Conceptual Model of Knowledge Management Implementation in the Heavy Equipment Industry to Enhance Innovation and Productivity

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Abstract: Productivity and innovation are two components that are very important for the progress of a company. Business competition, rapidly changing situations and the increasingly short life cycle of a product require companies to be able to carry out exploration and exploitation in order to achieve high performance and at the same time maintain business continuity. Knowledge plays an important role in improving exploration and exploitation capabilities, so every company needs to pay special attention to how to manage knowledge so that it can be utilized optimally. Therefore, the role of knowledge management becomes very important. From the research of previous researchers, the implementation of knowledge management in various knowledge-intensive industries has been widely carried out. The heavy equipment industry, which has its own character and uniqueness, also requires a knowledge management model. This research is aimed at developing a conceptual model of knowledge management in the heavy equipment industry based on knowledge management models that have been introduced by previous researchers. It is hoped that the results of this research can help companies operating in the heavy equipment industry to implement knowledge management so that they can increase their innovation capabilities and productivity

Keywords: Conceptual Model, Heavy Equipment Industry, Knowledge Management System, Productivity and Innovation.

1. Introduction

Productivity and innovation are two components that are very important for the sustainability of a company. Innovation is the introduction of a new product, process, solution, or idea that can change the way a business operates or meets customer needs. Innovation allows businesses to stay relevant and competitive in an ever-changing market. Meanwhile, productivity is a term that refers to the way an organization manages its resources, including labor, equipment, and processes, to increase operational efficiency and produce more output with the same or fewer resources.

Increasingly fierce competition, a rapidly changing and disruptive environment, and increasingly short product life cycles are several factors that require companies to be able to carry out exploration and exploitation in order to survive and achieve successful performance (Filippini et al., 2012). Ambidexterity has become an important strategy for companies to solve the dilemma between exploration and exploitation that exists in a highly competitive environment. When a combination of exploitation and exploration occurs in a company, it is called organizational ambidexterity (OA) (Fernández-Pérez De La Lastra et al., 2022). The concept of ambidexterity is applied to organizations that are able to simultaneously engage in competitive strategies, both in knowledge exploration and knowledge exploitation. (Simeoni et al., 2020)

Knowledge is a fundamental basis in Organizational Ambidexterity (Nahapiet and Ghoshal, n.d.). Knowledge plays an important role in improving exploration and exploitation capabilities, so every company needs to pay special attention to how to manage knowledge so that it can be utilized optimally. Therefore, the role of knowledge management becomes very important.

From research by previous researchers, the implementation of knowledge management in various knowledge-intensive industries has been widely carried out (Arling and Chun, 2011; Calitz and Cullen, 2017; Hossain et al., 2022; Hsieh et al., 2020; Masa'deh et al. , 2019; Samuel and Justina, 2023; Yu et al., 2017). This emphasizes the importance of implementing knowledge management in knowledge-intensive industries.

The research question developed in this study is what is the ideal knowledge management model for the heavy equipment industry to increase innovation capabilities and productivity?

The Knowledge Management Model (KMM) is important in responding to the challenges faced by the heavy equipment industry. KMM offers a systematic approach to measuring how effectively knowledge assets are managed within a company. By understanding the level of KM maturity, a heavy equipment industry company can identify areas that need improvement and develop strategies to achieve these goals.

2. Literature Review

2.1 Heavy Equipment

Heavy equipment or heavy machinery is large mechanical equipment designed to carry out construction functions such as earthworks, road construction, building construction, agriculture and mining (Jaya et al., 2022). Various types of heavy equipment used for industrial activities are categorized based on their function and role, and all heavy equipment has the same purpose as operational support (Jaya et al., 2022). In large-scale construction projects, heavy equipment plays a crucial role. The use of heavy equipment makes tasks easier and more efficient, resulting in faster project results (Mandira and Damayanti, 2023). Industries involving heavy equipment play an important role in the economic development of many countries in the world. The mining industry contributes significantly to GDP and offers employment to millions of people (Hamilton et al., 2022).

