

AI Adoption in Product Innovation: How Artificial Intelligence Helps Create More Relevant Products?

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ARTICLE INFO

Article history:

Received: 14 March 2025

Revised: 17 March 2025

Accepted: 30 March 2025

DOI:

10.61100/tacit.v3i1.255

Keywords:

Artificial Intelligence, Product Innovation, Data Analysis, Personalization, Operational Efficiency



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ABSTRACT

The adoption of artificial intelligence (AI) in product innovation has become a key factor in creating products that are more relevant to customer needs. AI enables companies to analyze market trends, optimize product design, and personalize offerings based on consumer preferences. This study is a literature review employing a qualitative approach and descriptive analysis, utilizing data from Google Scholar and credible websites from 2018 to 2025. From an initial 30 articles, a rigorous selection process reduced the sample to 18 primary sources for this research. The findings indicate that AI has had a significant impact across various industries, such as automotive, healthcare, retail, and food, by enhancing innovation efficiency and aligning products more precisely with customer needs. However, AI adoption in product innovation also faces challenges, including data quality, algorithmic bias, and difficulties in integrating technology at the organizational level. The implications of this research highlight the importance of optimizing AI strategies in product development, improving human resource competencies, and establishing regulations that support ethical and sustainable AI implementation. Therefore, companies need to develop more adaptive strategies for integrating AI to create more competitive product innovations that align with market dynamics.

ABSTRAK

Adopsi kecerdasan buatan (AI) dalam inovasi produk telah menjadi faktor kunci dalam menciptakan produk yang lebih relevan dengan kebutuhan pelanggan. AI memungkinkan perusahaan untuk menganalisis tren pasar, mengoptimalkan desain produk, serta melakukan personalisasi berdasarkan preferensi konsumen. Penelitian ini merupakan tinjauan pustaka dengan pendekatan kualitatif dan analisis deskriptif, yang menggunakan data dari Google Scholar dan website kredibel dalam periode 2017–2025. Dari 30 artikel awal yang ditemukan, dilakukan seleksi ketat hingga tersisa 18 artikel yang digunakan sebagai sumber utama dalam penelitian ini. Hasil penelitian menunjukkan bahwa AI telah memberikan dampak signifikan dalam berbagai industri, seperti otomotif, kesehatan, ritel, dan makanan, dengan meningkatkan efisiensi inovasi serta menyesuaikan produk dengan kebutuhan pelanggan secara lebih presisi. Namun, adopsi AI dalam inovasi produk juga menghadapi tantangan, seperti kualitas data, bias algoritma, serta hambatan dalam integrasi teknologi di tingkat organisasi. Implikasi penelitian ini menyoroti pentingnya optimalisasi strategi AI dalam pengembangan produk, peningkatan kompetensi sumber daya manusia, serta regulasi yang mendukung penerapan AI secara etis dan berkelanjutan. Oleh karena itu, perusahaan perlu mengembangkan strategi yang lebih adaptif dalam mengintegrasikan AI guna menciptakan inovasi produk yang lebih kompetitif dan sesuai dengan dinamika pasar.

1. INTRODUCTION

In the era of digital transformation, the adoption of artificial intelligence (AI) in product innovation has become a strategic factor for companies seeking to create products that are more relevant to market needs. AI enables businesses to analyze consumer preferences more quickly and accurately by processing vast amounts

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of data (Hariguna & Ruangkanjanases, 2024). Technologies such as machine learning, natural language processing (NLP), and computer vision allow companies to understand customer behavior patterns, market trends, and predict unmet needs. For instance, companies like Amazon and Netflix have leveraged AI to tailor their product recommendations to individual customer preferences, ultimately enhancing customer satisfaction and loyalty. Thus, AI serves as both a production tool and a key driver in data-driven decision-making for more relevant product innovation.

