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ARTICLE

OPEN INNOVATION: TOWARD AN ORGANIZATIONAL DIGITAL INNOVATION

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Abstract
Organizations are utilizing digital technologies to modernize their innovations in today's competitive and rapidly changing market environment. This study's goal is to explore the influence of open innovation on firms' digital technology integration, aiming to enhance their innovation skills and produce competitive, adaptable digital solutions. The methods used include analysis, synthesis, and generalization. Organizations can enhance open innovation by acquiring knowledge, capabilities, ideas, technologies, and information for new products and services, with the relationship between open innovation and digital innovation accelerating their capabilities. The study emphasizes the challenges organizations face in modern IT, emphasizing open innovation, access to external knowledge, and the need for improved internal production efficiency and competitiveness. The practical value of this study is manifested in the identification of strategies for optimizing open innovation for their transformation into digital solutions.

Keywords: technological changes; enterprise; stakeholders; external knowledge; competitiveness

JEL codes: D83; O32; O36

1. Introduction

In today's rapidly evolving digital environment, innovation has become crucial for organizational success. The constant development of digital technologies necessitates that organizations continuously adapt their innovations to meet new opportunities and challenges. This adaptation requires integrating novel technologies into all aspects of operations, from production to customer interaction, while also shifting attitudes and organizational culture. As the pace of technological change accelerates, organizations must be flexible, responsive, and open to collaboration with other market players. This open approach to innovation enables the acquisition of new knowledge, capabilities, and ideas for developing digital innovations. The primary challenge lies in tracking and thoroughly examining the latest trends in open innovations and their integration into organizational digital frameworks, as specific technical improvements rapidly alter innovative strategies and requirements. Consequently, identifying optimal adaptation and management strategies is essential for organizations to effectively harness the potential of digital technologies within the context of open innovation.

Open innovation is a concept in which organizations actively seek out and incorporate information, ideas, and technologies from both internal and external sources. Collaboration with external partners, such as firms, universities, and research institutions, provides access to a broader range of knowledge and resources. This concept aims to accelerate innovation, enhance product development, and gain a competitive edge by harnessing the collective wisdom and talents of a larger network beyond the organization's borders. Closed innovation is a classic strategy in which research and development (R&D) activities take place within a business, depending only on internal resources and expertise.

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This approach is frequently highly secretive, with the goal of protecting intellectual property and maintaining control over the whole process. However, this method might be constraining because it relies completely on the organization's own ideas and skills, thus obstructing innovation and limiting innovative solutions.

Skog (2019) examines the unpredictable modern organizational environment, characterized by socio-cultural changes, political instability, economic uncertainty, and rapid technological change. The study examines new opportunities and challenges, how organizations respond through innovative practices, and how rapid changes impact their competitiveness. However, the study does not consider specific aspects of digital transformation in specific industries or the socio-cultural implications of digital change for society. Mgunda (2019) highlights the impact of information technology on daily activities and global businesses. She emphasizes the need for organizations to understand the effects of digital technologies like artificial intelligence, blockchain, and the Internet of Things on their operations. However, the article fails to detail the effects of these technologies and does not address the ethical considerations of using information technology in business. Wyrtki (2021) highlights the importance of digital technology in transforming businesses by enabling them to connect activities and innovate. The study explores how organizations are implementing digital technologies in production, marketing, customer service, and management. It highlights how these technologies revolutionize business models, generating new opportunities for profitability and competitiveness. However, the study does not fully address the social and ethical dimensions of digital innovation, as it does not fully address the interaction with society.

Kilay *et al.* (2022) assessed how electronic payments and e-commerce services affect the supply chain efficiency of micro, small, and medium-sized firms (MSMEs). They also suggested open ideas and solutions to speed up the digitalization of MSMEs. The study showed a clear and important influence of electronic payments and e-commerce service characteristics on the supply chain performance of MSMEs in Indonesia. According to Ciarli *et al.* (2021), digital technologies are permeating and restructuring all aspects of economic and social activity. For some, their adoption disrupts current activities, while for others, it has a gradual influence and enhances existing activities. Paunov and Planes-Satorra (2019) stated that digital technologies impact innovation across all sectors of the economy and lead to the development of organizational digital innovations.