Maintaining high-performance heavy equipment is essential due to demands for higher product quality, faster production times, and increased operating efficiency in an environment of ever-changing consumer demands (Saputra et al., 2023). The importance of maintaining machine performance cannot be ignored. High product quality, fast production times and increased operational efficiency are key demands in today's competitive business environment. Without effective knowledge management, achieving the expected level of performance becomes difficult (Saputra et al., 2023). By implementing KM concepts, heavy equipment industry companies can ensure that knowledge of best practices, latest technology and operational efficiency strategies is available to everyone in the organization. This allows them to continuously improve their performance and remain competitive in an ever-changing market (Bougoulia and Glykas, 2023).

On the other hand, because heavy equipment usually operates in environments that have never been inhabited by humans, the heavy equipment industry is faced with several specific challenges such as extreme work site conditions, both in terms of land contours and weather. Construction and mining activities generally take place in harsh environments, ranging from remote deserts to remote mountains. In these situations, machines must continue to operate effectively, even when exposed to extreme heat, dust and even other extreme weather conditions. These conditions will directly put significant pressure on heavy equipment performance. Therefore, the need for proper knowledge in operating, maintaining and repairing equipment in difficult conditions like these is very important so that the equipment can operate with optimal performance.

The next challenge is the problem of limited human resources both in quantity and quality. Workers in the field often face complex situations that require precise knowledge to overcome the problems that arise. However, with a limited number of qualified technicians and operators, ensuring that any problems are handled quickly and efficiently becomes a challenge. By applying the KM concept, heavy equipment industry companies can build a centralized knowledge base that can be accessed by all employees, enabling them to obtain the information they need quickly and effectively, even if they do not have direct experience with the problems they face.

Another challenge is the issue of fuel efficiency. According to the International Council on Mining and Metals (ICMM), fuel costs account for 32% of total energy costs in mining. This implies that for large-scale mining operations, diesel fuel costs can be an important factor in overall company profitability (Figueiredo et al., 2023). Knowledge Management can assist in identifying, storing, and disseminating this knowledge throughout the organization, allowing each unit to manage their equipment efficiently.

2.2 Knowledge Management (KM)

Knowledge has emerged as a company's most strategically significant asset (Grant, 1996). Organizations continue to look for innovative ways to exploit the benefits of their knowledge assets (Lyu et al., 2016) where the essence of the analysis of competitive advantage and sustainability lies in the issue of the ability to imitate knowledge (Spender and Grant, 1996).

Knowledge Management is the planned and sustainable management of tools, processes, systems, structures, and culture to improve the creation, sharing, and use of knowledge that is important for decision making and competitiveness. Knowledge Management is a valuable strategic tool, because it can be a key resource in decision making, especially for the formulation of alternative strategies to achieve a series of capabilities to increase competitiveness (Carneiro, 2000). Two goals of Knowledge Management (Wiig, 1997): (1) Make the organization act as intelligently as possible to ensure its survival and overall success; (2) To realize the best value from its knowledge assets.

Knowledge plays an important role by facilitating better decision making, improving the quality of work, and driving innovation. The application of knowledge management produces significant benefits, including increased efficiency, improved decision quality, stimulation of innovation, and enrichment of employee knowledge (Astarika, 2022).

A knowledge management model serves as a structured framework used to operationalize knowledge management initiatives, providing comprehensive guidance and structure while assisting organizations in selecting appropriate tools and techniques. The Knowledge Management Model helps determine the right starting point, implementation steps, and resource requirements to drive long-term company development (Hsieh et al., 2009).

