Journal of Electronic Business & Digital Economics

203

From hype to value: harnessing generative AI in fashion retailing from a technology-organization-environment perspective

Yanbo Zhang, Chuanlan Liu and Sibei Xia
Department of Textiles, Apparel Design, and Merchandising, Louisiana State University, Baton Rouge, Louisiana, USA

Received 1 November 2024
Revised 18 January 2025
9 March 2025
Accepted 13 March 2025

Abstract

Purpose – This study aims to comprehensively examine generative artificial intelligence (GenAI) applications in the fashion retail value chain and propose a practical framework to guide effective GenAI innovation for fashion retailers.

Design/methodology/approach – An extensive literature review was conducted, including use cases of GenAI within the fashion industry. Given GenAI's evolving nature, a forward-looking perspective is applied to explore its potential and challenges within fashion retail. The technology-organization-environment (TOE) theory was used as the foundation for the proposed framework.

Findings – This study presented a systematic, future-oriented view of GenAI's opportunities and challenges across the fashion retail value chain. GenAI enhances productivity across the fashion retail value chain by streamlining design, enhancing operations, improving marketing and customer experiences and optimizing decision-making. However, its implementation presents key challenges in four areas: data issues, technical constraints, output reliability and social concerns. A TOE-based practical framework and actionable insights were proposed to help fashion retailers navigate GenAI's complexities, harness its potential and address related challenges.

Originality/value – Our study provides a holistic view and actionable guidance for fashion retailers on effectively and responsibly implementing GenAI across the retail value chain. These insights can also benefit GenAI practitioners in other industries.

Keywords Generative artificial intelligence (GenAI), Fashion retail,
The technology-organization-environment (TOE) theory, Technological innovation

Paper type Conceptual paper

Introduction

Artificial Intelligence (AI), commonly defined as computational systems that emulate human intelligence to perform complex tasks, has been widely applied to various fields (Cui, van Esch, & Phelan, 2024; Haefner, Wincent, Parida, & Gassmann, 2021; Sikka, Sarkar, & Garg, 2024; Zhang & Liu, 2024a). Recently, the emergence of a specialized subset of AI, known as Generative AI (GenAI), has rapidly gained prominence, distinguished by broad impact and unparalleled capabilities (Kar, Varsha, & Rajan, 2023; Mariani & Dwivedi, 2024). Since the introduction of ChatGPT at the end of 2022, the profound influence of GenAI has permeated all layers of society, influencing nations and cultures at the macro level, affecting organizations and institutions at the meso level, and transforming individual daily lives at the micro level (Dwivedi *et al.*, 2023; Mariani & Dwivedi, 2024).

Conflicts of interest: The authors declare no conflicts of interest.

Journal of Electronic Business & Digital Economics
Vol. 4 No. 2, 2025
pp. 203-219
Emerald Publishing Limited
e-ISSN: 2754-4222
p-ISSN: 2754-4214
DOI 10.1108/JEBDE-11-2024-0042

The transformative potential of GenAI lies in its ability to facilitate human-like interactions and generate diverse content, including text, images, videos, and code (Hermann & Puntoni, 2024; Mariani & Dwivedi, 2024). For instance, GenAI can accelerate the fashion design process and foster creativity by enabling designers to create high-fidelity visuals through refined text, images, and sketch-based prompts (Zhang & Liu, 2024a). GenAI models can be trained on structured and unstructured data and function independently or as enhancements to existing AI systems, broadening their utility across diverse tasks (Nah, Cai, Zheng, & Pang, 2023; Rajaram & Tinguely, 2024). For example, integrating GenAI into decision-making processes throughout the fashion retail value chain offers more accurate, comprehensive, and actionable insights (Harreis, Koullias, Roberts, & Te, 2023; Sukharevsky *et al.*, 2024).

The fashion retail industry, driven by rapidly evolving trends and the need for continuous innovation in product design and development, stands to benefit significantly from GenAI technologies (Harreis *et al.*, 2023; Jin & Shin, 2020). By leveraging GenAI for trend forecasting and image content generation, retailers can enhance the value chain through more precise trend analysis and accelerated design processes. Fashion serves as a medium for self-expression and social presentation, yet the perception of fashionability remains inherently subjective (Shirkhani, Mokayed, Saini, & Chai, 2023; Zhang & Liu, 2024b). This subjectivity has fueled increasing demand for personalization in fashion retail, including product customization, targeted marketing, and styling recommendations. Existing research highlights GenAI's ability to replicate human-like behaviors in recommendation settings, enabling scalable personalization and enhanced customer experiences (Wang *et al.*, 2024; Zhang, Chen, Sheng, Wang, & Chua, 2024). As innovation and personalization remain central to the industry, fashion retailers are integrating GenAI into their technology strategies to drive commercial value and sustain competitive advantages.

GenAI holds significant potential to enhance productivity and efficiency across the fashion retail value chain. In product design and development, it can seamlessly integrate into designers' creative workflows, providing precise and timely fashion trend insights, accelerating ideation, and enabling product customization (Wu & Li, 2024; Zhang & Liu, 2024a). Across sourcing, manufacturing, distribution, and inventory management, GenAI-powered human-like communication and advanced data analytics can significantly improve operational efficiency (Bain, 2023a; Harreis *et al.*, 2023). Additionally, GenAI streamlines marketing processes from strategic planning to generating high-quality visual and written content (Bain, 2023a). It also enhances both e-commerce and in-store operations by improving customer experiences through intelligent inquiries and personalized recommendations (Hermann & Puntoni, 2024; Kar *et al.*, 2023). Decision-makers in fashion retail can leverage GenAI to support strategic planning and operational execution (Harreis *et al.*, 2023).

However, fashion brands face several critical challenges in implementing GenAI, primarily in four areas: data-related issues, technical constraints, output limitations, and social concerns. Data-related and output challenges affect the entire fashion retail sector, including concerns over data privacy and security, the scarcity of high-quality datasets, difficulties in analyzing unstructured data, and the risk of generating inaccurate content (Tavakoli *et al.*, 2024). Technical challenges vary across operational areas but often involve the compatibility of GenAI with existing technologies. Social concerns, such as fears of job displacement and copyright infringement, further complicate adoption (Bain, 2023a). Addressing these challenges is crucial for maximizing the benefits of GenAI in fashion retail.

Fashion retailers must develop a deep understanding of GenAI's transformative role in the industry, recognizing both its opportunities and challenges while strategically unlocking its full potential and mitigating associated risks. To this end, this conceptual study aims to achieve two primary objectives. First, it provides a comprehensive and dynamic understanding of GenAI's applications in fashion retail by identifying its potential benefits and challenges across the retail value chain. To accomplish this, we conducted an extensive review of both academic and gray literature, including real-world use cases of GenAI within the fashion sector. Second, this study proposes a practical framework and actionable insights to help

fashion retailers leverage GenAI responsibly and effectively. We employ the Technology-Organization-Environment (TOE) theory, which has been widely used in research on technological innovation adoption and implementation at the organizational level (Ahmed, 2020; Chang, Bruess, & Chong, 2024; Hashimy, Jain, & Grifell-Tatjé, 2023). The TOE theory guides us to explore how fashion retailers can unleash GenAI's potential and address the associated challenges from technological, organizational, and environmental perspectives.

