

Consumers' online decision-making process toward sustainable apparel: An exploratory study
using eye-tracking technology

by

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Abstract

Marketing of sustainable apparel could have several inherent barriers including the higher product price, limited choices, aesthetic disadvantages, and complexity of information.

Individuals working in the field of sustainable apparel need to know the important attributes such as price and consumer review provided with a product that consumers focus on during their decision-making process to encourage consumption of sustainable apparel. Recently, online apparel sales grew at a higher rate than the overall apparel sales did. However, no existing research has studied how online presentation of the sustainability attributes of an apparel product influences consumers' online purchasing behaviors. Therefore, this study investigated 1) how sustainability attributes of apparel products presented on a website influence the purchase decision of a participant, and 2) how a consumers' level of concern on the environmental impact of the apparel industry influence his/her purchase decision. Additionally, this study explored the potential usage of eye-tracking technology (ET) as a tool for investigating consumers' online purchasing decision-making process, particularly for sustainable apparel.

The study consists of two phases. The first phase was a survey, and the second phase was an eye-tracking study plus an exit survey. An online survey was administered to more than three hundred fifty 18-65 years old participants to collect demographic information, information of purchasing behavior, and level of concern on the environmental impact of the apparel industry. Based on the score of concern, the respondents were categorized into a lower concern group (lower 33%) and a higher concern group (upper 33%). Later, eligible participants in each group were invited to participate in the second phase. Participants were provided with screenshots of apparel from the website of two selected brands including a more sustainable apparel brand (Patagonia) and a less sustainable apparel brand (Adidas). They were instructed to wear a pair of

eye-tracking glasses during the evaluation process. Immediately after completing the eye-tracking recording, participants completed an exit survey where they were asked to respond to the questions about the eye-tracking experience and indicate which out of the two brands they would most likely to purchase. Data were analyzed using independent samples T-test and Mann-Whitney' Wilcoxon test.

By examining the gaze behavior and self-reported data of the participants, this study found that sustainability attributes may influence the purchase decision when consumers have a higher concern on the environmental impact of the apparel industry and place adequate attention to these attributes. In addition, findings indicate that consumers' existing concern for apparel industry impact has no significant effect on consumers' online decision-making for the purchase of sustainable apparel. This study offers insights into how consumers' attention works in the decision-making process for online marketing of sustainable apparel. Limitations of the study are discussed.

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Chapter 1 - INTRODUCTION

Background

The fashion industry, particularly apparel production and consumption has been criticized for exploiting workers, damaging the ecosystem and the environment, depleting of natural resources, and increasing textile waste (Ozdamar Ertekin & Atik, 2015). Over the last thirty years, the awareness of the adverse impact of apparel production and consumption, on both people and the environment, has fostered a growing interest in transforming unsustainable practices in apparel production and consumption to sustainable ones (Beard, 2008; Clark, 2008; Goworek, Fisher, Cooper, Woodward, & Hiller, 2012). Nowadays, clothing companies engage in more sustainable clothing practices and fair trade marketing than ever before. Their recent endeavor to provide fair wages to workers and to provide sustainable products allows consumers the choice to purchase ethically-made products (Littrell, Jin Ma, & Halepete, 2005; Rex & Baumann, 2007). However, companies claim that the successful marketing of sustainable apparel products has not been fully realized by the potential market (Han, Henninger, Apeagyei, & Tyler, 2017; Rex & Baumann, 2007). Meyer (2001) reported that there could be several inherent barriers in the marketing of sustainable products, including higher product cost, limited choices, aesthetic disadvantages, and complexity of information. To successfully market sustainable products, marketers need to ensure that consumers' focus is on the sustainable dimension of the products (Meyer, 2001). Previous researches in instore context found that consumers may not consider sustainability attributes if the products cannot meet the consumer demand of apparel product appearance, functionality, fashionability, quality, performance, and price (Goworek et al. 2012, Joergens, 2006). However, the existing literature is unclear about how consumers attend to sustainability information provided by sustainable apparel products when purchasing products

online. Therefore, studying consumers' visual attention patterns and identifying key information consumers rely on for evaluating different aspects of apparel products is a critical next step for researchers and industry professionals in the field of apparel design, production, and marketing. Such studies will also enhance the website and graphic design.