2.3 Knowledge Management, Innovation and Productivity

In their research, Chen et al. says that Knowledge Management is responsible for a company's efficiency, effectiveness and innovation (Chen and Yan, 2022). In the innovation literature, knowledge is considered a key component in the recombination process that drives innovation (Galunic and Rodan, 1998). In emerging distributed organizations, success is closely related to effective knowledge sharing between individuals, teams, and units (Alavi and Leidner, 2001). Knowledge exchange is considered to play an important role in growing organizational capabilities, such as innovation, which is fundamental to driving company performance (Kogut and Zander, 1996). Organizations' interest in Knowledge Management (KM) is motivated by the potential for further benefits such as increased creativity and innovation in products and services (Darroch, 2005) Knowledge plays an important role in fostering creative thinking and encouraging innovation. This explains why innovation is considered the most significant area of impact resulting from KM initiatives (Majchrzak et al., 2004). Knowledge creation, knowledge integration, and knowledge application facilitate innovation and performance (Mardani et al., 2018)

Effective Knowledge Management has a positive impact on productivity and makes workers more innovative and makes a meaningful contribution in strengthening the company's competitive advantage and growth (Torabi and El-Den, 2017). Therefore, Knowledge Management is an important factor to ensure sustainability and increase productivity in organizations..

3. Conceptual Model

Heavy equipment companies with unique operational characteristics and challenges require the implementation of an appropriate knowledge management system to support various operational activities and assist management decision making. The implementation of a knowledge management system in heavy equipment companies is expected to increase operational efficiency. In addition, this system can encourage collaboration between teams and departments, speeding up the innovation process through a more structured exchange of ideas. Therefore, optimal implementation of a knowledge management system that suits the specific characteristics and needs of companies operating in the heavy equipment industry is very necessary.

Knowledge management has a maturity level that is used to measure how far an organization has developed and adopted knowledge management practices. This maturity level is measured through practice-related activities that directly or indirectly support the application of knowledge management.

Corporate culture is a convention of values that influences interactions between workers in a company as well as interactions between management and workers (Nguyen et al., 2019). The similarities in values and habits between workers that occur over time will naturally form organizational culture. Culture is the most important factor in increasing company productivity. Several studies have also concluded that there is a positive and significant relationship between corporate culture and knowledge management. When a company has a constructive work culture (a culture that emphasizes values related to encouragement, affiliation, achievement, and self-actualization), they tend to achieve greater success in Knowledge Management (KM) (Leidner et al., 2006) . Culture can support teamwork and collaboration, which can increase productivity levels. Additionally, culture can stimulate new ideas to encourage innovation.

In addition, a clear organizational structure can facilitate the flow of information, making decision making easier. Flexible organizations that support new ideas can drive corporate innovation. As organizational structures become more decentralized, KM will increase. High centralization inhibits interaction between organizational members and hinders creative solutions to problems (Mahmoudsalehi et al., 2012). The more complex the organizational structure, the greater the increase in KM. Higher complexity implies greater functional differences

in terms of goals, task orientation, and autonomy. Knowledge management has a positive effect on organizational performance; the better the knowledge management, the higher the organizational performance.

From several studies it was also found that ethical leadership behavior is related to the creation and development of knowledge, codification and storage of knowledge, as well as the use and utilization of knowledge (Çelik and Sağsan, 2022). Visionary leadership will be able to transform the ambitions and preferences of their followers into a cohesive whole. Leadership is a person's capacity to persuade others to do or not do something to achieve predetermined goals. This skill is useful for motivating and influencing subordinates, building enthusiasm for work, increasing the spirit of collaboration, and having a disciplined attitude to achieve certain goals systematically.

Another factor that is no less important is Social Capital. In various studies, many academics are increasingly considering the importance of social capital factors where social capital acts as a binding force that keeps institutions in place (Agyapong et al., 2017). In an organization, social capital is critical because it contributes to organizational knowledge and provides opportunities to understand its network structure, both of which are important for a company's success. The level of trust is a key indicator of social capital. Agyapong et al. 2017, in his research stated that social capital has a positive effect on innovation and innovation has a positive relationship with performance (Agyapong et al., 2017)

With respect to effective management practices, technology plays an important role in increasing the level of knowledge management maturity in companies by providing decision support tools and human-machine interfaces to measure company performance during digital transformation. Additionally, technology plays an important role in supporting these efforts. In realizing innovative ideas and increasing human productivity, technology can facilitate goals more efficiently. For example, technology can automate processes, improve communications, and meet customer needs during periods of high demand and over time. Technology can reduce the possibility of errors occurring in work processes and eliminate the possibility of product defects. Hosseini revealed that processes and technology have a significant influence on Knowledge Management (Hosseini et al., 2014)