Dreßen (2021) contends that digital technology might encourage open innovation by enabling easier access and sharing of knowledge, hence establishing a connection between the two. The growth of technological innovation and its impact on businesses continues to increase due to the greater availability of infrastructure and resources such as data and knowledge. This set of factors has led to a growing interest among companies in conducting innovation collaborations, known as "open innovation," as opposed to the traditional "closed innovation," where R&D are completed within organizational boundaries (Martono *et al.*, 2020). Through this open innovation, organizations can optimize knowledge from multiple sources to enhance innovation and deliver value to customers. While digital innovation and open innovation are interdependent, there is still a lack of explanation of how open innovation accelerates the process and outcomes of digital innovation.

This research seeks to evaluate how open innovation approaches may be effectively used to accelerate the development and integration of digital technologies within businesses. It focuses on the dynamics of knowledge acquisition, external cooperation, and resource optimization as they relate to the transition of traditional innovation processes into digitally enabled frameworks. The study aims to identify the key factors that influence the successful adoption of digital technologies and the creation of innovative products and services that improve competitive advantage in rapidly changing market conditions by focusing on the organizational mechanisms that foster open innovation.

2. Literature review

Martínez-Caro *et al.* (2020) stated that new digital technologies have brought significant changes to individuals, organizations, and society in recent years. The current research focuses on how

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open innovation practices help organizations integrate digital technologies to improve innovation capabilities, unlike work by Martínez-Caro *et al.* (2020) on the impact of digital organizational culture on firm performance. Grinin and Grinin (2023) highlight the cybernetic revolution as a significant shift from industrial manufacturing to self-regulating systems for creating services and products and making complex decisions without human intervention. Digital technologies are increasingly recognized as the primary productive resource in the modern global economy, driving social welfare growth and impacting production management across all economic sectors. Priyono *et al.* (2021) highlight that digital technologies will be the primary focus for organizations to enhance business productivity and competitiveness. They suggest that digital businesses aim to transform traditional businesses into digitally enabled ones, transforming goods, services, and information. These technologies are transforming sociotechnical aspects for individuals, society, organizations, and the economy, driving innovation through globalization, technological advancements, and technological intricacy (Urban *et al.*, 2023). Open innovation, a cooperative approach, contrasts the traditional "closed innovation" approach, which integrates R&D within corporations.

Farjam *et al.* (2023) noted that studies focusing on innovation management demonstrate that, in the face of intense competition, enterprises can move from the conventional model of innovation (known as closed innovation) to the concept of "open innovation." In contrast to the focus of Farjam *et al.* (2023) on establishing a risk management model for SMEs, this study investigates the potential of open innovation methods to improve digital technology integration and stimulate organizational innovation. The term "open innovation" was first used in 2003 by Chesbrough to describe the phenomenon where enterprises could no longer rely on their own ideas for business development. Zhu (2022) defines open innovation as a model advocating for enterprises to utilize both external and internal ideas to enhance their technologies. Therefore, open innovation management techniques that involve information transfer and market exploitation are encompassed within the idea of open innovation. Innovation is a crucial element for advancement and economic growth. Mankevich (2019) argues that managing digital innovation poses significant challenges for enterprises, as it is a complex and diverse phenomenon. Digital innovation has created new possibilities for service innovation, particularly when consumer exchange capabilities enable whole new types of connections (Opris *et al.*, 2020). The current research examines the role of open innovation in improving the integration of digital technologies within organizations, which is not addressed by Mankevich (2019), who explicitly explores digital innovation management using the lens of digital trace data in online communities.

