NEW TECHNOLOGIES AS TOOLS SUPPORTING INNOVATION MANAGEMENT

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Purpose: The objective of this article is to examine the application of emerging technologies as tools for enhancing innovation management in organizational settings. The article seeks to provide insights into how these technologies contribute to the generation of ideas, collaboration, scalability, and accessibility in the context of innovation management. Furthermore, the authors analyse the current state of open innovation and the mutually beneficial relationship between artificial intelligence and open innovation platforms. The article concludes by discussing strategies for effectively utilizing new technologies, with a particular emphasis on cross-functional collaboration and making data-driven decisions to achieve successful innovation.

Design/methodology/approach: The research utilizes rigorous methodologies, including a review of existing literature and the use of visual representation techniques.

Findings: This research investigates the influence of emerging technologies, such as artificial intelligence, big data analytics, and blockchain, on the management of innovation. The results suggest that these technologies facilitate the use of data to inform decision-making, streamline the processes involved in managing ideas, and foster collaboration across different functions within an organization. Analysis of the current state of open innovation in the European Union indicates favourable developments as well as certain obstacles in research and development expenditures.

Originality/value: The originality of the paper lies in its comprehensive exploration of the synergies between emerging technologies and innovation management strategies. The study contributes novel insights by examining the state of open innovation in the European Union. The paper's value lies in its applicability to organizations seeking to leverage technology for innovation, offering insights to navigate the evolving landscape of innovation in a digital era.

Keywords: emerging technologies, innovation management, collaboration, artificial intelligence, data-driven decision-making.

Category of the paper: Literature review.

1. Introduction

In the context of the dynamic and competitive modern business environment, the effective management of innovation plays a crucial role in enabling organizations to maintain their competitive edge. To successfully navigate the complexities of innovation, companies are increasingly adopting novel technologies that facilitate the optimization of processes, stimulation of creativity, and facilitation of growth. This article aims to examine the significance of these emerging technologies as instrumental resources in supporting innovation management. Furthermore, it will delve into the essential technologies and strategies that empower organizations to effectively harness innovation, supplemented by the inclusion of tables and charts to visually illustrate crucial concepts.

In the modern business landscape, innovation plays a crucial role in maintaining relevance and competitiveness. It is driven by rapid advancements in technology, globalization, and evolving consumer demands (Chesbrough, 2003; UNCTAD, 2021). The ability to innovate, effectively manage creative processes, and translate ideas into marketable products or services is not just a desirable trait for organizations, but rather a necessity for their survival and prosperity (Tidd, Bessant, 2013; Janjic, Radenovic, 2019; Lyeonov et al., 2022). Successful innovation management involves systematic planning, organization, and monitoring, all within a dynamic and iterative framework. It goes beyond idea generation and focuses on fostering a culture of innovation, efficiently allocating resources, and mitigating risks in the ever-changing technological and market landscape (World Intellectual Property Organization et al., 2022; Radziwon et al., 2023).

Organizations are faced with the daunting task of effectively utilizing innovation, fostering creativity, and successfully navigating the intricate innovation landscape. However, there is optimism as advancements in technology have emerged as crucial instruments that enable organizations to directly confront these challenges (Eggers, Turley, Kishnan, 2019; Am et al., 2020).

This article explores the significant impact of emerging technologies on the facilitation of innovation management. These technologies include idea management software, which encourages the sharing and selection of ideas, as well as open innovation platforms that foster collaboration with external partners. Additionally, the article discusses the role of artificial intelligence (AI) in enabling data-driven decision-making, along with other advanced technologies. As a result, the field of innovation is transforming.

The integration of new technologies, along with efficient innovation tactics, can bring about a paradigm shift in the way organizations engage in innovation. This transformation is not a choice but rather an essential requirement. As enterprises become more interconnected and face heightened competition, effective innovation management is not merely a means of survival but also a means of thriving and assuming a leadership position in the market (Brem,

Voigt, 2009; Urbancova, 2013; Celukanovs, Wattle Björk, 2019; Nadikattu, 2020; Kuzior, 2021).

The paper thoroughly examines the precise technologies and strategies that are transforming the field of innovation management. Moreover, it investigates the obstacles and future trajectories that organizations must carefully contemplate as they embark on their innovation endeavours. Remaining at the vanguard of innovation management necessitates an ongoing commitment, requiring organizations to constantly adapt and embrace the latest technological advancements.

2. Methods

In this study, the authors employed various methodologies to investigate the research questions at hand.

This research utilized a rigorous methodology to examine and evaluate the use of emerging technologies as instruments for facilitating innovation management in organizational settings. The methodology involved a diverse range of methods, such as an extensive review of relevant literature and visual representation methods.

The section on literature review aims to provide a comprehensive overview and analysis of the existing scholarly works and research studies relevant to the topic at hand.

The study commenced with a comprehensive analysis of relevant academic literature to establish a robust theoretical framework. Scholarly publications from various disciplines including innovation studies, management, and technology adoption were thoroughly scrutinized. The primary objective of this literature review was to identify fundamental ideas, patterns, and areas of insufficient understanding of the dynamic interplay between technology and innovation management.

To improve the comprehensibility and ease of use of the research results, the study utilized visual representation methods. Graphs and tables were strategically utilized to visually display important data, patterns, and comparisons that were discovered.

3. Key Technologies Supporting Innovation Management

In the contemporary business environment characterized by rapid change and intense competition, innovation is a crucial factor determining the success of organizations. To maintain a competitive edge, companies must constantly strive to cultivate innovation in their processes, offerings, and service delivery. Fortunately, the advent of novel technologies

has played a pivotal role in facilitating and reinforcing the management of innovation. Consequently, it is substantial to explore the fundamental technologies that empower businesses to augment their strategies for managing innovation, thereby nurturing creativity and propelling growth.

