

# An Evaluation of Artificial Intelligence Components in E-Commerce Fashion Platforms

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**Abstract.** Technological innovation and democratization of artificial intelligence (AI) have been leveraging the potential success in every field we know today, while more is yet to come. This paper presents an analysis of AI achievements within the fashion industry, particularly in e-commerce fashion brand platforms, and how it is impacting the consumer personal sphere, particularly the decision-making process of young (Gen-Z) consumers. The field of AI has been evolving in such a way that allows companies to not only improve their supply and customer demand, but also provide a shopping experience that goes beyond the mechanical “select and buy”: AI-driven touchpoints influence and enrich each stage of the decision-making process, whether more positively or negatively. Ultimately, this paper intends to provide the reader with a better knowledge of AI and fashion e-commerce joining applications, and to delineate their impact on the online customer journey.

**Keywords:** Artificial Intelligence, E-commerce, Digital Fashion Platforms, Consumer Behavior.

## 1 Introduction

The vast concept of artificial intelligence (AI) has been extensively used throughout the years, ever since its benefits in connecting human intelligence with computer logic have been proved. The extension across human activities and the augmentation of human tasks are what makes AI so relevant and important in so many industries, and the fashion industry is no exception [1].

The applications of AI in the fashion industry are very widespread, but the most far-reaching have been in trend forecasting and decision making in supply chain management, according to Chris Boos, in the Business of Fashion [2]. From a customer-centric perspective such as user experience (UX) or customer service, whether being on social networks or fashion marketing, AI has an enormous potential that has been

yet to be successfully invested (meaning: to reduce costs and increase efficiency): in 2017, fashion brand Everlane backed off its AI-powered chatbot on Facebook Messenger to concentrate their resources on the email format. Obviously, one example in an extensive industry is not very telling but it is representative of the challenges fashion brands have to face in order to better attend customers' needs and to drive profits [2].

Therefore, this paper intends to consider e-commerce AI-based approaches and to provide an analysis on how fashion e-commerce has been, in fact, following these technological innovations, with a particular focus on the user experience and customer service-related technology.

The paper is organized as follows. Section 2 reviews related work. Section 3 describes the methodology used in our study. Section 4 presents the quantitative and qualitative results obtained in a pilot user study. Section 5 offers concluding remarks.

## **2 Related Work**

As a research topic, the applications of AI in the fashion industry have been wide and intensively covered [3]. Most existing literature on this topic aims to illustrate and explain the possibilities and advantages of AI in three main areas within the fashion industry: fashion sales forecasting, textile apparel manufacturing, and supply chain and garment design.

In this context, Leanne Luce [1] explores AI through a fashion lens with the aim of creating an understandable guide for non-AI experts. Although the author dives into the AI components, from consumer-facing platforms to fashion manufacturing, a perspective from the customer experience and the direct impact on the user behavior is lacking. Another general guide for AI in the fashion business is presented by Thomassey and Zeng's [3], which follows a commercial standpoint and focus on business and economic research in areas such as retailing, manufacturing, and sourcing.

More focused on the AI applicability is the work by Giri et al. [4], which considers the impact of AI in the fashion and apparel industry, specifically throughout the supply chain. The authors take into consideration several published articles to conduct their research, firstly categorizing them according to the AI tools, then proceeding to a classification based on supply chain stages and types of business (B2C or B2B). This work supports the premise in the beginning of this paper, where its conclusion points out the research gap from a B2C perspective, especially from a consumer-oriented archetype in the fashion industry.

Bonera and Corvi [5] centered their research on the online buying process, by analyzing the influence of psycho-social variables in the online fashion purchase in e-commerce sites. Their conclusions, however, connect the utilitarian and hedonic shopping dimensions in the consumer experience to interactive web features, acknowledging vaguely the concept of technology and providing a narrowed approach to e-commerce platforms (in this case, websites). By expanding customer-centric

research to multichannel experiences in fashion retail through a quantitative approach, Blázquez [6] brought to light the influence of technology on perceptions and motivations of fashion consumers. Despite the contribution this research presented to the topic, the author indicates the importance of a qualitative inquiry to enrich the study of consumer experience, as well as the pertinence to focus on specific targets, since this research included a wide age and gender range.

None of the aforementioned works explore in depth the direct impact on the consumer or better yet, how the young fashion consumer is affected when being an active actor in the interactive process with data-based and AI-enabled techniques. Considering this gap, this paper intends to consider e-commerce AI-based approaches and to shine a light on how these technological techniques have been affecting the young consumer experience on e-commerce fashion platforms.

