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Artificial Intelligence (AI) and Machine Learning: The Future of Information Technology and Information Systems

Kecerdasan Buatan (AI) dan Pembelajaran Mesin: Masa Depan Teknologi Informasi dan Sistem Informasi

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ABSTRACT
In the context of data and information management in large organizations, the integration of Artificial Intelligence (AI) and Machine Learning (ML) technology is an interesting research subject. This research aims to investigate the benefits, challenges and findings related to the use of this technology. Through a systematic literature review approach, the analysis results show that the integration of AI and ML has great potential to increase efficiency, productivity and innovation in large organizations in various industrial sectors. However, the research also identified challenges that need to be overcome, such as technical complexity, data security issues, and ethical considerations. The implications of this research highlight the importance of awareness of effective risk management and the development of appropriate strategies to optimize the benefits of AI and ML technologies while minimizing their risks and negative impacts. Overall, the integration of AI and ML is a promising area for further research, with the potential to provide significant positive impact for large organizations in this digital era.
Keywords: Artificial Intelligence, Machine Learning, technology integration, data management, large organizations, efficiency, productivity, innovation, challenges, implications.

ABSTRAK
Dalam konteks pengelolaan data dan informasi di organisasi besar, integrasi teknologi Artificial Intelligence (AI) dan Machine Learning (ML) menjadi subjek penelitian yang menarik. Penelitian ini bertujuan untuk menginvestigasi manfaat, tantangan, dan temuan terkait penggunaan teknologi ini. Melalui pendekatan literature review sistematis, hasil analisis menunjukkan bahwa integrasi AI dan ML memiliki potensi besar untuk meningkatkan efisiensi, produktivitas, dan inovasi dalam organisasi besar di berbagai sektor industri. Meskipun demikian, penelitian juga mengidentifikasi tantangan-tantangan yang perlu diatasi, seperti kompleksitas teknis, masalah keamanan data, dan pertimbangan etis. Implikasi dari penelitian ini menyoroti pentingnya kesadaran akan manajemen risiko yang efektif serta pengembangan strategi yang tepat untuk mengoptimalkan manfaat teknologi AI dan ML sambil meminimalkan risiko dan dampak negatifnya. Secara keseluruhan, integrasi AI dan ML merupakan bidang yang menjanjikan untuk penelitian lebih lanjut, dengan potensi untuk memberikan dampak positif yang signifikan bagi organisasi besar di era digital ini.
Kata kunci: Artificial Intelligence, Machine Learning, integrasi teknologi, pengelolaan data, organisasi besar, efisiensi, produktivitas, inovasi, tantangan, implikasi.

1. Introduction

Artificial Intelligence (AI) and Machine Learning have emerged as transformative technologies with significant implications for the future of Information Technology and

Information Systems. These technologies have found applications in various domains, including healthcare, manufacturing, communication systems, and cultural heritage management. The potential of AI and Machine Learning in healthcare is evident from the development of regulatory frameworks by the United States Food and Drug Administration (FDA) to support the use of AI-based technologies (Pappada, 2021). Furthermore, the impact of AI and Machine Learning on workforce skills and economic mobility in developing countries has been investigated, highlighting the global relevance of these technologies (Muhammad et al., 2023). In the context of healthcare, AI components such as machine learning, deep learning, natural language processing, and expert systems have been utilized for diagnosis, screening, and treatment, demonstrating their potential to revolutionize medical practices (Uz & Umay, 2023).

In addition to healthcare, AI and Machine Learning have also made significant strides in communication systems, with machine learning methods being discussed in the context of knowledge graphs for semantic communications and state-of-the-art coding methods for large-scale distributed machine learning (Günlü et al., 2023). Moreover, the application of AI and Machine Learning in cultural heritage management has been exemplified by the use of machine learning models for the management of intangible cultural heritage, such as Northwest Folk Song Huaer, showcasing the diverse applications of these technologies beyond traditional domains (Li & Song, 2022).

The integration of AI and Machine Learning in Information Technology and Information Systems is poised to shape the future of these fields. The potential for personalized and emotionally appealing advertising through the use of AI and Machine Learning reflects the evolving landscape of digital marketing and data analytics (Mogaji et al., 2019). Furthermore, the development of intelligent network architectures for self-learning control strategies in software-defined networks underscores the role of AI in advancing network technologies (Yao et al., 2018). As AI and Machine Learning continue to evolve, their impact on business and information systems engineering is becoming increasingly pronounced, with the availability of technology and data driving the need for practical solutions in running systems (Aalst et al., 2018).