Innovation management encompasses multiple interconnected activities, including generating ideas, allocating resources, evaluating risks, and executing plans. Given the contemporary digital era, organizations are increasingly relying on advanced technologies to enhance these processes and propel their innovation strategies. Presented below are several significant technologies such as artificial intelligence and machine learning, big data and analytics, cloud computing and blockchain technology that are instrumental in facilitating innovation management.

Table 1.
Emerging technologies that enable the assistance of innovation management

Criteria	AI and Machine Learning	Big Data and Analytics	Cloud Computing	Blockchain Technology
Description	Artificial intelligence and machine learning technologies are employed to analyse data and streamline processes to facilitate innovation management.	Big data enables the examination of customer behaviour and patterns.	Cloud technology provides the ability to scale resources and enables remote access, fostering innovation.	The utilization of blockchain technology enhances the protection and monitoring of intellectual property, consequently promoting a conducive environment for collaboration.
Data Analysis	Offers predictive analytics and insights based on data analysis.	Examines extensive datasets to identify patterns and potential areas for improvement.	Facilitates the process of making decisions based on data.	A protected ledger system for safeguarding intellectual property.
Collaboration	Enables collaboration and the exchange of ideas through the utilization of artificial intelligence-powered tools.	Collaboration is facilitated through the exchange and dissemination of insights and trends.	Enables the facilitation of remote collaboration and the availability of resources.	Promotes the establishment of trust among stakeholders to facilitate collaboration.
Scalability	Expands the capacity for data analysis and automation to align with the expansion of a business.	Capable of efficiently managing larger amounts of data and conducting extensive analysis.	Provides scalable resources and infrastructure.	The concept of scalability in relation to blockchain networks.
Accessibility	Enables the remote utilization of data and resources to facilitate international cooperation.	This facilitates the ability of teams to collaborate on data and analytics regardless of their geographical locations.	Enables individuals to remotely access and collaborate with others.	This platform offers a secure means of accessing and retrieving blockchain records.

Cont. table 1.

Use Cases	Analysis of customer behaviour, automation of processes, implementation of chatbots, and other related topics.	The examination of market trends, the division of customers into distinct groups, and the creation of models to forecast future outcomes.	The practice of remotely overseeing project management, developing applications, and collaborating with virtual teams.	The safeguarding of intellectual property, the promotion of transparency in supply chains, and the effective management of contracts.
Challenges	Issues related to the protection of personal data, biases in algorithms, and the challenges associated with integrating systems.	Issues related to the quality of data, threats to cybersecurity, and challenges in integration.	Issues related to security, challenges associated with data transfer, and complexities involved in migrating to the cloud are some of the key concerns in this context.	The issues related to scalability, adherence to regulations, and the establishment of trust.
Source	(Brynjolfsson, McAfee, 2017; Haefner et al., 2021)	(McAfee, Brynjolfsson, 2012; Zhou, 2020; Capurro et al., 2021; Dehbi et al., 2022)	(Khanagha et al., 2013; Golightly et al., 2022)	(Alkhudary et al., 2020; Baudier et al., 2022; Kuzior, Sira, 2022)

Source: developed by authors.

3.1. Idea Management Software

Idea management software stands at the forefront of modern innovation strategies, offering organizations a dynamic platform to harness the collective intelligence of their workforce and external stakeholders. This sophisticated software solution facilitates the ideation process by providing a structured framework for the generation, evaluation, and selection of ideas (Chesbrough, 2003). Therefore, it makes sense to undertake an analysis of idea management software on the base of such features as idea submission portal, idea evaluation, collaboration tools and analytics and reporting.

One of the core features of idea management software is its user-friendly idea submission portal. This portal serves as a digital suggestion box, encouraging employees and external contributors to share their innovative ideas effortlessly. By creating an accessible avenue for idea submission, organizations nurture a culture of innovation where every member feels empowered to contribute (Gassmann, Enkel, Chesbrough, 2010; Tomczak, 2022).

Idea management software incorporates advanced evaluation algorithms that help organizations sift through the influx of ideas (Mikelsone et al., 2022). By employing criteria such as feasibility, market relevance, and alignment with strategic goals, this software assists in identifying high-potential concepts. It streamlines the evaluation process, ensuring that valuable ideas are not lost amidst the volume of submissions (Chesbrough, 2003).

Collaboration is the heartbeat of innovation, and idea management software provides a collaborative ecosystem for refining and developing ideas. Cross-functional teams can engage in discussions, offer feedback, and collectively enhance the concepts. These collaborative tools

break down organizational silos, fostering interdisciplinary cooperation crucial for innovative breakthroughs (Tidd, Bessant, Pavitt, 2005; Castañer, Oliveira, 2020).

Data-driven decision-making is a hallmark of successful innovation management. Idea management software comes equipped with robust analytics and reporting tools. These tools offer real-time insights into innovation metrics, idea progression, and the effectiveness of innovation campaigns. By analysing these data points, organizations can fine-tune their strategies, optimize resource allocation, and elevate the overall innovation process (Visvizi et al., 2021).

Idea management software not only promotes internal innovation but also extends its reach to external partners and customers. Open innovation principles emphasize the value of external collaboration in innovation processes (Chesbrough, 2003). Idea management software serves as a bridge, connecting organizations with external innovators, thereby enriching the pool of ideas with diverse perspectives and expertise.

The implementation of idea management software aligns with the evolving landscape of innovation, where collaboration, transparency, and data-driven insights are paramount. By incorporating this technology into their innovation strategies, organizations position themselves to navigate the complexities of the modern market, transforming innovative ideas into tangible, market-ready solutions (Endres, Huesig, Pesch, 2021).