This conceptual study offers both theoretical and practical contributions. Theoretically, it applies the TOE theory to GenAI innovation in fashion retail, expanding the knowledge base around TOE, GenAI applications, and the fashion industry. Practically, our study provides actionable guidance and valuable insights for fashion retailers on implementing GenAI across the retail value chain, with applications that can also benefit GenAI practitioners in other industries.

Potential and challenges of GenAI across the fashion retail value chain

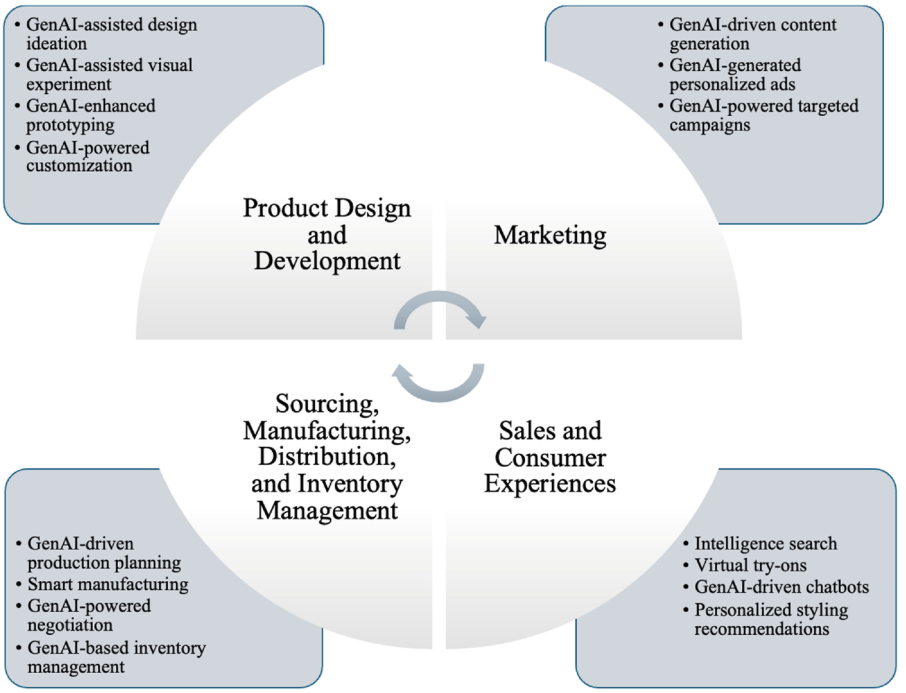
As GenAI continues to evolve rapidly, its applications in the fashion industry are advancing at an unprecedented pace. This study adopts a forward-looking perspective to explore both the potential and challenges of GenAI across the fashion retail value chain. In retail, the value chain encompasses all stakeholders and processes involved in delivering products or services to customers, with each component contributing to customer value creation (Oosthuizen, Botha, Robertson, & Montecchi, 2021). Unlike the traditional linear value chain, GenAI-based technologies enable fashion retailers to establish seamless connections across various value chain activities, enhancing operational integration and efficiency.

The incorporation of GenAI holds significant promise for optimizing key operational aspects of fashion retail. For instance, GenAI can facilitate product design and development, enhance distribution and inventory management, accelerate high-quality marketing content creation, and deliver hyper-personalized customer service (Bain, 2023a; Harreis *et al.*, 2023). Additionally, GenAI enhances decision-making at both strategic and operational levels by synthesizing and analyzing structured and unstructured data across the fashion retail value chain (Sukharevsky *et al.*, 2024). Rather than following a linear process, the operational aspects of fashion retailing form a dynamic, interconnected network. Figure 1 illustrates how GenAI empowers key operational activities within fashion retailing.

While GenAI offers immense potential, there are also challenges to consider. Some issues may be mitigated through technological advancements and responsible management practices, while others may persist and remain complex to resolve (Bain, 2024b; Mariani & Dwivedi, 2024). GenAI-related key challenges can be broadly classified into four key domains: data-related issues, technical constraints, output reliability problems, and social concerns, each manifesting differently across various operational areas of fashion retailing. Table 1 provides an overview of GenAI's potential benefits and challenges across the fashion retail value chain. Each of these areas is discussed in detail in the following sections.

Potential benefits of GenAI in fashion retail

Product design and development. In the product design and development stage, GenAI-facilitated systems and tools empower fashion designers by analyzing diverse real-time data to forecast trends and generate design concepts (Harreis *et al.*, 2023). These technologies facilitate the ideation process by swiftly transforming initial ideas into high-fidelity design images, unleashing creativity (Zhang & Liu, 2024a). Additionally, GenAI enhances product customization through iterative digital visual experiments and human-like communication, enabling more tailored and dynamic design development (Harreis *et al.*, 2023). Existing research has revealed that emerging GenAI-driven image generators, such as Midjourney and Stable Diffusion, can help designers create a diverse range of fashion products, including haute couture collections, ready-to-wear garments, knitted textiles, and jewelry designs, while



Source(s): Authors' work

Figure 1. GenAI-driven optimization of key operational activities in fashion retail

potentially meeting consumers' functional, expressive, and aesthetic needs (Lyu, Shi, Zhang, & Lin, 2023; Wu & Li, 2024; Zhang & Liu, 2024a).

Sourcing, manufacturing, distribution, and inventory management. GenAI holds significant promise for complementing and enhancing traditional AI tools by expanding their capabilities beyond structured data analysis to include unstructured data, resulting in more accurate insights (Cui *et al.*, 2024; Hermann & Puntoni, 2024). This advancement can facilitate value chain activities, including sourcing, manufacturing, distribution, and inventory management, with significant time and cost savings for fashion retailers (Harreis *et al.*, 2023). Moreover, GenAI's data processing capabilities can strengthen retailers' bargaining power when negotiating with suppliers and other third parties (Sukharevsky *et al.*, 2024). GenAI-driven chatbots can also be deployed in these external communications, enhancing productivity and convenience (Sukharevsky *et al.*, 2024).

Marketing. The integration of GenAI has significantly transformed marketing activities in fashion retail. First, marketers can leverage GenAI technologies to analyze market trends and develop strategic initiatives (Harreis *et al.*, 2023). Second, GenAI-assisted content generation has proven highly effective, producing high-quality visual and textual outputs with remarkable speed (Hermann & Puntoni, 2024; Rajaram & Tinguely, 2024). Fashion brands such as Casablanca and Sheep Inc. have utilized GenAI to create advertising and campaign visuals, enhancing creative freedom, improving visual appeal, and significantly reducing production time (Bain, 2023a). Similarly, GenAI-powered copywriting has gained widespread adoption, automating repetitive tasks while enriching marketing content with storytelling and creative inspiration (Harreis *et al.*, 2023). For example, early adopter Snipes reported that tasks previously requiring two weeks can now be completed in just two hours (Bain, 2023a), shifting