The development of AI in product innovation has significantly transformed various industries, including manufacturing, healthcare, retail, and technology. In the automotive industry, AI is used to develop autonomous vehicles and AI-driven safety features that adapt better to their surroundings. In the healthcare sector, AI facilitates drug discovery and precision diagnostic tools, as demonstrated by DeepMind's predictive models for disease detection based on medical data. Meanwhile, in the retail and fashion sectors, AI analyzes fashion trends and customer preferences to create product designs that better align with market demand. AI's ability to process real-time data allows companies to respond to market shifts more rapidly, ensuring that product innovations are more accurately targeted (Ali et al., 2024).

AI adoption in product innovation is also closely related to a more adaptive design-based approach. AI can be utilized to simulate and test products in various scenarios without requiring costly and time-consuming physical production processes. For example, generative design technology enables engineers and designers to generate multiple product design alternatives based on specific parameters, allowing companies to select the most efficient and market-relevant solution. Additionally, AI facilitates the development of virtual prototypes, enabling businesses to test product features digitally before scaling up production. AI not only accelerates the innovation process but also enhances resource efficiency in new product development (Babina et al., 2024).

Moreover, AI contributes to enhancing product personalization, which serves as a key factor in creating added value for customers. In the beauty and skincare industry, AI is used to analyze customers' skin conditions and recommend the most suitable products for their individual needs. Companies such as L'Oréal and Procter & Gamble have developed AI-based applications that allow customers to receive more accurate product recommendations based on skin data analysis and their personal preferences. With this technology, customers feel more engaged in the purchasing process, thereby improving user experience and increasing their satisfaction with the products they use (Bilal et al., 2024).

However, despite the numerous benefits AI brings to product innovation, several challenges still need to be addressed. One of the primary challenges is the limitation of accurate and representative data (Ferrara, 2023). AI heavily relies on the quality of data used for model training, and if the collected data does not accurately reflect actual customer preferences, AI predictions may become biased or irrelevant. Additionally, ethical concerns regarding the use of customer data, particularly in terms of privacy and information security, remain a significant issue. Companies must ensure that they manage customer data transparently and in compliance with relevant regulations to build trust in AI-driven technologies.

Another critical aspect to consider is internal resistance within organizations toward AI adoption. Many companies still struggle to integrate AI into their business processes due to a lack of technical expertise and organizational culture shifts. Implementing AI often requires significant investments in technological infrastructure and employee training to ensure that personnel can effectively understand and operate AI-based systems (Haefner et al., 2023). The successful adoption of AI in product innovation depends not only on the technology itself but also on an organization's readiness to embrace change and develop the necessary competencies.

In the long run, AI is expected to continue evolving into an increasingly sophisticated technology capable of creating more innovative and relevant products. Companies that can adopt AI with the right strategy will gain a stronger competitive advantage in an increasingly dynamic market (Climent et al., 2024). As AI's capabilities to understand customer preferences and generate more market-driven product innovations continue to improve, it has the potential to become a key determinant of business success in the future. A deeper understanding of AI's role in product innovation is essential to providing companies with insights into optimizing the use of this technology.

Based on the background outlined above, this study aims to analyze how artificial intelligence facilitates the creation of products that are more relevant to market needs. The primary focus of this research is to explore various AI applications in the product innovation process, identify the benefits and challenges companies face in adopting this technology, and provide strategic recommendations for organizations to

optimize AI utilization in developing more adaptive and competitive products.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

Artificial Intelligence (AI)

Artificial Intelligence (AI) is a branch of computer science focused on developing systems that can mimic human intelligence in decision-making, problem-solving, and learning from data (Collins et al., 2021). AI encompasses various technologies such as machine learning, deep learning, and natural language processing, which enable computers to process large volumes of data automatically and generate relevant insights. In the business context, AI has become an essential tool for improving efficiency, accelerating innovation, and creating more personalized customer experiences. As AI technology continues to advance, many industries are adopting it for various applications, including predictive analytics, business process automation, and the development of more sophisticated and market-relevant products.