The following table delineates the characteristics and both advantages of idea management software.

Table 2.
Strengths and weaknesses of the features for the idea management software

Feature	Advantages	Disadvantages
Idea Submission Portal	Encourages idea sharing. Allows for a centralized platform for idea collection.	Risk of idea overload without effective curation. Requires continuous engagement to maintain participation.
Idea Evaluation	Streamlines the idea selection process.	Potential for bias in the evaluation process. Can be time-consuming if not automated.
Collaboration Tools	Fosters cross-functional innovation.	Collaboration can sometimes slow down the process.
Analytics & Reporting	Monitors innovation performance. Provides data-driven insights for decision-making.	Requires time and effort to set up and interpret data. Data overload can be overwhelming without clear objectives.

Source: developed by authors.

In the subsequent sections, the authors explore complementary technologies such as open innovation platforms and artificial intelligence, shedding light on their synergistic roles in shaping a comprehensive and effective innovation management framework.

3.2. State of Open Innovation and Open Innovation Platforms

Data regarding research and development (R&D) investment provides somewhat indirect indications of open innovation. Researchers particularly keep investigating different external and internal factors that influence the business-education R&D collaboration (Samoilikova et al., 2023a; 2023b). Detailed data on the allocation of funds for R&D, both from public and private sources, offers some insights into the extent of interaction and collaboration between the government and the business sector (Backer et al., 2008).

Over time, from 2019 to 2022, there was a positive tendency for R&D expenditures in both public and business sectors as well as direct and indirect support of business R&D in the European Union (Figure 1). The authors suggest that a decrease in R&D expenditures in both public and business sectors could be observed due to such factors as economic conditions, policy changes, private sector dynamics or global factors.
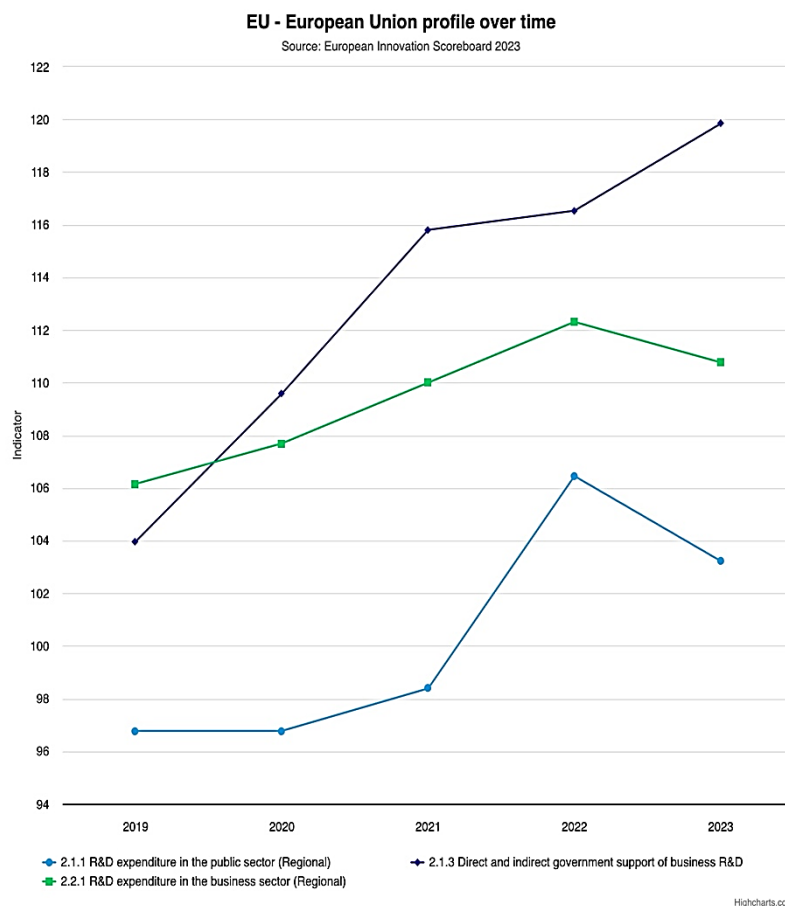

Figure 1. European Union profile over time for finance, support, and firm investments.

Source: European Innovation Scoreboard 2023 (retrieved November 10, 2023).

Furthermore, collaboration is another evidence of open innovation. The innovative small and medium-sized enterprises SMEs collaborating with other public-private co-publications and job-to-job mobility of human resources in science & technology (HRST) are among the factors that provide an understanding of the linkages, therefore collaboration (Figure 2). As for the score for innovative small and medium-sized enterprises SMEs, there was

considerable growth from 2020 to 2021. From 2021 to 2022 the score remained stable whereas from 2021 to 2023 it shows a downward trend. From 2019 to 2022 the score for private co-publications showed an upward trend and afterwards is going to remain stable. After 2022, the score of job-to-job mobility of HRST declines sharply and it is lower than in 2020.