Table 1. Potential and challenges of GenAI in fashion retail

Operational aspects of fashion retailing	Potential benefits of GenAI	Challenges of GenAI
Product Design and Development	1. Trends forecasting 2. Expediating ideation process 3. Converting initial idea descriptions, sketches, and mood boards into high-quality fashion images 4. Enhancing product customization	Data aspect: • Lack of fashion-domain-specific data • Difficulties in using unstructured data when fashion trend forecasting • Data privacy and security concerns during customization Technical aspect: • Lacking embedded design editing functions • Difficulties in keeping design legacy, refining input prompts, and transferring from images to pattern design Output aspect: • Bias in fashion image • Hallucinations in fashion image Social aspect: • Designer job replacement concern
Sourcing, Manufacturing, Distribution, and Inventory Management	1. Saving time and cost 2. Enhancing productivity and communication 3. Getting bargaining power	Data aspect: • Difficulties in using unstructured data Technical aspect: • Difficulties in integrating GenAI with other technologies Output aspect: • Inaccuracy
Marketing	1. Tailoring marketing strategy initiatives using marketing trends identification and analysis 2. Streamlining high-quality marketing content generation, including both visual content and writing copy 3. Sustainability benefits 4. Creating hyper-personalized content	Data aspect: • Difficulties in using unstructured data when marketing trends forecasting • Data privacy and security concerns during personalized content generation Output aspect: • Misleading marketing content • Bias in Marketing content Social aspect: • Marketers/models job replacement concern
Sales and Consumer Experiences	1. Improving e-commerce • Product categorization • Curation • Online resale 2. Optimizing store operation • Layout/Inventory plan and management • Labor resource allocation 3. Enhancing consumer experiences • Intelligent searching • Intelligent inquires • Virtual try-on • Personalized recommendation and styling service	Data aspect: • Lacking high-quality consumer data • Difficulties in using unstructured data when analyzing consumer behavior • Data privacy and security concerns during consumption Technical aspect: • Difficulties in integrating GenAI with other technologies Output aspect: • Unsatisfactory recommendations Social aspect: • Sales/customer consultants job replacement concern

(*continued*)

Table 1. Continued

Operational aspects of fashion retailing	Potential benefits of GenAI	Challenges of GenAI
Decision-making Activities	1. Refining strategic-level decision-making • Human-like communication • Output accuracy • Proactive insights • Root-cause analysis 2. Optimizing operational-level decision-making • Streamline workflow o Internal communication o Effectiveness	Data aspect: • Lacking high-quality, comprehensive, updated data Technical aspect: • Lacking GenAI-related expertise • Difficulties in integrating GenAI with other technologies Output aspect: • Inaccuracy Social aspect: • Job replacement concern

Source(s): Authors' work

the role of copywriters from content creation to guiding, overseeing, and refining AI-generated material.

Furthermore, GenAI-driven visual content generation offers sustainability benefits by minimizing waste associated with traditional photo shoots (Bain, 2023a). Additionally, GenAI facilitates the large-scale production of hyper-personalized marketing content (Sukharevsky *et al.*, 2024), enabling tailored branded emails and messages based on consumers' fashion preferences and purchasing history, thereby enhancing marketing effectiveness. Major technology companies, including Google, Meta, and TikTok, have introduced GenAI-powered marketing tools to streamline advertisement creation and optimize consumer engagement (Bain, 2024a).

Sales and customer experiences. GenAI presents transformative potential in enhancing sales and customer experiences within fashion retail. In e-commerce, GenAI-driven technologies empower fashion retailers to refine product categorization, content curation, and online resale processes (Harreis *et al.*, 2023; Sukharevsky *et al.*, 2024). For instance, labor-intensive tasks on peer-to-peer resale platforms, such as inputting product details and pricing, can discourage sellers. Addressing this challenge, the startup Truss has developed GenAI-powered solutions that generate comprehensive product descriptions, suggest prices based on previous listings, and link items to relevant events using a single image (Bain, 2024c). These advancements enhance product discoverability, streamline sale transaction processes, and improve the overall online shopping experience. In physical retail settings, GenAI also optimizes fashion product sale processes. Through advanced data analytics empowered by GenAI, fashion retailers can predict demand fluctuations, optimize shelf placements, and allocate resources more efficiently, ensuring seamless in-store operations (Harreis *et al.*, 2023).

GenAI significantly enhances customer experiences through intelligent search and inquiry functions, advanced virtual try-ons, and personalized recommendations and styling services (Bain, 2023a; Harreis *et al.*, 2023; Sukharevsky *et al.*, 2024). GenAI-powered chatbots and recommendation systems facilitate intuitive, human-like interactions that simplify product discovery and consumption processes (Rajaram & Tinguely, 2024; Shirkhani *et al.*, 2023). By leveraging multimodal data processing capabilities, GenAI enables highly personalized services at scale, offering tailored fashion advice based on individual preferences and purchase histories (Hermann & Puntoni, 2024; Kar *et al.*, 2023).

Decision-making activities. GenAI has the potential to enhance clarity and productivity in decision-making across the entire fashion retail value chain at both strategic and operational levels. Strategically, GenAI functions as a copilot, offering decision-makers personalized,

actionable reports, proactive insights, and root-cause analysis (Sukharevsky *et al.*, 2024). By integrating internal data from supply chain and customer management systems with external data on industry trends, consumer behavior, and competitor actions, GenAI provides more accurate and comprehensive insights for business decision-makers (Sukharevsky *et al.*, 2024). Operationally, GenAI can streamline workflows and enhance decision-making efficiency at every stage of business operations and management (Harreis *et al.*, 2023). Moreover, GenAI improves internal communication by presenting data analysis outputs in clear, human-like formats, making complex information more accessible and actionable for teams (Rajaram & Tinguely, 2024).

Challenges of GenAI in fashion retail

Data aspect. Data-related challenges associated with GenAI applications span the fashion retail value chain (see Table 1), primarily involving the lack of high-quality data, difficulties in utilizing unstructured data, and concerns over data privacy and security. Current GenAI-based image-generation systems, such as Midjourney, lack fashion-specific datasets, which may hinder the effectiveness of GenAI deployment in fashion retailing (Tavakoli *et al.*, 2024; Zhang & Liu, 2024a). The collection and analysis of unstructured data remain a challenge, yet they are essential for key operational and decision-making processes in fashion retail (Oosthuizen *et al.*, 2021; Tavakoli *et al.*, 2024).

While concerns about data privacy and security are longstanding, the advanced data processing capabilities and widespread adoption of GenAI have intensified related risks (Dwivedi *et al.*, 2023; Mariani & Dwivedi, 2024). A particularly criticized example is the misuse of Deepfake Technology (DT), as seen in the Zao mobile application's initial stage, which can alter visual, auditory, and video content to create false events and misuse individuals' likenesses, voices, or identities without their consent (Golda *et al.*, 2024). Such breaches pose significant threats, including identity theft and reputational harm to individuals and organizations. In the fashion retail sector, data privacy violations can have cascading effects, eroding consumer trust and diminishing profitability (Humphreys, Koay, Desmond, & Mealy, 2024). Moreover, noncompliance with data protection laws, such as the General Data Protection Regulation (GDPR) in the European Union and the California Consumer Privacy Act (CCPA) in the United States, can lead to severe legal consequences (Golda *et al.*, 2024). These regulations require companies to manage personal data transparently and obtain explicit user consent.

