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Conference on
Economics and Business
**CHALLENGES IN
THE CARPATHIAN BASIN**

Innovation: Bridging the Gap between
Urban Centers and Peripheries

SAPIENTIA HUNGARIAN UNIVERSITY OF TRANSYLVANIA



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Director editură: GHEORGHE POP

Editor in Chief: Dr. Nagy Benedek

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POSSIBILITIES OF ARTIFICIAL INTELLIGENCE (AI) IN PRODUCT DEVELOPMENT: IMPLICATIONS FOR MARKETING, COMMERCE, AND ECONOMICS

SZŰCS RÓBERT SÁNDOR - FÖLDI KATA

ABSTRACT

This paper explores the transformative role of Artificial Intelligence (AI) in product development, marketing, and commerce. AI technologies enable personalized marketing strategies, enhance customer engagement, and optimize sales through advanced analytics and recommendation systems. In product development, AI accelerates innovation cycles, reduces costs, and improves efficiency by automating tasks and augmenting human creativity. Despite these benefits, challenges such as high implementation costs, data privacy concerns, and skill shortages hinder widespread adoption. The study highlights real-world examples of AI-driven product innovation and discusses AI integration's broader economic and sustainable impacts.

Keywords: Artificial Intelligence, Product Development, Marketing Strategies, Personalization, Innovation, Economic Impact

1. AI IN MARKETING AND CONSUMER ENGAGEMENT

AI technologies enable highly personalized marketing by tailoring advertisements to individual consumer preferences, improving relevance and conversion (Lee et al., 2024). Generative AI can create individualized content based on minimal data, boosting customer engagement by delivering the right message at the right time (Lee et al., 2024). AI-driven campaigns adapt to consumer behavior; studies show that AI-generated ads are perceived differently across demographic groups, underscoring the need to align content with audience expectations (Nesterenko & Olefirenko, 2023). AI is also transforming the customer experience. Incorporating AI features into products and services allows more interactive and responsive consumer interactions. New research finds that AI elements in products significantly alter how customers perceive and engage with offerings, which means firms must update their approaches to managing customer satisfaction (Wang et al., 2024). Notably, AI-driven marketing strategies can boost interest in sustainable products while improving efficiency, as seen in retail where AI increases engagement with eco-friendly offerings (Salhab et al., 2025). AI enables marketers to deliver more engaging, tailored experiences, strengthening customer engagement and brand loyalty (Business Wire, 2025).

2. AI IN COMMERCE AND SALES OPTIMIZATION

AI is boosting sales in commerce through advanced analytics and personalization. In e-commerce, recommendation engines leverage customer data to suggest products tailored to each shopper, improving the shopping experience and conversion rates (Zhang & Xiong, 2024; Wang et al., 2024). AI is also applied in dynamic pricing and demand forecasting, where algorithms adjust prices and predict real-time sales trends to maximize revenue and optimize stock levels. On the operations side, AI enhances supply chain efficiency. Intelligent forecasting helps ensure the right products are stocked at the right time, reducing overstock and waste. AI-driven distribution planning, for instance, can optimize logistics and routing, streamlining deliveries and cutting excess inventory (Salhab et al., 2025). In sum, integrating AI into commerce leads to more innovative pricing, better inventory management, and more effective sales strategies, improving operational efficiency and customer satisfaction.

3. ECONOMIC IMPACT OF AI IN PRODUCT DEVELOPMENT

Adopting AI in product development can significantly lower costs and boost productivity. Early adopters report faster innovation cycles and shorter development timelines from AI use in new product projects (Paliwal et al., 2024). By automating labor-intensive tasks and augmenting human creativity, AI accelerates time-to-market – studies indicate development times can be cut by up to 50% (Zhang et al., 2021). These efficiencies also translate into cost savings, as projects require fewer resources to reach completion. Furthermore, AI analytics help optimize resource allocation by identifying high-potential ideas and reducing the risk of costly project failures (Cooper, 2024). In short, AI allows companies to innovate more efficiently and effectively. These productivity gains can scale up to broader economic benefits. Evidence links greater AI utilization with higher new product success rates and quality improvements (Zhang et al., 2021). This suggests that industries could see higher overall innovation output and productivity as AI adoption grows. However, AI use in product development remains limited – only about 13% of companies have broadly implemented it so far (Cooper, 2024) – so much of the potential economic upside is still untapped.

