Cognitive Commerce in the Fashion Industry: Technological Transformation in the United States

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1. Introduction

1.1 Background

Online shopping has become increasingly popular in the United States, replacing the traditional brick-and-mortar stores. This has created a highly competitive market, where firms fight for their customers through the enhancement of consumer experience (Weiß & Pfeiffer, 2024). Cognitive commerce is a way for companies to use customer information in order to understand what they want, and when. It's about learning from the behavior of users, in order to design interactions that provide customer engagement, creating passionate and loyal customers (mrzimmerman, 2015). Studies have shown that personal user assistance is becoming increasingly relevant, including features such as conversational agents, virtual assistants and try-ons and advanced recommendation systems. (Weiß & Pfeiffer, 2024) An increasing number of popular fashion brands are employing AI-based chatbots, including the American brands Levi's and American Eagle Outfitters (Kang and Choi, 2023).

Using the Multi-Level Perspective (MLP) framework developed by Frank Geels, this study will analyze the ongoing transition across various societal levels: niche, regime and landscape.

1.2 Problem definition

The fashion industry in the United States is increasingly using cognitive commerce in order to enhance the consumer shopping experience (Weiß & Pfeiffer, 2024). While this has the potential to revolutionize the fashion industry by personalized shopping experiences, the transformation presents challenges as it requires changed business models and consumer behavior. Using the MLP framework, this research will examine how cognitive commerce is reshaping the fashion industry at the niche, regime and landscape level, in order to study the industry's ability to adapt to these technological changes.

1.3 Purpose

The purpose of this study is to explore the role of cognitive commerce in the transformation of the fashion industry in the United states. By examining how AI is used to reshape retail operations, by utilizing the MLP framework this study aims to provide a deeper understanding of the driving force behind this industrial transformation. This will further highlight the potential opportunities and challenges for current and future fashion brands.

1.4 Research questions

1. *How are industrial transformations and technological changes occurring in the U.S. fashion industry with the rise of cognitive commerce?*

2. *How does the ongoing shift towards cognitive commerce in the U.S. fashion industry impact different levels within the Multi-Level Perspective (MLP)?*

2. Method and materials

Empirical data was gathered through case studies of fashion brands implementing AI technologies, while theoretical data was sourced from academic literature. The analysis was conducted using the Multi-Level Perspective framework to examine the dynamics of the technological transition and its impact on the fashion industry.

The study uses a combination of academic literature, industry reports, and real-world case studies. Data sources include journals, government reports, corporate white papers, and industry databases. Key sources such as IEEE Xplore, and the Journal of Neuroscience, Psychology, and Economics provide insights into AI applications in consumer behavior and retail. Additionally, case studies from major fashion brands like Levi's, Nike, and Stitch Fix offer empirical evidence of cognitive commerce in the fashion industry.

Government documents, including the Federal Register and reports from the White House, provide regulatory changes affecting AI deployment in fashion retail. The quality of data was ensured by prioritizing sources with a strong reputation for accuracy and transparency. Corporate reports from industry leaders, such as Levi Strauss & Co.'s AI implementation with Google Cloud, were evaluated critically to assure credibility.

3. Theory

3.1 The multi-level perspective

The MLP framework explains transitions as interactions between three levels; niches, socio-technical regimes, and the technological landscape, where a higher level has stronger alignment between elements (Geel, 2011).

According to the MLP framework, a transition is seen as a systematic change and is triggered when external forces create pressure. This pressure gradually weakens the stability of the regime level, allowing the niche level innovations to challenge the existing systems. If integrated successfully, these can then transform the dominant regime, resulting in technology evolution (Kaukoranta, 2019).

Radical innovations are developed at the niche level, where they can be developed in a protected environment, with the hopes of challenging the dominant designs in the existing regime at a later stage. The socio-technical regime coordinates actors by establishing rules, routines and legal frameworks. Regimes are often restrained by a lock-in, making it sometimes difficult for niche innovations to establish. The third level, the landscape level, sets external conditions and constraints, creating a broader context (Geels, 2011). See the levels illustrated in Figure 1 below.