According to Ahmed *et al.* (2020), product innovation refers to creating a product or service that is original, novel, or significantly enhanced in terms of its features, qualities, or effectiveness. Process innovation involves implementing a new or greatly enhanced production or delivery technology that incorporates substantial modifications in processes, tools, and/or software. The ability of a corporation to innovate is considered a source of sustainable competitive advantage in a context where competition is focused on innovative ideas, shorter product life cycles, and market volatility. The current study explores the role of open innovation in integrating digital technologies within organizations, contrasting the focus of Ahmed *et al.* on innovative capabilities driving firm performance. Kohli and Melville (2019) argued that, according to theories on organizational capabilities, the competitive environment affects digital innovation. They suggest that effective digital innovation requires strategic alignment of organizational competencies, the implementation of new technology, and the leadership's ability to navigate the changing digital world. This study explores the role of external knowledge acquisition, collaboration with partners, and open innovation frameworks in driving digital innovation, differing from Kohli and Melville's research on internal capabilities alignment. According to Nambisan *et al.* (2017), incorporating new ideas into market items, business processes, or business models via digital technologies is referred to as "digital innovation." Digital innovation involves combining physical and digital products to produce new products, changing business culture, and transforming products, services, processes, and business models.

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3. Materials and methods

The theoretical overview was a crucial element of the study, concentrating on the examination of current knowledge and concepts in the field of open innovation. The theoretical overview involved an analytical strategy that scrutinized current knowledge and concepts in the open innovation field, enabling the development of fundamental study approaches. The analysis of definitions and theoretical frameworks related to open innovation helped to clarify the terminology and identify key conceptual aspects. Considering different approaches to the definition of open innovation contributed to a holistic understanding of the object under study. Furthermore, the theoretical overview included an analysis of the benefits and challenges associated with open innovation in various business sectors. This helped to identify trends and problems that may arise when implementing open innovations and lay the groundwork for further analysis of their impact. The theoretical overview also covered the benefits and challenges associated with open innovation in today's business environment to identify the main aspects that influence its success.

The synthesis method proved to be necessary to combine information from various scientific sources and identify key topics that deserve research within the framework of open innovation. This stage has become an effective tool for creating a holistic picture, combining different approaches and opinions on the problem. The combination of various sources helped to get a more complete overview of the topic and identify prospects for further research. The synthesis method also proved useful in identifying gaps in existing knowledge and determining the need for new research, making it possible to clarify areas for further research.

The method of synthesis included the collection of data and the identification of key trends arising from the theoretical overview and synthesis. This stage proved to be key in formulating a conceptual framework for further research and identifying methods for implementing the collected knowledge into practice. The final synthesis of the collected data helped to identify the main trends in the development of open innovations and to identify areas that require further research. The synthesis also considered the various approaches and perspectives that emerged from the theoretical analysis and synthesis. The synthesis of the results also played a key role in formulating conclusions based on scientific evidence and analysing current trends in open innovation.

A framework was evaluated that addressed open innovation characteristics to facilitate organizational innovation transformation and guide the path toward organizational digital innovation. This part of the study focused on examining the specific factors that influence the effectiveness of organizational digital transformation from the perspective of open innovation. The structural analysis involved examining the impact of various phases and components on the advancement and maintenance of organizational digital innovation. This was a major step in identifying the key factors that influence the effectiveness of organizational digital development through open innovation.

4. Results and discussion

4.1. The role of open innovation in organizational digital transformation

Innovation encompasses the organizational and procedural elements of a corporation focused on enhancing productivity through increased production efficiency and decreased production costs. This process is widely recognized as a key element of competitiveness that increases the value of an organization and is considered in transformation systems (Di Vaio *et al.*, 2021). Organizational culture, information sharing, and organizational innovation positively influence competitive advantage. Organizational culture promotes knowledge sharing and creativity among employees, connecting them to key business processes that can enhance the development of advanced manufacturing skills. In this context, the model of innovation is changing to consider the rapid spread of knowledge (Azeem *et al.*, 2021). Furthermore, organizations need research innovation capabilities by constantly improving their current knowledge and operational innovation capabilities by creating radically new ideas and knowledge (Chaudhary *et al.*,2021).