The authors imply that the decrease in the rating of innovative SMEs between 2022 and 2023 could be indicative of obstacles or modifications in the innovation environment for these types of businesses. The consistent presence of joint publications by private entities implies an ongoing and consistent level of collaboration in the domain of open innovation. The significant decrease in job-to-job mobility among highly skilled HRST field after 2022 is a matter of concern, as it has the potential to affect the movement of personnel in this sector.
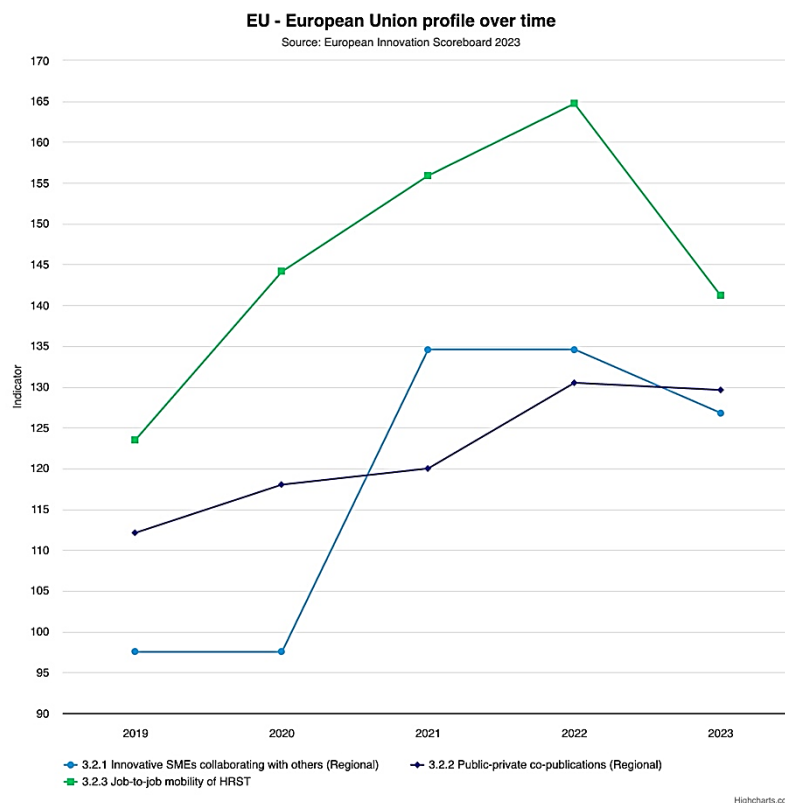

Figure 2. European Union profile over time for linkages.

Source: European Innovation Scoreboard 2023 (retrieved November 10, 2023).

In the dynamic realm of business and technology, the notion of open innovation has surfaced as a potent tactic for enterprises aiming to access external pools of knowledge and skill. Open innovation platforms, a crucial facilitator of this approach, assume a significant role in fostering collaboration with a diverse array of external stakeholders, encompassing clientele, suppliers, and emerging ventures. Such collaboration not only expands the prospects for innovation but also yields substantial and profound outcomes.

3.3. The Role of AI for Open Innovation Platforms

Over the past few years, there has been a significant shift in the field of innovation management, marked by the emergence of new technologies that greatly influence the methods through which organizations encourage creativity and facilitate progress. Aligned with a worldwide tendency towards the integration of artificial intelligence across various spheres of human existence, there has been a noticeable surge in interest and the emergence of distinct research clusters focusing on the utilization of this technology to address organizational challenges in recent years (Bilan et al., 2022). In this rapidly evolving environment, AI has emerged as a crucial factor, bringing about substantial changes in Open Innovation Platforms.

Open Innovation Platforms signify a fundamental change from conventional closed innovation approaches, emphasizing cooperation, knowledge sharing, and inclusiveness (Andrzej, Skulimowski, Köhler, 2023). Artificial intelligence plays a pivotal role in this environment, providing unmatched abilities to enhance and optimize different aspects of the innovation process (Kuzior, Sira, Brożek, 2023).

AI's main benefit to Open Innovation Platforms is its capability to rapidly analyse large datasets. This allows organizations to efficiently navigate through extensive information, uncovering patterns, market trends, and potential advancements that could have been overlooked otherwise. Using machine learning algorithms, AI improves the evaluation of innovative ideas, guaranteeing that the most promising concepts are promptly recognized and given priority.

In addition, AI promotes improved communication and collaboration among heterogeneous teams, surpassing geographical limitations (Skulimowski, Köhler, 2023). Natural Language Processing (NLP) systems enable effective engagement and sharing of ideas, nurturing a worldwide community of creative individuals who can effortlessly contribute their knowledge and skills. This not only speeds up innovation but also guarantees the inclusion of a broader and more diverse array of viewpoints.

In the domain of idea generation, AI-powered tools have a significant role to play in producing innovative ideas and solutions. Through the utilization of predictive analytics and recommendation engines, these tools aid innovators in refining their concepts and aligning them with market requirements. This proactive guidance not only improves the calibre of proposals but also mitigates the potential risks associated with pursuing unfeasible ideas.

In addition, artificial intelligence contributes to the ongoing development of Open Innovation Platforms through the automation of repetitive tasks and decision-making procedures. By streamlining activities such as project management and resource allocation, AI-powered systems improve operational effectiveness, enabling organizations to devote increased time and resources to the imaginative facets of innovation.

As the importance of AI in Open Innovation Platforms becomes more widely acknowledged by organizations, the symbiotic relationship between human creativity and machine intelligence is set to redefine the limits of what can be accomplished (Wang et al., 2022). The incorporation of AI as a fundamental element in innovation management signifies a strategic commitment, propelling organizations towards a future where the combined capabilities of technology and human inventiveness merge to propel remarkable progress.

4. Strategies for Leveraging New Technologies

4.1. Cross-functional Collaboration

Implementing technology to support cross-functional collaboration is crucial for innovation. In the modern context of constantly changing areas of knowledge, there is a pressing need to promote innovation, which has become exceptionally significant. A key driver of innovation lies in the collaboration between individuals with different areas of expertise and perspectives, working together to tackle complex challenges. This collaboration, which goes beyond the confines of specific departments or fields, becomes even more effective when supported by advanced collaboration tools. Extensive research strongly emphasizes the crucial role that cross-functional collaboration and collaboration tools play in achieving successful innovation (Ungureanu et al., 2020; Raivio, 2022; Deng et al., 2023).

