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Application of technology in operational management

Imam Wibowo
Krisnadwipayana University, Jakarta, Indonesia

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ABSTRACT

With the rapid development of information and communications technology, modern organizations are faced with opportunities to improve their operational efficiency and effectiveness through technology integration. This research aims to investigate and analyze the impact of implementing the latest technology in the context of operational management of an organization. This research uses a qualitative approach with descriptive methods. The research results show that the application of technology in operational management has a positive impact on the efficiency, productivity and quality of an organization's production results. The use of software systems such as Enterprise Resource Planning (ERP) and Supply-Chain Management (SCM) can improve interdepartmental integration, minimize data errors, and speed up workflow. Computerized Numerically Controlled (CNC) machines provide high precision in the production process. However, research also highlights challenges related to initial investment costs, maintenance costs, and risks of implementation errors that need to be carefully considered before adopting this technology. In conclusion, technology plays a crucial role in improving organizational operations, but wise implementation policies are required to maximize its benefits.

Corresponding Author:
Imam Wibowo
Krisnadwipayana University, Jakarta, Indonesia
wibowoimam253@gmail.com

INTRODUCTION

In the last decade, technological developments have created a major transformation in the way organizations run their businesses. Advances in information and communication technology, including the implementation of the latest software, automation systems, and cloud solutions, have presented new opportunities in managing organizational operations (Fauziyyah, 2022). Operational management integrated with technology not only creates efficiency in business processes, but also increases overall productivity. The application of technology in operational management provides the ability to monitor, manage and optimize various operational aspects more accurately and quickly (Maharsi, 2000). Processes that previously consumed significant time and human resources can be automated, allowing human resources to focus on tasks that require creativity and strategic decision making (Yuriandhan et al, 2022).

In addition, technology also opens the door to better collaboration between business units, teams, and even across geographic boundaries. A technologically integrated operational management system enables real-time access to important information, speeds up the decision-making process, and optimizes coordination between departments (Salwa

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& Nasution, 2024). The scope of technology and operations management has experienced significant development over a period of time, experiencing a fundamental shift from an initial focus on product development to broader aspects such as design, management and improvement of operating systems and business processes (Saputra et al, 2023). Initially, technology and operations management were more related to production efficiency and product development, with the main aim of increasing output and reducing production costs (Kristanto et al, 2022).

However, with the growing complexity of business and increasingly dynamic market demands, attention to operations management has expanded beyond production and product aspects (Utama & Gani, 2019). The focus has expanded into the design of more efficient operating systems, integrated supply chain management, and overall business process improvements. This shift is driven by the need to adapt to market changes and utilize the latest technology (Jumadi, 2003). The role of technology is not only limited to automating production processes, but also includes the implementation of sophisticated information systems, big data analysis, artificial intelligence (AI), and other latest technologies to increase efficiency, timeliness, and flexibility in operations management (Zaini & Adriana, 2022).

In addition, this shift also reflects the important role of operations management in supporting overall business strategy. A broader understanding of the impact of technology on the entire life cycle of a product or service, including the design, production, distribution and post-sales service phases, is key to achieving competitive advantage in an ever-changing business environment (Rohimah et al, 2023). The use of technology in operations management has opened the door for organizations to achieve a number of significant strategic benefits. One of the positive impacts is the ability to reduce costs substantially (Ratnasari et al, 2023). Through process automation, better planning, and resource optimization, organizations can identify new efficiencies that lead to reduced operational costs. This not only increases profitability, but also gives organizations a competitive advantage in an increasingly tight market (Idris & Nurnajamuddin, 2023).

Technology in operations management enables significant improvements in delivery processes. Through integrated information systems and real-time data analysis, organizations can optimize their supply chains, identify potential bottlenecks, and improve logistics efficiency (Dahoklory, 2013). The result is increased delivery speed and faster response to changing market needs. The application of technology also helps standardize and improve the quality of products or services (Utami, 2023). Automatic quality monitoring systems, strict process control and high-quality data processing ensure that every operational step meets high standards. Thus, organizations can ensure consistency in their products or services, improve brand reputation, and meet customer expectations (Rimantho & Mariani, 2017).

Additionally, technology provides the ability to focus more on adapting to changes in the market or customer needs. With a responsive and adaptive operations management system, organizations can quickly adapt their business processes and strategies. This creates added value for customers, as organizations can more easily meet their expectations and face market challenges with more agility.

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This research aims to investigate the impact of implementing technology in organizational operational management, with a focus on identifying its main objectives and benefits (Widajanti, 2007). The main objective is to evaluate how technology integration can reduce operational costs, increase the efficiency of delivery processes, standardize and improve product or service quality, and focus on adapting to market changes. Thus, this research intends to provide a deeper understanding of how technology plays a crucial role in improving organizational operational performance, creating value for customers, and helping organizations compete more effectively in an ever-changing and competitive business environment (Istiqamah, 2023).