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Digital technologies have influenced innovation in all sectors of the economy (Loxha, 2019). Organizations should strive for technology-based innovation in the current digital age by creating digital-based innovation. These changes, driven by new digital technologies, are known as "digital innovation" (Kaczmarek *et al.*, 2020). Digital innovation involves combining physical and digital products to produce new products through initiation, development, implementation, and operation activities.

The new model of innovation, known as "open innovation," offered an alternative to the existing model of "closed innovation," which was based only on internal experiments that were expensive and developed in a self-contained organizational environment. The new open innovation approach integrates internal and external sources of knowledge in innovation management. It proposed a new method for overseeing the innovation process, emphasizing two interconnected elements: inbound and outbound open innovation. Inbound techniques involve firms integrating external resources into their internal environment through sourcing and acquisition, as highlighted in certain research (Leitão *et al.*, 2020). Conversely, outbound techniques involve sharing internal resources with the external world for sale. Researchers have demonstrated the beneficial effects of some open innovation approaches on innovation activities (Mazzola *et al.*, 2016).

The Open Innovation Platform is a critical tool that firms utilize to integrate external knowledge, technology, and ideas into their innovation processes. This platform provides a systematic framework for corporations to collaborate with external partners, such as other firms, academic institutes, and individual entrepreneurs, to develop innovative goods and services. Organizations may use the Open Innovation Platform to maximize their innovation efforts by constantly investigating and sourcing external resources, which are then incorporated into internal processes to generate digital innovations. This platform not only speeds innovation but also improves the quality and efficacy of the results, helping firms to remain competitive in a quickly changing technological field. The strategic usage of the Open Innovation Platform emphasizes the value of open innovation as a dynamic and adaptable method for managing and sustaining innovation in today's information-rich world.

Organizations should not only be focused on the implementation of digital technologies but also be capable of managing and using digital technologies in the innovation process, as this ability improves the innovation process by integrating and organizing both human and technological resources (Khin and Ho, 2019). Therefore, open innovation is viewed as a strategic activity for businesses to benefit from their digital inventions once organizational innovation has been converted into digital innovation.

The proposed framework addresses the aspects of open innovation that transform organizational innovation and create a trajectory toward organizational digital innovation (Figure 1). Inbound open innovation involves acquiring and sourcing, while outbound open innovation involves revealing and selling. The framework demonstrates how open innovation plays a key role in converting organizational

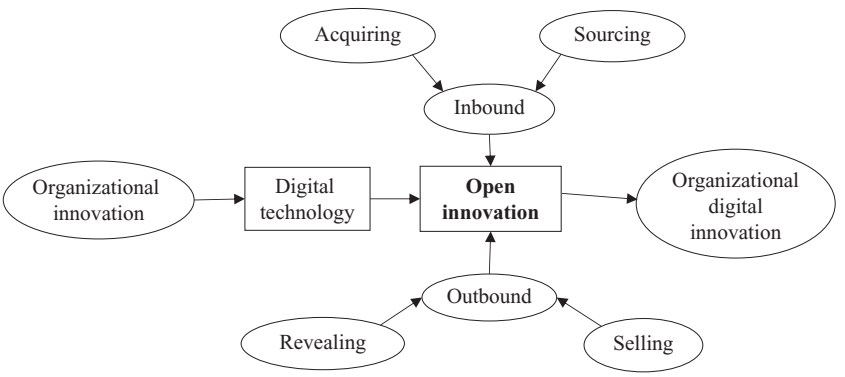


Figure 1. The proposed structure of transformation of organizational innovation into an organizational innovation cycle.
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innovation into digital organizational innovation. This refers to how open innovation, as a mechanism for managing organizational innovation, translates into organizational digital innovation, whether through inbound or outbound open innovation.