Product Innovation

Product innovation refers to the process of developing or improving products to enhance customer value and increase a company's competitiveness in the market (Kuncoro & Suriani, 2018). This innovation may involve creating new products, enhancing features of existing products, or modifying product design and usability to better meet consumer needs. In the digital era, product innovation increasingly relies on advanced technologies such as AI, the Internet of Things (IoT), and big data analytics to identify market trends and tailor products to customer expectations. Companies that can continuously innovate can maintain their market share and create more engaging consumer experiences, thereby strengthening customer loyalty to their brands.

Data Analysis

Data analysis is the process of processing, interpreting, and utilizing data to generate insights that support decision-making across various fields, including business, healthcare, and government. In the context of product innovation, data analysis enables companies to understand customer preferences, predict market trends, and evaluate product performance based on historical and real-time data (GhorbanTanhaei et al., 2024). With the support of AI and machine learning, data analysis can be conducted more quickly and accurately, allowing companies to identify new opportunities while mitigating potential risks. Effective data analysis aids in strategic decision-making and enhances a company's competitiveness by delivering products that better align with consumer needs.

Personalization

Personalization is a strategy used by companies to tailor products, services, or customer experiences based on individual preferences and behaviors (Weidig et al., 2024). With the help of AI and data analytics, companies can develop systems that recognize consumer consumption patterns and offer more relevant product recommendations. In the e-commerce industry, for instance, personalization allows platforms like Amazon and Tokopedia to present product listings based on customers' search history and purchase behavior. Beyond improving customer satisfaction, personalization contributes to increased sales, customer retention, and the effectiveness of marketing campaigns. Data-driven personalization strategies have become a key factor in creating more engaging and efficient customer experiences.

Operational Efficiency

Operational efficiency refers to a company's ability to optimize resources, processes, and technology to achieve better results at lower costs (Handoyo et al., 2023). In the context of product innovation, AI plays a crucial role in enhancing operational efficiency through process automation, smarter supply chain management, and waste reduction in product development. For example, in the manufacturing industry, AI is used to detect product defects in real time, reducing failure rates and improving production quality. With improved operational efficiency, companies can cut costs, boost productivity, and respond to market changes more swiftly and effectively.

3. RESEARCH METHOD

This study is a literature review with a qualitative approach aimed at analyzing the role of artificial intelligence in product innovation and how AI helps create products that are more relevant to market needs. The qualitative approach was chosen because this research focuses on an in-depth exploration of the concepts, implementation, and impact of AI in product innovation based on available scientific sources. The method used in this study is descriptive analysis, which allows for a comprehensive understanding of trends, benefits, and challenges in AI adoption for product innovation based on various perspectives found in the reviewed literature. The data in this study were collected from relevant and credible academic sources, focusing on journal articles, conference proceedings, and publications from reputable websites that discuss artificial intelligence and product innovation. The primary data sources were obtained from Google Scholar and websites of academic institutions and industries with strong reputations in artificial intelligence and business innovation. The publication timeframe used in this study spans from 2017 to 2025 to ensure that the analyzed data and findings are relevant to the latest developments in AI applications for product innovation. In the initial data collection stage, 30 articles were identified as potential sources for this study. However, to ensure the quality and relevance of the data, a rigorous selection process was conducted based on several criteria, including alignment with the research topic, methodologies used in previous studies, and the credibility of sources. Articles that did not directly discuss the role of AI in product innovation or failed to meet the established academic standards were eliminated from further analysis. After this selection process, 18 of the most relevant articles were chosen as the foundation for the analysis in this study. The analysis in this research was conducted descriptively by categorizing findings from the reviewed literature into several key themes, such as AI implementation in product innovation, the benefits of AI in enhancing product relevance, challenges in AI adoption, and strategies for optimizing AI utilization in product development. By using this approach, the study aims to provide a systematic and comprehensive overview of how AI contributes to creating more innovative and market-relevant products. To enhance the validity of the study, a source triangulation process was carried out by comparing findings from the selected articles. This was done to identify similarities, differences, and emerging patterns in previous studies related to AI's role in product innovation. Additionally, special attention was given to case studies demonstrating real-world AI implementations in product development across various industries to provide more concrete illustrations of AI's impact and effectiveness in driving product innovation.