It is clear that consumers' previously held environmental concerns affect purchasing; therefore it is crucial that marketers understand those concerns in order to develop an appealing presentation. The information provided at the point of sale may influence consumers' clothing purchase decisions (Goworek et al., 2012). Meyer (2001) explained that for the effective marketing of a sustainable product, it is essential to demonstrate the product's environmental superiority to consumers. An understanding of the concerns for apparel industry impact that influence the decision-making process of the consumer can provide insight into the effective presentation of environmental attributes. Therefore, the level of consumers' concern can be used by marketers to improve the marketing strategies for sustainable apparel (Aman, Harun, & Hussein, 2012; Lee, 2011). Lee (2011) claimed that consumers' existing environmental concerns have a significant influence on their intention to purchase sustainable apparel products. Consumers who have higher environmental concern tended to pay more for sustainable apparel. However, recently scholars based on food labeling study claimed that higher level of concerns does not translate into action (Bucklow, Perry, & Ritch, 2017). Besides, no previous researches investigated the influence of consumers' concern on their online purchase decision for sustainable apparel. Thus to better understand the influence of concern for apparel industry impact, it is essential to know how consumers' with higher concern for apparel industry impact process the sustainable information, particularly in this exponential growth of an online apparel marketing.

Electronic retailing continues to grow in size and importance as increasing numbers of consumers buy online, but more research needs to be done to understand the online shopping preferences of consumers purchasing sustainable clothing. Electronic retailing became a very important part of the growth of the sustainable apparel market (Lipson, 2008). Aside from a brick-and-mortar store, many companies are expanding their market through their company websites and online eco-boutiques(Lipson, 2008). Of all the online consumption, apparel purchases represent a significant portion of consumption (Rueter, 2012, Goldsmith & Goldsmith, 2002). It is clear that with the expansion of online shopping, it is crucial for marketing departments to understand the online decision-making of the consumer during purchasing in order to garner website and online business success. (Bucklin & Sismeiro, 2009; Goswami & Khan, 2015). Research has addressed online shopping behavior in general, but only a few studies have explicitly focused on the apparel domain (Goldsmith & Goldsmith, 2002; Goswami & Khan, 2015). Moreover, very little research has investigated the decision-making of consumer purchasing sustainable apparel (Rothenberg & Matthews, 2017). Additionally, not a single study was found which deals with the online decision-making of the consumer for sustainable apparel. The proposed study addresses these gaps by exploring the online decision-making of consumer purchasing sustainable apparel.

Objectives and research questions

Various researches demonstrated that information provided by a web page (Bhandari & Kaushal, 2013) and an understanding of consumers' information searching process (Noone & Robson, 2014) are important to improve webpage design for successful product marketing. This current study investigated the influence of webpage information and consumers' decision making process for sustainable apparel. Thus the primary purpose of this exploratory study was to

investigate how sustainability attributes of apparel products presented on a website influence consumers' purchase decision, and how consumers' existing concern level for apparel industry impact influence their purchase decision. Besides, the study intended to explore the potential usage of eye-tracking technology (ET) as a research tool. In the study, consumers' level of concern for apparel industry impact was measured based on both self-reported data from a survey. Consumers' decision-making process was investigated by examining their attention patterns utilizing eye-tracking technology in addition to the self-reported data.

Thus, based on the mentioned objectives, the study formulated four research questions.

Research questions

RQ 1. From a consumer's perspective, what is the relative importance of different web page attributes while a consumer attempts an online purchasing/preference decision?

RQ 1.1. From a consumer's perspective, what is the relative importance of different web page attributes toward a webpage highlighting more sustainable apparel while a consumer attempts an online purchasing/preference decision?