The proposed framework separated the aspects of open innovation, focusing on their contribution to the process of transforming organizational innovation into digital innovation. This clarity has helped to define how open innovation can be applied to achieve concrete goals. The framework depicted the connections between inbound and outbound open innovation and their impact on the transformation process, highlighting how these types of innovation might affect organizational digital innovation. The framework refers to current research that has already examined aspects of open innovation. This highlighted the importance of using existing knowledge to investigate this topic. The suggested framework facilitated a deeper comprehension of how open innovation influences the conversion of organizational advances into digital innovations. This is especially true in a rapidly changing technological environment. The structure embodied the principles of open innovation and the process of transitioning into digital innovation, rendering them more comprehensible for examination and interpretation.

The study of theoretical aspects and analysis of examples of open innovation has revealed prominent issues related to its role in the development of digital technologies and organizational innovation strategies. The analysis revealed that open innovation has been a key factor in the development of digital technologies, as it has allowed organizations to access external resources, knowledge, and technology. This helped them adapt to the changing technological environment faster. The use of open innovation required an internal transformation of organizations. Open innovation has contributed to the development of a competitive advantage, as organizations that successfully implement it can respond more quickly to market changes and develop innovative products and services. Digital technologies played a key role in the implementation of open innovation, as they provided the means to collaborate, share data, and communicate with partners and communities.

One of the main aspects of open innovation was to collaborate with external stakeholders, such as other companies, universities, and start-ups. Examples of open innovation show how this collaboration can lead to the exchange of knowledge and technology, which contributes to innovative development. To successfully integrate open innovation, organizations need to be open to new ideas and collaboration and have the proper infrastructure in place. The study showed that the use of open innovation can become a source of competitive advantage. Organizations that successfully integrate this strategy can be more agile and capable of adapting to changes in the market.

4.2. Exploring the potential of open innovation in organizational and technological transformation

Studying open innovation is crucial for organizations to enhance their competitiveness in today's information and technological landscape. This paradigm enhances comprehension of how open innovation plays a crucial role in converting organizational creativity into digital innovation. The study enhances our understanding of how businesses can effectively utilize internal and external sources to obtain the knowledge, technology, and ideas necessary for creating new products and services. This technique enables better adaptation to change in the current dynamic information environment, which is essential for organizational success.

Developing a competitive edge involves using technology and mastering the development and implementation of digital innovations within businesses. Some experts stress that effectively integrating digital technology is crucial for improving the fundamental competitiveness of businesses, such as by addressing customer wants, streamlining processes, and developing innovative business models (Baimukhametova *et al.*, 2024). Otherwise, organizations risk losing their competitiveness compared to other players in the market. To achieve digital transformation of products, services, or business functions, organizations need to effectively integrate new digital solutions and use them to gain a competitive advantage. Specifically, understanding the processes of developing and implementing digital innovations

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allows organizations to effectively interact with the needs of their customers, optimize internal operations, and create new business models (Yu and Moon, 2021).

Advances in digital technology have fuelled new innovations in many organizations, which have transformed themselves so that knowledge sources can be easily and quickly shared within and outside the organization. This arose because organizations need both internal and external knowledge to compete. Open innovation in this scenario is propelled by management strategies that facilitate a specific exchange of information within and outside the organization to encourage internal creativity and broaden markets for external utilization of the invention (El Maalouf and Bahemia, 2023). These conditions have led to the use of new digital technologies, followed by the creation of more digital innovations, where digital innovation is actively used, i.e., mandatory. As a result, the emergence of open innovation, which is assumed to be the central focus of organizational activity, is one of the transitions in organizational innovation towards digital organizational innovation.