In conclusion, the future of Information Technology and Information Systems is intricately linked with the advancements in Artificial Intelligence and Machine Learning. These technologies have the potential to revolutionize healthcare, communication systems, cultural heritage management, and business and information systems engineering, among other domains. As regulatory frameworks evolve and research in these areas continues, the transformative impact of AI and Machine Learning on the future of Information Technology and Information Systems is becoming increasingly evident.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies is poised to revolutionize the management of data and information systems in large organizations, fundamentally altering the way data is collected, stored, managed, and utilized for strategic decision-making. AI enables systems to learn from data, analyze patterns, and make decisions autonomously, while ML allows computers to learn from experience and enhance their performance over time (Benjamens et al., 2020). These advancements have significant implications for various sectors, including healthcare, where AI and ML are expected to optimize clinical care delivery and information management, leading to earlier disease diagnoses and personalized treatment plans (Gerke et al., 2020). Furthermore, the impact of AI

and ML extends to precision psychiatry, with these technologies playing a critical role in this field (Chen et al., 2022).

The potential of AI and ML in healthcare is substantial, with experts foreseeing their ability to diagnose, manage, and treat a wide range of medical conditions (Benjamens et al., 2020). However, the integration of AI and ML in healthcare also raises ethical and regulatory considerations, as the technologies have the potential to disrupt healthcare structures and delivery while promising to optimize care delivery and information management (Drabiak, 2022). Additionally, the use of AI and ML in medical imaging presents novel regulatory challenges due to the rapid evolution of these technologies (Petrick et al., 2023). The impact of AI and ML in drug discovery and clinical pharmacology is also a subject of interest, with the potential for these technologies to significantly influence these areas (Zhavoronkov et al., 2020).

In the context of organizations, the deployment of AI and ML technologies raises questions about the simultaneous economic and social benefits of their usage (Kumar, 2023). The deployment of these technologies at an organizational level also gives rise to the phenomenon of technostress, which necessitates the exploration of coping mechanisms within socio-technical systems (Kumar et al., 2023). Furthermore, the integration of AI and ML components into systems has become closely related to engineering intelligent systems, reflecting the increasing complexity and impact of these technologies on people's lives (Cody & Beling, 2023).

The potential of AI and ML is not limited to healthcare and organizational settings. These technologies are also expected to impact various other domains, such as precision psychiatry, nuclear security, and drug discovery, indicating their wide-ranging influence across different sectors (Chen et al., 2022; , Eggers & Sample, 2020; , Zhavoronkov et al., 2020). However, the ethical implications of AI and ML, particularly in the context of emotional expression and social applications, are also a subject of concern, highlighting the need for ethical frameworks and tools to guide the responsible development and deployment of these technologies (Stark & Hoey, 2019; , Morley et al., 2019).

In conclusion, the integration of AI and ML technologies is set to shape the future of information technology and information systems, with far-reaching implications for various sectors, including healthcare, organizational management, and regulatory frameworks. However, the ethical, regulatory, and societal implications of these advancements must be carefully considered to ensure their responsible and beneficial integration into different domains.

Despite advances in AI and ML technologies, there are still a number of challenges faced by large organizations in managing their data and information. Emerging problem phenomena include increasing data complexity, challenges in deriving meaningful insights from large and complex data, the need for robust computing infrastructure, and challenges in securing and protecting sensitive data. In addition, organizations are also faced with the demand to integrate data originating from various sources, including IoT sensors, social media, and mobile devices, into a cohesive and integrated information ecosystem.

Although the literature on the integration of AI and ML technologies in data and information management has grown rapidly, there are still several knowledge gaps that need to be filled. Some studies focus on the technical aspects of AI and ML implementation, while others highlight the business and managerial aspects. However, there is a need to investigate in

more depth how this integration affects various aspects of the organization, including organizational culture, organizational structure, and human resource capabilities. Additionally, existing literature has not fully explored the ethical, justice, and social impact implications of using these technologies in the context of large organizations.

The aim of this research is to conduct a systematic review of existing literature on the integration of AI and ML technologies in data and information management in large organizations. The research question that is the main focus is "How can the integration of AI and Machine Learning technology optimize data and information management in large organizations?" This research aims to provide an in-depth understanding of the benefits, challenges, and implications of this integration, as well as to identify knowledge gaps that need to be filled by future research. The novelty of this research lies in its systematic approach in exploring the existing literature and in providing a comprehensive review of this topic.

