Application of Artificial Intelligence in Recommendation Systems and Chatbots for Online Stores in Fast Fashion Industry

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Abstract. The competition in the fast fashion industry is getting more complex as online-only retailing has emerged in the industry. The fast fashion online-only companies rely on e-commerce platforms to merchandize products and provide services to customers. Online-only companies use artificial intelligence (AI) and machine learning (ML) through recommendation systems and chatbots to improve business functions and enhance online customer shopping experience. Fast fashion multichannel companies (online and physical stores) have a concern about their physical stores' performance, and the role that physical stores can play to enhance customer experience. Multichannel companies are continuously looking for new ways to optimize services and enhance customer experience in both channels. Physical stores can play a crucial role in enhancing customer experience. By collecting data on in-store customers, their interests and interactions with products, multichannel companies can analyze such data using AI and ML to optimize production, marketing, and customers experience. This paper highlights the application of AI in ecommerce by fast fashion companies. Also, this paper discusses the effect of fast fashion online-only companies on fast fashion multichannel companies' physical stores, aiming to understand the current impact of online-only business on physical stores performance. This paper, further, discusses the future role of fashion physical stores in the industry.

Keywords: Online-Only Companies, Multichannel Companies, Artificial Intelligence, Machine Learning, E-Commerce, Fast Fashion, Customer Experience.

1 Introduction

The fashion industry has witnessed a significant evolution due to internal and external factors. Intense cultural expressions in streets, events, and other popular social settings as well as televisions and the movie industry have significantly influenced the fashion industry. The industry has witnessed an increased rate of fashion shows and catwalks that have increased the rate of fashion awareness among customers. Customers have begun adopting fast-paced living standards, leading to rapid changes

in customers' preferences and demand. "There were high rates of expansion, intense competition, increased number of fashion seasons and increased manipulation in the supply chain that has led to significant changes in the industry" [1]. Companies in the fashion industry have changed their pace of operations by compressing lead times, leading to increase the rate of demand satisfaction by availing the right products at the right time [2]. The change in the industry has led to the emergence of fast fashion. Fast fashion is a sector in the fashion industry whereby fashion companies frequently update inventories with products that follow the latest fashion emerged in the market, adopt marketing approaches based on big data analysis, and respond to demand by offering the right products to the right audience at low prices [3].

Along with adopting flexibility by operating shorter, comprehensive, and agile supply chains, fast fashion online-only companies have adopted e-commerce retailing model that helps companies to get broad customer base and improve business functions. "E-commerce refers to the deals of buying and selling products and services on the internet" [4]. The growth of e-commerce has required online companies to use advanced technologies such as AI and ML to improve business functions and understand customers, resulting in enhancing customer experience. Companies use AI and ML through recommendation systems to analyze customers behavior and searches history to predict what customers prefer [5]. The use of AI and ML through recommendation systems save customers time as customers can find preferred products quickly and easily [6]. The application of AI and ML in e-commerce is also found in the chatbots which provides automated communication through different forms including text, voice, and pictures [7]. AI and ML help companies to automate service processes which reduces costs and enhances service quality, resulting in enhancing customer experience [7].

In-store customer experience is a core objective for fast fashion multichannel companies. The growth of the in-store fast fashion businesses is aligned to the continuous understanding of customer behavior [8]. Technology is an elemental key in enabling fast fashion businesses to understand and anticipate customers' needs through in-store consumer behavior analysis. According to [9], technology has transformed the art of shopping with objects becoming the center of operations enhancing service delivery by speeding up processes, minimizing errors, and incorporating flexible organization systems. The major concern for fast fashion multichannel companies is the effect of ecommerce on their physical stores' performance. Even though multichannel companies maintain online stores, their business, specifically physical stores, have been affected, and many multichannel companies have announced closure of their physical stores including H&M, GAP, Abercrombie & Fitch, and Forever 21.

This paper is divided into three sections. First section presents the adoption of ecommerce by fast fashion companies and the use of AI and ML in e-commerce platforms. Second section discusses the effect of e-commerce on multichannel companies' physical stores. Last section discusses the future role of multichannel companies' physical stores.

2 Ecommerce and Fast Fashion

The internet has become a marketplace wherein customers can find, compare, and purchase fashion goods upon their considerations. Customers use fashion e-commerce platforms as an alternative shopping way of traditional commerce. Traditional commerce is defined as the buying and selling of goods and services with physical interaction between sellers and buyers [10]. “E-commerce, on the other hand, is the purchasing and selling of goods and services on the internet without physical interaction between sellers and buyers” [10]. Increased online shopping for fashion-related goods has transformed fashion companies’ activities as companies use online platforms as a channel to sell and market products. Companies use data analytics tools to analyze data from e-commerce platforms to design customized marketing campaigns and target a specific audience. Companies collect data on customers from e-commerce platforms along with fashion data that fashion companies generate, to personalize products and services to enhance online customer experience. Big data and data analytics tools such as AI and ML have become a source of competitive edge in the fast fashion industry.