Digital technology and open innovation methods reinforce one another, driving corporate innovation and competitiveness. Digital technologies provide companies with the tools and platforms they need to effectively communicate, exchange information, and incorporate external inputs into their innovation processes. These technologies enable real-time communication, data exchange, and seamless integration of external resources, all of which are necessary for the effective implementation of open innovation. Open innovation methods use these digital tools to increase the scope of innovation outside the organization's boundaries, allowing for the absorption of varied ideas and cutting-edge technology from outside sources. This interaction results in a dynamic innovation ecosystem in which digital technologies facilitate the flow of information and collaboration, while open innovation practices ensure the organization's agility, adaptability, and ability to continuously innovate in response to rapidly changing market conditions.

Figure 1 shows the role of open innovation in transforming organizational innovation into digital innovation. The proposed platform for this transformation provides an important function for organizations in creating a transition system that acts as a major step for transforming organizational innovation through ownership and use of digital technologies. Furthermore, as a driver, organizations optimize open innovation by gradually and continuously exploring external sources and leveraging their abilities and capabilities internally. This implies the role of these resource flows, which can have a considerable impact on the creation of organizational digital innovation. This open innovation framework can improve organizational capabilities for inbound and outbound actions.

In terms of initial actions, organizations can engage in acquisition, such as acquiring knowledge, capabilities, ideas, external technologies, and information. Whereas the acquisition activity involves developing innovations, searching for innovative ideas and challenges, and attracting external knowledge. In terms of outbound actions, organizations can undertake disclosure actions, which include coordinating and disclosing external knowledge, disclosing employee knowledge, providing additional knowledge and improving relationship management capabilities, facilitating knowledge sharing and reducing technological inefficiencies, and disclosing and integrating knowledge from sources outside the company. Specifically, all these actions can be adapted to technological actions, such as obtaining technical advances: collecting and evaluating data; disseminating information and selling their technology; integrating and improving external technologies; and acquiring additional skills and technologies. Organizations will respond to technological changes and opportunities based on their own view of the benefits and risks, as well as their objectives and technical, organizational, and human resources.

For organizations, all these information-gathering and communication activities are digitally driven and lead to changes in business models, internal processes, products, and services (Kalna-Dubinyuk *et al.*, 2023). Organizations use external information in their production processes through open innovation activities to enhance innovation successfully. This includes the processes of developing new products, improving firm productivity, building supply chain competence, increasing social capital, and engaging customers in co-creating value. To create digital innovations, organizations can also organize the process of acquiring, filtering, processing, interpreting, and using the large amount of technological knowledge that is already available. Clearly, organizations must develop proactive

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strategies to increase their digital resources and use open innovation opportunities to their advantage. This allows organizations to adapt to the current conditions of the digital economy, undergo stages of qualitative change, and create competitive products. Through this dynamic process, new technologies replace old ones, helping firms gain a competitive advantage. Organizations that actively embrace open innovation can acquire knowledge, capabilities, ideas, technologies, and information from external sources and use them to develop new products and services. This facilitates maintaining a competitive advantage in a swiftly evolving technological landscape and attaining superior outcomes in product innovation. Open innovation is increasingly important for businesses aiming to remain competitive and enhance their performance in a rapidly changing technology landscape.

Rumanti *et al.* (2021) conducted a study on cleaner production and open innovation in Indonesian small and medium-sized enterprises (SMEs). They created a research model and examined the connections between open innovation and cleaner production. The authors' study yielded useful insights into the impact of open innovation on cleaner production in Indonesian SMEs. The identified links and issues highlighted in the paper reveal the potential for introducing innovative approaches to improve the environmental efficiency of production at these enterprises. The model developed by the researchers provides a unique perspective on how open innovation can serve as a driver of cleaner production in Indonesian SMEs. One of the key findings is that open innovation can act as a catalyst for SMEs to move towards cleaner production, delivering not only increased productivity but also a reduced environmental footprint. This opens new perspectives for the sustainable development of SMEs through open innovation in the field of environmental efficiency (Gimranova *et al.*, 2023; Pürhani *et al.*, 2022). The comparability of the studies lies in the methods used to investigate open innovation. Both studies are aimed at understanding the impact of open innovation on organizational processes using an analysis of the literature. However, the first paper focuses on the strategy of organizational innovation in the context of the dynamics of the everyday technological environment, while the second analyses cleaner production in Indonesian SMEs. Nevertheless, both studies help to enrich the understanding of open innovation and its role in the organizational environment.