In the field of innovation within the public sector, the development of strong ecosystems is of utmost importance, as highlighted by McKinsey & Company in their analysis of how to accelerate the growth of technology hubs (Davis et al., 2023). The article emphasizes the fundamental role of collaboration across different functions in the establishment of innovation ecosystems. In this context, collaboration across functions goes beyond the boundaries of individual organizations, integrating diverse areas of expertise and creating synergies across sectors. The article emphasizes that the success of technology hubs relies on the harmonious collaboration between government entities, private companies, educational institutions, and start-ups, serving as evidence of the transformative impact of cross-functional collaboration in driving innovation within complex and ever-changing public-sector environments.

Within the ever-evolving realm of business education, Harvard Business School demonstrates its commitment to innovation through initiatives like the IT Hackathon (Simkin, 2023). This event serves as a prime example of the vital role played by collaborative efforts in generating inventive solutions to modern-day obstacles. The hackathon's inherent structure fosters cooperation among heterogeneous teams comprising students possessing diverse proficiencies in technology, business, and design. By uniting these interdisciplinary talents, the event serves as a miniature representation of the wider significance of cross-functional

collaboration, highlighting how the amalgamation of distinct perspectives and expertise can yield innovative results.

In addition, collaboration tools function as strongholds of information exchange and the generation of ideas. They enable virtual sessions for brainstorming, an essential element of the innovation process. Collaborators can effortlessly participate in idea-generation sessions by utilizing shared workspaces and document management systems based on cloud technology, which accelerates the advancement of projects and the immediate improvement of ideas.

In summary, the convergence of cross-functional collaboration and collaboration tools is a prime example of how modern innovation is facilitated. Organizations that recognize the importance of bringing together diverse skills, using specialized tools to leverage these skills, and fostering a culture of knowledge sharing are well-positioned to achieve significant breakthroughs. Their efforts contribute to the ongoing pursuit of intellectual advancement, a pursuit that has long been emphasized in both academic research and corporate agility.

4.2. Driven Decision Making

AI and data analytics are instrumental in making data-driven decisions. There are numerous advantages to utilizing data-driven decision-making in the realm of innovation, which can greatly influence the prosperity of businesses and organizations. The following table presents the benefits of data-driven decision-making in innovation.

Table 3.
Advantages of leveraging data in the decision-making process

Benefit	Description
Faster Identification of Opportunities	Real-time data analysis accelerates decision-making by providing instant insights into market trends, customer preferences, and emerging opportunities. This agility allows organizations to swiftly capitalize on new prospects and stay ahead of the competition.
Reduced Risk	Utilizing data-driven decision-making in innovation projects reduces risks by obtaining a thorough comprehension of potential obstacles. By examining historical data and present patterns, possible pitfalls can be identified and resolved, empowering organizations to make well-informed decisions that minimize the probability of failure.
Improved Resource Allocation	Organizations have the potential to enhance resource allocation by making data-informed decisions. By examining historical performance data, market demand trends, and resource utilization patterns, businesses can pinpoint areas of inefficiency, enhance resource allocation strategies, and guarantee that valuable resources are allocated towards initiatives that hold the greatest promise for success.

Source: developed by authors.

AI and data analytics have become increasingly influential instruments in the realm of decision-making, fundamentally transforming the way businesses and organizations leverage the inherent value of data. Some research emphasized the pivotal significance of AI and data analytics in facilitating decision-making processes driven by data (Duan, Edwards, Dwivedi, 2019; Shrestha, Ben-Menahem, von Krogh, 2019; Akter et al., 2020; Stone et al., 2020). It elucidated the profound impact of these technological advancements on multiple sectors, including the domain of innovation.

The utilization of data analytics and AI enables organizations to accurately predict future trends, market demands, and customer preferences, thereby allowing them to proactively adjust their innovation strategies to meet changing consumer needs (Bharadiya, 2023). This predictive capability enhances the effectiveness of innovation efforts. Additionally, data-driven decision-making aids in identifying inefficiencies within innovation processes, leading to more efficient resource allocation and cost reduction without compromising the quality of innovations.

The application of artificial intelligence and data analytics can enhance risk management practices within organizations (Rodríguez-Espíndola et al., 2022). This technology enables businesses to evaluate and address potential risks linked to innovation initiatives by identifying areas of vulnerability and potential threats. Consequently, informed decisions can be made to minimize risks and optimize the likelihood of achieving desired outcomes.

The utilization of data-driven decision-making enables businesses to customize their innovative solutions according to the unique preferences of individual customers, thereby fostering increased levels of customer satisfaction and loyalty (Czvetkó et al., 2022). This ability to personalize offerings can confer a substantial competitive edge.

One benefit of utilizing data-driven insights is the optimization of resource allocation within organizations. By employing these insights, organizations can effectively distribute resources to ensure that the appropriate projects receive the necessary attention and investment (Pratama, Dachyar, Pratama, 2023). This strategy helps prevent wasted efforts on initiatives that have limited potential.

The acceleration of time-to-market can be achieved through the streamlining of the innovation process, facilitated by data-driven decision-making. This ability to swiftly bring new products and services to market is of utmost importance in industries characterized by rapid changes, as being the first to introduce a product can yield significant advantages (Troisi et al., 2019).

In the present data-centric economy, organizations can gain a substantial competitive edge by utilizing data for innovation (Brynjolfsson, McAfee, 2017). Those who adeptly leverage data are frequently in a stronger position to outperform their rivals.

The combined advantages mentioned above highlight the significant impact that employing data-driven decision-making can have on innovation. As companies increasingly adopt AI and data analytics, they equip themselves to navigate the intricate and constantly evolving realm of innovation more effectively, swiftly, and prosperously.