### 3 Methodology

An empirical research based on netnographic methodologies was conducted to demonstrate the application of AI technology and its effects to the young consumer in digital fashion platforms (apps and websites).

This research was based on the Convergent Mixed Methods Design [7], a mixed-methods approach that combined quantitative data, such as psychographics and behavioral data, from a questionnaire with qualitative data, based on a netnography research, gathered from a participant observation of the online consumer behavior which underpinned the interviews to extract insights about the participants' experience. During the participant observation, it was also implemented the *think-aloud protocol*, a type of research usually used in usability tests to gain insights into participants' feelings and thoughts during the tasks' performance [8]. This method implies that when performing a set of tasks, participants have to verbalize whatever crosses their mind. Even though these types of verbalizations alone are insufficient to provide a complete picture of the user experience, hence the importance of combining with other types of research, they are often accurate and insightful [8].

The key idea of this methodology was to collect both forms of data while using parallel variables and concepts, so at the end certain themes could be associated with statistical data.

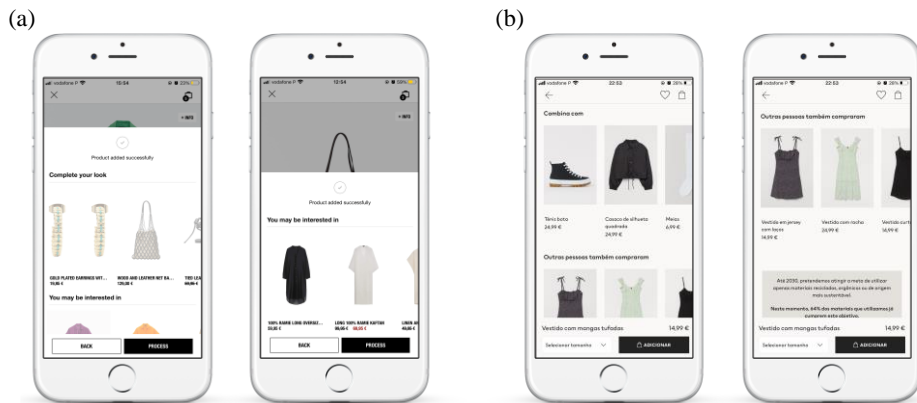
For this study, a convenience sampling that took place on social media (Instagram) was used to randomly select participants (aged 18-25 years old). From 37 users that were contacted, 21 responded, but within this number, only 57% of the contacts resulted in successful tests. Therefore, 12 users participated in the study. No additional participants were sought afterwards because the recurrence of the same patterns was observed in the results.

Once the sample was assembled, the study began with a questionnaire. Within the aim to obtain relevant psychographic and online behavioral data about the participants, the questionnaire was divided into three main sections: Demographics (including previous online experience), Online Shopping, and AI Components. These were pur-

posely designed for this study using Google Forms and were administered via online to the selected sample of participants ( $n = 12$ ).

Then, a participant observation based on netnography research was conducted, with a script of online shopping tasks provided to the participants. The tasks were designed to recreate an online buying process through previously selected mobile apps and websites from two fashion brands: Massimo Dutti and H&M. The selection of these e-commerce fashion platforms went through a lengthy process of experimentation, based on the criteria of choosing brands that were more accessible to young consumers (price and popularity), and with AI-enhanced UX and customer service in both mobile apps and desktop formats. In this case, Massimo Dutti and H&M were the only brands that satisfied the criteria. The participants had to execute the provided tasks while using the following AI tools: voice search, visual search, recommender systems, chatbots, and learning fit. Examples of the user interfaces for the recommender systems of Massimo Dutti and H&M apps and websites are shown in Fig. 1 and Fig. 2. The observation was conducted virtually during a video call, which was recorded with a signed consent from the participants. It was also asked the participants to share their desktop screens and record their mobile screens while performing the tasks, which were sent to the researcher afterwards. Video screen (mobile and desktop) and audio recordings were collected with the consent of the participants. As a result, a gathering of descriptive data on the observed user experience in the digital fashion platforms using the AI tools was collected.

This data then provided stimulus material for the interviews that were conducted, still in the same video call as the observational study: the focus was to interpret the motives and inquire opinions and attitudes behind the participants' behavior. The transcripts from the interviews were then assembled and ready to be interpreted according to a categorization method. The categories were chosen based on the perceptual behavior (think, feel, do) of the participants, in order to better organize and understand the insights taken from the think-aloud protocol and the interviews. Section 4 presents the quantitative and qualitative results of this study.