Similar research has been carried out in publications focusing on assessing the influence of open innovation in the corporate setting. De Aro and Perez (2021) highlighted the significance of developing dynamic capabilities for managing internal and external knowledge in a company in their paper on identifying dynamic capabilities in open innovation. The analysis of the researchers' work has revealed important conclusions about the development of dynamic capabilities in open innovation. This helped to understand how these dynamic opportunities affect the strategic management of knowledge in the company, both internal and external.

Teplov *et al.* (2019) investigate open innovation by conducting a comparative analysis of the perceptions of open innovation. The authors found a discrepancy in these perceptions, as only a few activities considered "open" by innovation scholars seem to influence the state of open innovation adoption as reported by companies. The survey also revealed discrepancies in how organizations of different sizes interpret open innovation. The researchers' analysis of the study offered valuable insights into several strategies related to the concept of open innovation. Identifying discrepancies in the comprehension of this notion could suggest issues in the execution and application of open innovation across various industries and businesses. It is important to focus on how organizations of different sizes view open innovation differently. This may indicate that open innovation strategies need to be adapted to particular conditions and resources, which is typical for enterprises of different sizes (Makhazhanova *et al.*, 2022). Both the present paper and the study by the authors attempt to cover and systematize the concept of open innovation. Both approaches use the analysis of previous research articles to form a theoretical overview and identify organizational innovation strategies.

Bigliardi *et al.* (2020) examined the influence of open innovation on company performance in their research article. The researchers' work was analysed to ascertain the impact of open innovation on business performance. The analysis also identified strategies that proved to be effective in the context of open innovation and can provide practical insights for enterprises seeking to optimize their operations through open innovation. The similarities between the papers are that both explore aspects of open

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innovation and its impact on organizations. Both studies utilize a theoretical framework to understand the impact of open innovation in the contemporary technology landscape.

Cui *et al.* (2015) introduced a model that explores how the alignment of IT strategy and open innovation strategies within organizations affects the outcomes of open innovation. The author discovered that in a study of 225 enterprises in China, there is a relationship between IT flexibility and breadth that leads to increased innovation radicality and volume. Additionally, IT integration and depth were found to have a favourable impact on innovation volume. It was also found that the volume and radicality of innovation increase an organization's productivity in terms of sales growth. This study's analysis examined the impact of aligning IT strategy with open innovation initiatives on organizational open innovation outcomes. Studying the connections between IT agility, breadth, integration, and depth and their influence on innovation's radicality and scope has enhanced our comprehension of how businesses can effectively leverage information technology for tangible innovation results (Leonow *et al.*, 2019). The study significantly contributes to the comprehension of how IT strategies and open innovation impact the overall success of organizations, particularly in sales growth. The researchers' study is comparable to the present study in that they both perform a theoretical overview of works that analysed and summarised previous scientific articles to identify strategies for organizational innovation in a dynamic technological environment. Both papers address the effectiveness of organizational innovation, the interaction between IT and open innovation strategies, and the impact of these factors on company performance, including sales growth. This approach provides a more profound understanding of how organizations can make the best use of information technology to achieve concrete results in innovation and business performance.

The study found that open innovation is driven by a wide range of factors, including technological change, strategic alignment, and interaction with ecosystems. Specifically, it revealed that the success of open innovation depends heavily on the flexibility and breadth of an enterprise's IT strategies (Musayeva *et al.*, 2024). Furthermore, it was found that the interaction between IT integration and the depth of innovation affects the amount of innovation that transcends conventional market strategies. This suggests that companies that can integrate deep-level technological solutions can achieve great success in expanding their product portfolio and exceeding the boundaries of conventional innovation approaches. This study emphasizes the significance of broadening the geographical range of research to assess how cultural and regional traits influence the efficacy of open innovation. This approach allows companies to adapt their strategies to local conditions, facilitating maximum interaction with global partners and optimizing innovation processes.

