The Role of Artificial Intelligence in Transforming Innovation Management

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Abstract

Artificial intelligence (AI) has rapidly emerged as one of the most important and widely discussed topics in today's world, playing a crucial role in reshaping the global business landscape. Its growing relevance highlights the transformative impact AI has on organizations, particularly in the way innovation management is designed and executed. The main objective of this study is to analyze the impact of artificial intelligence on modern businesses by gathering information from a variety of sources, including academic articles, survey results, case studies and official data published by European Union institutions. Our key findings reveal that AI adoption and application vary significantly depending on the size of enterprises, with larger organizations generally leading in integration compared to smaller firms. Additionally, the extent of AI implementation differs across regions, with certain areas showing greater technological advancement and readiness than others. Overall, AI solutions offer significant benefits, including enhanced productivity, improved operational flexibility, greater sustainability, workforce augmentation and support for long-term strategic objectives. This study uses document analysis to compare the impact of artificial intelligence at the national and business levels, drawing on articles, surveys, case studies, and official data from EU institutions.

Keywords

Artificial intelligence, machine learning, innovation, modern businesses

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Introduction

Artificial intelligence has undergone remarkable transformation since its inception in 1956, when John McCarthy first introduced the term. Initially rooted in theoretical and methodological studies, AI has since evolved into an interdisciplinary field, influencing a wide range of research domains. While scholars debate the precise definition of AI, its fundamental trait remains its ability to simulate human cognition and problem-solving (Lee, et al., 2019).

Continuous advancements in AI technology allow businesses across industries to harness its potential more and more. From deep learning and data analysis to external data integration, AI is driving innovation and reshaping the way enterprises operate in the modern digital landscape (Corrado, et al., 2021).

As artificial intelligence increasingly permeates industries and societies, driving digital transformation around the globe, governments and organizations acknowledge the necessity of leveraging its capabilities for improved efficiency, competitiveness and sustainable development. The influence of AI is rapidly expanding within business enterprises, affecting various areas such as investments, marketing, customer relations, supply chain management, new product development and many others (Vecchiarini and Somià, 2023). AI offers businesses the opportunity to assess performance, analyze work patterns and enhance skills. As a crucial element of modern business, it drives innovation, creativity and competitive advantage.

By integrating such practices, organizations can reap significant benefits and the advancement of this technology will transform global society (Kumar, 2023).

Artificial Intelligence is gradually shaping innovation management and policy, transforming how firms operate and develop with significant market, economic and societal implications (Agrawal, et al., 2019). It encompasses IT methods that enable machines to perform human-like cognitive functions such as learning, reasoning and interaction (Baruffaldi, et al., 2020).

While AI has been in development for decades, its rapid adoption in recent years is driven by digitalization (Haenlein et al., 2019). The interconnectedness of products, services and machines, along with the growing volume of digital data, has unlocked new opportunities for data-driven applications and operational efficiency. AI enables businesses to harness these vast data sources effectively. Advances in deep learning and automated machine learning techniques are revolutionizing industries, from optimizing multi-machine systems and enhancing industrial research to reshaping markets, supply chains and production processes (Nolan, 2020).

Despite its transformative potential, AI adoption comes with several challenges (Brock and Wangenheim, 2019). Its implementation often requires adapting existing IT systems, leading to compatibility issues. The effectiveness of this technology also depends on the availability and quality of data, as well as employees' technical skills.

Like other emerging technologies in their early stages, AI faces uncertainty regarding technological feasibility and market acceptance. Users may be skeptical about AI-driven decisions and hesitant to fully integrate its processes. Additionally, legal and regulatory concerns, including data protection and security, pose further obstacles. As a result, leveraging AI does not automatically guarantee increased or more successful innovation.

1. Review of the scientific literature

Artificial Intelligence is typically defined as systems created to imitate human thinking processes in order to solve problems or make decisions. J.H. Fetzer noted that AI is a system that mimics functions comparable to human intelligence and that contemporary definitions have evolved due to advancements in technology (Fetzer, 1990). As proposed by Haenlein et al. (2019), it can be defined as self-powered computational systems capable of making decisions based on data analysis and logical reasoning. This concept builds on Luckin's definition of AI (Luckin and Holmes, 2016), which emphasizes the use of machine learning, big data and predictive analytics to manage operations, enhance customer experience and generate value.

A review of existing literature reveals two key findings: (1) Research on AI's impact on digital enterprise innovation remains scarce and (2) The mechanisms and boundary conditions that shape this influence are not yet well-defined. As AI continues to evolve, understanding how to harness its capabilities to drive innovation in digital enterprises presents both a crucial research challenge and a valuable opportunity for future exploration.