METHOD

In this research, the research method applied is qualitative, chosen as an approach to answer the problem formulation that was previously proposed. With a qualitative approach, researchers can explore the meaning of problem phenomena, with the aim of explaining, describing and understanding the phenomena that are occurring (Yulianah, 2022. This research specifically adopts qualitative methods with descriptive research strategies. The descriptive method was chosen because of its ability to convey data through concepts illustrated by data, providing detail and depth of understanding of phenomena, and not limited to numerical representation.The data analysis process uses a model developed by Huberman, (2014), which includes an iterative interactive cycle between four steps: data collection, data reduction, display data, and withdrawal/verification. Data reduction involves the process of simplifying data to enable verifiable presentation. The reduced data is expected to provide conclusions that support the formation of appropriate arguments, and can even become a guide for producing innovations and new knowledge contributions, such as concepts or theory.

RESULTS AND DISCUSSION

The introduction of technology in the operational context of an organization is a strategic step to increase efficiency and productivity. The first step, technology acquisition, requires care in selecting technology solutions that align with the organization's overall goals. Careful cost-benefit analysis is required to ensure that investments in technology add significant value and have a positive impact on organizational performance. By selecting the right technology, organizations can ensure that resources are allocated efficiently to achieve their business goals (Farchan, 2016).

The next step is technology integration, where a thorough plan is needed to ensure that technology influences all aspects of production. The integration process involves adjustments to capital, labor, and interactions with customers. This plan must be solid and flexible to respond to change and ensure that technology is not only implemented efficiently, but can also adapt to evolving business dynamics.

Once the technology is integrated, the final step is technology verification. This involves a thorough evaluation of operational effectiveness following the implementation of the technology. Monitoring and measuring performance is necessary to ensure that technology is delivering the desired results and is being used to its full potential. By

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verifying the technology, organizations can assess the real impact of their investments and make adjustments if necessary. This process not only optimizes the use of technology, but also provides an in-depth view of the technology's contribution to achieving the organization's long-term goals. By following these steps, organizations can ensure that technology adoption is not just a short-lived innovation, but is also sustainable and has a positive impact on overall operational performance.

Technology is increasingly being used in product customization and design services. The use of computers and supporting electronic systems is an integral part of modern industry and the service industry (Ningsih, 2005). Current techniques can be broadly classified into the following categories:

Computer-Aided Design (CAD)

The use of Computer-Aided Design (CAD) software has had a revolutionary impact on the design and production industry. One of the main advantages of CAD is its ability to facilitate the linking of two more complex design components with a very high degree of accuracy. With CAD, designers can create detailed three-dimensional models, allowing them to assemble, integrate, and test components virtually before entering physical production. This not only saves time and costs, but also minimizes the risk of errors that can occur during the production process. With this high accuracy, design productivity increases significantly because designers can work more efficiently and effectively.

Apart from high accuracy, another advantage of using CAD is its ability to speed up the design and development process. With a user-friendly interface, designers can quickly create and modify design models without having to start from scratch. This flexibility allows for rapid adaptation to changing requirements or necessary improvements during the design cycle. As a result, product development time can be reduced significantly, allowing companies to respond to the market faster and more precisely.

Implementing CAD also facilitates better design team collaboration. Designers from different disciplines can work together on the same model in real-time, allowing for a smoother exchange of ideas and feedback. This not only increases creativity and innovation, but also creates room for increased overall team productivity. With this technology, the design and development process becomes more integrated, efficient and responsive to changing market needs.

Computer Aided Manufacturing (CAM) Systems

Precision is a key factor in various machining operations, and to achieve the highest level of accuracy, the use of Computer Numerical Control (CNC) machines has become a necessity. CNC machines have the ability to convert instructions given via computer programs into precise, precise movements in machine components. Using this system, every operational step can be coordinated with great precision, creating a final product with extraordinary precision. The ability of CNC machines to repeat processes with high consistency not only increases accuracy, but also minimizes human errors that may occur in manual processes.

Apart from that, the use of CNC machines also provides benefits in increasing operational efficiency and productivity. Carefully designed computer programs allow machines to work at a speed and consistency that is difficult to achieve manually. This not

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only saves time, but also optimizes the use of raw materials and resources. With strict control over every movement and operation, CNC machines ensure that every product detail is processed with maximum precision, helping organizations achieve high levels of quality and consistent standards. The application of CNC machines is not only limited to the needs of the manufacturing industry, but is also found in various sectors including automotive, aerospace, and other fields that require production with a high level of accuracy. Therefore, CNC machines not only improve operational accuracy, but also become an important foundation for efficiency and quality in modern manufacturing processes.

Standards for Product Data Exchange

As the name reflects, product design is transmitted between Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) in three dimensions. This process creates important synergies between the design stage and the production stage, allowing up-to-date and accurate information to be exchanged efficiently between the two systems. With standards for Product Data Exchange (PDX), the product sharing process is facilitated at all stages of the product life cycle. This PDX standard functions as a neutral file exchange protocol that ensures data integrity and information consistency between CAD and CAM. In this way, the design stage can effectively communicate with the production stage, minimizing the risk of misinterpretation and speeding up the work flow from design concept to finished product.