From the results of a review of relevant literature, the study proposes a conceptual knowledge management model to answer research problems related to the implementation of knowledge management for the heavy equipment industry (Fig. 1). The conceptual model consists of five variables, namely Culture, Organization, Leadership, Social Capital and Technology. These variables are based on theories from previous research and adapted to the characteristics of the heavy equipment industry so that these variables are believed to be the main success factors in implementing KM in the heavy equipment industry to increase productivity and innovation capabilities.

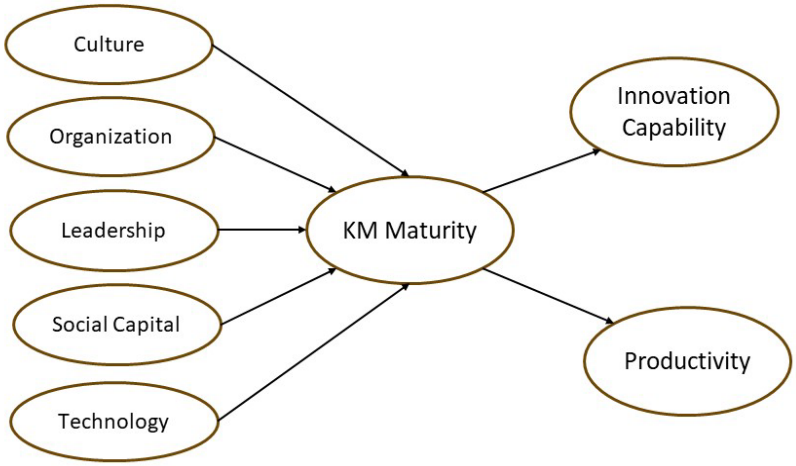

Figure 1: Conceptual Model Framework

Effective KM practices play an important role in increasing a company's productivity and driving innovation by ensuring that knowledge is systematically collected, organized and stored in a way that facilitates its future utilization.

4. Conclusion

With a better understanding of how to manage knowledge effectively, companies can optimize the utilization of their resources, improve product quality, and increase their competitiveness in global markets. Therefore, the application of KM concepts is not only important but also urgent for the long-term success of the heavy equipment industry.

Each industry has its own characteristics so that the variables that influence the effectiveness of knowledge management implementation are also different. Heavy equipment which mostly operates in isolated locations, faces extreme environments and demands for minimal breakdown levels requires a specific approach to knowledge management variables. Based on relevant literature studies, Culture, Organization, Leadership, Social Capital and Technology are variables that need more serious attention to increase the effectiveness of KM implementation in the heavy equipment industry or other industries that have similar characteristics.

Culture will support teamwork and collaboration, which can increase productivity levels. Additionally, culture can stimulate new ideas to encourage innovation. The formal organizational structure in a company influences interactions between employees which directly or indirectly will influence knowledge management within the company. A flexible organizational structure will encourage interaction between employees. Leadership style also influences the implementation of knowledge management in the company. Leaders who frequently recognize their employees' contributions to the company's success will improve performance through the knowledge management process. In an organization, social capital is very important because it contributes to organizational knowledge and provides opportunities to understand its network structure. Apart from that, technology plays an important role in supporting the implementation of knowledge management. In realizing innovative ideas and increasing human productivity, technology can facilitate goals more efficiently.

5. Limitation and Direction for Future Research

Research related to the implementation of knowledge management in various knowledge-intensive industries has been widely carried out. This research was conducted with a focus on several variables that influence knowledge management and which are in accordance with the characteristics of the heavy equipment industry and heavy equipment applications in general. Therefore, future research can be carried out for more specific heavy equipment application industries such as mining, forestry, agroindustry and construction. This research may be applied to other industries that have similar characteristics.

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