In general, the study of open innovation has considerable potential for the development of scientific research. Understanding the impact of open innovation, its strategies, and its interactions with other factors can help businesses adapt to changes in the technological environment, develop more effective strategies, and increase competitiveness. Thus, an in-depth investigation of open innovation can reveal new perspectives for improving innovation processes and ensuring the sustainable growth of enterprises. Further analysis of the different dimensions of open innovation, such as technological, social, and economic aspects, may reveal new areas for innovation development and implementation. Consideration of the impact of cultural and social factors on open innovation can reveal key aspects of the interaction between companies and external stakeholders. This will help improve communication and cooperation between distinct groups, contributing to the more successful implementation of innovative solutions. A comparative analysis of the strategies of different enterprises in the field of open innovation can help identify optimal approaches and best practices to achieve competitive advantage. This is a major step in developing effective models of open innovation that consider the unique characteristics of different sectors and industries.

Therefore, advancing this research can pinpoint new opportunities to enhance the execution of open innovation in the corporate setting. Examining specific instances of open innovation adoption might yield valuable insights for crafting a precise enterprise strategy. Expanding the geography of research can reveal how different cultural and regional characteristics affect the success of open innovation. This can help businesses adapt their strategies to specific market conditions and maximize their interaction with

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global partners. An in-depth analysis of the impact of open innovation on various sectors of the economy and business can lead to new technological and strategic discoveries that will contribute to the further development of effective approaches to innovation in various sectors. Thus, a detailed investigation of the impact of open innovation in various industries will help to identify specific features and improve strategies to maximize success in the innovation environment. Considering the influence of cultural and geographical characteristics on the adoption and execution of open innovation is crucial. Expanding the scope of the study to different geographical markets will reveal how variations in culture and regional characteristics can affect the effectiveness of innovative approaches.

5. Conclusions

Studies on open innovation have identified innovation as a crucial factor for organizations to have a competitive edge. In today's technology-driven organizational environment, organizations must consider technological aspects when designing innovations and then create opportunities for digital innovation. This is usually achieved by organizations when they own and develop their technological capabilities. In a changing technological environment, considering the role of an open approach to innovation as an organizational strategy for creating organizational digital innovation becomes an essential part of an organization's activities. One of the primary obstacles to employing open innovation is guaranteeing the security and confidentiality of information. Open innovation involves the sharing of knowledge and ideas, but this can put companies' confidentiality and intellectual property at risk.

This study emphasizes the relevance of open innovation as a critical aspect for enterprises seeking to preserve a competitive advantage in a technologically driven economy. The study underlines that in order to successfully incorporate digital technologies, firms must proactively enhance their expertise in technology and use open innovation methodologies. The findings show that in a fast-changing technology context, open innovation is critical for encouraging organizational digital innovation. The primary issues observed include the need to balance the benefits of open innovation against risks associated with security and confidentiality. Organizations that participate in both inbound and outward operations to generate innovation must carefully manage the acquisition of external knowledge, capabilities, ideas, and technologies, while also protecting intellectual property and sensitive information. According to the research, a well-implemented open innovation framework allows organizations to continually modify their processes, hence improving their capacity to produce and deliver new goods and services. Organizations may speed up the innovation process by successfully merging internal and external resources, resulting in better product development outcomes.

The study emphasizes the need for continued efforts to create solutions that meet the problems of open innovation, notably in terms of security, confidentiality, and successful application in manufacturing processes. Future research should concentrate on best practices for addressing the security and privacy elements of open innovation, as well as successful cooperation models with external stakeholders. Furthermore, developing legal frameworks and instruments to handle intellectual property protection and risk management in open innovation environments is critical for moving organizational innovation forward.

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