Table 1. Comparison between Traditional Commerce vs. E-Commerce.

	Traditional Commerce	E-Commerce
Definition	Physical stores that buy and/or sell products and services.	Online stores that buy and/or sell products and services over the internet.
Mode	Direct and physical interaction with customers – face-to-face.	Electronic interaction between sellers and buyers – online transaction.
Availability	Physical stores have a limited time of operation based on each country's regulations.	Online stores are not obligated to certain operation times.
Product inspection	Customers can check and/or try products before purchasing.	Customers cannot check and/or try products before purchasing.
Presence	Physical stores have limited presence due to the business strategy of expansion, budgeting, and business type.	Online stores are based on the internet and can be reached from anywhere in the world.
Establishment and Maintenance	Physical stores require more investment to establish and maintain attractive stores.	Online stores require less investment to establish and maintain the platform than physical stores.
Payment Methods	Physical stores accept traditional payment methods such as credit	Online stores accept the traditional payment methods along with variety of

	cards, cash, cheque, etc.	online payment methods such as PayPal, Amazon Pay, etc.
Delivery of Goods	Physical stores provide Instant delivery of goods.	Online stores deliver goods to customers after some time of making the purchase.

E-commerce sales are evaluated at 4.28 trillion USD in 2020, and it is estimated to grow to reach 5.4 trillion USD in 2022 [11]. “57% of the international internet users purchased fashion-related items via the internet, which made the apparel segment the most common online shopping category globally” [11]. 24% of the fashion revenue globally is going to be produced online by 2024 as shown in figure 1 [11]. The growth of online store sales, in general, is attributed to the integration of shopping functionality into the content display on social media and the improvement in mobile browsing [11].

Fig 1. Global Fashion Sales and Fashion Online Sales in 2024.

In a global comparison of online fashion revenue, 55% of fashion revenue in China ($221 billion USD) is going to be produced online by 2024, which makes China's fashion online sales the largest fashion online market worldwide [12]. 26% of the fashion revenue in the United States ($43 billion USD) is going to be generated online by 2024 [13]. 29% of the fashion revenue in the U.K. ($10.4 billion USD) is projected to be produced online by 2024 [14]. 21% of the fashion revenue in Germany ($5.7 billion USD) is anticipated to be generated online by 2024 [15]. 17% of the fashion revenue in Japan ($4.6 billion USD) is anticipated to be produced online by 2024 [16]. Figure 2 represents the 5 largest Fashion online markets around the world in 2024.

The vast usage of e-commerce for fashion has significantly revolutionized the fast fashion industry, and it has become an integral part of business development. The fast fashion industry has transformed as fashion companies with physical stores presence expanding the business to the online environment (multichannel - “physical and online stores”) and there are newcomers to the market based online business [17]. Based on these two business types, there are three proposed online-based market

entries for fast fashion companies including entering a host market with a physical store first and then expand to an online store (multichannel), entering a foreign market with an online store then expand to a physical store (multichannel), and/or entering a market only with an online store (ecommerce) [17] as described in table 2.

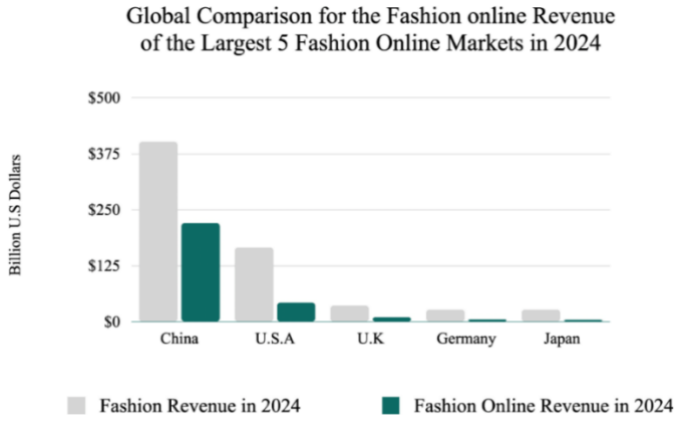

Fig 2. Global Comparison for the Fashion Online Revenue of the Largest 5 Fashion Markets in 2024.

Table 2. Developmental process of online-based internationalization [17].

