THE ROLE OF OPEN INNOVATION IN ENHANCING MANAGERIAL COMPETENCIES IN AI-DRIVEN SYSTEMS

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Abstract:

As businesses undergo digital transformation, artificial intelligence (AI) is becoming an integral part of decision-making and operational processes. However, managing AI-driven systems effectively requires a multidisciplinary approach that blends technical expertise, strategic foresight, and adaptive management skills.

This paper examines how open innovation contributes to the development and refinement of managerial competencies in organizations that incorporate AI technologies and the relationship between AI and open innovation, focusing on how the AI and open innovation concepts enhance decision-making and collaboration in business environments. By reviewing relevant literature and industry cases, we provide insights into AI's role in modern management and suggest directions for future research.

The findings indicate that organizations leveraging open innovation strategies—such as collaborative research and development, external partnerships, and crowdsourced problem-solving—demonstrate greater adaptability and efficiency in AI-driven management. Furthermore, this paper proposes a framework for integrating AI capabilities with business management practices, emphasizing the role of dynamic leadership and innovation ecosystems. By offering insights into how firms can optimize their AI strategies through open innovation, this study contributes to both academic research and practical applications.

The results suggest that organizations adopting these approaches can enhance performance, strengthen their competitive edge, and drive sustainable growth.

Keywords:

Open Innovation, AI-Driven Management, Business Competencies, Knowledge Sharing, Digital Transformation.

INTRODUCTION

Artificial intelligence (AI) is reshaping industries by automating processes, making systems more scalable, enhancing decision-making, and driving innovation. AI systems usually leverage machine learning, predictive analytics, natural language processing, and data visualization, with the aim of analyzing huge amounts of data, enabling businesses to optimize workflows, improve customer experiences, and gain a competitive edge [1] [2]. The adoption of AI extends across multiple sectors, including services, manufacturing, finance, healthcare, media, marketing and is used for sales channel support, CRM, fraud detection, medical diagnosis, supply chain optimization, and personalized communication and recommendations [3] [4].

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Beyond its technological capabilities, AI demands a fundamental shift in business strategy and management practices. Successful implementation requires more than just advanced algorithms; it necessitates an open innovation approach that fosters collaboration between businesses, research institutions, and technology developers [5] [6]. By leveraging external knowledge and interdisciplinary expertise, organizations can accelerate AI-driven advancements, enhance adaptability, and create sustainable competitive advantages in an increasingly digital economy.

Rapid technological advances are reshaping industries, with many organizations increasingly adopting artificial intelligence (AI) to enhance their open innovation strategies. Open innovation, a concept introduced by Chesbrough [1], promotes the integration of internal and external sources of knowledge to drive innovation and maintain a competitive advantage. Unlike the traditional closed innovation model, where research and development (R&D) activities remain confined within the company, open innovation encourages collaboration with external partners, such as research institutions, startups, technology firms, and industry experts. As technological advances become more complex and market dynamics become increasingly unpredictable, companies embrace this approach to improve adaptability, accelerate innovation cycles, and create value through shared expertise and collaborative networks. From a management perspective, AI plays a key role in powering open innovation by simplifying data analysis, optimizing cross-organizational collaboration, and supporting informed decision-making. Studies show that companies incorporating AI into their open innovation frameworks experience accelerated product development, improved problem-solving capabilities, and greater responsiveness to market fluctuations [6] [7]. Machine learning and AI-driven data analytics enable organizations to process vast amounts of previously underutilized data, extracting valuable insights that align innovation strategies with evolving consumer preferences and industry trends [8] [9]. Moreover, AI tools facilitate seamless collaboration with external stakeholders, including universities, research centers, technology hubs, and innovation consultants—by identifying synergies and optimizing the exchange of knowledge and expertise.

In addition to improving internal efficiency, AI provides managers with deeper insights into consumer behavior, market trends, and the competitive landscape. AI-based decision support systems enable data-driven strategic planning, reducing reliance on intuition, and enabling businesses to proactively adapt to internal and external changes [10] [11]. By integrating AI into open innovation frameworks, organizations can develop more agile business models that promote continuous learning, rapid prototyping, and collaborative problem-solving [12] [13]. In addition, AI improves knowledge transfer within and across corporate boundaries by automating data processing, improving information accessibility, and fostering interdisciplinary communication [14].