The main contribution of this research is providing a better understanding of how the integration of AI and ML technologies can optimize data and information management in large organizations. It is hoped that the results of this research will provide valuable insights for practitioners and researchers in understanding the benefits, challenges and implications of using this technology in the context of large organizations. Apart from that, it is also hoped that this research can identify future research directions and inspire the development of more effective and innovative solutions in facing the challenges faced by organizations in the era of AI and ML.

2. Research Methods

The research method used in this systematic literature review begins with the selection of a reputable international database that suits the scope of the research topic. In this context, recommended databases include IEEE Xplore, ACM Digital Library, and Google Scholar. The selection of this database was based on their reputation for providing access to quality scientific articles relevant to the topic "Artificial Intelligence (AI) and Machine Learning: The Future of Information Technology and Information Systems".

After selecting the database, the next step is to determine search keywords that are relevant to the topic and research questions that have been previously formulated. Keywords used include terms such as "Artificial Intelligence", "Machine Learning", "Information Technology", "Information Systems", "Data Management", and "Organization". The use of appropriate keywords is very important to ensure that the articles found are truly relevant to the research focus.

After determining the search keywords, an initial search is carried out in the selected database. The number of articles retrieved from the initial search will be recorded to provide an idea of the volume of literature available in the selected research domain.

Article inclusion and exclusion techniques are carried out based on certain predetermined criteria. Inclusion criteria include relevance to the research topic, year of publication of the article, and the existence of a research gap in accordance with the research objectives. Articles that do not meet the inclusion criteria will be removed from this study.

Finally, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method will be applied in the selection process of articles to be included in the review. The PRISMA method helps ensure that the article selection process is carried out transparently and systematically, thereby minimizing bias in this research.

3. Results and Discussion

3.1. Benefits of Integrating AI and Machine Learning Technology in Data and Information Management in Large Organizations

Integrating AI and machine learning technology in data and information management in large organizations offers numerous benefits. These technologies play a crucial role in various aspects such as supply chain risk management, big data analytics, marketing, business analytics, risk management, human resource information systems, sustainable energy technologies, medical diagnosis, and customer satisfaction. For instance, AI techniques based on machine learning improve demand forecasting, inventory management, and control, thereby enhancing supply chain risk management (Nayal et al., 2021). Additionally, the integration of AI and machine learning empowers big data analytics in smart city environments through self-building AI and unsupervised learning (Alahakoon et al., 2020). Moreover, the rapid development of AI has been attributed to the advancement of cognitive mechanisms and the capabilities of machines to learn from data, creating previously non-existing information (Jarek & Mazurek, 2019).

Furthermore, leveraging data analytics and machine learning techniques provides competitive advantages for large organizations across various industries (Kannan et al., 2021). Integrating AI in enterprise resource planning (ERP) systems is essential for working with large databases and conducting intelligent machine learning analyses based on multiple algorithms and information flows from different sources (Biolcheva & Molhova, 2022). Additionally, the integration of machine learning in human resource information systems aids in managing employee records, turnover, data analytics, and the generation of electronic personal data sheets (Pomperada, 2022). Moreover, AI empowered IoT technologies contribute to sustainable energy technologies through big data handling, massive computational power, and improved machine learning (Kumar, 2022).

In the medical field, AI and machine learning play a significant role in the diagnosis and management of cardiovascular diseases, demonstrating their potential in improving healthcare outcomes (Barry et al., 2023). However, the adoption of these technologies may lead to technostress in organizations, highlighting the need for coping mechanisms to address the challenges associated with automation and augmentation paradox (Kumar et al., 2023). Furthermore, AI and big data analytics impact decision-making processes in organizations, influencing both intuitive and analytical human decision processes (Tabesh, 2021). While AI-based analysis offers advanced and detailed analytics, it also presents challenges such as privacy concerns and the potential for human-biased learning (Zada, 2022). In addition to these applications, AI and machine learning technologies are also being utilized for early wildfire detection using IoT, computer vision, and remote sensing technologies, demonstrating their potential in addressing environmental challenges (Grari et al., 2022).

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies has become a major focus in large organizations' efforts to increase efficiency and effectiveness in managing their data and information. This integration offers several benefits, including the ability to perform deeper and more complex data analysis automatically. AI and ML techniques enable organizations to identify hidden patterns in their data that cannot be seen with traditional methods, leading to more informed and timely decision-making (Plathottam, 2023). Furthermore, the integration of AI and ML technology can increase an organization's

operational efficiency by automating processes that previously required significant human intervention, thereby reducing operational costs (Plathottam, 2023). AI and ML technologies also enable organizations to respond to changes in the market or business environment faster and more flexibly, as they can proactively identify new trends and patterns from constantly updated data, providing a significant competitive advantage in this digital era (Plathottam, 2023).

