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Artificial Intelligence a Panacea for Innovation Management? Review and Directions

Waqas Tariq¹, Dr. Adeel Tariq², Dr. Umair Saeed Bhutta³, Dr. Madiha Gohar⁴

1. School of Finance and Economics, Institute of Industrial Economics, Jiangsu University, 301 Xuefu Road, Zhenjiang 212013 Jiangsu Province, P. R. China. waqas.tariq@gmail.com
Faculty Member, Department of Commerce, University of Sialkot, Sialkot, Pakistan
2. Industrial Engineering and Management Department, LUT University, Kouvola, 45100, Finland
Assistant Professor, Department of Human Resource Management, NUST Business School, National University of Sciences and Technology, H-12, Islamabad, Pakistan. adeel.tariq@lut.fi
3. Assistant Professor, Higher Colleges of Technology, Higher educational institution in Abu Dhabi, United Arab Emirates. bumairsaeed@gmail.com
4. Assistant Professor, Department of Human Resource Management, NUST Business School, National University of Sciences and Technology, H-12, Islamabad, Pakistan. madiha.gohar@nbs.nust.edu.pk

New disruptive language models like Artificial Intelligence (AI), which can facilitate the development of unique ideas, are likely to have an impact on how businesses approach and manage innovation. Thus, it's essential to ascertain AI effect on innovation management to draw practical conclusions for research and practice. The objective of this research is three-fold: first, we discuss how AI is expected to affect innovation management practices and evaluated the literature; second, we tested a few assumptions related to AI influence on innovation management; and finally, we offer recommendations for the research avenues that need more attention from the researchers. In addition to giving researchers a basic grasp, we hope that this study will provide an improved understanding related to AI influence on innovation management.

Keywords: Artificial Intelligence, Innovation Management, Innovation Processes, Research Directions

Introduction

Artificial intelligence (AI) model that relies on deep learning techniques to make use of the enormous amount of data for producing text responses, has triggered a debate regarding its effective utilization for different domains of businesses (Wenzlaff and Spaeth, 2022; Zaremba and Demir, 2023) and particularly innovation management (Torkkeli et al., 2002; Tariq et al., 2017; Torkkeli et al., 2017; Tariq et al., 2020; Bahoo, Cucculelli, & Qamar, 2023; Bouschery, Blazevic, and Piller, 2023; Bhutta et al., 2022; Haefner et al., 2021; Pietronudo, Croidieu, and Schiavone, 2022; Sumbal et al., 2023). In this regard, researchers have argued that artificial

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intelligence can rationalize arbitrary and chaotic innovation processes by reducing confusion and random behavior in decision-making (Pietronudo et al., 2022) to generate novel ideas for exploration (Haefner et al., 2021).

Most of the existing literature on artificial intelligence and innovation is restricted to analyzing artificial intelligence influence on innovation process or different types of innovation, however, the question remains how AI could influence other innovation management processes such as training employees and transfer of training (Park, 2024) their innovative behaviours and their psychological well-being (Yin, Jiang, and Niu, 2024), assessing the current state of organization innovation culture (Salah and Ayyash, 2024), based on past data deciding about future innovation practices and directions, and developing virtual innovation platforms for better collaboration, communication, and support for innovation among relevant stakeholders, and regarding the successful utilization of AI for innovation. These missing innovation management components, in our opinion, merits attention for two reasons.

First, AI has become an important topic due to its relevance in the current era to produce diverse ideas, therefore, it is necessary to understand the state-of-the-art literature on the topic. Second, it is necessary to provide clarity on the assumption that AI can be a panacea for all innovation management challenges, so we have advanced knowledge about the areas where AI may be useful and those where it could not. It is pertinent to intrigue this line of inquiry as initial studies have explored a few specific issues; for this reason, a comprehensive perspective on AI's emerging role in innovation management is embraced.

Following the opening section of this article, we provided a brief review on the state of the art literature in section 2. Section 3 presents the assumption tested in this study and section 4 provides the conclusion of this research. Lastly, in section 5, we provided directions for future research.

Artificial Intelligence and Innovation Management

Artificial intelligence (AI) can be defined as the system's capacity for data interpretation and makes use of computers and other devices to improve personal's capacity for decision-making, problem-solving, and innovation (Bahoo et al., 2023; Haenlein and Kaplan, 2019). Due to AI's capacity to foster creativity, existing literature has just lately begun to focus on understanding how AI may enhance innovation management procedures (Bahoo et al., 2023; Haefner et al., 2021; Pietronudo et al., 2022; Truong and Papagiannidis, 2022). Scholars have divided innovation processes into mainly three or four stages namely: 1) New idea generation and discovery, 2) idea screening, 3) concept experimentation, and 4) idea development and monetization (Haefner et al., 2021; Truong and Papagiannidis, 2022). It is found that by overcoming information processing and local search routines constraints, AI may be used to generate concepts for exploration, expansion, and exploitation. These scholars have significantly added to the body of knowledge, however, literature did not provide consensus on which particular stage AI is likely to replace or augment human creative skills. Truong and

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Papagiannidis (2022) argued that possibility of AI replacing humans in the innovative process' creative jobs is far-fetched.