RQ 1.2. From a consumer's perspective, what is the difference in the relative importance of web page attributes between a webpage highlighting more sustainable products and a webpage highlighting less sustainable apparel products while a consumer attempts an online purchasing/preference decision?

RQ 2. How does the presence of sustainability attributes affect the online decision-making process of a consumer who intends to purchase of apparel?

H. 2.1. A consumer who has a higher dwell time on sustainability attributes likely to purchase more sustainable apparel than a consumer who has a lower dwell time on sustainability attributes.

H. 2.2. A consumer who has a higher fixation on sustainability attributes likely to purchase more sustainable apparel than a consumer who has a lower fixation on sustainability attributes.

RQ 3. What is the relationship between consumers' concern level on the environmental impact of the apparel industry and his/her visual attention pattern such as dwell time and eye fixation on the sustainability information provided on a sustainable apparel product in the online retailing setting?

H. 3.1. Consumers having higher concern on the environmental impact of the apparel industry will have higher dwell time on the sustainable attributes of the web page of more sustainable apparel than the consumer who has less concern for apparel industry impact.

H. 3.2. Consumers having higher concern on the environmental impact of the apparel industry will have higher eye fixation on the sustainable attributes of the web page of more sustainable apparel than the consumer who has less concern for apparel industry impact.

RQ 4. Is eye-tracking technology a potential instrument/experimental tool for explaining consumers' self-reported data in the area of sustainable apparel?

RQ. 4.1. What is the relationship between participants' environmental concern reported from the survey of Phase I and their visual pattern on sustainability attributes?

RQ. 4.2. What is the relationship between consumers' self-reported apparel preferences from the exit survey and their eye-tracking data while they consider purchasing sustainable apparel online?

The information on a web page is typically communicated through some perceptual elements of that web page, such as text and image. These perceptual elements can naturally guide users in viewing the page by generating a visual hierarchy through a proper arrangement

(Djamasbi, Siegel, & Tullis, 2010). According to Ares et al. (2013), when consumers are confronted with product information during purchasing, they have processed very little of the product's information. Consumers cannot pay attention to all the product information provided. As a result, the brain uses attentional mechanisms to select a subset of information for further processing, suppressing processing of non-selected information. Thus, attention is a primary step in the decision-making process of a consumer (Ares et al., 2013).

Researchers measure consumers' visual attention based on their eye movements using eye-tracking techniques (Pieters & Warlop, 1999). There are two major parameters of eye movement in analyzing a person's visual attention: dwell time and eye fixations (Ares et al., 2013; Ju & Johnson, 2010). The authors explain that dwell time indicates the total amount of time spent on a stimulus. Eye fixations indicate the number of times the eyes focus on specific details in a stimulus, such as an ad (Ares et al., 2013; Ju & Johnson, 2010). It is reported that consumers usually tend to have a higher fixation on an area of a stimulus that is more important to them when making a purchase decision (Ares et al., 2013; Świda, Halagarda, & Popek, 2018). Thus, investigating consumers' attention to sustainable product advertisements may aid in understanding how product information influences the consumers' choice to purchase sustainable apparel (Ju & Johnson, 2010). In addition, investigating participants' attention on the sustainability attributes based on the level of concern on the environmental impact of the apparel industry may provide insights into understanding the influence of concern on the environmental impact of the apparel industry on the consumers' purchase decision.

Justification

The proposed study is novel in two aspects. First, no existing research has explored the effect of the online presentation of sustainability attributes for online apparel products and how

that presentation influences consumers' online purchasing behaviors. Understanding the influence of sustainability attributes on consumer purchasing behavior may help an individual to design an effective website for marketing sustainable apparel. Therefore, this effort may offer insights for successful online marketing of sustainable apparel products which may have a benefit for the environment by reducing the consumption of current fast fashion. Second, this study used both eye-tracking method and survey-based self-reported data which could illuminate consumers' purchasing decision-making process by providing objective data. Therefore, a more comprehensive and rounded understanding of utilizing eye-tracking technology in investigating consumer online purchase decision can be identified. With a better understanding of utilizing eye-tracking technology in the area of sustainable apparel may help to further utilization of eye-tracking technology for a deeper investigation of consumer behavior for successful marketing of sustainable apparel.