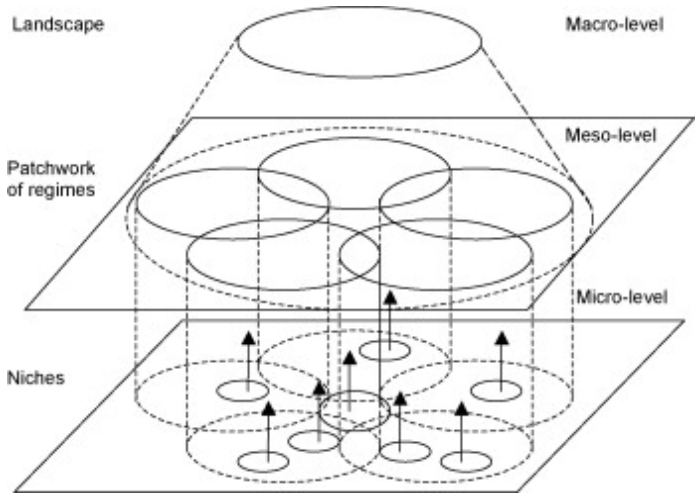


Figure 1: The levels of the MLP framework (Genus and Coles, 2008)

4. Findings

4.1 The niche level

The niche level is for emerging innovations and experiments. In the fashion industry, there has been an increased amount of usage of cognitive commerce. Fashion brands, such as Stitch Fix, are using AI in order to produce personalized recommendations for their customers. Stitch Fix, an original personal styling service, uses AI driven recommendation in order to provide personalized fashion suggestions for their customers. Their AI model analyzes customer preferences, purchase history and style feedback to predict what clothing their customers would enjoy. They continue to optimize their machine learning models, creating a highly tailored experience for each customer (Gongalla, 2023).

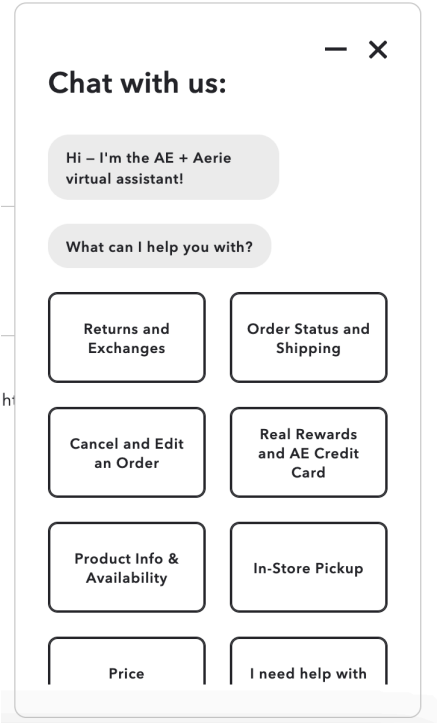
Another innovation is the use of virtual try-ons, which brands like Gucci and Nike are actively exploring. By leveraging AI technology, Nike enhances the shopping experience, allowing customers to virtually visualize how the shoes will look on their feet before making a purchase (Zou et al., 2025).

Cognitive commerce in the fashion industry has also been utilized in the form of predicting demand. Levi Strauss & Co used Google Cloud's data analytics in order to identify the demand of baggy jeans across all demographics. Levi's collected purchase data, web browsing behavior and retail partner sales used machine learning to predict fashion trends more accurately, ensuring that looser jeans fits stayed in stock and met customer demand (Bousquette, 2025).

At the niche level of the MLP framework, emerging innovations like these represent early-stage technological experiments. They remain in the innovation phase but have the potential to influence the landscape level (Geel, 2011).

4.2 The regime level

Observing the dominant structure in today's fashion industry it can be noted how many brands are shifting from traditional brick-and-mortar stores to AI utilizing omnichannel retail. Many popular brands, such as American Eagle Outfitters, for example offer AI chatbots in order to provide customer service (Kang and Choi, 2023). See an example of American Eagle's virtual assistant in figure 2 below.



American Eagle's chatbot, providing customer service (American Eagle Outfitters, 2015)

However, the regime also presents challenges that may require regulatory adaptation, and ethical considerations. As E-commerce relies heavily on customer data, concerns about privacy and algorithmic bias would need to be addressed in order to push towards a dominant design. These concerns highlight the need for regulatory frameworks to ensure that the evolving technology aligns with consumer protection and values (I. Mohana Krishna et al., 2023). In order to ensure data security and ethical applications of AI, robust governance frameworks should be implemented, which would ensure a trustworthy usage of AI in the fashion industry. This could include user education, policies and clear guidelines to protect consumer interests (Fraser and van der Ven, 2022).

4.3 The landscape level

Customer behavior was significantly influenced by the COVID-19 pandemic, resulting in an increased rate of purchased goods online. According to the article *Digital Consumer Behaviour and eCommerce Trends during the COVID-19 Crisi*s, written by Petra Jílková and Petra Králová, 43% of all respondents had shopped online since the COVID-19 crisis began in comparison with 12% before the crisis. At the same time, weekly shopping through the internet increased as well (Jílková and Králová, 2021).