Technical aspect. Technical constraints in applying GenAI to fashion retail primarily arise from incompatibility with existing technologies and proprietary datasets (Singla *et al.*, 2024; Sukharevsky *et al.*, 2024). While collaboration with GenAI providers can help mitigate these challenges, seamless integration remains complex, requiring transformative organizational efforts (Kar *et al.*, 2023). Additionally, a lack of technological expertise among fashion retailers further complicates adoption across various operational areas (Rajaram & Tinguely, 2024).

In fashion design, despite GenAI's potential to enhance creative workflows, early adopters such as Revolve and Collina Strada have encountered notable technical challenges (Bain, 2023a; Mzizi, 2024). Current GenAI-based image-generation systems lack built-in editing tools, requiring designers to manually refine outputs and craft highly detailed input prompts. Other key challenges include ensuring output consistency, translating AI-generated images into 2D pattern designs and physical products, and preserving designers' unique creative identities. However, as GenAI tools continue to advance, these limitations may gradually diminish.

Output aspect. Ensuring the reliability of GenAI outputs is a critical challenge in fashion retail, as issues such as bias, hallucinations, inaccuracies, and misleading or unsatisfactory content may arise. These challenges primarily stem from the nature of GenAI models, particularly those trained on large, diverse datasets, which can generate content based on incomplete or inaccurate information (Mariani & Dwivedi, 2024). Since these issues are

closely linked to data quality, they can be mitigated by using proprietary datasets for model training. Additionally, maintaining output reliability requires rigorous human oversight, including systematic content review, evaluation, and refinement (Nah *et al.*, 2023). Incorporating synthetic data during model training can further help reduce biases, particularly those related to fashion model representation, promoting greater inclusivity and fairness in AI-generated fashion content (Nah *et al.*, 2023).

Social aspect. Social concerns, particularly copyright infringement and job displacement, present significant challenges to the widespread adoption of GenAI in fashion retail. The use of GenAI in content generation, especially fashion design, has sparked debate over copyright issues, as existing legal frameworks remain insufficient to address these complexities. Early adopters of GenAI-assisted fashion design have also faced consumer criticism regarding intellectual property rights (Bain, 2023a). While GenAI enhances efficiency in tasks such as content creation (Bain, 2023a; Mzizi, 2024), concerns about job displacement contribute to resistance among fashion retailers. These anxieties span various roles, including fashion designers, marketers, models, sales associates, customer consultants, and even executives. However, research suggests that rather than eliminating jobs, GenAI reshapes roles and creates new opportunities (Nah *et al.*, 2023). Effectively addressing these social concerns is essential for the successful integration and scaling of GenAI in fashion retail.

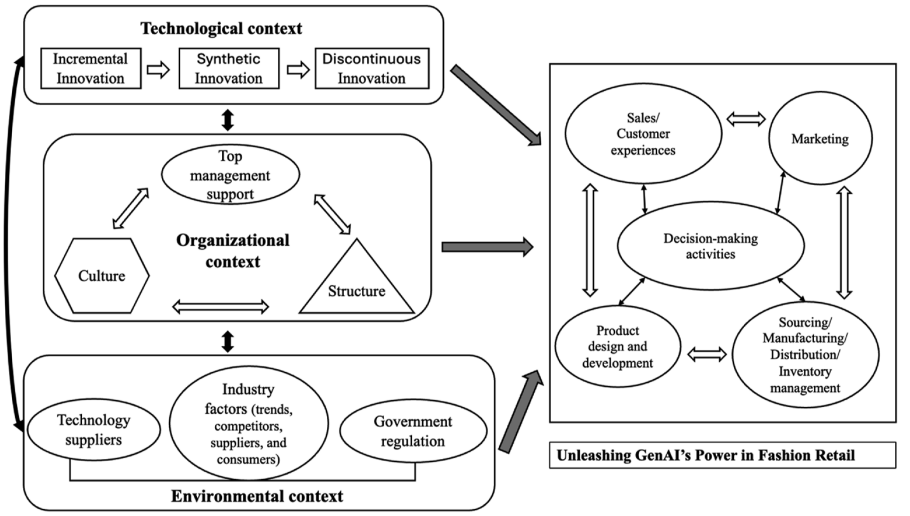
In conclusion, despite the ongoing and emerging challenges of applying GenAI in fashion retail, its potential to enhance efficiency, performance, and competitiveness is undeniable. For fashion retailers, the question is no longer whether to adopt GenAI but how to leverage it responsibly and sustainably. Striking the right balance between scalability and safety is critical to unlocking GenAI's full potential. Hence, this study employs the technology-organization-environment perspective to propose a practical framework, offering actionable guidance for fashion retailers to navigate the complexities of GenAI implementation.

Practical framework for harnessing GenAI in fashion retail

Theoretical background

The Technology-Organization-Environment (TOE) framework, introduced by Tornatzky, Fleischer, and Chakrabarti (1990), is an organizational-level theory that explains how a firm's adoption and implementation of new technologies are influenced by three contextual factors: technology, organization, and environment. These factors drive technological innovation within organizations (Baker, 2012; Nguyen, Le, & Vu, 2022). The technological context encompasses both the existing technologies in use and emerging ones not yet adopted (Baker, 2012). The organizational context refers to the firm's internal characteristics, including top management, operational structure, and corporate culture (Nguyen *et al.*, 2022). The environmental context addresses external factors such as industry trends, technology service providers, and government regulations, which can affect a firm's decisions and execution regarding technological innovation (Chang *et al.*, 2024).

The TOE theory has been widely applied across various fields to explain and guide companies in adopting technological innovations, such as blockchain (Hashimy *et al.*, 2023), big data analytics (El-Haddadeh, Osmani, Hindi, & Fadlalla, 2021), online retailing (Nguyen *et al.*, 2022), and cloud computing (Ahmed, 2020). Its explanatory power has been validated through quantitative and qualitative research (Ahmed, 2020; Chang *et al.*, 2024). The TOE framework's effectiveness stems from two key strengths: comprehensiveness and flexibility. This theory provides a thorough and holistic understanding of technology innovation by considering three contextual dimensions (Chang *et al.*, 2024). It can be adapted to focus on specific technologies and industries, offering the flexibility needed for diverse applications (Ahmed, 2020). Thus, we employ TOE as the theoretical foundation to propose a practical framework (refer to Figure 2) and provide a comprehensive and dynamic understanding and actionable insights for fashion retailers to leverage GenAI based on the proposed framework.



Source(s): Authors' work

Figure 2. A proposed practical framework for harnessing GenAI in fashion retail

Technological context. Based on the TOE theory, the technological context suggests that firms should evaluate, set, and regularly update the degree of innovation brought by emerging technologies, such as GenAI, in alignment with their overall business strategies (Baker, 2012). Technological innovation can be classified into three levels: incremental, synthetic, and discontinuous (Tushman & Nadler, 1986). Incremental innovation involves minor changes that pose minimal risks and are easy to implement, often reflecting new versions or features of existing technologies (Baker, 2012). An example in the fashion industry is using off-the-shelf GenAI tools like ChatGPT to assist with routine office tasks, such as drafting emails or reports. These applications improve existing workflows with minimal risks. However, when GenAI tools are used for consumer-facing tasks, such as generating marketing content or launching new fashion collections, they may introduce critical risks, including inaccuracies and output biases. Additionally, the democratized nature of GenAI makes it challenging for firms to maintain a competitive edge (Cui *et al.*, 2024).