4. AI-DRIVEN PRODUCT INNOVATION: CASE STUDIES

Real-world examples highlight AI's role in product innovation. One notable case is Coca-Cola's limited-edition Y3000 soda, which was co-created by human designers and AI. Coca-Cola used AI to analyze how consumers envision the future, guiding the creation of a novel “futuristic” flavor for Y3000 (Coca-Cola Company, 2023). This collaboration helped Coca-Cola craft a unique product and marketing story centered on AI innovation. Another example is Hell Energy's “HELL A.I.” energy drink, advertised as the world's first beverage fully developed by artificial intelligence. AI handled the entire development cycle in this case: the system formulated the recipe based on consumer preference data, selecting ingredients and even taste-testing variations without human input (Southey, 2023). The AI then generated several prototype flavors and identified the best one – a fruity blend – marking the first time AI created an energy drink end-to-end (Southey, 2023). These cases show how AI can move beyond assisting humans to generate product ideas and formulations, giving companies new ways to innovate and differentiate their offerings. Other industries are also harnessing AI in product innovation. For instance, IBM and McCormick & Company utilized IBM's AI for product composition to accelerate flavor and food product development. This collaboration created a new line of “ONE” Dish Recipes seasonings, designed to enhance the cooking experience and flavor (McCormick, 2019). P&G uses machine learning algorithms to develop new products that are more effective and environmentally friendly. For example, AI helps in the development of perfumes using the Perfume Development Digital Suite, which creates new fragrances up to fifty times faster. P&G uses AI-based sensors and cameras on the production line for real-time quality control, reducing waste and manual labor. This allows every product to be inspected on the line rather than just sampling. P&G uses AI to analyze consumer behavior and develop personalized solutions. AI helps better understand consumer needs and preferences, aiding in product development (PG 2024, Canino 2024, Dominguez 2024, Michu 2024). In the automotive sector, BMW integrates AI into their product development process. BMW uses AI technologies like AIQX and Car2X to automate and optimize manufacturing processes. Car2X enables real-time communication between vehicles and manufacturing systems, while AIQX performs acoustic and visual quality checks. AI-powered cameras assist in quality control on the production line, detecting defects that human inspectors might miss. BMW utilizes AI to accelerate product development, such as simulating and predicting vehicle performance. This allows developers to test new technologies more quickly and efficiently. (BMW Group, 2023, Estes, 2024, Filipsson 2025). Additionally, Adidas, in collaboration with Carbon, developed the Futurecraft 4D shoes using AI to analyze years of running data. This helped design a midsole that offers optimal performance tailored to runners' movements, significantly reducing time to market. Adidas uses AI to develop new products rapidly. For example, AI helps the company design new shoes and apparel in days, compared to weeks or months previously (Nexttech3D 2023,

Thomas 2023). Alibaba uses AI to predict customer purchases and generate product descriptions, enhancing its ability to meet consumer demands efficiently. Amazon, Google, Apple, Baidu, Facebook, Microsoft, and Tencent have integrated AI into their corporate processes. (Marr, 2025). These examples demonstrate AI's extensive capability to assist and drive the product development process, providing companies with new ways to innovate and differentiate their offerings.

5. CHALLENGES AND LIMITATIONS OF AI ADOPTION IN PRODUCT DEVELOPMENT

Despite its promise, significant barriers exist to implementing AI in product development. High implementation costs and uncertain returns make firms hesitant to invest (Cooper, 2025). There is often no compelling business case, or companies lack the necessary skills and organizational readiness to integrate AI (Cooper, 2025). Smaller enterprises usually lack resources and risk tolerance; many cite high costs, cybersecurity fears, and past failures as reasons for the slow uptake of AI (Cooper, 2025). Data and ethical issues further limit AI adoption. Effective AI systems require large, quality datasets, but using extensive data can raise privacy concerns, and algorithms may introduce bias without careful oversight (Salhab et al., 2025). In addition, a shortage of skilled AI professionals and inadequate IT infrastructure makes deployment challenging for many organizations (Amankwah-Amoah & Lu, 2024). Thus, without strong leadership support, investment in expertise, and proper governance, firms may struggle to realize AI's full potential in product development.