Location Advantages	Ownership-Specific Advantages: High	Ownership-Specific Advantages: Low
High	Type 1: Physical → online expansion	Type 2: Online → physical expansion
Low	Type 2: Online → physical expansion	Type 3: Online only

- **High ownership-specific advantages:** strong multinational knowledge and experience and brand identity [17].
- **High location-specific advantages:** psychic distance among countries such as language, legal and political systems, and educational levels [17].

Type 1: Companies with high ownership-specific advantages and high location-specific advantages generally establish the business with a physical store first and then expand the existence of the business to online [17]. Although intercontinental companies enter markets with physical stores first, they would not expand their physical existence to the rural areas in the same country due to demand uncertainty in rural areas [17]. They prefer to expand to online stores to reach wider base of customers in the rural areas [17].

Type 2: Companies that have either low ownership-specific advantages or low location-specific advantages establish an online business at first and then expand the business to physical stores after increasing the ownership or location advantages [17]. This strategy is followed because it requires less investment which reduces risks for companies [17]. After lowering the risk by gaining knowledge and experience of the market and customers become aware of the brand, companies expand to physical stores [17].

Type 3: Companies that have low ownership-specific advantages and low location-specific advantages establish an online-only business because of the high uncertainties and risks [17]. This type of business has a wide range of assortment that makes it difficult to open attractive physical stores to customers [17]. Restrictive government policies also play a role for this type of business to establish physical stores in forging countries [17].

2.1 Application of AI and ML in Ecommerce

Intense competition in the fast fashion industry makes companies look for ways to leverage the latest technology to create a niche and gain a competitive advantage in the market. Companies seek different ways to create demand and make brand awareness to help them become the leading players in the industry [18]. Companies constantly look for new ways that help them sell their products before they become out of fashion. “AI and ML continue to change the way companies do business across several sectors to boost their sales growth and optimizing e-commerce operations” [5]. Artificial Intelligence is a technology with the capabilities to develop theoretical methods, technologies and applications that efficiently simulate and extend human Intelligence [5]. Machine learning is the application of technology to recognize patterns to enhance data mining and probability theory, leading to useful statistics outputs. “Artificial intelligence and machine learning emphasize more on computation, perception, reasoning, and action” [4].

Online companies increasingly use AI and ML to improve sales processes and enhance online customers’ shopping experience. AI and ML provide companies with different applications in e-commerce that enable companies to analyze large datasets regarding customer behavior and usage patterns. Online companies use recommendation systems to create a holistic shopping experience for their customers. “Such recommendation systems use machine learning algorithms to achieve deep learning and analysis of customer behaviors, thereby making it easier for the companies to analyze large datasets and effectively predict types of products that customers find more attractive” [5]. “Algorithms in recommendation systems analyze customers’ searches and record crucial details” [6]. “After obtaining the key details, the recommendation system analyses available data and displays relevant suggestions to customers, thereby making it easier for customers to find products quickly without wasting time” [6]. AI and ML enhances the effectiveness of recommendation systems as making recommendation systems a comprehensive system depending on human-computer interaction [6].

Companies like Amazon and Walmart implemented AI and ML in e-commerce. The rapid adoption of technology and inevitable need to compete has made several other e-commerce retailers to invent and implement AI an ML in their operations [18]. For instance, Alibaba extensively uses AI and ML to improve its e-commerce retail system and processes. Alibaba uses “Taobao”, a recommendation system that use ML to recommend products matching customers’ demands and preferences [19]. Since Alibaba offers online market for sellers, an online buyer can log into the platform and search for fashion products, machine learning algorithm quickly sorts out different products that meet the customer’s preferences. Forever 21 is also a fast fashion company that uses AI and ML in their online store. Forever 21 allows customers to use visual search navigation powered by artificial intelligence. Forever 21 introduced AI-enabled visual search and navigation feature that allows online shoppers to search for dresses, pants, shorts, jeans, and tops with results appearing as a standalone “Discover Your Style” module on the Forever 21 webpage and mobile app [20]. Besides, Forever 21 Company uses AI and ML technology to improve merchandising, recommendations and lifecycle analysis. Fast fashion companies continue to implement AI and ML in their online store to optimize sales and online customers shopping experience.

The other application of AI and ML in e-commerce is found in chatbots. Chatbots help online companies to automate service processes, hence reducing labor expenses and enhance service quality [7]. The primary function of chatbots is to provide automated support to customers online. “Chatbots allow communication via text, voice and pictures” [7]. Chatbots recognize simple commands that save customers time and enhance their satisfaction. Besides, chatbots help customers to conduct purchasing in a conversational text format as chatbots use natural language processing techniques [4]. Through such AI assistants, customers can easily find suitable products, check the availability of products, do quick comparisons with other products, and escalate the payment processes. [7]. AI and ML play a crucial role in enhancing online customers experience as they improve customers conversational shopping and directions as well as allowing businesses to operate effectively.