In the similar vein, researchers have reported that adoption of AI technology can improve corporate business model innovation, product innovation, process innovation, social innovation, and other innovation outcomes (Bahoo et al., 2023; Mariani, Machado, and Nambisan, 2023). Furthermore, Mariani et al., (2022) based on a systematic literature review, established antecedents (technological, social, and economic) and consequences (economic, competitive, and innovation) of AI adoption. Other scholars have also explored AI influence on digital transformation and digital innovation (Mariani and Nambisan, 2021), AI and business models (Di Vaio et al., 2020), and artificial innovation to augment human innovation (Bouschery et al., 2023).

Though these articles have added important knowledge, improved understanding, and have been successful in synthesizing the relevant literature related to AI and innovation management, however, they have largely centered on clarifying the narrow dimensions of innovation in relation to AI. Particularly, with emergence of advanced AI tools like ChatGPT more attention is needed to relook how ChatGPT is likely to influence innovation management practices or the extent to which ChatGPT can influence innovation management process and practices.

AI as a Panacea for Innovation Management

To explore the likelihood that AI impact innovation management or the degree to which AI can affect the innovation procedure and practices, we developed a set of questions to Pilot AI. The set of questions was created as we experimented using AI and these questions were tested in three phases: 1) in the first phase, we generated ideas related to how AI influence Innovation Management, 2) in the second phase, we asked questions related to topic ignored during the idea generation by AI in the first phase, and 3) in the final phase, we asked some expert or specific questions from AI to test its domain specific expertise.

Phase 1: AI influence on Innovation Management

We first asked AI to provide ideas on “how AI can influence innovation management practices”, “what is the influence of AI on Innovation management”. We also rephrased these questions to check if we can get different responses, for instance:

- How AI can influence innovation management practices?
- How AI might impact procedures for innovation management?
- How AI can impact methods for managing innovation?
- How AI can affect innovation management?

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- What is the influence of AI on innovation management?
- What impact does AI have on innovation management?

Surprisingly, with different iterations, it generated one or two new responses only and we have summarized all answers below for improved understanding. All these ideas can be summarized into four categories: 1) Improving innovation processes (ideation, screening ideas, prototyping, and product launch), 2) increasing customers services, 3) enhancing collaboration, and 4) supporting decision making related to innovation indicators like product launch timing.

AI can play a valuable role in assisting organizations in strengthening their innovation management practices by; 1) offering insights and knowledge based on a wealth of data to make informed decisions and stay updated, 2) facilitating idea generation by igniting creative thinking and generating ideas, 3) improving innovation processes by identifying improvement into areas such as prototyping and product launch by analyzing data, 4) Integrating AI into customer channels, innovation managers may increase consumer engagement and gather feedback on new goods and services, 5) supporting decision-making by analyzing data and offering recommendations for which innovation projects to pursue, 6) providing managers insights into the efficacy of their innovation management processes by analyzing data on innovation indicators like time-to-market, client adoption, and financial performance, 7) facilitating to organize virtual innovation events, and 8) supporting collaboration by supplying a platform for it.

Phase 2: Topics related to innovation management not picked by the AI in first round

To inquire further, we asked questions related to innovation management that does not appear during our first phase to understand effectiveness of AI for managers:

Building innovative organizations: How AI can help managers in building an innovative organization?

AI generated following responses:

1) Managers can use the information provided by AI to design their own practices by learning about current best practices in innovation cultures, tactics, and practices. Moreover, AI can assist managers in creating a precise definition of innovation that fits with the goals and values of your business. 2) Managers can use AI to implement effective innovation processes, such as design thinking or agile development for creating new products and services. 3) AI can facilitate enhance collaboration for supporting innovation practices. 4) Managers can use AI to find potential barriers and their solutions for innovation within their company, such as reluctance to change or a lack of resources. 5) AI can recommend resources and training to support people in enhancing their knowledge and expertise in innovation. 6) Managers can ask AI for the necessary adjustments or updates to enhance their innovation strategies, cultures, and practices.

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Sustainable Innovation: What type of sustainable products manufacturing industries can introduce to meet sustainable development goals?

To achieve the objectives of sustainable development, manufacturing industries might introduce a variety of sustainable products. 1) To lessen reliance on fossil fuels and cut greenhouse gas emissions, manufacturing businesses can develop renewable energy items like solar panels, wind turbines, and hydroelectric power systems. 2) Sustainable Building Materials - To lessen the environmental impact of building and construction, manufacturing companies can produce sustainable building materials including recycled concrete, energy-efficient windows, and low-emission insulation. 3) Sustainable Textiles - To lessen the environmental impact of the fashion industry, manufacturing industries can create sustainable textiles including organic cotton, recycled polyester, and plant-based fabrics. 4) Sustainable Food Packing - To reduce waste and advance a circular economy, manufacturing businesses can create sustainable food packaging's such those made of biodegradable or compostable materials, reusable containers, and packaging created from recycled materials. 5) Water Conservation Goods - To reduce water use and protect water resources, manufacturing businesses can create water conservation products including low-flow showerheads, dual-flush toilets, and rainwater harvesting systems.