To address these challenges, fashion retailers can leverage proprietary data to develop customized GenAI models tailored to their specific needs (Cui *et al.*, 2024; Sukharevsky *et al.*, 2024). For instance, training GenAI models on exclusive design datasets can help designers preserve their creative legacy and reduce copyright issues. Customized GenAI-powered chatbots, based on consumer behavior data, can optimize fashion recommendations. These applications represent synthetic innovation, which enhances existing technologies and leads to moderate innovation change within a firm (Baker, 2012). However, synthetic innovation demands more technological expertise, stringent human oversight, and risk management compared to incremental innovation. Discontinuous innovation involves substantial shifts from existing technologies or processes, driving radical changes within organizations (Baker, 2012). For example, if a fashion retailer fully integrates GenAI across its entire value chain, from operations to decision-making processes, this would represent a discontinuous innovation.

From a technological perspective, fashion retailers are encouraged to adopt a gradual incremental-synthetic-discontinuous innovation strategy. This progression is necessary due to the varying technological expertise and data readiness required at each stage. In the

incremental innovation stage, most fashion applications use ready-made GenAI tools, such as employing ChatGPT for product descriptions, which don't require custom models or proprietary data. As GenAI adoption deepens, data quality and governance become more critical. For both synthetic and discontinuous innovation phases, technological compatibility with existing systems is essential for generating commercial value and ensuring long-term success (Tavakoli *et al.*, 2024). Strengthening data quality and readiness remains a significant challenge for fashion brands using GenAI applications. For instance, many companies face challenges in processing unstructured data and deriving actionable insights (Singla *et al.*, 2024). Thus, following a phased incremental-synthetic-discontinuous innovation process enables fashion retailers to adopt GenAI technology at an accelerated yet secure pace.

Organizational context. According to the TOE theory, three interconnected factors drive technological innovation in the organizational context: top management support, operational structure, and organizational culture (Baker, 2012; Nguyen *et al.*, 2022; Rajaram & Tinguely, 2024). In our proposed framework (see Figure 2), top management support is positioned at the top, depicted as an ellipse, reflecting its leadership role in shaping both organizational structure and culture (Rajaram & Tinguely, 2024). Without executive backing, the adoption and implementation of GenAI innovations within organizations would be unfeasible. Strong top management support enables fashion retailers to establish a clear vision, define objectives, and guide the successful implementation of GenAI applications, fostering a supportive cultural environment.

The operational structure is a critical component in driving technological innovation, acting as the mechanism that powers the innovation process (Ahmed, 2020; Baker, 2012). The operational structure coordinates technologies, resources, and personnel to translate GenAI applications into commercial value. Represented as a triangle in our framework (see Figure 2), the structure symbolizes the need for stability to ensure the effective deployment of GenAI applications. A robust operational structure begins with clear goals and implementation plans aligned with the overall business strategy. A dedicated team overseeing GenAI adoption and implementation is essential, whether led by a qualified executive or a technological expert. Collaboration, especially cross-departmental and cross-functional cooperation, is also key to leveraging GenAI's potential across the fashion retail value chain. Additionally, establishing an ethical GenAI committee is advisable for risk evaluation and management.

Organizational culture, within the TOE framework, refers to the internal environment that influences technology innovation (Ahmed, 2020; Baker, 2012). In our framework, culture is represented by a hexagon, symbolizing its pervasive influence across leadership, employees, and operational structures. For fashion retailers, culture encompasses intangible factors, such as company history, values, and openness to change, which affect the adoption of GenAI technologies. Tangible elements, like training programs and innovation incentives, also play a critical role in fostering technological advancement (Sukharevsky *et al.*, 2024). For instance, addressing employee concerns about job displacement through transparent communication and upskilling initiatives is essential for creating a supportive environment for GenAI adoption (Rajaram & Tinguely, 2024). In summary, successful GenAI innovation in fashion retail in the organizational context depends on strong top management support, an effective operational structure, and a culture that encourages technological advancement.

Environmental context. The environmental context, as outlined by the TOE theory, encompasses external factors that influence a firm's decision to implement emerging technologies (Chang *et al.*, 2024). Research indicates that factors such as industry trends, technological service providers, and government regulations significantly affect organizational efforts in technological innovation (Baker, 2012; Nayak, Nguyen, Panwar, & Jajpura, 2020). For GenAI innovation in fashion retail, industry factors play a pivotal role due to the fast-paced, competitive nature of the fashion sector (Zhang & Liu, 2024a). In our framework, industry factors are depicted as a larger ellipse, highlighting their substantial impact on GenAI adoption.

Key industry factors include trends, competition, suppliers, and consumer behavior, all of which shape GenAI innovation in the fashion domain. Gaining consumer acceptance is crucial for creating commercial value and sustaining profitability with GenAI applications. Consumer reactions to GenAI-assisted fashion products vary from enthusiasm to skepticism (Lee & Kim, 2024; Sohn, Sung, Koo, & Kwon, 2020), underscoring the need for ongoing research into consumer acceptance. Fashion retailers should conduct GenAI-driven trials and collect consumer feedback to better align applications with expectations. Additionally, industry trends, such as sustainability, and competitors' strategies influence GenAI adoption. For example, GenAI can aid in achieving sustainability goals, such as reducing waste and improving fabric recycling (Bain, 2023a). The stance of key suppliers, such as resistance to digitalized fabrics, also impacts GenAI implementation in product design.

Fashion retailers have access to a wide range of GenAI providers. Tech giants like OpenAI and Google offer foundational GenAI models (Sukharevsky *et al.*, 2024), while companies such as Amazon, Meta, and TikTok provide GenAI tools specifically for marketing and sales in the fashion industry (Bain, 2024a). Emerging startups like Raspberry specialize in developing fashion-specific GenAI models, enabling fashion brands to leverage GenAI better while addressing challenges with generic models (Bain, 2024b). However, selecting the right GenAI provider and establishing long-term partnerships remain challenging. Fashion retailers should conduct thorough research on available providers to make informed decisions.

Developing regulations for GenAI applications, including policies and legislation, have not kept pace with technological advancements (Mariani & Dwivedi, 2024). For example, patent laws have not clarified whether GenAI-generated outputs, such as design images, are eligible for patent protection. Governments play a crucial role in defining the regulatory landscape for AI/GenAI adoption. The European Union's AI Act (2021) sets a regulatory framework for AI providers and users, emphasizing transparency and imposing obligations based on AI system risk levels (Mariani & Dwivedi, 2024). In the United States, the Biden administration's executive order (2023) addresses AI development concerns, mandating private companies to comply with industry standards and adopt best practices for transparency (Bevan, Chui, Kristensen, Presten, & Yee, 2024). Given this evolving regulatory environment, fashion retailers must continually refine their GenAI risk evaluation and management practices to comply with updated regulations.

Implementation of the TOE-based framework in fashion retail and use cases

Adopting GenAI in fashion retail requires a structured approach that aligns with business objectives while addressing technological, organizational, and environmental factors. Our TOE-based framework (Figure 2) provides a comprehensive yet adaptable model, guiding retailers in integrating GenAI strategically and effectively. While each retailer's approach or focus may vary, successful implementation generally unfolds in three key stages.