Product Data Exchange Standards are critical because they create an open, standardized environment for the exchange of information between potentially disparate CAD and CAM systems. This provides organizations with the flexibility to choose the CAD and CAM software that best suits their needs without worrying about compatibility or integration complexity. With the adoption of this standard, organizations can maximize productivity and efficiency in the entire product life cycle, ensuring that the transfer of information between the design and production stages occurs smoothly and accurately. Thus, the Product Data Exchange standard is not only a link between CAD and CAM, but also is the key to success in achieving harmonious integration between these two stages. With the support of this standard, organizations can leverage synergies between design and production, creating high-quality products and accelerating time to market.

There are a variety of software systems available to support integrated operations and link manufacturing functions with other aspects of a business organization. One of the most common and comprehensive systems is Enterprise Resource Planning (ERP). ERP includes various modules that cover important aspects of business, such as accounting, supply chain management, production, distribution, and human resources. By utilizing ERP, organizations can unify their data and business processes in one integrated system, ensuring connectivity between various departments and increasing operational efficiency (Oktalia et al, 2022).

In addition, Supply-Chain Management (SCM) is key in optimizing the supply chain and ensuring the availability of raw materials, efficient production and timely distribution. SCM systems enable full visibility of the entire supply chain, enabling rapid decision making and responsiveness to changes in market needs or operational conditions. New-Product Development (NPD) is a system that supports the development of new products from

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concept to launch. By facilitating collaboration and project management, NPD systems speed time to market and ensure that product innovation occurs effectively and efficiently.

Customer Relationship Management (CRM) focuses on managing relationships with customers. By monitoring and analyzing customer interactions, organizations can improve their understanding of customer needs and preferences, enabling better service and increased customer retention. Overall, the integration of software systems such as ERP, SCM, NPD, and CRM plays a crucial role in creating a coordinated and efficient business environment. The combined use of these systems allows organizations to better manage various aspects of their business, increase competitiveness, and achieve their business goals more effectively (Peppard, 2000).

Enterprise Resource Planning (ERP) is an integral solution that connects and integrates all of an organization's business functions, including manufacturing, marketing, human resources, and finance, through a common software platform. One of the main benefits of implementing an ERP solution is the creation of harmony and efficiency across the organization. By having centralized data and better accessibility, organizations can make more timely and accurate decisions. The main advantage of an ERP solution is its ability to reduce database errors. By integrating various business functions in one platform, the risk of manual data entry errors can be significantly reduced. This not only improves data accuracy, but also helps organizations avoid problems that can arise from inconsistencies between parts.

Additionally, ERP solutions provide added value to customers through faster delivery and order fulfillment. Interdepartmental integration enables a seamless flow of information, from customer orders to stock management and product delivery. In this way, organizations can provide more responsive service, better meet customer needs, and increase overall customer satisfaction. Overall, ERP solutions not only improve an organization's internal efficiency but also have a positive impact on customer relationships. By involving all business functions in one integrated system, organizations can achieve greater synergy, increase competitiveness, and respond to market changes more quickly and effectively.

Technology has great potential to facilitate changes in production operations and management, however, the decision to adopt technology must be wise and balanced. While technology can bring innovation and efficiency, it is not always feasible to implement it in all operational aspects. One of the main obstacles organizations face is high initial investment costs. Purchasing, installing, and integrating new technology requires significant budgets, and organizations need to carefully consider whether the long-term benefits will be worth those initial costs. Not only that, high maintenance costs are also a serious challenge. After implementation, software and technology equipment require regular maintenance and updates to maintain reliability and performance. These additional operational costs can be a significant financial burden on the organization, and need to be carefully measured against the resulting benefits. Therefore, careful consideration is needed regarding aspects of sustainability and long-term cost sustainability.

In addition, the risk of mismanagement or implementation errors must also be considered. Inappropriate use of technology or lack of understanding in managing change can cause a mismatch between technology and business needs, potentially causing losses

and operational disruption. Therefore, a wise approach is to carefully evaluate each step of technology implementation, ensure alignment with business needs, and actively involve stakeholders in the change process. In facing these challenges, organizations must take a balanced and strategic approach in adopting technology, focusing on solutions that provide maximum added value while minimizing risks and costs. In this way, technology can become an effective tool to support positive transformation in operations and production management.

CONCLUSION

The application of technology in operations and production management promises significant progress, bringing innovation, efficiency and the potential to increase the competitiveness of an organization. However, the decision to adopt technology needs to be made carefully, considering challenges such as high initial investment costs, maintenance costs, and the risk of implementation errors. There are various software systems, such as ERP, SCM, NPD, and CRM, that can help integrate and optimize an organization's operations. The importance of alignment between technology and business needs cannot be overstated, and organizations need to focus on solutions that provide maximum added value while minimizing risk and costs. Product data exchange standards, such as PDX, play an important role in facilitating efficient communication between various systems, ensuring data integrity and information consistency. While technology provides opportunities to improve efficiency and product quality, intelligent and strategic use requires accommodating the challenges and risks that may arise. In facing the era of digital transformation, organizations that are able to combine the potential of technology with wise management policies can achieve competitive advantage. In conclusion, successful implementation of technology in operations and production management depends on careful management, deep understanding of organizational needs, and focus on achieving long-term goals.

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