A digital enterprise is defined as a firm that is deeply engaged in the digital economy, either by utilizing a substantial proportion of digital resources or by generating a significant portion of its revenue through digital products and services (Giustiziero, et al., 2023). By leveraging information and communication technologies, these firms can swiftly reallocate resources to develop products or services that align with market demands and customer needs. Leveraging the inherent nature of digital enterprises, AI directly accelerates the innovation cycle and enhances innovation outcomes. In ideation and knowledge acquisition, AI provides access to diverse industry knowledge, overcoming initial constraints, lowering innovation costs and enabling knowledge restructuring. It also strengthens knowledge transfer and integration across supply chains, fostering cross-industry innovation (Deperi, et al., 2022).

AI is transforming business model innovation through data-driven approaches (Rammer, et al., 2022). By enabling enterprises to reconfigure operations and develop new products and services, it promotes continuous development in business models (Reim et al., 2020). Enhancing data collection and infrastructure, AI accelerates product design and functional testing, creating a self-reinforcing cycle of innovation (Lee et al., 2019).

Therefore, the innovative impact of AI on firms can be classified into three key areas:

1. Products, services and business models: AI paves the way for data-driven business models that leverage real-time insights into customer behaviour, product usage and market conditions, leading to the creation of new products and services. For example, AI can be integrated as a software component to enhance product

performance or add extra service features as seen in autonomous driving. Additionally, AI improves product and service marketing by identifying user patterns and enabling personalized communications.

2. Production, delivery and administrative processes: AI optimizes operations by automating tasks and supporting human decision-making. It can detect patterns in production issues, identify defects and facilitate predictive maintenance. Other applications include real-time fleet management, digital security (such as spam detection or preventing dangerous email attachments) and streamlining administrative operations like automated customer responses and invoicing.

3. RandD and innovation processes: AI is transforming research and development by utilizing extensive datasets and advanced prediction algorithms. In sectors like pharmaceuticals and chemicals, AI accelerates RandD through methods like compound identification and neural network-based material discovery. In manufacturing, virtual factories simulate and optimize production processes. Thus, AI not only enhances the efficiency of RandD but also revolutionizes knowledge production by speeding up searches for relevant information and facilitating breakthrough discoveries.

The literature also outlines that the successful implementation of AI in innovation faces several key challenges (Haefner, et al., 2021). Data availability and quality remain critical, as AI requires continuous, high-quality data, with extensive efforts needed for cleaning and integration. The shortage of specialized skills further complicates large-scale AI adoption, as firms struggle to build multidisciplinary teams. Additionally, AI's "black-box" nature raises concerns about transparency and trust, while regulatory and legal uncertainties arise when merging data from multiple sources. Despite these challenges, it remains a powerful driver of industrial innovation, warranting further exploration.

2. Research methodology

For this research, we adopted document analysis as our methodology, collecting information from articles, survey results, case studies and official data published by EU institutions. We conducted a comparative analysis, examining the impact of artificial intelligence both at the macro level, focusing on countries and at the micro level, analyzing its effects on businesses.

We used Eurostat statistical data on the use of artificial intelligence available between 2021 - 2024 as our database. We mapped the most common AI applications identified according to the literature, identifying clusters and analyzing how companies integrate this technology into their operations, both by company size and by country.

To support our research, we checked publications from reputable scientific sources, such as Web of Science and Scopus. The documents were selected using the keywords "the impact of artificial intelligence" or "artificial intelligence in business," with a focus on articles from the fields of business, economics and finance, published since 2019.

To guide this research and provide a structured framework for analysis, two hypotheses were formulated. These hypotheses aim to examine the relationship between AI adoption and organizational performance, as well as the influence of enterprise size and regional technological readiness on the level of AI integration.

Hypothesis 1:

The adoption of artificial intelligence positively influences organizational performance across various business dimensions, including productivity, flexibility, and sustainability.

Hypothesis 2:

Enterprise size and regional technological readiness are significant determinants of the level and effectiveness of AI integration within modern businesses.

3. Results and discussions

A detailed study from McKinsey and Company forecasts that Artificial Intelligence will significantly boost global economic output, adding approximately $15.7 trillion by 2030 (McKinsey and Company, 2023). Within this estimate, Generative AI, which focuses on producing original content and innovative solutions, is projected to contribute an extra $4 trillion. These projections emphasize AI's profound ability to transform industries, streamline processes and drive economic growth worldwide in the years ahead.