3 The Effect of Online-Only Business on Physical Stores

Online-only companies have powerful capabilities, which obviously affected multichannel companies’ physical stores. Online stores are more cost-effective as compared to physical stores [21]. Online stores are not exhausted with physical stores’ operating costs. Online retailers benefit from running online-only wherein maintaining online stores and centric warehouse help retailers to reduce operation costs. “Online retailing works as the main channel for reducing the advertising cost, direct managing promotion campaign using visual power and latest technologies online” [22]. “Online companies can easily reach out an uncountable number of audiences in a short time who will be target customers” [22]. Online companies reduce merchandise consumption cycles [21]. When a new design becomes available,

customers can simply review it online and purchase it rather than waiting for physical stores to make it available at stores.

The impact of online-only retailing on multichannel companies' physical stores is found on H&M. H&M has declared the closure of 160 stores, and this was caused by accumulated stocks of more than $4 billion for unsold items, which has forced the company to provide significant discounting to clear out the goods [23]. H&M has planned to throw more resources into online sales, and they are upgrading the online store including improving product navigation and display, and shorter delivery times [23]. The U.S. fashion industry, including home grown icons such as GAP and Abercrombie & Fitch, have announced closures of 4,500 stores in 2019 alone [23]. Charlotte Russe has announced bankruptcy during 2019, and it could end up liquidating if it cannot find an investor to keep the business running [23]. Forever 21 company would cut out the operations in 40 countries as its revenue diminished from more than $4 billion to $3 billion in 2016 [24]. Forever 21 is planning to close 350 stores over all and fired more than 10,000 employs [24]. The company, however, will continue executing the online store [24]. According to [25], the expansion strategy made Forever 21 unable to invest in their supply chain, which made the company take more time to get fresh styles of clothes to market at a time when shoppers were hungry for newness. Forever 21 failed to understand markets outside of America as it opened more shops in Asia and Europe [25].

4 Discussion and Recommendations

The competition in the fast fashion industry has become more complex as online-only business has emerged in the industry. E-commerce by online-only companies will continue to shift the industry from strictly brick-and-mortar to mobile and social media-based sector, opening doors for more adoption of AI and ML to enhance business functions and customer experience. AI and ML are the main tools used by online-only companies to handle online customer, online-only companies will increase the involvement of AI and ML in their businesses in the future. The increasing adoption of AI and ML through recommendation systems and chatbots will improve marketing strategies, customize online offerings, and personalize customer experiences which lead to sustaining competition in the market in the future.

Multichannel companies, on the other hand, can capitalize on the advantage that they possess physical and online stores. Multichannel companies' physical stores can play a crucial role in enhancing online customer experience and help companies to optimize business functions. By gathering in-store data on customers and discovering their interests, companies can personalize online services that enhance customer satisfaction and customers retention. Integrating in-store data along with the online data, companies can develop effective recommendation systems and chatbots that make personalized suggestions and provide a superior automated and personalized support for online customers. Gathering in-store data about customers and their interests can help companies customize production. By discovering fashion interests, companies can produce products that match customers' needs and preferences,

resulting in increasing sales, reducing wastes, and better resource customization. Therefore, multichannel companies should through more resources in in-store customer behavior analysis methods such as loyalty cards, QR codes, smart mirrors, smart hangers, among other technologies aiming to collect more data about customers. It is crucial for multichannel companies to prepare plans for the transformation in the industry, trade tensions and uncertainties of markets due to unexpected circumstances such as health pandemics that caused closure of physical stores. Multichannel companies should reconsider the role of their physical stores as physical store can be used as a source of collecting data about customers and their interests to enhance online customer experience and business functions.

5 Conclusion and Future Work

The fashion industry has significantly changed due to the influence of television, the movie industry, the change in supply chains' structure, and increased number of fashion shows and seasons. This change has yielded the so-called fast fashion. The competition in the fast fashion industry has become more complex as online-only business has emerged in the industry relying on e-commerce. Online-only companies integrate AI and ML through recommendation systems and chatbots on ecommerce platforms to optimize business functions and enhance online customer experience. Online retailing in fast fashion industry has affected multichannel companies' physical stores' performance as multichannel companies closed shops in the last few years. Multichannel companies, however, will have opportunities in the market if they adopt AI and ML along with the in-store data effectively. They will be able to understand customers as well as personalize products and services and customize marketing campaigns. Future work should focus on developing a method that helps multichannel companies to effectively involve physical stores in enhancing customers' experience. Innovative methods should concentrate in collecting in-store data about customers and their interests with the aim of enhancing same customer's experience when they shop online. This method will help companies to improve recommendation systems and chatbots to enhance online customer experience as well as boost sales.

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