Definitions

Sustainability- According to Pearson (1985), sustainability refers to a concept that current decisions should not inhibit the future living standard. For many decades, environmentalists and social scientists have been reporting on the impact of resource depletion, species extinction, deforestation, warming oceans, changing seasons, and melting ice caps as a crisis of sustainability (Matthews, Garlick, & Smith, 2009, Niinimäki, 2017). However, the frequently-cited definition of "sustainable development" was provided by the report of the Brundtland Commission in 1987. They defined "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987, p. 43). The Brundtland Commission

also argued that sustainable development requires the integration of environmental policies with the process of economic and social change in both rich and poor countries of the world.

Sustainable fashion- Gardetti and Torres (2017) explained that sustainability within fashion means that the development and use of a fashion item or a process have no adverse impact on people or the planet. Moreover, the item or the process once put into action can enhance the well-being of the people and the environment connected with that item and process (Gardetti & Torres, 2017). The definition of sustainable fashion is not a single-industry standardized definition (Henninger, Alevizou, & Oates, 2016; Lundblad & Davies, 2016). The term 'Sustainable Fashion' is used interchangeably with a variety of terms such as eco-friendly fashion, green fashion, ethical fashion, fair trade, and slow fashion (Lundblad & Davies, 2016). It may also have many definitions depending on contexts. For example, "ethical fashion" can be defined as fashionable clothes that incorporate fair trade principles with sweatshop-free labor conditions while not harming the environment or workers by using biodegradable and organic cotton (Joergens, 2006). A similar definition can be applied to define the term "green fashion" (Haines & Des, 2017). On the other hand, the concept of slow fashion is relatively new in the textile and apparel industry. Henninger et al., (2016) explain that the purpose of slow fashion is not to slow down the textile and apparel supply chain, but to place more holistic emphasis on creating a more sustainable process, which includes design planning, production sourcing, and consumer education. Despite using various terms and definitions for sustainable fashion, each concept attempts to embody an alternative to the current fast fashion industry (Henninger et al., 2016).

Eye-tracking technology- For several decades eye-tracking (ET) technology has been used by researchers to determine the underlying cognitive processes (Orquin & Loose, 2013).

Through oculomotor studies, ET provides an ideal neuroscience model to investigate the association between brain mechanisms and behavior (Luna, Velanova, & Geier, 2008). To investigate this association, ET uses several types of ocular measurements, such as pupil dilation, spontaneous blink rate, and eye gaze (Eckstein et al., 2017). Of these ocular measurements, Eckstein et al., (2017) stated that the most commonly utilized measurement is the eye gaze.

Fixation count- Fixation count has a significantly positive correlation with the choice rate (Jantathai, Danner, Joechl, & Dürschmid, 2013). A higher number of fixations on a particular region indicates stronger noticeability or that the subject of fixation is more important, to the viewer than other areas (Lin, Chang, & Lee, 2014). A longer duration of fixation may indicate difficulty in extracting information, but it can also mean that the object is more engaging in some way (Lin et al., 2014). Rahulan et al. (2015) thus explained that the most frequently used eye gaze parameters are the total number of fixations, number of fixations over an area of interest, total fixation duration time, and fixation duration time over an area of interest.

Duchowski (2007) explained that fixations contribute approximately 90% of the viewing time, which can be characterized as a miniature eye movement, such as tremor, drift, and microsaccades. In fixation, the retina, which is located at the rear interior surface of the eye, attends to a stationary object of interest. The fixations indicate a desire to maintain the gaze on an object of interest (Duchowski, 2007).