**Fig. 1.** Recommender systems on the apps of: (a) Massimo Dutti, and (b) H&M.

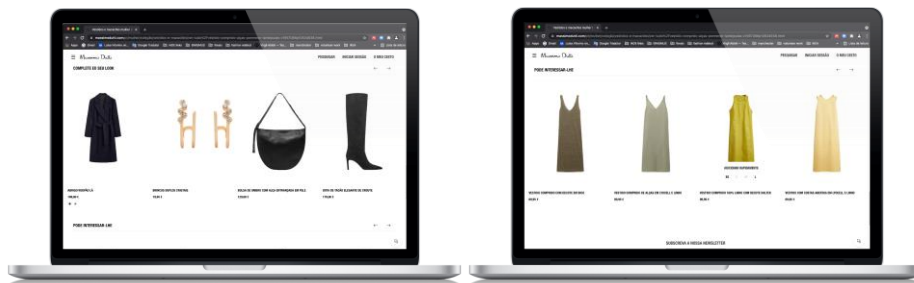


Fig. 2. Recommender Systems on the Massimo Dutti website.

## 4 Data Analysis and Discussion

### 4.1 Quantitative Analysis

The sample of participants in this study was characterized by 91.7% female and 8.3% male. The mean age was 21 years old, and their primary location was Lisbon.

When asked about the frequency of shopping fashion online, half of the respondents replied “*several times a year*”, which is surprising compared with the global fashion consumption tendency amongst this generation. As online consumers, the fashion shopping habits amongst this sample are less frequent. However, none of the respondents replied “*never*” as to how frequently they shop fashion online.

Regarding their most used devices when shopping fashion online, more than 80% use their computer desktop to navigate through fashion e-commerce websites, whereas the remaining participants use mobile apps. The fast fashion brands dominated the response section about the most frequently used fashion apps/websites. Other mentions included Amazon, Asos and Shein, indicating the (timid) prominence of wholesale channels over DTC channels. In fact, the main reasons behind the use of the previously indicated wholesale brands were “*more variety*”, “*affordable price*”, and “*fast delivery speed*”. The style of clothes and taste preference were the prominent responses given to justify the selection of the fast fashion brands, followed by simple delivery and return procedures. About the participants’ awareness of AI tools when shopping online, 58.3% answered they have never observed or used them in e-commerce platforms. Only 16.7% responded positively, whereas 25% were in doubt. Chatbots, followed only by visual/voice search, were the only AI tools a few participants were able to identify in the pre- observation questionnaire. On evaluating the usability of the AI tools previously mentioned, most of the participants were neutral about their opinion. None of the participants indicated that they view AI tools as very useful to the e-commerce experience.

Overall, the online shopping experience with fashion e-commerce is not very representative within this sample, so it is not surprising how the interaction with AI tools fell short in the results. Perhaps the fact that more than 80% of the participants use websites to shop online also help to explain this user indifference since most of the AI tools on this type of devices relate to the backend of the system, like machine learning

or data mining processes (except chatbots which relate to a more mainstream AI applicability of personal customer service).

As part of the current shifting in the reality of consumption due to the COVID-19 pandemic, the contingency measures consumers adopted may also explain the lower frequency of shopping. While fashion retailers are still experiencing continuous volatility in supply and demand, consumers are still adapting to the consequences of rearranging their priorities and expectations, which dropped fashion shopping habits for last.

## 4.2 Qualitative Analysis

The descriptive data of the observation and the transcripts from the interviews were assembled and organized into six categories: *Accuracy*, *Complexity*, *Utility*, *Enjoyability*, *Indispensability* and *Confidence*. The interaction with each AI tool was analyzed according to each one of these categories. The next subsections present our findings for each AI component analyzed in the study.

### Voice Search

Most of the participants were not surprised by the voice search tool. Although it was very easy to use, the speech recognition failed for 50% of the participants, as in terms not identified or unrelated results to the spoken input (even though the participants spoke in the language in which the app was configured to use). Besides being viewed as “useless” by most of the participants, 25% still liked the experience. This comes to prove that, despite the fact that this type of technology was not able to deliver perfect meaning or context according to the voice inputs, a pleasant experience was provided, and users still envisaged the potential in this tool. Ultimately, around 40% of the participants claimed the effort of using the voice search was not worth it when compared to text-based search. However, none of the participants had physical impairments, so in a scenario where voice search is the only alternative, it is interesting to observe how the automation process within speech recognition would be able to handle user interactions. In this context, we can argue that future developments in computational linguistics are still needed to improve this type of human-machine interaction.