5. Discussion

The discussion section of this article provides an analysis and integration of current knowledge and discoveries, clarifying the consequences of novel technologies as instruments that facilitate the management of innovation. The examination of new technologies, including AI) big data analytics, cloud computing, and blockchain, within the framework of innovation management has uncovered a landscape of significant change that necessitates strategic navigation by organizations.

Observing the process of reconfiguring the innovation landscape, the authors conclude that the incorporation of these technologies represents a fundamental change in the way innovation is approached (Chesbrough, 2003; UNCTAD, 2021). In response to a rapidly changing and highly competitive global business environment, organizations are not only compelled to adopt technological advancements for survival but also to excel and establish themselves as market leaders. This emphasizes the significance of remaining at the forefront of innovation management, which necessitates organizations to continuously adapt and adopt the most current technological resources (Eggers et al., 2019; Am et al., 2020).

Technological advancements have greatly contributed to the process of innovation. The paper provides a comprehensive analysis of the various technologies that have a significant impact on innovation management, highlighting their unique contributions. These technologies include AI and machine learning, which play a vital role in data analysis and decision-making (Brynjolfsson, McAfee, 2017), as well as big data analytics, which examine customer behaviour and patterns (Zhou, 2020; Capurro et al., 2021). Additionally, cloud computing offers scalability and remote accessibility (Khanagha et al., 2013; Golightly et al., 2022), while blockchain contributes to the protection of intellectual property and facilitates collaboration (Alkhudary et al., 2020; Baudier et al., 2022). Each of these technologies is crucial in the context of innovation management.

Idea management software serves as a catalyst. The importance of idea management software in promoting innovation within organizations is emphasized by Gassmann et al. (2010) and Tomczak (2022). This software plays a critical role in facilitating the generation, evaluation, and selection of ideas by providing a structured framework. Through promoting collaboration, streamlining evaluation processes, and facilitating data-driven decision-making, idea management software is a crucial element of innovation management strategies. The discussion thoroughly examines the advantages and disadvantages of various features offered by this software, including idea submission portals, evaluation algorithms, collaboration tools, and analytics and reporting.

Open innovation platforms and collaboration have become increasingly popular in recent years.

The conversation encompasses open innovation platforms and their role in promoting collaboration outside of organizational boundaries. Collaboration is seen as not only a strategic necessity but also backed by data that highlights the positive relationship between research and development investments, joint publications between private and public entities, and the movement of individuals between jobs in the fields of science and technology (European Innovation Scoreboard, 2023). The authors suggest that the decline in innovative small and medium-sized enterprises and job mobility after 2022 could suggest potential barriers or changes in the innovation landscape.

The subject of artificial intelligence's involvement in open innovation platforms is a subject of great importance (Skulimowski, Köhler, 2023). The transformative effects of AI, which include its capacity to efficiently analyse extensive data sets, enhance idea evaluation, facilitate communication, and assist in idea generation, are emphasized by the authors. Additionally, they highlight the interdependent bond between human creativity and machine intelligence, portraying AI as a strategic investment that drives organizations towards a future characterized by the convergence of technology and human ingenuity for significant advancements (Wang et al., 2022).

While investigating the influence of innovations on the organisation's maintenance there is always a need to examine strategies for taking advantage of new technologies.

The examination of the essential roles of cross-functional collaboration and data-driven decision-making in innovation management explores the strategies for harnessing new technologies. This discussion emphasizes how these strategies, aided by cutting-edge collaboration tools and AI-driven insights, aid in surmounting obstacles, minimizing risks, and optimizing the allocation of resources to enhance innovation effectiveness (Ungureanu et al., 2020; Raivio, 2022; Deng et al., 2023).

The authors of the article discuss the practical implications of their findings, focusing on how organizations can adapt and utilize these technologies to improve their innovation practices. They also highlight potential areas for future research, indicating the need for further exploration into the changing dynamics of technology and innovation management. Overall, the discussion section serves as a comprehensive summary of the article, bringing together the various aspects of technological contributions, strategic implications, and the evolving landscape of innovation. It provides a guide for organizations to navigate the complex relationship between emerging technologies and innovation management, offering timely and crucial insights for those aiming to stay ahead in the field of innovation.

6. Summary

In conclusion, the article effectively examines the complex connection between emerging technologies and the management of innovation. It offers a comprehensive examination of the technologies that are propelling innovation, evaluates their specific contributions, and presents practical approaches for capitalizing on these resources. The incorporation of tables and charts improves the visual depiction of important ideas, thereby improving the overall comprehensibility and availability of the article. By addressing the different aspects linked to the implementation of emerging technologies, the authors provide valuable perspectives for managers overseeing innovation and contribute to the ongoing academic discourse regarding the evolving interplay of technology and innovation.

References

1. Akter, S. et al. (2020). Transforming business using digital innovations: the application of AI, blockchain, cloud and data analytics. *Annals of Operations Research, 308(1).* Retrieved from: https://doi.org/10.1007/s10479-020-03620-w.
2. Alkhudary, R., Brusset, X., Fenies, P. (2020). Blockchain in general management and economics: a systematic literature review. *European Business Review, 32(4),* pp. 765-783. Retrieved from: https://doi.org/10.1108/ebr-11-2019-0297.
3. Am, J.B. et al. (2020) *Innovation in a crisis: Why it is more critical than ever.* McKinsey & Company.
4. Backer, K.D., López-Bassols, V., Martinez, C. (2008). Open Innovation in a Global Perspective. *OECD Science, Technology and Industry Working Papers [Preprint], 4.* Retrieved from: https://doi.org/10.1787/230073468188.
5. Baudier, P., Chang, V., Arami, M. (2022). The Impacts of Blockchain on Innovation Management: Sectoral Experiments. *Journal of Innovation Economics & Management, 37(1),* pp. 1-8. Retrieved from: https://doi.org/10.3917/jie.037.0001.
6. Bharadiya, J.P. (2023). Machine Learning and AI in Business Intelligence: Trends and Opportunities. *International Journal of Computer (IJC), 48(1),* pp. 123-134.
7. Bilan, S. et al. (2022). Systematic bibliometric review of artificial intelligence technology in organizational management, development, change and culture. *Business: Theory and Practice, 23(1),* pp. 1-13. Retrieved from: https://doi.org/10.3846/btp.2022.13204.
8. Brem, A., Voigt, K.-I. (2009). Integration of market pull and technology push in the corporate front end and innovation management—Insights from the German software