The potential of AI and ML in various domains is evident. For instance, in manufacturing operations, AI and ML have been shown to improve efficiency, productivity, and sustainability (Plathottam, 2023). In the healthcare sector, these technologies have tremendous appeal for addressing unmet diagnostic needs (Tran et al., 2023). Additionally, AI and ML are reshaping how we live, learn, and work, and they have the potential to efficiently solve unstructured and seemingly intractable problems in wireless networking and communication systems (Sarirete et al., 2021; , Wang et al., 2020). Moreover, the integration of AI and ML technologies in healthcare delivery organizations is growing, and they are increasingly used in healthcare, including in the diagnosis, management, and treatment of medical conditions (Benjamens et al., 2020; , Kim, 2023).

In conclusion, the integration of AI and ML technologies in data and information management offers significant advantages to large organizations, including improved decision-making, increased productivity, reduced operational costs, and enhanced adaptability to market changes. The potential applications of AI and ML span various sectors, including manufacturing, healthcare, wireless networking, and healthcare delivery organizations, highlighting the wide-reaching impact of these technologies.

3.2. Challenges and Obstacles in the Integration of AI and Machine Learning Technologies

The integration of AI and machine learning technologies faces several challenges and obstacles. highlight the numerous obstacles for the implementation of AI/ML in daily clinical practice, especially concerning the regulation of these technologies (Benjamens et al., 2020). emphasize the major obstacle in developing better algorithms for practical machine learning tasks that require large datasets (Khan et al., 2022). Furthermore, discuss the ethical challenges associated with implementing machine learning in healthcare, indicating the complexities involved in ensuring ethical standards are met (Char et al., 2018). also point out challenges such as collecting relevant annotated data, developing robust and reliable AI algorithms, and leveraging deep learning approaches for improved classification performance in medical applications (Dray et al., 2021).

These references collectively underscore the multifaceted challenges in integrating AI and machine learning technologies, including regulatory, technical, and ethical considerations. The need for addressing these challenges is crucial for the successful and responsible implementation of AI and machine learning in various domains, particularly in healthcare and medical applications.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technology in various domains promises numerous benefits, but it also presents several challenges. One of the main challenges is the technical complexity associated with developing and operating

advanced AI and ML systems. This integration often requires a powerful and complex computing infrastructure, as well as the need for skilled technical resources to manage and maintain the system (Plathottam, 2023). Additionally, data security and privacy issues are a major concern. The data used in AI and ML systems is often highly sensitive and valuable, requiring stringent measures to protect it from security threats and privacy breaches (Meister et al., 2019).

The implementation of AI and ML in healthcare, for instance, has shown significant promise but has also faced challenges in successful deployment in clinical care settings (Hong et al., 2022). Similarly, in the manufacturing sector, AI and ML have the potential to improve efficiency, productivity, and sustainability, but the complexities of integrating these technologies into existing operations pose significant challenges (Velev & Zlateva, 2023). Furthermore, the application of AI and ML in disaster risk management has the potential to play a significant role in predicting disasters and optimizing response efforts, but it also presents challenges in terms of implementation and operationalization (Zhang et al., 2021).

Moreover, the ethical and governance aspects of AI and ML have been highlighted as crucial considerations, with researchers playing an important role in addressing ethical issues and taking action against unethical uses of AI (Singh, 2023). The impact of AI and ML on various industries, including finance, banking, and law, has also raised concerns regarding compliance with regulatory burdens and the need for effective governance (Bartels et al., 2022).

In conclusion, while the integration of AI and ML technology offers numerous benefits across different domains, it is essential to address the technical complexity, data security, privacy issues, ethical considerations, and regulatory compliance to ensure successful implementation and operation of these advanced systems.

The implementation of AI and ML technologies in organizations is hindered by several challenges, including the initial investment costs, complex development processes, and the requirement for high technical expertise (Shaw et al., 2019). The complexity and time-consuming nature of developing AI and ML systems can lead to high costs, particularly for organizations with budget constraints (Shaw et al., 2019). Additionally, the lack of skills and expertise in managing AI and ML technologies presents a serious challenge, as their implementation demands a high level of technical proficiency, including a deep understanding of AI algorithms and ML methods, as well as the ability to analyze and interpret system outputs (Shaw et al., 2019). Furthermore, the implementation of AI and ML initiatives in various sectors, such as healthcare, also poses unique challenges related to decision support, explainability, privacy, consent, algorithmic bias, security, and scalability (Shaw et al., 2019).