E-commerce relies heavily on machine learning, for example through trend predictions and personalized shopping. As the price of data storage decreases and the speed of data processing increases there's a massive amount of data being generated and stored, and becoming more affordable. This enables machine learning to flourish, as it gets access to a massive dataset (Tufail et al., 2023).

However, there are also restrictions to the use of AI and machine learning in the fashion industry. Especially identified issues are privacy, security data biases, "black box", ethical issues, legal issues and regulation policies (Mukhamediev et al., 2022).

There have been an increase of concerns regarding data privacy. In the EU, the need for accountability in the usage of AI has resulted in GDPR and the AI Act, however, gaps remain, for example the division of responsibility between AI providers and deployers (Nisevic, Cuypers and De Bruyne, 2024). In October 2023, Joe Biden signed the *Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence*. This directive aimed to ensure that AI technologies are developed and utilized in ways that uphold American values, protect national security, and promote economic competitiveness (unblock.federalregister.gov, 2023). However, this action was reversed by President Donald Trump in January 2025 with his Executive Order 14179, titled *Removing Barriers to American Leadership in Artificial Intelligence*. This order aimed to promote innovation free from ideological constraints, in order to strengthen America's position within artificial intelligence (THE WHITE HOUSE, 2025).

5. Discussion

The fashion industry is going through a significant transformation through cognitive commerce. By applying the MLP framework, the effects of cognitive commerce on consumer interactions and business operations can be observed.

At the niche level, cognitive commerce offers tailored recommendations and shopping experiences, virtual try-ons and demand forecasting. While these technological advancements demonstrate potential, they still face challenges to get adopted into the dominant structures of the fashion industry. These challenges include consumer scepticism and privacy concerns regarding data. In order for the niche innovations to become more broadly accepted by customers, and to transition into industry norms, these concerns must be addressed, for example through transparency and struct policies for data handling.

At the regime level, cognitive commerce in the fashion industry is reshaping traditional business models. Major brands have adopted AI-driven chatbots and omnichannel strategies to improve customer engagement. However, there are some ethical concerns related to privacy and algorithm bias, indicating the need for regulation to ensure that the use of cognitive commerce aligns with customer values and ethical standards in order to achieve stability within the regime level.

At the landscape level, external events such as the COVID-19 pandemic significantly changed consumer behavior, pushing towards online shopping and e-commerce and creating a window of opportunity for change. Furthermore, because of technology advancements, decreased data storage costs and increased processing power have strengthened the landscape for cognitive commerce. However, in the United States, there's still uncertainty regarding regulations. Joe Biden introduced

measures to ensure safe development and usage of AI, which was reversed under the Trump administration in 2025. This hints at a shift towards a deregulated environment, which may accelerate innovation and provide an opportunity for cognitive commerce in the fashion industry to become more dominant in the system, while also raising concerns about ethical and security implications.

The ongoing transformation of the U.S. fashion industry through cognitive commerce demonstrates how technological advancements interact with existing industry structures and broader societal trends. The MLP framework illustrates the interaction between the three different levels, demonstrating both opportunities and challenges. The balance between innovation, regulation and ethical considerations will be crucial moving forwards, determining if cognitive commerce will continue transforming the fashion industry.

6. Conclusion

The purpose of this study is to explore the role of cognitive commerce in the transformation of the fashion industry in the United states utilizing the MLP framework. The following research questions have been studied:

1. *How are industrial transformations and technological changes occurring in the U.S. fashion industry with the rise of cognitive commerce?*

2. *How does the ongoing shift towards cognitive commerce in the U.S. fashion industry impact different levels within the Multi-Level Perspective (MLP)?*

To answer the first question, the transformation of the U.S. fashion industry is being driven by cognitive commerce, as companies integrate AI-powered tools such as chatbots, virtual assistants, and personalized recommendation systems. Major American fashion brands like Levi's are being pushed to innovate continuously to meet evolving customer expectations.

To answer the second question, by analyzing the transition through the MLP framework, the study has highlighted how, at the niche level, innovations such as virtual try-ons and advanced recommendations are disrupting conventional retail models. At the regime level, established fashion brands are integrating AI powered tools to enhance personalization. Finally, at the landscape level, external factors such as the pandemic, advancements with AI, and new regulations, have accelerated the adoption of cognitive commerce in the fashion industry, while also raising concerns about privacy and security.

To summarize, cognitive commerce is reshaping the U.S. fashion industry. The study demonstrates how AI-driven commerce is not only a response to changing market dynamics but also a catalyst for long-term industrial transformation.

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