AI tools process vast amounts of data, enabling people to lead better and safer lives, support business growth and contribute to the sustainable development of global economies. But does AI truly present new

opportunities, or does it introduce new risks for humanity? According to the 2020 Eurobarometer on EU citizens' attitudes toward digitalisation, public opinion on the benefits and usage of digital technologies is mixed. While many recognize the advantages, there are also concerns, with notable differences across demographic groups. For instance, women, older adults, individuals with lower education levels and those living in childless households tend to rate their digital skills lower. Differences also emerge at the national level: residents of countries like Italy and Hungary report lower confidence in their digital abilities, whereas in countries such as Spain, Estonia and the UK, citizens generally express much higher confidence (Săseanu, Gogonea and Ghiță, 2024).

Using Eurostat data from 2021, 2023 and 2024, we created the following graph to analyze the evolution of AI adoption in enterprises by country. One of the limitations is that for 2022 there isn't available any data. It can be observed that Northern European countries, along with Belgium, Luxembourg and Netherlands, show the highest percentages of AI adoption. Over the analyzed period, AI usage has increased each year, indicating that companies are recognizing the potential and benefits of artificial intelligence and are increasingly investing in its adoption.

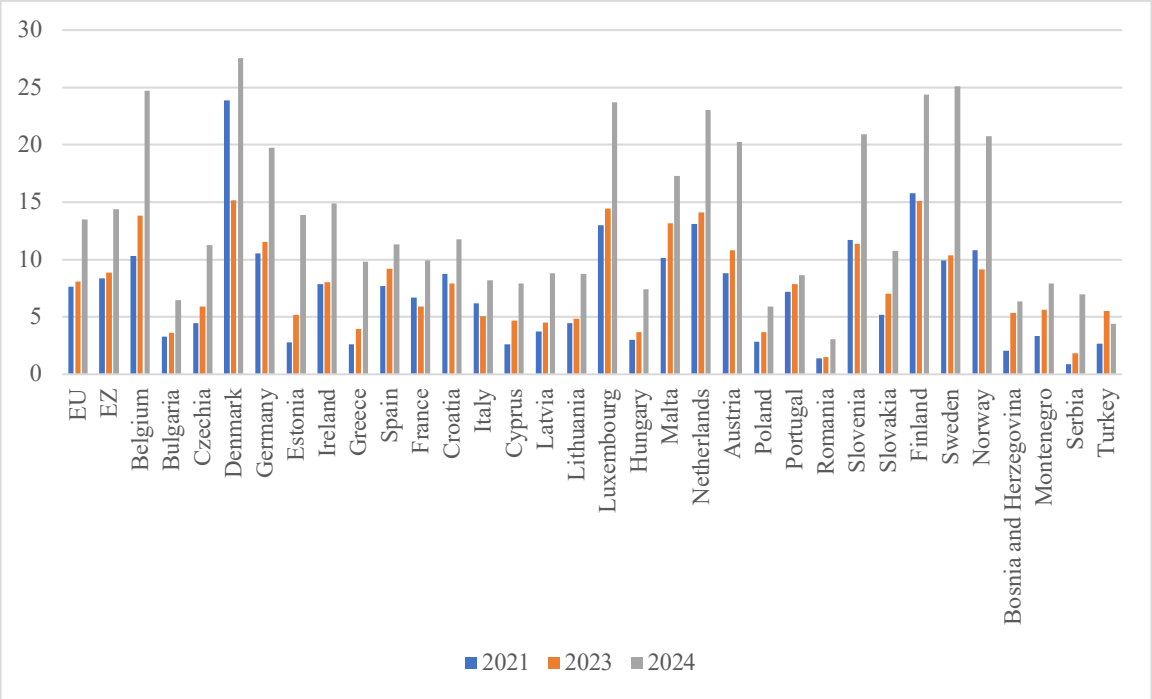

Figure no. 1. Enterprise AI Adoption Across Countries (% of enterprises)
Source: Eurostat (2025)

It is important to mention that the European Union introduced the AI Act, the first comprehensive regulatory framework for AI by a major authority, which which may hinder the expansion of artificial intelligence due to stricter regulations compared to other regions. According to it, "AI system means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments".

In our opinion, this definition highlights some key characteristics of this disruptive technology, including: machine-based system, autonomy, adaptiveness, the ability to generate outputs and the capacity to influence physical or virtual environments.

Through an extensive review of literature on artificial intelligence, we have compiled a detailed summary of its primary capabilities, accompanied by concise explanations and practical applications within the banking sector. Our findings reveal that this technology significantly enhances operational efficiency by accelerating processes, thereby leading to considerable cost savings for organizations.