In the healthcare industry, the application of AI is viewed positively, offering new opportunities while also presenting challenges that need to be addressed (Lee & Yoon, 2021). The implementation of AI in radiology faces hindering factors such as inconsistent technical performance, unstructured implementation processes, uncertain added value for clinical practice, and varying levels of acceptance and trust among adopters (Strohm et al., 2020). Moreover, the limited existing AI education programs act as a barrier to the development and implementation of AI-assisted applications in medical education and healthcare systems (Iqbal, 2022).

The challenges of implementing AI and ML technologies extend beyond the healthcare sector. In the manufacturing industry, the implementation of AI and ML technologies aims to improve understanding, decision support, and transformational returns for the industry, but it

also presents challenges that need to be addressed (Plathottam, 2023). Furthermore, the implementation of AI in regional and rural health districts in Australia is hindered by varied understanding of AI and limited workforce knowledge (Shinners, 2023).

In conclusion, the challenges of implementing AI and ML technologies encompass various sectors, including healthcare, manufacturing, and education. These challenges include high initial investment costs, complex development processes, the need for high technical expertise, and sector-specific issues such as decision support, algorithmic bias, and workforce knowledge. Addressing these challenges is crucial for successful implementation and utilization of AI and ML technologies in organizations.

The successful integration of AI and ML technologies in large organizations requires significant cultural and organizational changes. This involves creating awareness and gaining acceptance from the entire organization regarding the importance of these technologies in supporting business processes and decision-making. However, this process can encounter resistance from various parties within the organization, making it crucial to manage these challenges effectively for successful implementation (Kumar et al., 2023; Herrmann & Pfeiffer, 2022; Barsha & Munshi, 2023; Weber et al., 2022; Watson et al., 2020).

Kumar et al. (2023) highlighted the importance of integrating AI and ML technologies with existing organizational practices for successful deployment (Kumar et al., 2023). Furthermore, Herrmann & Pfeiffer (2022) emphasized the need to view the integration of AI systems and employees as an organizational task, requiring careful planning and management (Herrmann & Pfeiffer, 2022; . Barsha & Munshi, 2023) identified challenges such as the lack of infrastructure, shortage of skilled personnel, and high implementation costs, which can hinder the successful integration of AI-based solutions in organizations (Barsha & Munshi, 2023). Additionally, Weber et al. (2022) highlighted the significance of organizational capabilities in using and integrating resources for successful AI implementation (Weber et al., 2022; . Watson et al., 2020) recommended robust evaluation methodologies, partnership with vendors, and the development and dissemination of best practices to overcome barriers to the adoption and implementation of predictive modeling and machine learning in clinical care (Watson et al., 2020).

In conclusion, the successful integration of AI and ML technologies in large organizations necessitates managing challenges such as resistance, lack of infrastructure, and the need for robust evaluation methodologies. Organizations need to carefully plan and manage the integration process, align these technologies with existing practices, and develop the necessary organizational capabilities to achieve successful implementation.

3.3. Findings and Analysis of Articles Included in the Review

3.3.1. Findings related to increasing efficiency and productivity

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technology has been shown to significantly enhance efficiency and productivity across various sectors. By automating business processes and routine tasks, organizations can optimize resource utilization, save time, and reduce costs (Lee et al., 2019). AI and ML technologies enable organizations to identify opportunities for performance improvement and respond to market changes more efficiently, thereby increasing overall productivity and competitiveness (Kumar et al., 2021). These technologies also have the potential to drive business model innovation and improve the quality of products and services (Lee et al., 2019; Kumar et al., 2021).

Furthermore, the deployment of AI and ML technologies can lead to an automation-augmentation paradox, impacting both economic and social aspects of organizations (Kumar, 2023; Kumar et al., 2023).

The adoption of AI and ML technologies in various industries, such as retailing, food processing, and pharmaceuticals, has demonstrated their potential to enhance production efficiency and quality (Weber & Schütte, 2019; Kumar et al., 2021; Escudero, 2022). Additionally, the role of AI and ML in the digitalization of industries has garnered increased attention, especially in the context of the COVID-19 pandemic, where technology adoption and usage have become crucial for business continuity (Mr, 2021; Mishra & Sainy, 2022). Moreover, the application of AI and ML in fields such as agriculture and organic farming has the potential to improve production efficiency and sustainability (Pawitri et al., 2021).