industry. *Technovation, 29(5),* pp. 351-367. Retrieved from: https://doi.org/10.1016/j.technovation.2008.06.003.

9. Brynjolfsson, E., McAfee, A. (2017). The Business of Artificial Intelligence. *Harvard Business Review.* Retrieved from: https://hbr.org/2017/07/the-business-of-artificial-intelligence, 7 November 2023.

10. Capurro, R. et al. (2021). Big data analytics in innovation processes: which forms of dynamic capabilities should be developed and how to embrace digitization? *European Journal of Innovation Management.* Retrieved from: https://doi.org/10.1108/ejim-05-2021-0256.

11. Castañer, X., Oliveira, N. (2020). Collaboration, Coordination, and Cooperation Among Organizations: Establishing the Distinctive Meanings of These Terms Through a Systematic Literature Review. *Journal of Management, 46(6).* Retrieved from: https://doi.org/10.1177/0149206320901565.

12. Celukanovs, A., Wattle Björk, S. (2019) *Best Practices for Innovation Management A Study on Large Companies in Sweden.* Retrieved from: https://www.diva-portal.org/smash/get/diva2:1367055/FULLTEXT01.pdf, 14 November 2023.

13. Chesbrough, H.W. (2003) *Open Innovation: the New Imperative for Creating and Profiting from Technology.* Boston, Mass.: Harvard Business School Press.

14. Czvetkó, T. et al. (2022). Data-driven business process management-based development of Industry 4.0 solutions. *CIRP Journal of Manufacturing Science and Technology, 36,* pp. 117-132. Retrieved from: https://doi.org/10.1016/j.cirpj.2021.12.002.

15. Davis, C. et al. (2023). *A playbook for innovation hubs and ecosystems.* Retrieved from: https://www.mckinsey.com/industries/public-sector/our-insights/building-innovation-ecosystems-accelerating-tech-hub-growth.

16. Dehbi, S. et al. (2022). Big Data Analytics and Management control. *Procedia Computer Science, 203*, pp. 438-443. Retrieved from: https://doi.org/10.1016/j.procs.2022.07.058.

17. Deng, W.H. et al. (2023). *Investigating Practices and Opportunities for Cross-functional Collaboration around AI Fairness in Industry Practice.* FAccT '23: Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency, pp. 705-716. Retrieved from: https://doi.org/10.1145/3593013.3594037.

18. Duan, Y., Edwards, J.S., Dwivedi, Y.K. (2019). Artificial Intelligence for Decision Making in the Era of Big Data – evolution, Challenges and Research Agenda. *International Journal of Information Management, 48,* pp. 63-71. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0268401219300581.

19. Eggers, W.D., Turley, M., Kishnan, P. (2019) *The future of regulation, Deloitte Insights.* Retrieved from: https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html.

20. Endres, H., Huesig, S., Pesch, R. (2021). Digital innovation management for entrepreneurial ecosystems: services and functionalities as drivers of innovation management software

adoption. *Review of Managerial Science, 16.* Retrieved from: https://doi.org/10.1007/s11846-021-00441-4.

21. Golightly, L. et al. (2022). Adoption of cloud computing as innovation in the organization. *International Journal of Engineering Business Management, 14(1),* p. 184797902210939. Retrieved from: https://doi.org/10.1177/18479790221093992.

22. Haefner, N. et al. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda. *Technological Forecasting and Social Change, 162(120392).* Retrieved from: https://doi.org/10.1016/j.techfore.2020.120392.

23. Janjic, I., Radenovic, T. (2019). The importance of managing innovation in modern enterprises. *Ekonomika, 65(3),* pp. 45-54. Retrieved from: https://doi.org/10.5937/ ekonomika1903045j.

24. Khanagha, S. et al. (2013). Management Innovation and Adoption of Emerging Technologies: The Case of Cloud Computing. *European Management Review, 10(1),* pp. 51-67. Retrieved from: https://doi.org/10.1111/emre.12004.

25. Kuzior, A. (2021). *Innovation management as a tool for sustainable development and improving the quality of life of societies.* Innovation management and information technology impact on global economy in the era of pandemic of the 37th International Business Information Management Association Conference (IBIMA), pp. 211-216.

26. Kuzior, A., Sira, M. (2022). A Bibliometric Analysis of Blockchain Technology Research Using VOSviewer. *Sustainability, 14(13),* p. 8206. Retrieved from: https://doi.org/10.3390/ su14138206.

27. Kuzior, A., Sira, M., Brożek, P. (2023). Use of Artificial Intelligence in Terms of Open Innovation Process and Management. *Sustainability, 15(9),* p. 7205. Retrieved from: https://doi.org/10.3390/su15097205.

28. Lyeonov, S. et al. (2022). Management of the Sports Industry for Ensuring the Public Health: Prospect of Implementing the Innovations. *Marketing ì menedžment ìnnovacìj, 13(4),* pp. 109-119. Retrieved from: https://doi.org/10.21272/mmi.2022.4-11.

