By adopting a rational investment strategy to strengthen knowledge systems, companies can stay ahead of international competition and address the challenges posed by the global economy in market regulation.

REFERENCES

Arjang, A., Yani, A., & Suparwata, D. O. (2025). Peran Strategis Sistem Informasi Bisnis dalam Sinkronisasi Pengelolaan Talenta, Penguatan Branding, Inovasi Layanan, dan Peningkatan Daya Saing UMKM di Era Ekonomi Digital. Jurnal Minfo Polgan, 14(1), 665-675. https://doi.org/10.33395/jmp.v14i1.14839

Cheng, C., Li, M., Tang, B., & Cheng, Y. (2024). The impact of knowledge management and organizational learning promotion in small and medium enterprises on the implementation of industry 4.0 and competitiveness. Administrative Sciences, 14(8), 161. https://doi.org/10.3390/admsci14080161

Danutirta, A., Sulasno, M., Fathoni, A., & Qital, D. (2024). Sistem manajemen pengetahuan pada lembaga pemasyarakatan: strategi, tantangan, dan manfaat. Infotech Journal of Technology Information, 10(2), 251-258. https://doi.org/10.37365/jti.v10i2.312

Dewi, N. (2019). Review jurnal "indonesia's efforts to achieve globally competitive human resources".. https://doi.org/10.31227/osf.io/83xua

Djajasoedarma, M., Sukmawati, A., & Anggraeni, E. (2020). Analisis pengelolaan pengetahuan dengan asian productivity organization - assessment tools pada perusahaan perkebunan indonesia. Baca Jurnal Dokumentasi Dan Informasi, 41(1), 61. https://doi.org/10.14203/j.baca.v41i1.506

Ginting, Y., Elfindri, E., & Rahman, H. (2020). The impact of social capital on the role knowledge management system in the creative industry in getting sustainable competitive advantage. Jurnal Benefita, 5(2), 187. https://doi.org/10.22216/jbe.v5i2.5276

Hurzhyi, N., Kravchenko, A., Кулініч, Т., Saienko, V., Чопко, Н., & Skomorovskyi, A. (2022). Enterprise development strategies in a post-industrial society. Postmodern Openings, 13(1 Sup1), 173-183. https://doi.org/10.18662/po/13.1sup1/420

Lavinsaa, P., Somu, H., Ahmad, N., Joshi, J., & Wahid, N. (2020). Industry 4.0 technology re-engineering impacts on strategy agility and sme competitiveness in malaysia.. https://doi.org/10.2991/aebmr.k.200514.012

Lestari, E. P. (2010). Penguatan ekonomi industri kecil dan menengah melalui platform klaster industri. Jurnal Organisasi dan manajemen, 6(2), 146-157.

Mathrani, S., Mathrani, A., & Viehland, D. (2013). Using enterprise systems to realize digital business strategies. Journal of Enterprise Information Management, 26(4), 363-386. https://doi.org/10.1108/jeim-01-2012-0003

Nagy, J., Oláh, J., Erdei, E., Máté, D., & Popp, J. (2018). The role and impact of industry 4.0 and the internet of things on the business strategy of the value chain—the case of hungary. Sustainability, 10(10), 3491. https://doi.org/10.3390/su10103491

Purwasih, N. and Sensuse, D. (2014). Pengembangan strategi manajemen pengetahuan untuk mendukung pelaksanaan reformasi birokrasi: sebuah studi kasus di kementerian perindustrian. Jurnal Sistem Informasi, 10(1), 52. https://doi.org/10.21609/jsi.v10i1.378

Purwasih, N., & Sensuse, D. I. (2014). Pengembangan strategi manajemen pengetahuan untuk mendukung pelaksanaan reformasi birokrasi: sebuah studi kasus di Kementerian Perindustrian. Jurnal Sistem Informasi, 10(1), 52-61.

Rachman, A. (2021). Peluang investasi dana haji pada industri halal di indonesia. El-Buhuth Borneo Journal of Islamic Studies, 131-152. https://doi.org/10.21093/el-buhuth.v3i2.3254

Sahrinra, I. (2024). Strategi manajemen perusahaan yang berfokus masa depan. Nawala Education, 1(2), 18-27. https://doi.org/10.62872/v4wvp161

Solihin, I. P., Triwahyono, B., Wibisono, M. B., & Munir, S. (2024). Rencana Strategis Transformasi Teknologi Informasi pada Industri Kelapa Sawit Menggunakan Framework Zachman. Jurnal Teknologi Terpadu, 10(2), 98-104. https://doi.org/10.54914/jtt.v10i2.1417

Straková, J., Rajiani, I., Pártlová, P., Váchal, J., & Dobrovič, J. (2020). Use of the value chain in the process of generating a sustainable business strategy on the example of manufacturing and industrial enterprises in the czech republic. Sustainability, 12(4), 1520. https://doi.org/10.3390/su12041520