Dwell time- Another excellent metric that conveys the level of interest with a certain Automated Optical Inspection (AOI) is dwell time (Tullis & Albert, 2013). Tullis and Albert (2013) described dwell time as the total amount of time spent looking within an AOI. This includes all fixations and saccades within the AOI, including revisits. Consumers spend more time fixating on an item that they choose to purchase (Armel, Beaumel, & Rangel, 2008; Graham

and Jeffery, 2012). The greater the dwell time, the greater the level of interest in the AOI (Tullis & Albert, 2013).

Time to first fixation- Time to first fixation on an AOI indicates the level of attention-getting properties of an AOI. If the time to first fixation on an AOI is short then this AOI is considered to be a good attention drawer (Ehmke & Wilson, 2007).

Chapter 2 - LITERATURE REVIEW

The literature review of the current study is consisted of mainly seven sections to provide an understanding of the research related to the present study. Of those sections, the first five sections including barriers of sustainable apparel marketing, online marketing of apparel, consumers online purchase decision making, webpage-presentation of sustainability attributes, and influence of concern for apparel industry impact illustrated the purpose of the study to formulate the research question. The section titled as eye-tracking technology in explaining consumer behavior described the literature on which the purpose of the study was formulated into the research questions. Later, the section named as the formulation of the research question described the four research questions and the researches related to those research question.

Barriers to sustainable apparel marketing

Although sustainable fashion has been embraced as an alternative to the current fast fashion industry, there is no perfectly sustainable apparel company in existence in the fashion industry (Fulton & Lee, 2013). Sustainable clothing of many apparel brand does not strictly meet all of the criteria including incorporate Fair Trade principles with sweatshop-free labor conditions while not harming the environment or workers, by using biodegradable and organic cotton (Goworek et al., 2012). Thus, this paper used a more sustainable apparel brand and a less sustainable apparel brand.

There are multiple barriers to the introduction and consumption of sustainable clothing in the fashion industry. For example, scholars claimed that price may be one of the critical barriers for sustainable fashion as the production cost of sustainable fabrics is enormous (Montero, 2009). Even if consumers were willing to purchase sustainable garments, they might not be able to follow through because of the high premium (McNeill & Moore, 2015). In addition,

consumers have an unconscious assumption that sustainable apparel may not be affordable for everyday consumers due to its exclusivity and luxury (Henninger et al., 2016; Jansson-Boyd, 2010). On the other hand, previous study found that more sustainable fashion is considered as less fashionable (Lai, Henninger, & Alevizou, 2017).

Sustainable apparel has certain specific inherent barriers, in order to market them effectively, more research is needed to investigate the information provided by the retailer and consumer behavior. Many companies had difficulty in developing effective marketing strategies which may stimulate the apparel market growth, and transforming their environmental innovations into a competitive advantage (Tung, Koenig, & Chen, 2017). Pickett-Baker and Ozaki (2008) found that most consumers do not find marketing for environmentally friendly products to be relevant or engaging. Many consumers want to make environmentally friendly choices, but they cannot complete all of the background research necessary to determine a product's sustainability on their own. Most consumers will not know about companies' green initiatives unless the retailer informs them of these actions. Therefore, it is important for a retailer to give the consumers an opportunity to make an informed decision about a sustainable purchase that is possible through their company (Fulton & Lee, 2013). For consumers to be able to make an informed decision, especially when purchasing sustainable fashion, information needs to be broadcasted to the audience in a clear and coherent manner (Han, Henninger, Apeageyi, & Tyler, 2017). Besides, consumer perceptions within the context of sustainable fashion not only communicate their message to their audience, but also analyze how their consumers perceive their messages (Han, Henninger, Apeageyi, & Tyler, 2017; Rex & Baumann, 2007).

