Mapping the Landscape of Generative AI in Retail: A Machine Learning-Driven Systematic Review to Uncover Existing Knowledge, Methods and Research Gaps

Introduction & Background: The advancement of Generative Artificial Intelligence (Gen AI) is reshaping the fashion and retail industry (Sarkar et al., 2025). According to a recent market report, Chief Marketing Officers worldwide believe that Gen AI application and integrations benefit various areas, including content creation and optimization, overall productivity, personalization, predictive analytics, and customer segmentations or profiling (Viveiros, 2024). While the growing interest in Gen AI is reflected in academic research, a comprehensive understanding of Gen AI in retail remains limited. This is because the findings on Gen AI in retail are scattered and fragmented at this point, despite the valuable contributions of individual studies. Thus, this study aimed to address this gap by providing a holistic view of the literature on Gen AI in retail by conducting a systematic literature review aided by machine learning (ML) techniques. Specifically, the following research questions (RQ) were answered leveraging natural language processing (NLP) techniques and large language models (LLMs).

RQ1. What is the existing knowledge and themes in the literature on the use of Gen AI in retail?
RQ2. What theories and methodologies are employed in the literature?
RQ3. What are the gaps and opportunities for future research for Gen AI in retail?

Methodology: Based on the literature on ML-aided systematic reviews (e.g., Lieberum et al., 2025; van De Schoot et al., 2021; van Dijk et al., 2023; Wagner et al., 2022), and PRISMA framework (Moher et al., 2009), this study followed the steps of identification, screening, inclusion, and analysis. First, journal articles, conference proceedings, and book chapters were searched on Scopus. The search criteria were developed through an iterative process to effectively identify literature on Gen AI in retail. The studies published between 2020 and early February of 2025 were searched, given that the public and academic discourse around Gen AI has been shaped more significantly since 2020 (Zehnle, 2025). As a result, 326 records were identified. The abstracts of the 326 records were screened using five ML models—FLAN-T5-large, DeBERTa-v3-large, DistilBERT-base-uncased-finetuned-SST-2-English, Mixtral-7B, and LLama 3—that represent diverse NLP architectures for text classification and language understanding. Records classified as relevant by all or most models were included for further consideration. After a brief manual screening, 60 documents were included for full-text analysis.

Results & Discussion: Before the main data analysis, the 60 articles were preprocessed through two steps: text extraction (e.g., using Python libraries such as PyMuPDF or PyPDF2 to obtain the full text from both single-column and two-column articles) and text cleaning (e.g., removing unnecessary content such as author details, in-text citations, reference lists, and footer text). Next, the text was analyzed to answer each RQ using different approaches and models. First, to answer RQ1, 53 out of 60 papers were analyzed using Meta's LLama 3 model to extract key themes and the use cases that appeared in the articles. The identified themes were clustered

into five areas using lemmatization, TF-IDF vectorization, KMeans++ Clustering algorithm, and Silhouette Score (see Figure 1). The results revealed that Cluster 1 'Optimization Using Generative AI in Retail: Ethical Innovation and Human-AI Synergy' represents the major themes, whereas Cluster 2 'AI/ML-driven Eco-conscious innovations and consumer-centric sustainability' represents the least appeared themes. Second, to answer RQ2, the Mistral 7B language model was used to extract major and minor methodologies, theoretical frameworks, and relevant concepts. The results successfully extracted from the 57 papers indicated that the most frequently applied theories or frameworks were Unified Theory of Acceptance and Use of Technology (UTAUT; n=4), Technology Acceptance Model (TAM; n=4), Theory of Reasoned Action (TRA; n=4), Algorithm Aversion (n=4). The most frequently used methodologies were surveys, experiments, content analysis, and interviews, whereas focus groups, archival research, and ethnography were the least common. Lastly, to answer RQ3, the topics identified across the articles were analyzed in accordance with the clusters of the least frequently appeared themes (Cluster 2 and Cluster 0). Specifically, the topics 'branding and retail strategy' and 'data-driven customer insights' were categorized under Cluster 2. This means that these topics were mentioned but least frequently, implying that the literature can further explore brands' strategies to utilize Gen AI and draw data-driven insights to foster sustainable yet innovative applications.

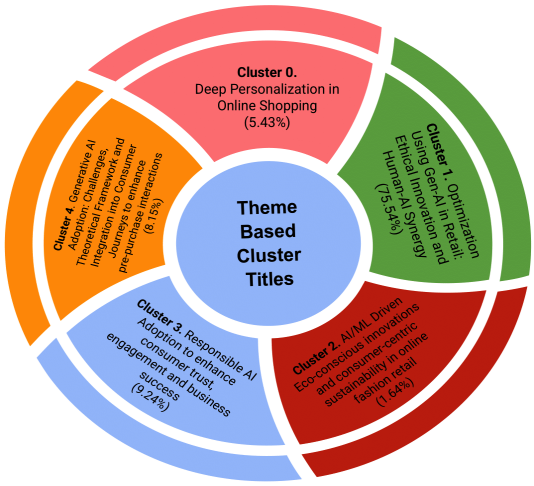

Figure 1. Theme-based clusters

Implications & Conclusion: This study contributes to the growing body of literature on Gen AI in retail by offering comprehensive insights into the field and advancing methodological approaches for systematic reviews. Leveraging NLP techniques and LLMs, the findings provide data-driven understanding to map the current state of the knowledge in this fast-developing topic. Overall, the findings indicated that Gen AI in retail is widely explored in the literature for human-AI collaboration, AI-driven marketing and branding, consumer behavior analysis, and improving online shopping experience through chatbots and personalized recommendations. The additional analysis of the Gen AI use cases revealed that the literature identifies content creation as the most popular implementations (e.g., AI marketing and advertising materials, generating email content, online receipts, online reviews, personalized shopping guidance or product descriptions; Brüns & Meißner, 2024). The literature on Gen AI in retail employs diverse frameworks and methods. Still, future research should focus on gaining deeper insights into AI-assisted sustainability initiatives and emerging technologies such as the metaverse to better leverage Gen AI in retail and smart manufacturing. For example, future research can explore under-examined use cases such as sales video generation, language translation, and voice-based commerce using focus groups or ethnography.

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