The first step is defining a clear GenAI innovation goal that aligns with the retailer's overall business strategy. This requires a deep understanding of both internal capabilities and external resources. Identifying where GenAI can create the most value, whether in design, marketing, operations, or customer experience, ensures a purposeful and strategic integration. For example, fashion retailer Revolve has leveraged GenAI to enhance online shopping experiences, using GenAI-driven curation to address consumer decision fatigue and boost engagement (Balchandani *et al.*, 2024).

The second step involves developing a well-designed implementation plan, balancing technological, organizational, and environmental considerations. From a technological perspective, a phased adoption strategy is essential. Retailers typically begin with incremental GenAI applications, such as using ChatGPT, Jasper, and Copy.ai for content generation, as seen with fashion brands like Casablanca, Sheep Inc., Snipes, and Amazon (Bain, 2023a; Bevan *et al.*, 2024; Mariani & Dwivedi, 2024). Despite certain challenges, early adopters such as Revolve, Collina Strada, Cala, and Frame have explored the potential of GenAI-based

image generators like Midjourney, Stable Diffusion, and OpenAI's DALL-E in fashion design (Bain, 2023a). The synthetic phase involves customizing GenAI models with proprietary data, as exemplified by Shopify, Kering, Mercari, and ShopWithAI's ChatGPT-driven shopping assistants (Bain, 2023b). At the most advanced stage, discontinuous innovation emerges, requiring significant investment and expertise to develop proprietary GenAI-powered applications.

On the organizational front, leadership buy-in and establishing a dedicated implementation team are crucial for GenAI adoption. Fostering a culture that embraces GenAI as an enabler rather than a disruptor further enhances adoption and minimizes resistance. Recognizing the transformative impact of AI/GenAI, companies like Levi Strauss have introduced machine learning boot camps to equip employees with the necessary skills to integrate AI into design and operations (Harreis *et al.*, 2023). The environmental landscape also plays a significant role in shaping GenAI adoption. The fast-paced nature of the fashion industry, evolving consumer expectations, and competitive pressures make innovation imperative. Selecting the right GenAI technology provider is equally critical, with companies like Amazon, Meta, and TikTok and fashion-specific GenAI startups like Raspberry offering solutions tailored to different retail needs (Bain, 2023a, 2024b). Additionally, navigating the regulatory landscape remains a priority, as compliance with related laws, such as GDPR and CCPA, is essential for responsible GenAI deployment. Establishing internal governance structures that go beyond regulatory requirements can further safeguard ethical GenAI use (Golda *et al.*, 2024).

The third step is ensuring continuous evaluation and refinement. Given the rapid advancements in GenAI and the dynamic nature of fashion retail, retailers must remain agile, iteratively assessing their GenAI-related initiatives and refining strategies as needed. Beyond commercial value creation, emphasis should also be placed on addressing challenges and mitigating risks.

Application of the TOE-based framework in GenAI-driven fashion recommendations

Inspired by the application approach of the Supply Chain Operations Reference (SCOR) model proposed by Bolstorff and Rosenbaum (2012), this study presents a hypothetical case to illustrate the practical application of the proposed TOE-based framework in a real-world fashion retail scenario. The aim is to provide actionable insights and assist practitioners in navigating the implementation process. The case focuses on GenAI-powered fashion styling recommendation services, selected for their significant potential and growing consumer demand (Shirkhani *et al.*, 2023). The hypothetical context involves a well-established fashion brand, A, which operates its own online retail platform and follows a direct-to-consumer strategy, seeking to integrate GenAI-driven styling recommendations into its offerings.

Applying the proposed TOE framework first requires A to establish a clear strategic objective for leveraging GenAI in styling services, ensuring alignment with its overall business strategy. The focus, whether on attracting new customers, retaining existing ones, or both, determines the required data sources and model training mechanisms. Targeting new consumers necessitates incorporating external data, such as fashion trends and social media consumer behavior, whereas focusing on existing customers primarily relies on internal data. In this case, the primary objective is to enhance online sales conversion by engaging both new and existing customers through GenAI-driven fashion recommendations. To achieve this, A must address three core, concrete objectives: developing a customized GenAI model (technological context), assembling a dedicated implementation team (organizational context), and effectively leveraging external resources (environmental context).

The implementation strategy must comprehensively address the three dimensions of the proposed TOE framework and their interconnections. Technologically, an effective fashion styling recommendation system targeting both new and existing customers should integrate four key data sources: product data, consumer behavior data, expert styling recommendations, and broader fashion industry trends. This requires leveraging both internal and external

resources alongside advanced GenAI expertise. Given the technical complexity, partnering with a reliable GenAI provider is recommended. Therefore, during the development of a customized GenAI model, A must strategically assess and utilize available resources to support technological requirements while proactively addressing potential challenges and risks.

Once the customized GenAI-driven fashion recommendation model is fully trained, a phased implementation approach should be adopted. In-house trials could be initially conducted to evaluate the system's effectiveness, followed by experimental consumer trials incorporating incentives such as discounts. Upon receiving strong positive feedback, A can progressively scale deployment, ensuring the seamless integration of GenAI-powered styling recommendations into its retail ecosystem. Continuous monitoring, evaluation, and refinement of the model, guided by customer feedback and technological advancements, are essential for sustaining a competitive edge and achieving long-term profitability.

Risk assessment and management must be integral to the planning and implementation of the brand A's consumer-facing GenAI-driven fashion recommendation system. A proactive approach is essential for identifying and mitigating risks related to data privacy and security. Technologically, GenAI enhances data protection through advanced privacy-preserving machine learning techniques, such as differential privacy, federated learning, and secure multi-party computation, ensuring data confidentiality during training and inference (Golda *et al.*, 2024; Sai, Yashvardhan, Chamola, & Sikdar, 2024). GenAI can also generate synthetic data, reducing reliance on real customer information and minimizing data breach risks. Furthermore, GenAI strengthens cybersecurity through automated threat detection, secure code generation, and cyber defense automation, with tools like Google Cloud Security AI Workbench and Microsoft Security Copilot exemplifying such capabilities (Gupta, Akiri, Aryal, Parker, & Praharaj, 2023; Sai *et al.*, 2024). By leveraging these technologies, A can safeguard internal and external data throughout the training and deployment of its GenAI-powered fashion recommendation model.

For the brand A, establishing a robust governance framework is essential to managing data privacy and security risks. Clear policies must govern data collection, storage, sharing, and disposal, while well-defined roles and decision-making structures ensure accountability (Humphreys *et al.*, 2024). Continuous risk assessments should guide mitigation strategies, and incident response protocols must be in place to address data breaches, including regulatory reporting and stakeholder communication (Golda *et al.*, 2024). Compliance with data protection laws such as GDPR is critical, necessitating stringent security measures at every stage of implementation (Gupta *et al.*, 2023). Importantly, human oversight and validation remain crucial to ensuring that the GenAI-powered fashion recommendation system adheres to ethical standards and contextual considerations (Golda *et al.*, 2024).