Online marketing of apparel

E-commerce has experienced exponential growth all over the world as companies explore new ways to improve their position in the highly competitive market (Prashar, Vijay, & Parsad, 2016; Flavian et al., 2008). For example, it is reported that worldwide retail e-commerce sales are expected to double between 2016 and 2020 (Statista, n.d.). A survey, conducted in 2017 in the United States, found that around forty percent of Internet users purchase items online several times per month and about twenty percent of users purchase items online on a weekly basis (Statista, n.d.). According to a 2018 online apparel report, clothing and accessories purchases contributed to around twenty-seven percent of total apparel purchasing in 2017, which was an increase from twenty-three percent in 2016. In 2017, online apparel sales grew around sixteen percent while overall apparel sales grew less than one percent (Digital Commerce 360, n.d.). In this expansion of online apparel shopping, understanding consumers online decision-making for sustainable apparel is very essential which may provide insights into successful online marketing of sustainable apparel.

Consumers online purchase decision making

Research has shown that consumers act very differently in the online environment than they do in the offline environment of traditional shopping. Koufaris (2002) investigated potential reasons for the differences between traditional offline shoppers and online shoppers and identified that the online information environment for a consumer could be very different from the traditional information environment. Although online consumers appear to think extensively about the products on the web and although they tend to request more information, they generally engage very minimally in information research before purchasing a product (Jansson-Boyd, 2010). The context of the Internet affects the consumer differently than the offline context

during the purchasing process, which leads people to think and evaluate products differently than when engaging in traditional shopping (Schlosser, 2003). Thus, the information search process of an online consumer during the decision-making process in an online environment is different from that of a traditional environment (Wei, 2016).

It was claimed that understanding consumers online information searching is very crucial to understand the consumers' online purchase behavior. Researchers investigated the online decision-making process and classified it into six different stages (Karimi, Papamichail, & Holland, 2015). Of those stages, information search, and product evaluation were found to be the two stages that primarily influence the decision-making process when selecting a product. Later, Wei (2016) simplified the stages of the online decision-making process into input, process, and output, with the process stage primarily explaining how consumers make purchasing decisions. The process stage includes product information searching, prices comparing, and promotions searching (Wei, 2016). The importance of understanding of the consumers' information searching to understand online consumption behavior was also found in previous research (Jansson-Boyd, 2010). With understanding the information searching of consumer, the retailers may know how web information is presented and how this information can impact the purchase likelihood and outcome. Previous research investigated the influence of sustainability information on apparel purchase behavior in offline context and found that sustainable, price, and production including were the most important attributes (Rothenberg & Matthews, 2017).

Consumers online information searching may be influenced by various variables which may determine the consumer decision-making process. For example, Karimi, Papamichail, & Holland, (2015) claimed that consumers prior knowledge affect their purchasing behavior because it influences information searching and evaluation during the decision-making process.

Consumers' effort that goes into researching products is also affected by how much previous knowledge the consumer has about the product (Karimi, Papamichail, & Holland, 2015). Besides knowledge, Jansson-Boyd (2010) described that there may be cultural differences in how people perceive products that are better for the environment. One of the reasons for the cultural difference is that different countries deal with the environment in different ways. Besides in real-life consumer settings, where and how people are seated, noise and those surrounding us are likely to be factors that will interfere with whether or not we are affected by these variables.

Consumers online purchasing of apparel

One of the primary barriers to online apparel purchasing is the lack of sensory evaluation of a product. Shim, Eastlick, and Lotz (2000) explained that the information consumers typically need to evaluate prior to purchase varies on product categories. For sensory experimental products, including clothing and accessories, consumers seek evaluative information by experiencing the product through one or more of the five senses, such as touch, sight, or smell. On the other hand, for cognitive products, including books and computers, consumers use perceptual and intellectual skills to examine various forms of product data such as facts, figures, and the testimony of experts (Shim, Eastlick, & Lotz, 2000). De Figueiredo (2000) claimed that sensory experimental products, which are also known as "touch/feel" products, are less likely to gain increased sales from Internet retailing, compared to cognitive products because consumers often require high sensory evaluation and trials for these products, which is not adequately available online (Grewal, Iyer, & Levy, 2004). Due to these sensory experimental attributes, the influence of different attributes presented by the webpage may be different for the sustainable apparel product.