6. MATERIAL AND METHODS

Before conducting the planned consumer survey in the future, I consider it essential to explore how internationally relevant literature views the relationship between AI, product development, and marketing. For the literature review and analysis, I used the Web of Science database. The investigation took place in March 2025. During the survey, I conducted a search on the Web of Science platform using the term "AI product development marketing." This search yielded 787 results on the Web of Science platform. I used VOSViewer version 1.6.18 to explore the interconnections among the scientific articles listed, through the exportation of bibliographic data from the results list (Visualisation of Similarities - VOS). VOSViewer is a data mining application capable of visually displaying various citation statistics and their relationships based on publication and citation structures of specific journals, leading authors, institutions, countries, and even keywords. Essentially, the methodology is a bibliometric analysis, which examines bibliographic sources using quantitative methods (Martínez-López et al, 2018). In addition to text mining, the software is also suitable for clustering tasks.

7. RESULTS

During the processing, the first step involved bibliographic preprocessing, followed by clustering and merging contents using metrics applied to matrices describing the contents/documents. The analysis parameters were co-occurrence - full-counting – author keywords, and I requested at least 2 occurrences of a given expression in the corpus. This setting only considered those keywords that appeared at least twice about the term "AI product development marketing." This setting created a good harmony between striving for completeness and finding the most critical keywords. The setting resulted in 24 keywords. The co-occurrence map reveals the total number of keyword occurrences across all documents. It identifies the "hot spots" in the specialities, in our case, in writings concerning AI, product development, and marketing. Figure 1 shows the relationships between the keywords of the publications examined in the paper. Each keyword is color-coded by group, with larger circles representing the most occurrences of a keyword. Shorter distances between clusters indicate stronger relationships, while greater distances between clusters symbolize weaker relationships.

includes strategic business concepts such as "competitive advantages," "business models," "B2B," and "customer involvement." This suggests that AI is a pivotal element in reshaping business strategies to enhance competitive positioning in the market, improve customer relationships, and drive business-to-business engagements. Other notable links to "branding," "social media," "perceptions," and "customer acceptance" emphasize the role of AI in transforming marketing communication strategies. These links illustrate how AI tools are utilized to manage brand perceptions across various channels, optimize social media interactions, and enhance customer engagement through tailored content. Overall, this network map is an intricate depiction of the multifaceted interactions between AI, product development, and marketing. It underscores the expansive impact of AI across different sectors, emphasizing its role in driving innovation, enhancing economic and sustainable development, and revolutionizing marketing and consumer engagement strategies.

8. CONCLUSIONS

Integrating Artificial Intelligence (AI) in product development, marketing, and commerce has revolutionized how businesses innovate, engage with customers, and optimize operations. AI technologies have proven instrumental in enhancing marketing strategies by delivering personalized experiences that boost customer engagement and brand loyalty. In product development, AI accelerates innovation cycles, reduces costs, and improves efficiency, leading to faster time-to-market and increased productivity. Real-world case studies, such as Coca-Cola's AI-created Y3000 soda and Hell Energy's AI-developed energy drink, demonstrate AI's capability to assist and drive product innovation. These examples illustrate how AI can generate novel product ideas and formulations, offering companies new avenues for differentiation and growth. However, despite these benefits, significant challenges impede the widespread adoption of AI in product development. Significant barriers include high implementation costs, data privacy concerns, and a shortage of skilled professionals. Addressing these challenges requires substantial investment in AI expertise, robust data governance, and strategic leadership support. As AI continues to evolve, its potential to foster economic growth and contribute to sustainable development through more efficient resource use and enhanced decision-making processes will become increasingly important. Future research should focus on overcoming the current limitations of AI adoption and exploring its applications in diverse sectors, including healthcare and automotive industries. Ultimately, the successful integration of AI into product development and marketing will depend on companies' ability to navigate these challenges while harnessing AI's transformative power to drive innovation, improve customer experiences, and enhance operational efficiency.

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AUTHOR'S ADDRESS

Szűcs Róbert Sándor: University of Debrecen, Faculty of Economics and Business, Institute of Marketing and Commerce, Hungary, 4032 Debrecen, Böszörményi út 138., associate professor, PhD., szucs.robert.sandor@econ.unideb.hu

Földi Kata: University of Debrecen, Faculty of Economics and Business, Institute of Marketing and Commerce, Hungary, 4032 Debrecen, Böszörményi út 138., college associate professor, PhD., foldi.kata@econ.unideb.hu