### Visual Search

The interaction with the visual search tool brought the participants to a positive consensus. Nearly 92% of the participants experienced successful results, so the usability of this tool was very well perceived. Regarding the enjoyability, there were no dissatisfactions amongst all the participants. Besides being completely unaware of its existence, 58.3% of the participants confidently claimed they would start using this tool more often. The reason being it became customary for most of them to capture/save images of fashion items they enjoy, want to buy later or to even find a cheaper option somewhere else. So, this tool is definitely relevant for the information search stage (one participant even described this tool as “very important” for their shopping expe-

rience). Although these types of tools, related to computer vision, are still in a very early implementation phase, one can already behold its promising use.

### **Recommender Systems**

Within the tested recommender systems, there were two distinguishable models: recommendations based on complementary products (to create “a full outfit”), and recommendations centered on category-related items. For each one, the insights were slightly different. One important aspect worth mentioning is that 25% of the participants are frequent shoppers of H&M, which for the predictive analytics behind these systems determines a different type of recommendation, since it uses historical data instead of new data. Nevertheless, the results did not seem to be significantly influenced. Also, despite Massimo Dutti and H&M being two different brands (fashion style and prices), both recommender systems seemed to have impacted similarly in the user experience.

In the recommendation model based on complementary products, the opinions differed between the participants. More than 40% described this recommendation as “workable, because most of the items were very appealing to me” and “a fulfilling and useful tool” that “makes sense because it completes the outfit”. To these participants, this tool is also “very persuasive” because they “always end up liking something and picking it”. On the opposite side, regarding the items suggested, 16.7% described the selection as being “too basic” and “normally, it is not something that I lean towards”. Despite the ambivalence, the recommender system based on complementary products was able to deliver items that 58.3% of the participants enjoyed and added to their virtual shopping carts.

The category-related recommender system was more in favor of the participants’ shopping experience, since only 16.7% think this type of recommendation “does not add anything new” and “the items are too similar”. For 75% of the participants, however, there is always some sort of interaction with this tool, whether it “facilitates immensely” when they are unsecure about their choices or, in a curious manner, “to make sure if I’m making the right choice”. In consonance, most of the participants expressed how they enjoy its usability. Further, some of these participants even admitted using this tool very regularly. Overall, items suggested in the category-related recommender system were added to 66.7% of the participants’ virtual shopping carts.

### **Chatbots**

The most contentious tool of this study was, without a doubt, the chatbot. For this study, it was considered the chatbot from Massimo Dutti. Although most of the issues participants had, were related to its own interface configuration, it was possible to obtain considerable insights about its impact on the shopping experience.

During the observation, only 16.7% of the participants were able to solve their task and find a plausible answer using this chatbot. But, despite this unpleasant interaction, a surprising 25% still found potential in this tool, even being capable of finding it “practical and agile” and useful “if it was an item that I really wanted”. Ultimately, more than 75% of the participants did not find this tool indispensable when needing

assistance, or it is considered as a last resort while shopping online because “there’s always other ways to find the answer” they need. In reality, a very common mindset among this group of young consumers is to prefer human interaction (live chats and phone calls were mentioned as a better alternative).

Specifically, with the chatbot analyzed in this study, a series of response actions in a decision tree format were given to the user. So, from the participants’ perspective, on one hand, “it was good because it directs the search, but if you have a more specific question it won’t answer”, but on the other hand, “it should be able to answer only to what I want to know, instead of waiting for it to ask”. Such a type of decision tree format has flaws when the question answering system implies too many branches, which can lead to weariness and confusion.

### **Learning Fit**

In contrast with the chatbot, the learning fit was among the most acclaimed tools during this study. Nearly 75% of the participants found this tool to be a “great option” (even adding a noteworthy comment: “I love this tool, it saves me a lot of work and if a brand does not have it, I get kind of upset”). Unfamiliar with this tool were merely 16.7% of the participants, but half of this percentage claimed they would use this tool from then on, without any difficulty. About the indispensability, almost 60% of the participants affirmed with the learning fit, they would buy online more frequently and were more confident in doing so (one participant even shared how frequently it was to order two, or even three sizes of the same item to try at home, and with this tool, that would be no longer necessary). One insight worth taking into consideration was regarding concerns about self-esteem and how consumers that are more insecure about their physical features would feel when using this tool. The fact that this tool presents intimate questions (about weight and stomach/hip shape, for example), could aggravate self-awareness and compromise the shopping experience. Whereas the recommender systems mostly deal with new data, the predictive analytics within the learning fit encompasses historical data, which a predictive algorithm carried by a machine learning technique that uses statistics to bring resulting data. The prediction system for itself (“because other customers with similar body sizes bought this, this is your size”), is not enough for customers to rely on their shopping certainties and gain confidence; here, only after the first shopping orders with this tool turn out successful customers will be able to abide with this tool and change their online shopping frequency.