29. McAfee, A., Brynjolfsson, E. (2012) Big Data: The Management Revolution. *Harvard Business Review.* Retrieved from: https://hbr.org/2012/10/big-data-the-management-revolution.

30. Mikelsone, E. et al. (2022). Idea Management Systems in Developing Innovation Capacity. *International Journal of Innovation and Technology Management, 19(3).* Retrieved from: https://doi.org/10.1142/s0219877022400016.

31. Nadikattu, R.R. (2020). Effective Innovation Management in Strategic Planning. *SSRN Electronic Journal, 9(5).* Retrieved from: https://doi.org/10.2139/ssrn.3622850.

32. Pratama, I.N., Dachyar, M., Pratama, N.R. (2023). Optimization of Resource Allocation and Task Allocation with Project Management Information Systems in Information Technology Companies. *TEM Journal, 12(3),* pp. 1814-1824. Retrieved from: https://doi.org/10.18421/tem123-65.

33. Radziwon, A. et al. (2023). The Future of Open Innovation. In: *The Oxford Handbook of Open Innovation*. Oxford University Press.

34. Raivio, H. (2022) *Proposal for best practices for cross-functional collaboration*. Retrieved from: https://www.theseus.fi/bitstream/handle/10024/747758/Raivio_Heidi.pdf?sequence =2&isAllowed=y, 14 November 2023.

35. Rodríguez-Espíndola, O. et al. (2022). Analysis of the adoption of emergent technologies for risk management in the era of digital manufacturing. *Technological Forecasting and Social Change, 178,* p. 121562. Retrieved from: https://doi.org/10.1016/j.techfore. 2022.121562.

36. Samoilikova, A. et al. (2023). Business -education collaboration in R&D investment: Analysis of development gaps and critical points using MAR-splines. *Sociological Research Journal of International Studies, 16(2),* p. 2023. Retrieved from: https://www.jois.eu/files/3_1348_Samoilikova%20et%20al.pdf, 15 November 2023.

37. Samoilikova, A. et al. (2023). University-Industry Collaboration in R&D to Reduce the Informal Economy and Strengthen Sustainable Development. *ProQuest, 16(3),* pp. 339-353. Retrieved from: https://doi.org/10.14254/2071789X.2023/16-3/18.

38. Shrestha, Y.R., Ben-Menahem, S.M., von Krogh, G. (2019). Organizational Decision-Making Structures in the Age of Artificial Intelligence. *California Management Review, 61(4),* pp. 66-83. Retrieved from: https://journals.sagepub.com/doi/10.1177/ 0008125619862257.

39. Simkin, S. (2023) Collaboration, Brainstorming, and Innovation: IT Hackathon Tackles the Back Office. *Harvard Business School*. Retrieved from: https://www.hbs.edu/news/articles/ Pages/it-hackathon.aspx, 14 November 2023.

40. Skulimowski, A.M.J., Köhler, T. (2023). A future- oriented approach to the selection of artificial intelligence technologies for knowledge platforms. *Journal of the Association for Information Science and Technology, 74(8).* Retrieved from: https://doi.org/10.1002/ asi.24763.

41. Stone, M. et al. (2020). Artificial intelligence (AI) in strategic marketing decision-making: a research agenda. *The Bottom Line, 33(2),* pp. 183-200. Retrieved from: https://doi.org/10.1108/bl-03-2020-0022.

42. Tidd, J., Bessant, J. (2013) *Managing innovation: integrating technological, market and organizational change.* Chichester, West Sussex, United Kingdom: John Wiley & Sons.

43. Tomczak, K. (2022). The Creative Culture and Level of Innovation in the Selected Manufacturing Enterprises. *Management and Production Engineering Review, vol. 13, No 13(2),* 117-126. Retrieved from: https://journals.pan.pl/dlibra/publication/142060/ edition/123633/content, 14 November 2023.

44. Troisi, O. et al. (2019). Growth hacking: Insights on data-driven decision-making from three firms. *Industrial Marketing Management, 90(1).* Retrieved from: https://doi.org/10.1016/j.indmarman.2019.08.005.

45. UNCTAD (2021). *Catching technological waves innovation with equity*. New York/Geneva: United Nations.

46. Ungureanu, P. et al. (2020). Multiplex boundary work in innovation projects: the role of collaborative spaces for cross-functional and open innovation. *European Journal of Innovation Management, 24(3),* pp. 984-1010. Retrieved from: https://doi.org/10.1108/ejim-11-2019-0338.

47. Urbancova, H. (2013). Competitive Advantage Achievement through Innovation and Knowledge. *Journal of Competitiveness, 5(1),* pp. 82-96. Retrieved from: https://doi.org/10.7441/joc.2013.01.06.

48. Visvizi, A. et al. (2021). Think human, act digital: activating data-driven orientation in innovative start-ups. *European Journal of Innovation Management, 25(6).* Retrieved from: https://doi.org/10.1108/ejim-04-2021-0206.

49. Wang, X. et al. (2022). Artificial Intelligence-Enabled Knowledge Management. In: *The Routledge Companion to Knowledge Management*, pp. 153-168. Retrieved from: https://doi.org/10.4324/9781003112150-13.

50. World Intellectual Property Organization et al. (2022). *Global Innovation Index 2022: What is the Future of Innovation-driven Growth?* Geneva, Switzerland: World Intellectual Property Organization.

51. Zhou, R. (2020). Application of Big Data Technology in Innovation Management System. *Journal of Physics: Conference Series, 1648*, p. 042045. Retrieved from: https://doi.org/10.1088/1742-6596/1648/4/042045.