Digital Innovation: What new digital products and services can the financial sector launch over the next five years to remain competitive?

Due to continuous evolution of financial sector and increased importance of digital innovation, following digital products and services can be launched by the sector in the next five years: 1) digital banking platforms that offers a variety of services, such as mobile payments, budgeting software, and online account opening, which enhances the user experience and draws in new clients. 2) In order to cut costs and enhance client experiences, banks can introduce new AI and machine learning technologies. 3) Banks can introduce new blockchain-based products like digital currencies and smart contracts that can facilitate quicker and more cost-effective transactions. 4) Banks can provide new robo-counselors that can assist clients in choosing investments more wisely, offer individualized investment portfolios, and cut costs related to traditional financial advisors. 5) To give customers access to a larger variety of financial services and products while yet retaining control over their data and security, banks can introduce new open banking solutions.

Phase 3: Domain specific expertise of AI

Lastly, to test the specialist knowledge, we asked AI some specific questions:

Protecting intellectual properties in developing countries: Can AI help international brands protect their intellectual properties in developing countries?

In response, we received an answer with a caveat from AI that necessitates experts' advice related to the matter AI, "provides some general information that might be useful" and "it

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is essential to work with a knowledgeable attorney who specializes in intellectual property law". We agreed with AI answer that answers provided are quite generic and need some expert advice to deal with specific and distinct challenges.

It suggested following general steps: 1) Make sure your brand's name, logo, or any other intellectual property does not infringe on existing trademarks in the target market by conducting a thorough trademark search before entering a new market. 2) Trademark and patent registration can aid in the protection of intellectual property in a particular country. 3) Watch for infringement: Keep an eye out for any use of your patents and trademarks in the target market that may be infringing. 4) Make sure your rights are upheld: If you discover any instances of infringement, act quickly to make sure your intellectual property rights are upheld.

New products for pulp and paper industry: What new products pulp and paper industries can introduce to face digital disruption with minimum resources and gain higher profits?

Though AI produced ideas in response to it but they may not be cost-efficient in the short term and predicting future profitability of these ideas could be unlikely in this dynamic era.

Here are few generic responses from AI which may or may not hold relevance, 1) Digital supply chain management: By putting in place a digital supply chain management system, managers may streamline their manufacturing procedures, cut down on waste, and boost productivity, which will save money and boost profits. 2) Sustainable Packaging, Biodegradable, compostable, and recyclable materials are examples of sustainable packaging that managers can use to draw in new clients and enhance brand reputation. 3) Papers with distinctive textures or colors, for example, are in high demand in the market for luxury goods, and this demand is anticipated to rise. The introduction of specialized papers that serve this market and charge premium pricing by managers can increase earnings. 4) Digital printing is a tool that managers can purchase to save manufacturing costs and boost revenue.

Conclusion

This study was interested in exploring existing knowledge related to AI and innovation management and advancing knowledge on the missing piece that how AI can facilitate innovation management. It would be safe to conclude that AI has a potential to assist innovation managers in generating improved and diversified ideas related to different areas of innovation management such as improving innovation processes and enhancing collaboration for innovation. It is likely to become an important tool for innovation managers and it is pertinent to evaluate its impact on firm innovation practices over the time. However, one shall be careful while seeking specialist or advanced innovation management knowledge pertinent to a specific domain and an expert shall evaluate AI responses before implementing them in real life. Thus, at the moment, AI is not a panacea for all innovation management problems, and the idea that AI can replace knowledge workers in their domain is far-fetched, but it can augment their innovation efforts.

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Future Directions

We encourage future research to examine effect of AI to specific dimensions of innovation management such as assessing the AI influence on the current state of organization innovation culture and innovation strategy, how AI can assist managers in determining technology based innovative products in future, and AI and its influence on employees' innovation skills, among others. Moreover, we also encourage future research to implement and extend this study to other important areas, management, logistics, finance, marketing, human resource, knowledge management, entrepreneurship, digitalization, analytics, and leadership to have improved understanding of AI impact. For instance, research could examine, what type of leadership or leadership capabilities are required to integrate AI to organizational processes for improved innovation performance. Moreover, future studies may test AI impact from several perspectives, such as integration of AI to employees' innovation processes, impact of AI on employees training skills, among others. This may open avenues for researchers to add and improve knowledge related to AI and its impact on other dimensions of management.

This line of enquiry shall improve understanding related to AI impact on sustainable development goals, however, detailed research is encouraged on AI and sustainable development goals to improve understanding and knowledge. Another interesting research stream could be that if AI can help organization to introduce novel products, can organization claim rights for AI developed intellectual property? It would also be interesting to inquire internal and external drivers of AI adoption for organization and its impact on innovation, logistics, market, and accounting performance. Moreover, more attention is required to understand how AI can facilitate firms in dealing with disruptive technologies and introducing disruptive platforms and products accordingly. Additionally, in terms of its application, policymakers may use the research-based guidance offered by scholars to develop supportive structures and ecosystems to improve innovation processes and acceptance of emerging technologies among employees.

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