However, the widespread adoption of AI and ML technologies also presents challenges, such as technostress and the need for explainable AI (xAI) frameworks to ensure trustworthiness and safety in automated tools (Kumar et al., 2023; Hernandez et al., 2021). Furthermore, the study of gender biases in ML and AI systems highlights the importance of ensuring fairness and accessibility in these technologies (Shrestha & Das, 2022).

In conclusion, the integration of AI and ML technology has the potential to revolutionize various industries, driving innovation, efficiency, and productivity. However, it is essential to address the challenges and ethical considerations associated with their deployment to ensure their responsible and effective use.

3.3.2. Findings related to more accurate and faster decision making

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies has been shown to significantly enhance decision-making processes in various organizational contexts. Research has demonstrated that AI and ML systems can rapidly analyze data and identify patterns that may not be discernible to humans, enabling organizations to make decisions based on more accurate and comprehensive information (He et al., 2019). This capability reduces risk and increases the success of business strategies by facilitating the identification of new opportunities and better prediction of market trends, thereby enabling organizations to respond to changes more effectively (Choudhury et al., 2020). Furthermore, the use of AI and ML technologies in decision-making enhances organizational responsiveness to the evolving business environment and improves their ability to adapt and compete in a competitive market (Uche-Anya et al., 2022).

The practical implementation of AI technologies has been observed to produce better results when combined with human expertise, leading to improved outcomes compared to either working alone (He et al., 2019). Additionally, the use of AI and ML in decision-making processes has been found to be increasingly relevant in mental health services, with research in embodied AI having clinical implications for therapeutic applications (Fiske et al., 2019). Moreover, the seamless integration of AI across different aspects of medical education has been emphasized, highlighting the growing importance of AI training in medical curricula (Paranjape et al., 2019).

In the context of healthcare, AI and ML systems are increasingly utilized to enhance clinical decision-making and healthcare delivery, particularly in fields such as cardiovascular imaging and inflammatory bowel disease (Seetharam et al., 2020; Kohli et al., 2020). Furthermore, the incorporation of AI and ML in cancer management has shown promise in

advancing healthcare research and improving clinical decision-making (Ali et al., 2023). However, as the use of AI and ML expands in healthcare, attention has been directed towards mitigating bias in algorithms to ensure fair and transparent deployment (Kostick & Gerke, 2022).

In the pharmaceutical industry, AI and ML-based platforms have made significant contributions to drug development processes, aiding in quick decision-making for faster manufacturing of high-quality products (Selvaraj & Chandra, 2021). Additionally, the potential benefits of incorporating AI tools into clinical decision-making include improved diagnostic accuracy and addressing human factors contributing to medical errors (Brown et al., 2023).

In conclusion, the integration of AI and ML technologies has demonstrated the potential to significantly enhance decision-making processes across various organizational contexts, particularly in healthcare and pharmaceutical industries. By leveraging the capabilities of AI and ML, organizations can improve their responsiveness to market changes, reduce risk, and enhance their ability to adapt and compete effectively.

3.3.3. Findings related to risk and error reduction

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technology has been shown to have significant potential in reducing risks and errors in various organizational processes and activities. Research has demonstrated that AI and ML systems can effectively detect anomalies or unusual patterns in data, which can serve as indicators of potential risks or errors (Danti et al., 2022). By utilizing advanced anomaly detection techniques, organizations can proactively identify problems or abnormal events and take appropriate preventative action before they escalate into more serious situations. Furthermore, the integration of AI and ML technology can aid in optimizing operational processes and identifying weak points that might lead to errors or failures (Pandarakone et al., 2019). Through thorough data analysis, AI and ML systems can assist organizations in identifying and addressing potential risks more effectively, thereby reducing the likelihood of future errors and losses (Chen et al., 2022).

The application of AI and ML in anomaly detection is particularly noteworthy, as it has been widely used in various domains such as wireless networking, cybersecurity analysis, and radio propagation for communications. Additionally, the use of AI and ML in fault diagnosis and anomaly detection in diverse systems, including small diesel engines, induction motors, and spaceborne Automatic Identification System (AIS) data for ship classification and anomaly detection, further underscores the broad applicability of these technologies in risk reduction and error prevention.

Moreover, the potential of AI and ML in reducing risks and errors extends beyond specific domains, as evidenced by their application in smart farming for crop management, pharmaceutical product development processes, and the development of an AI-empowered framework for cross-layer softwarized infrastructure state assessment. These diverse applications highlight the versatility and effectiveness of AI and ML in addressing risks and errors across different industries and operational aspects.