While the banking industry serves as a key example, the utility of this technology is by no means limited to this field. Its potential for innovation and optimization extends to virtually all sectors, underscoring its versatility and far-reaching impact.

Table no. 1. Exploring AI: capabilities, applications and impact

Capability	**What Can AI Do for Us?**	**Examples from Banking Industry**
Prediction	Predict an event, likelihood of something happening	Next best product, customer propensity, liquidity and rating forecast
Discovery	Pattern recognition: Normal vs. not Outlier vs. Anomaly e.g. Fraud detection	Customer segmentation, Channel affinity
Planning/Optimization	Substitute manual or rules-based engines for planning and optimization	ATM Cash optimization
Computer Vision	Understand images, videos e.g. floor plans, satellite images	Fraud ID
Linguistics	Understand Text e.g. Chatbots, translators etc.	Contact center, transaction classification
Speech/Audio	Speech to text, transcriptions e.g. Live transcription of calls	Microsoft Teams
Content creation	Create text and images	GenAI usage in Marketing

Source: Data processed by the authors (2025)

As previously mentioned, the industry or company size is not the only determining factor in AI adoption. In the figure below, we analyzed the integration of AI within enterprises, using data from Eurostat.

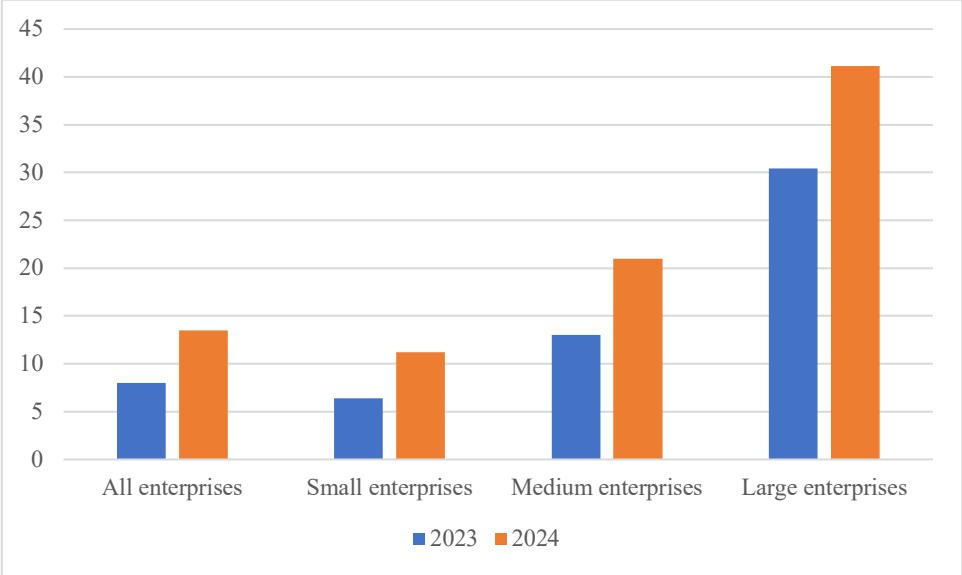

Figure no.2. Enterprise AI usage by size class (% of enterprises)
Source: Eurostat (2025)

In 2023, the overall usage rate across all enterprises stood at 8%. Small companies had the lowest rate at 6.4%, while medium-sized ones showed a higher rate of 13%. Large enterprises were far ahead, with 30.4% adopting AI technologies, revealing a clear pattern that bigger organizations are more inclined to incorporate AI into their operations.

By 2024, the overall usage rate rose to 13.5%, indicating a growing trend in AI adoption across all company sizes. For small enterprises the rate increased to 11.2%, while medium-sized ones saw a significant jump to 21% in AI usage, nearly doubling their rate from the previous year. Large enterprises maintained their lead, with a notable rise to 41.2%, further increasing the disparity with smaller companies.

The data highlights a marked increase in AI adoption across all enterprise sizes between 2023 and 2024, with the most substantial growth seen in large firms. This suggests that larger organizations, likely benefiting from greater resources and infrastructure, are more quickly integrating AI technologies. However, the significant growth in small and medium-sized firms also indicates a wider acceptance of AI, possibly driven by the availability of more accessible AI tools and growing recognition of its advantages. This trend emphasizes the increasing role of AI in the EU business landscape, with implications for competitiveness and innovation, especially for smaller enterprises working to keep up with larger ones.