## **5 Concluding Remarks**

The main objective of this study was to comprehend how technological techniques in AI have been affecting the consumer experience on e-commerce fashion platforms, particularly in the decision-making process. Although most AI applications can be found in the “backstage” of most systems and value chains, the tools and techniques consisting of “touchpoints” are still relevant for the research literature regarding this topic.



The online consumption is a close reality for most consumers nowadays, particularly teenagers and young adults. The presence of social media communities, influencer marketing and user-generated content has intertwined so deeply in this reality of consumption that became undeniable its impact on driving trends and pushing eager consumers to see and buy more. Where does AI insert itself in this scenario? A personalized, filtered, and agile online experience can only be obtained thanks to the interaction with AI tools, and this experience seems to be exactly what these young consumers aim for. This interaction may not directly influence the intention of buying more frequently, as it was shown during this study, but it certainly impacts the decision-making process.

Moreover, the spectrum of experiences regarding these tools was quite diverse. Even though more than half of the participants in this study were not aware of the existence of most of the AI tools used, the majority of them had somehow already engaged with them in their previous online shopping experiences without realizing it. But when asked about it, the participants could not remember for themselves, which would have reinforced the premise that the interaction with AI was too superfluous for the purpose of this research. However, the qualitative approach afterwards provided a rather fruitful proposal than what it seemed at first glance. Nonetheless, from the quantitative approach, one can assume that these young consumers do not buy fashion online more frequent (apart from personal and monetary reasons), due to the fact they commonly use websites to shop online over mobile apps, whence the interaction with AI tools is much more limited and does not bring any magnetism to the experience.

Later, it was proved that during the online shopping environment, each AI tool affected different stages of the decision-making process, as well as also making it much more practical, quicker, and enjoyable, even without realizing it. Even in cases where the outcome from using an AI tool fell short of the expectations, participants were still able to visualize the potential and how those tools could be useful with different inputs or in other contexts.

The visual search, on the other hand, was a tremendous success amongst these young consumers and it is not difficult to pinpoint the reason why. With the rise of fast fashion trends and social media, it is easy for this target to have access to thousands of visual references through their phones, scrolling between endless possibilities of style, aesthetics, and inspirations. So, combining this unlimited source of references with a tool that shortens the “when” and improves the “how” can only make the information search stage on their decision-making process more pleasant and practical. While the only limitations dwell on the fashion retailers’ stock and their style offer (a failed experience using the visual search does not imply the tool was ineffective), the visual search still supports the evident success of visual personalized experiences and the importance of computer vision related tools for the young customer, such as augmented reality technology on e-commerce platforms.

It should be pointed out that the conclusions from this study are preliminary, meaning that more studies with more participants towards this research topic are needed. The sample size was too unrepresentative from the generational reality and the selected participants did not fully represent the diversity of the online shopping public. Other limitations in this study came from the observation experiment and the

incompatibility with a real buying environment for the participants. By asking the participants to not have into consideration values like prices and discounts while realizing their tasks, it automatically detached the online experience from the reality, since most of the buying behavior is conditioned by products' affordability. Another issue regarding this depiction conflict was the selection of the e-commerce platforms for this study, particularly with Massimo Dutti. Most participants in this study were not customers of the brand, neither it was aesthetically relatable or price attainable for them, which ultimately could have led to biased responses and decisions.

Finally, for future developments, the integration and analysis of the post-purchase and advocate stages of the decision-making process could represent interesting approaches to study the impact of AI. In this sense, broadening the scope of digital platforms to social media channels, or even how multichannel experiences dwell on the rear stages of the consumer buying behavior can serve other insightful conclusions. Other AI tools that were not be considered in this study, such as virtual mirrors, social shopping, and virtual reality (all direct touchpoints to the final consumer) are part of digitally enhanced omnichannel tools that ambitious retailers are tackling further. At the end of the day, each brand's retail strategy will invest in the intertwined universe of virtual and physical (if they are not doing it already, it is due to a lack of resources), as marketing and business approaches will no longer escape the acceleration of e-commerce every industry is facing now, particularly in a post-pandemic reality.

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