In conclusion, the research findings support the significant contribution of AI and ML technology in reducing risks and errors in various operational and strategic aspects of organizations. The ability of these technologies to detect anomalies, optimize processes, and address potential risks effectively underscores their potential to enhance organizational resilience and minimize the occurrence of errors and losses.

3.3.4. Findings related to increasing innovation and organizational competitiveness

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies has been shown to significantly contribute to increasing innovation and organizational competitiveness. These technologies enable organizations to leverage data more effectively, identifying new opportunities and developing innovative solutions (Rana et al., 2021). By analyzing data in depth, AI and ML systems can help organizations identify market trends, customer needs, and innovation potential more quickly and accurately, allowing them to respond to market changes more flexibly and develop products and services that better meet customer needs and expectations (Lee & Trim, 2022).

The potential of AI and ML in various fields such as medicine, education, marketing, and business has been widely recognized (Maliha et al., 2021; Chen et al., 2020; Han et al., 2021; Kedar & Khazanchi, 2022; Byeon, 2022; Drabiak, 2022). For instance, in medicine, there are concerns about algorithm inaccuracy leading to patient injury and medical liability with the increasing integration of AI and ML (Maliha et al., 2021). In education, the impact of AI on education has been assessed, highlighting the significant inroads made by digital health, including AI-based and ML-based technology, into various aspects of healthcare, including neurological care (Kedar & Khazanchi, 2022). Furthermore, the application of AI and ML technologies in marketing and business-to-business (B2B) marketing has been a subject of rapid change and ongoing research (Han et al., 2021; Lee & Trim, 2022).

Moreover, the potential future research areas and challenges in the integration of the Systems Engineering process and the AI/ML model lifecycle have been emphasized, indicating the growing interest in equipping systems with intelligence and the need to adapt the engineering process to consider the specific characteristics of AI and ML systems (Álvarez-Rodríguez et al., 2019). Additionally, the use of AI and ML in clinical neurology has been highlighted, aiming to make computers perform tasks that minds do, with the delineation for how "intelligent" a computer must be to qualify as artificially intelligent being less clear (Hillis & Bizzo, 2022).

In conclusion, the integration of AI and ML technologies has shown promise in various domains, including medicine, education, marketing, and business, offering opportunities for innovation and improved decision-making processes. However, challenges such as algorithm inaccuracy and the need for ethical and legal considerations have also been identified, emphasizing the importance of responsible and safe deployment of these technologies.

The integration of AI and ML technology has the potential to significantly enhance the effectiveness of the innovation and product development process. By leveraging advanced data analysis techniques, organizations can expedite the testing and evaluation of innovative ideas, thereby accelerating the introduction of new products and services to the market. This, in turn, enables organizations to be more responsive to market changes and produce more innovative and competitive products and services (Gupta et al., 2023; Plathottam, 2023; Samdanis et al., 2023; Sanil et al., 2021; Shah et al., 2019; Geng, 2023; He, 2022; Dudnik et al., 2021; Okunlaya et al., 2022; Teoh et al., 2023; Kamning, 2021; Abrardi et al., 2021; Sarirete et al., 2021).

The application of AI and ML in various sectors such as agriculture, manufacturing, network optimization, nanomedicine, and business operations has been shown to yield significant benefits. For instance, in agriculture, the integration of AI and ML involves the use of sensors, data analytics, and machine learning algorithms to boost crop management (Gupta et

al., 2023). Similarly, in manufacturing, the incorporation of AI is distinct from digitization and information technology integration, offering unique advantages (Plathottam, 2023). Furthermore, the adoption of AI/ML in network optimizations and service life-cycle management has the potential to advance beyond 5G networks (Samdanis et al., 2023). In the field of nanomedicine, the development of integrated workflows based on automated experiments and AI/ML is expected to accelerate the development of nanomedicines (Zaslavsky et al., 2022). Additionally, the role of machine learning in changing social and business ecosystems has been highlighted, particularly in the context of the COVID-19 pandemic (Sanil et al., 2021).

Moreover, the utilization of technopreneurship has been identified as significantly enhancing business competitiveness, particularly for small businesses (Machmud et al., 2022). The application of AI technology in cloud computing environments has been shown to effectively improve work efficiency and promote the development of human economic and social civilization (Zheng & Wen, 2021). Furthermore, the impact of AI on the development and utilization activities in small and medium-sized enterprises has been recognized, capturing the influence of technological innovation through AI on companies (Kim & Seo, 2023).