However, integrating AI into open innovation governance poses significant challenges. Ethical concerns, such as algorithmic biases, data privacy risks, and the transparency of AI-driven decisions, have sparked discussions about accountability and fairness in AI applications [15] [16]. Furthermore, organizational resistance, including "algorithm aversion"—where employees and decision makers are skeptical of AI-generated insights, despite their proven accuracy—can hinder the adoption of AI in critical business functions [12]. Addressing these challenges requires the establishment of ethical AI frameworks, transparent and explainable AI systems, and targeted initiatives to build trust in AI-driven governance processes [17].

As AI technologies continue to evolve, their impact on business growth, innovation ecosystems, and governance structures will become increasingly significant. Organizations that embrace open innovation and strategically integrate AI into their decision-making processes will be better positioned to maintain their competitive advantage in dynamic markets [18]. Finally, this paper highlights the importance of balancing AI-driven automation with human expertise, ensuring that AI serves as a complementary tool that enhances governance efficiency, rather than replacing human judgment [19].

2. METHODOLOGY AND RESULTS

This research applies a Systematic Literature Review (SLR) and empirical analysis to investigate the role of open innovation in the adoption of AI in business management. The methodology consists of two key stages:

Systematic Literature Review (SLR): A comprehensive analysis of peer-reviewed journal and conference articles from IEEE Xplore, Web of Science, and Scopus, from the last five years (2019–2025). The selection criteria focus on:

- Integration of AI in decision-making and business management
- Open innovation strategies for implementing AI
- Case studies of companies successfully adopting artificial intelligence through open innovation

2.1. OPEN INNOVATION CONTRIBUTION TO MANAGEMENT

Open innovation helps businesses stay agile, collaborate effectively, and adopt modern technologies faster. By working with startups, universities, and research institutions, companies can foster innovation while reducing the risk of developing everything in-house. As shown in Table 1, for management, this approach supports flexible decision-making, access to advanced technologies, and better resource allocation. AI-powered open innovation further improves market analysis, trend identification, and strategic planning. The next section examines its impact on various industries and how it strengthens decision-making [1] [2] [3].

2.2. INDUSTRIES ENGAGED IN OPEN INNOVATION

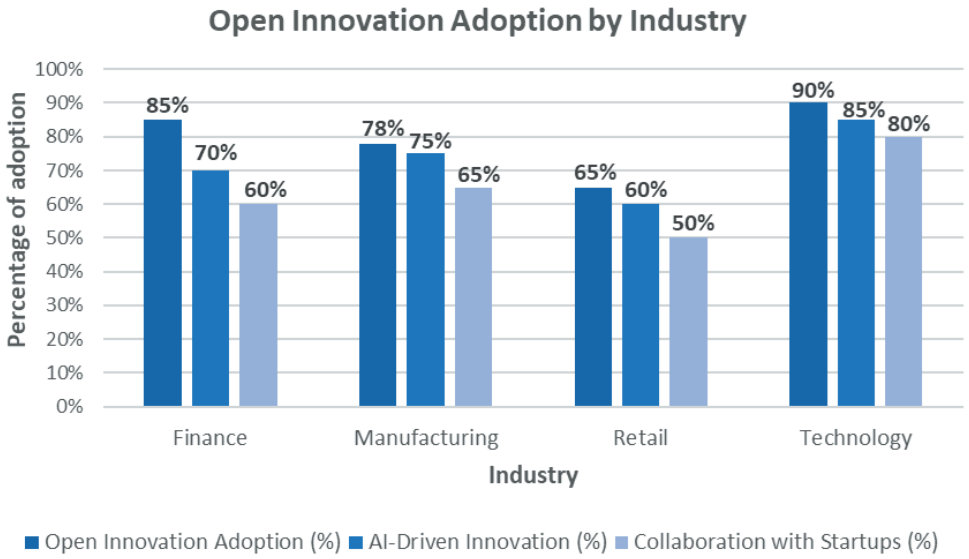
The adoption of open innovation varies across industries, which are influenced by market dynamics, technological advancements, and competitive pressure [1]. Figure 1 demonstrates the percentage of companies across industries that have adopted open innovation strategies, implemented AI-led innovation, and collaborated with startups. As shown, the technology sector leads the way in adopting open innovation (90%), followed by finance (85%), manufacturing (78%), and retail (65%). AI-led innovation is closely aligned with open innovation adoption, indicating a strong correlation between these two transformative approaches [2].