4. DATA ANALYSIS AND DISCUSSION

The adoption of artificial intelligence (AI) in product innovation enhances product relevance to customer needs and enables companies to respond to market dynamics more quickly and precisely by leveraging machine learning, big data analytics, and natural language processing to analyze customer data in depth. AI allows companies to extract insights from various data sources, including customer transactions, social media, and purchasing patterns, enabling them to identify hidden preferences and anticipate trends before they peak. Unilever, for instance, utilizes AI to integrate consumer sentiment analysis from product reviews and digital platform interactions to create cosmetic formulations better tailored to user preferences across different regions, allowing for more targeted product launches and increased customer satisfaction (Unilever, 2024). Furthermore, AI assists companies in conducting virtual testing of new product concepts, optimizing supply chains with more accurate demand forecasting, and reducing the risk of product failure in the market through a more data-driven approach, making innovation faster and more effective in meeting the ever-evolving consumer expectations.

In the automotive industry, artificial intelligence (AI) has become a key element in driving innovation, not only in fuel efficiency and safety but also in creating increasingly adaptive and personalized driving experiences. Tesla, as a pioneer in smart electric vehicle technology, employs AI in its Autopilot and Full Self-Driving (FSD) systems to enable real-time adaptation to road conditions through a combination of sensors, cameras, and neural networks that continuously learn from billions of kilometers of global driving data (Tesla, 2025). This technology supports self-driving features and optimizes energy efficiency by analyzing user driving patterns, predicting the most efficient routes, and automatically adjusting vehicle settings to enhance battery life. Moreover, Tesla's AI-powered vehicles can perform over-the-air (OTA) software updates, allowing for performance improvements without manual intervention from owners, ultimately creating an ecosystem of vehicles that evolve and become smarter over time. With this approach, Tesla attracts a customer segment seeking high-tech smart vehicles and builds customer loyalty through an increasingly intuitive, safe, and efficient driving experience, positioning itself as a leader in AI-driven mobility innovation.

In the healthcare industry, artificial intelligence (AI) has revolutionized diagnostics, therapy, and treatment by improving accuracy, speed, and personalization of medical care through deeper and real-time data analysis. IBM Watson Health, for example, utilizes AI to process vast amounts of medical data, including electronic medical records, radiology imaging results, and the latest research journals, providing faster and more accurate evidence-based recommendations to medical professionals for clinical decision-making, particularly in complex cases like cancer, where AI can identify specific molecular patterns that are difficult for humans to detect (Aggarwal & Madhukar, 2017). Additionally, in pharmaceutical development, BioNTech leveraged AI to accelerate the genomic analysis of the COVID-19 virus, enabling more efficient mapping of protein structures and expediting the design of vaccines that precisely target virus mutations, as seen in its collaboration with Pfizer to create mRNA-based vaccines (Sharma et al., 2022). AI is also increasingly used in precision-based therapy, such as in cancer treatment, where AI systems assist in adjusting chemotherapy dosages based on individual patient responses, as well as in robotic surgery technology that allows for more precise procedures with reduced risks. Efficiency and effectiveness in medical treatments have significantly improved with AI integration expanding across the healthcare sector, paving the way for the development of more adaptive therapies tailored to patients' specific needs, establishing AI as a cornerstone in modern medical transformation.