We would like to conclude our research referring to a global survey made in 2022 by the CFA Institute, which highlights the increasing demand for finance professionals with AI and big data expertise (Cao, 2022). Among respondents, 35% prioritized finance or investment talents with AI and big data training, while 32% valued expertise in both fields. The survey also emphasizes the widespread usage of AI and big data, with 56% applying these technologies in data analysis. The graphs below display the aggregated survey responses:

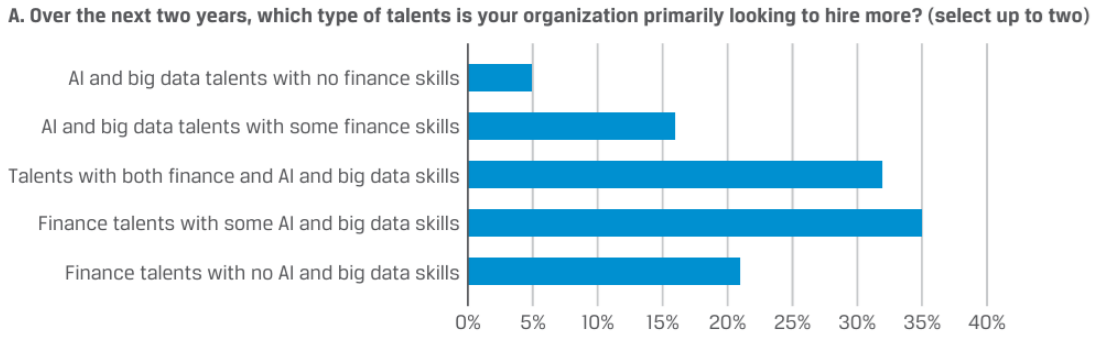

Figure no. 3. Talent hiring priorities over the next two years
Source: CFA Institute (2022)

Organizations are prioritizing hybrid talent, particularly those with finance expertise combined with AI and big data skills. This suggests a growing demand for professionals who can bridge technical and financial domains, likely driven by the increasing integration of AI and big data in financial decision-making. Pure AI/big data talent without finance skills is the least sought after, indicating a specific focus on finance-driven applications.

Figure no.4. Routine applications of AI and Big Data
Source: CFA Institute (2022)

AI and big data are most frequently applied in core business data analysis, highlighting their critical role in driving insights and operational efficiency. Risk management and Sales and marketing also see significant usage, reflecting the importance of predictive analytics and customer targeting. Lower adoption in compliance and mid-/back-office operations suggests either slower integration in these areas or less perceived value compared to core business functions.

The CFA survey responses reflect a strategic shift in organizations toward integrating AI and big data with finance expertise, likely in response to digital transformation trends. The focus on hybrid talent and applications in data analysis and risk management indicates that organizations are leveraging these technologies to enhance decision-making and competitiveness in finance-heavy sectors. However, the lower usage in compliance and back-office operations may point to challenges such as regulatory hurdles or implementation complexity, which could be explored further in the future. These findings align with broader trends in FinTech and data-driven decision-making as of early 2025.

Conclusions

The integration of artificial intelligence across diverse industries is transforming the landscape of modern business. AI technologies have significantly influenced workplace culture and possess the potential to redefine historical trajectories. Our research contributes to the innovation management literature by offering new insights into the role of artificial intelligence and machine learning algorithms in shaping the future. The findings highlight specific areas where AI technologies can be effectively applied to support organizational innovation, particularly in contexts where the innovation process is hindered by information processing limitations.

The findings reveal a consistent upward trend in AI adoption across all enterprise sizes and regions, with Northern European countries and large enterprises leading the way. While larger organizations are leveraging their resources to integrate AI more rapidly, the increasing uptake among small and medium-sized firms suggests a democratization of AI technologies facilitated by greater accessibility and awareness of its benefits. The introduction of the European Union's AI Act suggests the region's commitment to responsible innovation, though it may also pose regulatory challenges that affect the pace of AI integration compared to other jurisdictions. Nevertheless, AI's capacity for prediction, optimization and content generation is transforming operations.

As digital transformation continues to reshape global industries, our analysis confirms AI's pivotal role as a driver of innovation, efficiency and strategic decision-making. The findings supported the relevance of both hypotheses and highlighted the importance of these factors in shaping AI adoption trends. There is also a need to conduct future research on additional topics and consider other aspects as well, in order to get a clearer outlook of the AI utilization and its effects in organizations. Future research should explore the long-term impacts of regulatory frameworks and talent development on AI's integration across sectors, as well as address challenges in areas like compliance and back-office functions, where adoption remains limited.

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