2.3. AI USAGE IN BUSINESS MANAGEMENT FUNCTIONS

AI technologies are increasingly being applied across various management functions to improve business performance. Figure 2 demonstrates the distribution of AI usage across four key business areas: data analytics, process automation, user engagement, and strategic decision-making [20]. The highest adoption was observed in data analytics (30%), followed by process automation (25%) and strategic decision-making (25%). These trends suggest that businesses are prioritizing AI-driven insights and automation to maintain a competitive advantage in their industries [21].

Table 1. Key Areas of Open Innovation Contribution to Business Management

Open Innovation Contribution	Impact on Management
External collaboration	Faster technological adoption, access to expertise
Ecosystem partnerships	Strengthened R&D and co-innovation potential
Data sharing & AI training	Improved decision-making capabilities
Reduced innovation costs	More efficient resource allocation
Business model transformation	Enhanced competitive advantage



Listing 1. Open Innovation Adoption by Industry

2.4. AI IMPLEMENTATION BENEFITS FOR BUSINESS DECISION-MAKING

Artificial intelligence plays a pivotal role in enhancing business decision-making processes, optimizing operations, and providing strategic advantages. Figure 3 highlights how different AI applications contribute to improved decision-making efficiency, process optimization, and competitive advantage. Predictive decision-making demonstrates the highest impact (95%), followed by data analytics (80%), and process automation (85%). These findings suggest that organizations leveraging AI can achieve significant gains in efficiency and strategic planning.

2.5. THE CASE STUDY OF BMW AND UNILEVER

BMW was one of the first companies to adopt artificial intelligence through open innovation with the aim of improving its manufacturing processes and product development. The company partnered with several external startups and research institutions in order to integrate AI solutions into its business. A key area of focus for BMW is improving production efficiency and the overall user experience, especially with the context of autonomous vehicles. BMW's collaboration with the University of California, Berkeley, and AI startups such as aiMotive, facilitated their leverage of AI into real-world applications, such as vehicle safety features, predictive maintenance, and autonomous driving technologies [22] [23].