Consumers online purchasing of sustainable apparel

There were previous researches existed to investigate the influence of organic attributes on purchase decision for various products including organic food (Drexler, Fiala, Havlíčková, Potůčková, and Souček, 2018). However, the findings of those researches may be different for sustainable apparel. One of the possible reasons for the difference in sustainable apparel is that consumers think that clothes have no negative effect on the skin like organic food (Joergens, 2006). Rothenberg and Matthews (2017) claimed that price is one of the most important attributes consumers consider in their apparel purchase decision. Besides price, although the type of product has an effect on the sustainability attributes (Bucklow, Perry, & Ritch, 2017), sustainability attributes are also one of the important attributes in the consumers' decision-making process. However, consumers may not consider this sustainability attributes if the sustainable products don't fulfill the consumer demand in terms of apparel product appearance, functionality, fashionability, quality, performance, and price (Goworek et al. 2012, Joergens, 2006). Thus, previous researches investigated the influence of sustainability information on apparel purchase behavior in offline context (Rothenberg & Matthews, 2017), however investigating the influence of sustainability attributes in an online context is demanded.

Webpage-presentation of sustainability attributes

Various studies have investigated consumers' online purchasing behavior to identify the factors required for a successful e-commerce website. For example, Liu and Arnett (2000) claimed that a successful website is attractive, reliable and satisfactory to the consumer. Much research has shown that website security, privacy, and trustworthiness are significant factors in determining consumers' online purchasing behavior (Akbar & James, 2014; Bhandari &

Kaushal, 2013; Dange & Kumar, 2012; Donthu & Gracia, 1999; Goswami & Bhutani, 2014; Nazir et al., 2012; Park & Kim, 2003; Singla, Inder, & Arora, 2016).

There are many aesthetic factors that may be present for a website to successfully meet the needs and desires of potential consumers. The initial goal of a website is to attract users' attention (Flavian, Gurrea, & Orus, 2008). Flavian et al., (2008) stated that aesthetic elements of a website may play crucial roles in drawing the attention of consumers (Flavian, Gurrea, & Orus, 2008). Previous studies have shown that a diverse and varied presentation of information draws consumers' attention for effective e-commerce websites. For example, Djamasbi et al. (2010) illustrated that images can attract more attention than text. Additionally, larger objects, brighter color, top elements of a website draw more attention than smaller objects, darker color, and bottom elements of the website respectively (Djamasbi et al., 2010). After drawing attention, Benbunan-Fich (2001) explained that an effective website needs to generate efficient interaction with users. The author argued that usability determines how well and easily a consumer can interact with an information system of a web page (Benbunan-Fich, 2001). The interaction increases the probability that a user will make a purchase (Benbunan-Fich, 2001).

However, in addition to aesthetics, the content may be the most influential factor for a consumer. Many studies identified the content or information provided by a web page as one of the most influential factors in determining consumers' online purchasing behavior (Bhandari & Kaushal, 2013; Liu & Arnett, 2000; Maditinos & Theodoridis, 2010; Park & Kim, 2003; Singla et al., 2016). As a matter of fact, Katerattanakul and Siau (1999) claimed that the information provided by a website needs to be intrinsic, contextual, representational, and accessible. However, Noone & Robson (2014) argued that marketing researchers must explore what information consumers think essential for making an online purchasing decision. Several studies

identified that price (Donthu & Gracia, 1999; Nazir et al., 2012; Singla et al., 2016) and brand (Akbar & James, 2014, Donthu & Gracia, 1999) are the two pieces of information that consumers think important when making a decision to purchase online. Noone and Robson (2014) applied a combined method of eye-tracking technology and retrospective think-aloud (RTA) interviews with 32 participants to investigate how website information influenced consumers' decision-making process when booking an online hotel. The authors found that besides the firm-supplied information such as hotel name, images, price, and location, the consumer mostly attended to the user-supplied information such as customer ratings and reviews (Noone & Robson, 2014). The apparel website, particularly the sustainable clothing website, also contains both the firm-supplied and the user-supplied information. However, research has not yet shown to which information consumers attend during online purchasing of sustainable apparel.