The retail sector is increasingly relying on artificial intelligence (AI) to drive product innovation, enhance customer experiences, and optimize supply chain and inventory management to ensure higher operational efficiency. Nike, through its Nike By You program, has utilized AI to deeply analyze customer preferences by processing shopping behavior data, purchase histories, and fashion trends to provide more personalized shoe design recommendations, creating a more intuitive and engaging customization experience for consumers (Mathews, 2024). Beyond design, AI plays a crucial role in real-time demand forecasting, leveraging machine learning to optimize product production and distribution, thereby minimizing the risks of overstocking or stock shortages in stores and warehouses. Additionally, AI is employed in dynamic pricing systems that automatically adjust product prices based on factors such as demand, competition, and seasonal trends, providing companies with a competitive advantage in managing pricing strategies more flexibly. On the logistics side, AI is applied in predictive analytics systems to enhance supply chain efficiency by forecasting customer demand patterns across different regions, ensuring faster and more precise deliveries. The retail industry can improve customer satisfaction through more personalized and interactive shopping experiences while strengthening corporate competitiveness with more adaptive operational strategies aligned with market changes, by integrating AI across various business aspects.

In the food and beverage industry, artificial intelligence (AI) has become a revolutionary tool in creating healthier, more sustainable products tailored to consumer preferences through consumption data analysis, formulation optimization, and ingredient-based innovation. Nestlé, for instance, leverages AI to study customer consumption patterns by analyzing data from nutrition surveys, social media, and shopping preferences to develop healthier products with reduced sugar, salt, and fat content without compromising taste, as seen in the reformulation of KitKat's low-sugar variant. AI is also used in developing nutritionally balanced recipes by considering factors such as individual nutritional needs, dietary trends, and the demand for natural ingredients. On the other hand, startups like NotCo have developed an AI algorithm called Giuseppe, capable of analyzing the molecular composition of animal-based ingredients and matching them with plant-based alternatives, enabling the creation of dairy, meat, and mayonnaise products that replicate the taste and texture of conventional products with high accuracy (London L, 2020). Beyond product innovation, AI is also applied in supply chain management to predict raw material demand more precisely, reduce food waste, and enhance production efficiency through manufacturing process automation. With the growing integration of AI, the food and beverage industry can meet consumer demand for healthier and more sustainable products while accelerating innovation to deliver smarter, more adaptive, and data-driven food solutions.

Although artificial intelligence (AI) has revolutionized product innovation by providing more precise and data-driven solutions, companies face complex challenges that can impact its effectiveness, particularly regarding data quality, algorithmic bias, and ethical and regulatory issues. AI relies on clean, comprehensive, and representative data to generate accurate predictions and recommendations, yet many companies struggle with collecting, filtering, and managing large-scale data, which can lead to algorithmic bias if the data does not reflect the diversity of consumer preferences or if there is an imbalance in the collected samples. This bias can result in discrimination within products or services, as seen in AI recommendation

systems that tend to favor specific customer groups while overlooking other market segments. Additionally, ethical and regulatory concerns are becoming increasingly significant, particularly regarding customer privacy protection, data security, and compliance with regulations such as the General Data Protection Regulation (GDPR) in Europe or similar laws in other countries, requiring companies to manage user information transparently and responsibly. Businesses also face public trust risks, as consumers are becoming more aware of how their personal data is used, making transparency in data processing and efforts to mitigate information leakage crucial for building customer loyalty. Therefore, for AI adoption in product innovation to be effective, companies must invest not only in advanced AI technology but also in ethical data management, the development of more inclusive algorithms, and the implementation of policies prioritizing security and user privacy to create a sustainable innovation ecosystem that is widely accepted by society.

Beyond technical and ethical challenges, the successful adoption of artificial intelligence (AI) in product innovation heavily depends on an organization's readiness to embrace change, including infrastructure preparedness, workforce skills, and an adaptive corporate culture toward technology. Many companies struggle to integrate AI into their business processes due to a lack of human resources with expertise in AI and data science, creating a gap between technological potential and an organization's actual ability to utilize it effectively. Additionally, resistance to change is a major factor hindering AI implementation, particularly in companies with conventional work cultures that are less flexible in adopting automation or data-driven systems. Fear of job displacement by AI often triggers employee concerns, making it essential for companies to adopt change strategies focused on workforce upskilling through training and reskilling programs to help employees adapt to AI-driven work environments. From an investment perspective, AI adoption requires significant budget allocation, both for developing technological infrastructure such as cloud computing and big data systems and for integrating AI across the company's value chain. Without adequate organizational preparedness, large investments in AI risk being suboptimal, as even the most advanced technology will not yield significant impact if the company lacks a clear digital transformation strategy. Therefore, the success of AI implementation in product innovation is determined not only by technological sophistication but also by an organization's ability to manage change through investments in human resources, the application of effective change management strategies, and the creation of a corporate culture that supports sustainable technology adoption.