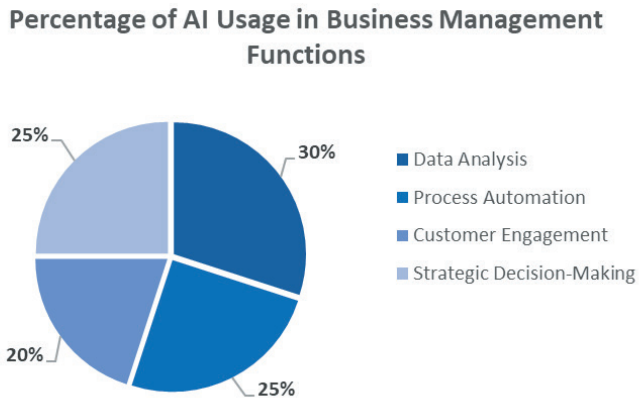


Figure 2. Percentage of AI Usage in Business Management Functions

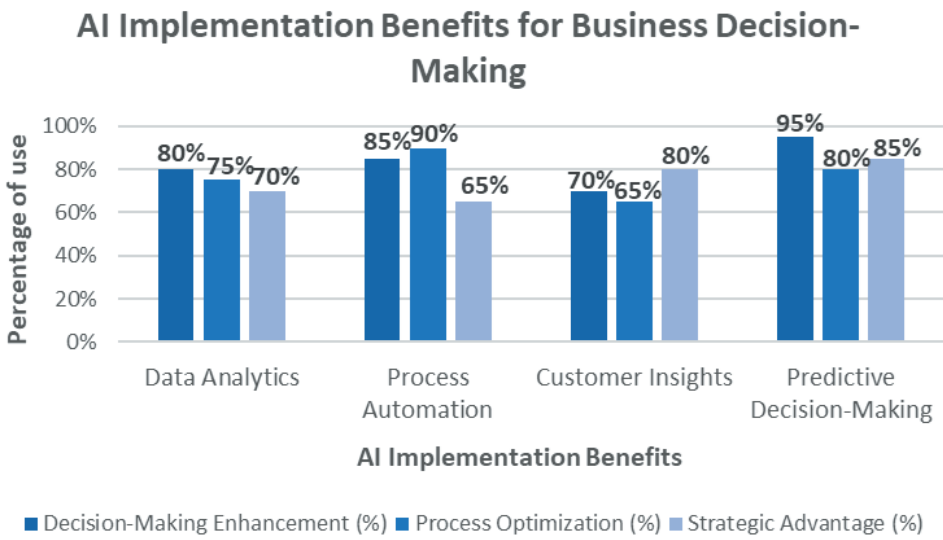


Figure 3. AI Implementation Benefits for Business Decision-Making

Unilever embraced artificial intelligence and digital technologies to enhance its product development processes. The company is working with various partners to leverage data and artificial intelligence with the goal of accelerating innovation and meeting evolving consumer needs. Unilever's approach involves using artificial intelligence to analyze consumer behavior, predict market trends, and design products that resonate with consumers around the world. This open innovation strategy allows Unilever to integrate external insights and technologies into its R&D efforts, thereby fostering a culture of continuous improvement and responsiveness to market demands [24] [25].

3. DISCUSSION

The integration of artificial intelligence supported by open innovation-driven ecosystems has fundamentally changed the way companies collaborate and innovate. Open innovation, as defined by Chesbrough [1], emphasizes the importance of leveraging external knowledge for internal needs and innovation. Here, AI plays a key role by improving decision-making and fostering collaboration across organizations and industries.

3.1. OPEN INNOVATION ECOSYSTEMS AND ARTIFICIAL INTELLIGENCE

Aldoseri et al. [9] state that artificial intelligence plays a fundamental role in creating dynamic and adaptive open innovation systems, enabling managers to discover and implement new business models and opportunities. The participation of AI in these systems helps managers accelerate the validation of ideas, thus improving the possibilities of companies responding quickly to changing and emerging markets and evolving customer preferences.

3.2. STRATEGIC DECISION-MAKING

The impact of artificial intelligence is significantly expanding to strategic decision-making. T. Broekhuizen et al. [4] emphasize that AI technologies can support managers and organizations in making more informed decisions through the analysis of large data sets. This capability allows companies to proactively adapt to different market challenges, change existing business models, and anticipate future market challenges [6].

3.3. AI AND BUSINESS MODEL INNOVATION

AI's potential to drive innovation in business models is substantial, as outlined by R. C. Climent et al. [13]. They argue that AI enables firms to embrace more agile and flexible business models, particularly when integrated with the principles of open innovation. By leveraging AI, organizations can gain deeper insights into market dynamics and consumer behavior, which fosters the development of innovative and sustainable business models [26] [27].

3.4. CHALLENGES AND OBSTACLES

While the integration of AI into open innovation frameworks offers numerous advantages, it also presents significant challenges. A. Kuzior et al. [12] note that companies face hurdles, such as data security, system interoperability, and resistance to technological change when adopting AI. Additionally, A. Taleghani et al. highlights the importance of cultivating the requisite skills and organizational capabilities necessary for fully harnessing AI's potential in open innovation ecosystems [21].

4. CONCLUSION

The role of AI in transforming open innovation is evident across industries, from improving decision-making to enabling more dynamic and flexible business models. However, as companies continue to adopt AI into their innovation processes, it is crucial to address the associated challenges to fully unlock its potential. As companies move forward, the integration of AI into open innovation ecosystems will play a key role in shaping future competitive landscapes.

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