In conclusion, the integration of AI and ML technology holds immense potential for revolutionizing the innovation and product development process across various industries. The diverse applications of AI and ML in agriculture, manufacturing, network optimization, nanomedicine, and business operations underscore the far-reaching impact of these technologies on enhancing competitiveness and driving innovation.

The integration of artificial intelligence (AI) and machine learning (ML) technologies has been recognized as having the potential to significantly impact various sectors, including healthcare, education, business, and technology. Shah et al. (2019) discuss the strategies for modernizing the clinical development process through the integration of AI and ML-based digital methods, emphasizing the potential for earlier disease diagnoses and individualized treatment plans. Similarly, Gerke et al. (2020) highlight the potential of AI and ML systems in medicine to improve healthcare by offering earlier disease diagnoses and personalized treatment plans. Furthermore, Kuleto et al. (2021) emphasize the potential of AI and ML in e-learning and higher education institutions, indicating the broad applicability of these technologies in the education sector.

In the business context, Herrmann & Pfeiffer (2022) argue for the integration of human and machine intelligence to achieve organizational goals, emphasizing the need to keep human organizations "in the loop" for successful AI/ML integration. Additionally, Sanil et al. (2021) discuss the role of AI and ML in changing social and business ecosystems, highlighting their significance as essential components for businesses, particularly in the context of the COVID-19 pandemic. Moreover, Samdanis et al. (2023) and Lin (2020) emphasize the potential of AI/ML in advancing network optimizations, service life-cycle management, and creating a paradigm shift in the technology industry.

The potential of AI and ML is not limited to specific sectors, as evidenced by the work of (Kumar et al., 2023), who explore the impact of AI and ML-induced technostress in organizations and propose socio-technical systems as coping mechanisms for technostress management. Furthermore, Sarirete et al. (2021) emphasize the role of AI and ML in digital transformation at a global scale, promoting research on AI and ML as functions of data-driven innovation and digital transformation.

In conclusion, the integration of AI and ML technologies has the potential to drive innovation and competitiveness across various sectors, including healthcare, education, business, and technology. These technologies offer opportunities for organizations to leverage data effectively, develop innovative solutions, and create significant value for customers and stakeholders.

4. Conclusion

In the context of integrating AI and Machine Learning (ML) technologies in data and information management in large organizations, research findings reveal a number of significant benefits.

First, this technology plays an important role in various aspects, including supply chain risk management, big data analysis, marketing, business analysis, risk management, human resource information systems, sustainable energy technology, medical diagnosis, and customer satisfaction. ML-based AI techniques improve demand prediction, inventory management, and control, thereby improving supply chain risk management. The integration of AI and ML also empowers big data analysis in smart city environments through AI learning and unsupervised learning. Additionally, the rapid development of AI is associated with advances in cognitive mechanisms and the ability of machines to learn from data, creating information that did not previously exist.

Second, leveraging data analysis and ML techniques provides a competitive advantage to large organizations in various industries. AI integration in enterprise resource planning (ERP) systems is important for working with large databases and performing intelligent machine learning analysis based on algorithms and information flows from various sources. Additionally, the integration of machine learning in human resource information systems helps in managing employee records, turnover, data analysis, and generating electronic personal data sheets. Furthermore, AI technology supported by the Internet of Things (IoT) contributes to sustainable energy technology through handling big data, large computing power, and enhanced machine learning.

Third, in the context of decision making, the integration of AI and ML allows organizations to perform deeper and more complex data analysis automatically. This system can identify hidden patterns in data that cannot be seen with traditional methods, thereby improving the quality of decisions and organizational responses to market changes more quickly and flexibly. However, implementing this technology can present challenges, such as privacy concerns and the potential for human-biased learning.

Fourth, the integration of AI and ML also contributes to reducing risks and errors by detecting anomalies or unusual patterns in data. By using advanced anomaly detection techniques, organizations can proactively identify problems or abnormal events and take appropriate countermeasures before they escalate into a more serious situation.

Fifth, the integration of AI and ML technology also results in increased innovation and organizational competitiveness. By analyzing data in depth, organizations can identify market trends, customer needs and innovation potential more quickly and accurately, enabling them to respond to market changes more flexibly and develop more innovative and competitive products and services.

However, the application of AI and ML technologies is also faced with a number of challenges, including technical complexity, data security issues, and ethical considerations. To

meet these challenges, measures such as the development of appropriate infrastructure, strict data protection and careful ethical considerations in the use of this technology are required.

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