With the continuous advancement of AI technology, the future of product innovation is shaped by AI adoption and a company's ability to strategically integrate it across the entire business value chain, from research and development to marketing and customer service. Competitive advantage in an increasingly dynamic market depends on using AI to enhance efficiency and leverage real-time market trend analysis, identify complex consumer behavior patterns, and develop more adaptive and customer-centric products. AI enables companies to create personalized products through big data analytics and machine learning, allowing automated product customization based on customer preferences, as seen in e-commerce recommendation systems or AI-driven dynamic software features. Additionally, AI accelerates innovation through generative algorithm-based simulations that enable companies to test various product designs and formulations virtually before mass production, reducing experimentation costs and shortening time-to-market. However, the successful utilization of AI is not solely dependent on technological sophistication but also on an organization's ability to understand, manage, and develop strategies aligned with business objectives and customer needs. This means that companies aiming to remain competitive in the digital era must build a strong digital foundation, enhance AI literacy among employees, and ensure that AI implementation is focused on efficiency while creating sustainable value for customers and the broader business ecosystem.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

The adoption of artificial intelligence (AI) in product innovation has become a key factor in creating products that are more relevant to market needs. AI enables companies to analyze consumer trends, personalize products, and optimize product development processes more efficiently. Case studies from various industries, such as Unilever, Tesla, IBM Watson Health, Nike, and Nestlé, demonstrate that AI has positively impacted competitiveness and customer satisfaction. However, AI implementation in product innovation still faces several challenges, including dependence on high-quality data, risks of algorithmic bias, and obstacles in integrating technology at the organizational level. The success of AI adoption depends on technological sophistication and a company's readiness to manage change and optimize data utilization.

This research presents several important implications for academics, business practitioners, and policymakers. For academics, the findings enrich the study of AI's role in product innovation and serve as a foundation for further research on optimizing AI strategies across various industries. For business practitioners, the findings reinforce that AI is not merely an automation tool but can also serve as a key driver in creating products that better align with consumer needs. Companies must invest resources in AI development and foster a data-driven innovation culture. Meanwhile, for policymakers, this study highlights the importance of regulations that support ethical and responsible AI development, particularly concerning data protection and algorithmic transparency.

Based on the research findings, several recommendations can be proposed: (1) Companies should improve the quality of data used in AI models to avoid bias and ensure that product innovation genuinely reflects customer needs. (2) Investment in human resource training is crucial to ensure employees have sufficient understanding to adopt AI technology effectively. (3) Companies should develop AI implementation strategies tailored to the specific needs of their respective industries to maximize the benefits of this technology. (4) Collaboration between the business sector, academia, and the government should be strengthened to formulate policies that support AI-driven innovation. (5) Regular evaluations of AI's impact on product innovation should be conducted so that companies can continuously adjust their strategies in line with technological advancements and consumer preferences.

This study has several limitations that should be considered when interpreting the results. First, this research relies solely on a literature review using a qualitative approach, without incorporating quantitative analysis that could measure AI's impact on product innovation more specifically. Second, the data sources used are limited to articles available on Google Scholar and credible websites from 2017 to 2025, meaning there is a possibility that the latest developments are not covered in this study. Third, this research does not directly evaluate the effectiveness of AI implementation in a specific company, requiring further empirical case studies to measure AI's real impact on product innovation across different industries. Fourth, ethical and regulatory aspects of AI remain an area requiring deeper study to understand how existing policies influence AI adoption in product innovation across various countries and industry sectors.

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