Conclusion, limitations, and future research

This conceptual exploration study provides a comprehensive, forward-looking view of the opportunities and challenges associated with GenAI applications across the fashion retail value chain. Based on a review of existing literature and recent GenAI use cases, our exploratory findings highlight GenAI's transformational impact on the entire fashion retailing process. GenAI enhances productivity across the fashion retail value chain by streamlining design, optimizing operations, and improving marketing and customer experiences. It enables data-driven decision-making at both strategic and operational levels. However, its implementation presents key challenges in four areas: data issues, technical constraints, output reliability, and social concerns. Overcoming these challenges is crucial to fully leveraging GenAI's potential in fashion retail.

This study proposes a practical framework for guiding effective GenAI innovation in fashion retail by applying the TOE theory to this evolving landscape. The framework provides fashion retailers with a structured, actionable approach to navigating GenAI complexities,

maximizing its potential, and addressing associated challenges. Technologically, a phased GenAI adoption strategy, progressing through incremental, synthetic, and discontinuous stages, is recommended. Organizationally, successful implementation requires strong top management support, an efficient operational structure, and a culture that fosters technological advancement. Environmentally, industry dynamics, GenAI technology providers, and regulatory compliance play critical roles in enabling business value creation and sustaining competitive advantage. This framework serves as a strategic guide for fashion retailers to assess and refine their approach to GenAI adoption.

Beyond the fashion retail industry, GenAI practitioners in other sectors can also obtain valuable insights from our study regarding how to harness GenAI's potential to achieve commercial success while addressing associated challenges. Theoretically, our conceptual study serves an exploratory and explanatory purpose, contributing to understanding GenAI applications within the fashion industry, enriching the TOE theory's knowledge base, and inspiring future research on GenAI innovation. However, this study is limited to a conceptual exploration stage, highlighting the need for empirical research to test and validate our findings.

Future research could employ diverse research methods to probe further GenAI innovation in the fashion industry, including quantitative and qualitative empirical approaches and systematic literature reviews. For instance, scholars could conduct in-depth interviews with GenAI-engaged fashion designers, technology professionals, and executives within fashion retailers to explore the GenAI application process and provide empirical evidence for our findings. Moreover, as consumer acceptance of GenAI is pivotal, further research should explore and investigate key factors shaping consumer perceptions, attitudes, and behaviors toward GenAI-empowered fashion products, styling services, and marketing strategies. Overall, this study presents a range of research ideas at the intersection of GenAI and fashion retail, offering inspiration for future research directions.

References:

Ahmed, I. (2020). Technology organization environment framework in cloud computing. *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, *18*(2), 716–725. doi: 10.12928/telkomnika.v18i2.13871.

Bain, M. (2023a). The complete playbook for generative AI in fashion. *Business of Fashion*. Available from: https://www.businessoffashion.com/case-studies/technology/generative-ai-playbook-machine-learning-emerging-technology/ (accessed 11 July 2024).

Bain, M. (2023b). *Putting AI shopping assistants to the test*. Business of Fashion. Available from: https://www.businessoffashion.com/articles/technology/putting-ai-shopping-assistants-to-the-test/ (accessed 20 May 2024).

Bain, M. (2024a). *The big money in AI might be for marketing*. Business of Fashion. Available from: https://www.businessoffashion.com/articles/technology/the-big-money-in-ai-might-be-for-marketing/#:~:text=A%20number%20of%20new%20AI,ads%20that%20grab%20shoppers'%20attention (accessed 11 August 2024).

Bain, M. (2024b). The race to build the best generative-AI platform for fashion design. *Business of Fashion*. Available from: https://www.businessoffashion.com/articles/technology/the-race-to-build-the-best-generative-ai-platform-for-fashion-design/ (accessed 20 July 2024).

Bain, M. (2024c). *Why one AI start-up is cataloguing millions of fashion items*. Business of Fashion. Available from: https://www.businessoffashion.com/articles/technology/why-one-ai-start-up-is-cataloguing-millions-of-fashion-items/#:~:text=The%20idea%20is%20that%2C%20using,data%20scraped%20from%20resale%20sites (accessed 21 July 2024).

Baker, J. (2012). The technology–organization–environment framework. In Dwivedi, Y. K., Wade, M. R., & Schneberger, S. L. (Eds.), *Information systems theory: Explaining and predicting our digital society* (Vol. 1, pp. 231–245). New York: Springer. doi: 10.1007/978-1-4419-6108-2_12.

Balchandani, A., Rölkens, F., D'Auria, G., Barrelet, D., Méndez, P. G., & Amed, I. (2024). *The state of fashion 2025: Challenges at every turn*. McKinsey & Company. Available from: https://www.mckinsey.com/industries/retail/our-insights/state-of-fashion (accessed 10 January 2025).

Bevan, O., Chui, M., Kristensen, I., Presten, B., & Yee, L. (2024). Implementing generative AI with speed and safety. *McKinsey&Company*. Available from: https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/implementing-generative-ai-with-speed-and-safety (accessed 1 July 2024).

Bolstorff, P., & Rosenbaum, R. G. (2012). *Supply chain excellence: A handbook for dramatic improvement using the SCOR model*. *AMACOM/American Management Association*, 1–32.

Chang, H. J., Bruess, F., & Chong, J. W. (2024). Opportunities and challenges of smart technology for small independent fashion retailers: A reflexive thematic analysis using the technology-organization-environment framework. *Fashion and Textiles*, *11*(1), 26. doi: 10.1186/s40691-024-00391-x.

Cui, Y. G., van Esch, P., & Phelan, S. (2024). How to build a competitive advantage for your brand using generative AI. *Business Horizons*, *67*(5), 583–594. doi: 10.1016/j.bushor.2024.05.003.

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., . . ., & Wright, R. (2023). Opinion Paper:'So what if ChatGPT wrote it?' Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, *71*, 102642. doi: 10.1016/j.ijinfomgt.2023.102642.

El-Haddadeh, R., Osmani, M., Hindi, N., & Fadlalla, A. (2021). Value creation for realising the sustainable development goals: Fostering organisational adoption of big data analytics. *Journal of Business Research*, *131*, 402–410. doi: 10.1016/j.jbusres.2020.10.066.

Golda, A., Mekonen, K., Pandey, A., Singh, A., Hassija, V., Chamola, V., & Sikdar, B. (2024). Privacy and security concerns in generative AI: A comprehensive survey. *IEEE Access*, *12*, 48126–48144. doi: 10.1109/ACCESS.2024.3381611.

Gupta, M., Akiri, C., Aryal, K., Parker, E., & Praharaj, L. (2023). From chatgpt to threatgpt: Impact of generative ai in cybersecurity and privacy. *IEEE Access*, *11*, 80218–80245. doi: 10.1109/ACCESS.2023.3300381.

Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda☆. *Technological Forecasting and Social Change*, *162*, 120392. doi: 10.1016/j.techfore.2020.120392.

Harreis, H., Koullias, T., Roberts, R., & Te, K. (2023). Generative AI: Unlocking the future of fashion. *McKinsey&Company*. Available from: https://www.mckinsey.com/industries/retail/our-insights/generative-ai-unlocking-the-future-of-fashion (accessed 19 January 2024).

Hashimy, L., Jain, G., & Grifell-Tatjé, E. (2023). Determinants of blockchain adoption as decentralized business model by Spanish firms – an innovation theory perspective. *Industrial Management and Data Systems*, *123*(1), 204–228. doi: 10.1108/IMDS-01-2022-0030.

Hermann, E., & Puntoni, S. (2024). Artificial intelligence and consumer behavior: From predictive to generative AI. *Journal of Business Research*, *180*, 114720. doi: 10.1016/j.jbusres.2024.114720.

Humphreys, D., Koay, A., Desmond, D., & Mealy, E. (2024). AI hype as a cyber security risk: The moral responsibility of implementing generative AI in business. *AI and Ethics*, *4*(3), 791–804. doi: 10.1007/s43681-024-00443-4.

Jin, B. E., & Shin, D. C. (2020). Changing the game to compete: Innovations in the fashion retail industry from the disruptive business model. *Business Horizons*, *63*(3), 301–311. doi: 10.1016/j.bushor.2020.01.004.

Kar, A. K., Varsha, P., & Rajan, S. (2023). Unravelling the impact of generative artificial intelligence (GAI) in industrial applications: A review of scientific and grey literature. *Global Journal of Flexible Systems Management*, *24*(4), 659–689. doi: 10.1007/s40171-023-00356-x.

Lee, G., & Kim, H. -Y. (2024). Human vs. AI: The battle for authenticity in fashion design and consumer response. *Journal of Retailing and Consumer Services*, *77*, 103690. doi: 10.1016/j.jretconser.2023.103690.

Lyu, Y., Shi, M., Zhang, Y., & Lin, R. (2023). From image to imagination: Exploring the impact of Generative AI on cultural translation in jewelry design. *Sustainability*, *16*(1), 65. doi: 10.3390/su16010065.

Mariani, M., & Dwivedi, Y. K. (2024). Generative artificial intelligence in innovation management: A preview of future research developments. *Journal of Business Research*, *175*, 114542. doi: 10.1016/j.jbusres.2024.114542.

Mzizi, Y. (2024). Fashion's AI dilemma is getting worse. Available from: https://www.businessoffashion.com/articles/technology/fashion-ai-dilemma-is-getting-worse/ (accessed 2 January 2025).

Nah, F., Cai, J., Zheng, R., & Pang, N. (2023). An activity system-based perspective of generative AI: Challenges and research directions. *AIS Transactions on Human-Computer Interaction*, *15*(3), 247–267. doi: 10.17705/1thci.00190.

Nayak, R., Nguyen, L. V. T., Panwar, T., & Jajpura, L. (2020). Sustainable technologies and processes adapted by fashion brands. In *Sustainable Technologies for Fashion and Textiles*. Elsevier.

Nguyen, T.H., Le, X. C., & Vu, T .H. L. (2022). An extended technology-organization-environment (TOE) framework for online retailing utilization in digital transformation: Empirical evidence from Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(4), 200. doi: 10.3390/joitmc8040200.

Oosthuizen, K., Botha, E., Robertson, J., & Montecchi, M. (2021). Artificial intelligence in retail: The AI-enabled value chain. *Australasian Marketing Journal*, *29*(3), 264–273. doi: 10.1016/j.ausmj.2020.07.007.

Rajaram, K., & Tinguely, P. N. (2024). Generative artificial intelligence in small and medium enterprises: Navigating its promises and challenges. *Business Horizons*, *67*(5), 629–648. doi: 10.1016/j.bushor.2024.05.008.

Sai, S., Yashvardhan, U., Chamola, V., & Sikdar, B. (2024). Generative ai for cyber security: Analyzing the potential of chatgpt, dall-e and other models for enhancing the security space. *IEEE Access*, *12*, 53497–53516. doi: 10.1109/ACCESS.2024.3385107.

Shirkhani, S., Mokayed, H., Saini, R., & Chai, H. Y. (2023). Study of AI-driven fashion recommender systems. *SN Computer Science*, *4*(5), 514. doi: 10.1007/s42979-023-01932-9.

Sikka, M. P., Sarkar, A., & Garg, S. (2024). Artificial intelligence (AI) in textile industry operational modernization. *Research Journal of Textile and Apparel*, *28*(1), 67–83. doi: 10.1108/RJTA-04-2021-0046.

Singla, A., Tavakoli, A., Harreis, H., Rowshankish, K., Hjartar, K., Fouilland, G., & Fournier, O. (2024). A data leader's operating guide to scaling gen AI. *McKinsey & Company*. Available from: https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/a-data-leaders-operating-guide-to-scaling-gen-ai (accessed 10 October 2024).

Sohn, K., Sung, C. E., Koo, G., & Kwon, O. (2020). Artificial intelligence in the fashion industry: Consumer responses to generative adversarial network (GAN) technology. *International Journal of Retail & Distribution Management*, *49*(1), 61–80. doi: 10.1108/IJRDM-03-2020-0091.

Sukharevsky, A., Ess, A., Emelyantsev, D., Reasor, E., Hürtgen, H., Sokolov, O., & Kondratyuk, S. (2024). LLM to ROI: How to scale gen AI in retail. *McKinsey & Company*. Available from: https://www.mckinsey.com/industries/retail/our-insights/llm-to-roi-how-to-scale-gen-ai-in-retail (accessed 7 August 2024).

Tavakoli, A., Giovine, C., Caserta, J., Machado, J., Rowshankish, K., Boorstein, J., & Westby, N. (2024). A data leader's technical guide to scaling gen AI. *McKinsey & Company*. Available from: https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/a-data-leaders-operating-guide-to-scaling-gen-ai (accessed 8 October 2024).

Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *The processes of technological innovation*. Lexington, MA: Lexington books.

Tushman, M., & Nadler, D. (1986). Organizing for innovation. *California Management Review*, *28*(3), 74–92. doi: 10.2307/41165203.

Wang, L., Zhang, J., Yang, H., Chen, Z.- Y., Tang, J., Zhang, Z., . . . Wen, J. R. (2024). User behavior simulation with large language model-based agents for recommender systems. *ACM Transactions on Information Systems*, *43*(2), 1–37. doi: 10.1145/3708985.

Wu, X., & Li, L. (2024). An application of generative AI for knitted textile design in fashion. *The Design Journal*, *27*(2), 1–21. doi: 10.1080/14606925.2024.2303236.

Zhang, Y., & Liu, C. (2024a). Unlocking the potential of Artificial Intelligence in fashion design and e-commerce applications: The case of Midjourney. *Journal of Theoretical and Applied Electronic Commerce Research*, *19*(1), 654–670. doi: 10.3390/jtaer19010035.

Zhang, Y., & Liu, C. (2024b). Unveiling how consumers accept digital-only fashion: An empirical examination building upon the functional theory of attitudes. *Journal of Electronic Business & Digital Economics*, *ahead-of-print*(ahead-of-print), 6–7. doi: 10.1108/JEBDE-07-2024-0021.

Zhang, A., Chen, Y., Sheng, L., Wang, X., & Chua, T.-S. (2024). On generative agents in recommendation. In *Proceedings of the 47th International ACM SIGIR Conference on Research and Development in Information Retrieval* (pp. 1807–1817). doi: 10.1145/3626772.3657844.

Corresponding author
Yanbo Zhang can be contacted at: yzha197@lsu.edu