Various researchers have investigated the attributes and attitudes of consumers toward online apparel shopping. For example, Kim and Kim (2004) explained that the security and privacy of transactions, in addition to the low cost of apparel, influences the online purchasing of clothing products. Another study conducted by Man (2012) also found that price, product quality and web trust are significant factors affecting the consumer's online purchasing decision and behavior. Man (2012) explained that besides security issues, customers need to trust that the online market can provide their needed goods and services and can distribute (or deliver) them, if necessary. However, for marketing sustainable apparel, Yan, Hyllegard, and Blaesi (2012) stated that retailers need to provide more explicit messages of the sustainability aspects of a product. These explicit messages may raise consumers' positive attitudes toward sustainable products, which may encourage their purchase intentions. By providing sustainability attributes, apparel marketers may attract the consumer who is interested in purchasing environmentally friendly

products. Besides, marketers may help to build the market for sustainable apparel by raising awareness of the benefits of sustainable products to the consumer who is less interested in purchasing environmentally friendly apparel (Yan, Hyllegard, & Blaesi, 2012). Thus, in order to understand the online decision-making process for sustainable apparel, it is crucial to investigate how consumers extract information from a website while making the purchase preference.

Influence of concern on the environmental impact of the apparel industry

Research has claimed that consumers having environmental concerns prefer to purchase sustainable apparel (Kang & Kim, 2013; Walter, 2009). “Environmental concern” is defined as a belief, stance, and degree of concerns a person has toward the environment (Mat Said, Ahmadun, Hj. Paim, & Masud, 2003; Zimmer, Stafford, & Stafford, 1994). In fact, environmental concern is considered to be one of the crucial factors in consumers’ decision-making for sustainable apparel (Diamantopoulos, Schlegelmilch, Sinkovics, & Bohlen, 2003). However, when consumers feel that they are sacrificing too much monetarily, they will consider environmental concerns to be less critical than the price and aesthetics (Henninger et al., 2017). Thus, in order to develop a more effective online marketing strategy of sustainable apparel, the consideration of the level of consumers’ environmental concern may be crucial for a retailer who intends to promote consumption and usage of sustainable clothing.

Retailers begin to recognize consumers’ growing concerns on the environmental impact of the apparel industry. In response, they have begun to raise target consumers’ awareness of their products’ sustainability attributes. Fulton and Lee (2013) stated that retailers should inform consumers about their sustainable initiatives. In this context, the United Nation’s Global Reporting Initiative (GRI) provides companies with the most widely used guidelines for sustainability reporting. The GRI suggests that companies who want to conduct sustainable

business need to include economic, environmental, and socially sustainable aspects in their report. According to GRI, economic sustainability can include philanthropic efforts and local manufacturing, while social sustainability refers to human rights, labor, and fair-trade initiatives. However, the most commonly mentioned areas by apparel companies are environmental aspects. For instance, more than ninety percent of sustainable apparel retailers attempt to tackle the environmental aspect of sustainability by utilizing organic fabrics as their raw materials (Fulton & Lee, 2013). One possible explanation for this is that companies may be trying to draw the attention of consumers who have concerns for the apparel industry. In fact, Laroche, Bergeron, and Barbaro-Forleo (2001) claimed that consumers are increasingly concerned about the environment, and the majority of them have understood the effect of their purchasing behavior on ecology. As a result, these customers are considering the environmental issues in the purchasing behavior in an effort to minimize the threat to the ecology (Laroche, Bergeron, & Barbaro-Forleo, 2001).

Eye-tracking technology in studying consumer behavior

Eye-tracking technology has been used to obtain quantitative information regarding consumer behavior, which cannot be acquired from traditional forms of research such as survey and interview. Most of the published work investigated consumer purchase decision for apparel using the survey method (Joergens, 2006, Henninger & Singh, 2017). Researchers suspect that self-reported data from a survey might have social desirability bias, and hence includes some errors (Auger & Devinney, 2007; Chung & Monroe, 2003). For example, people could feel the pressure to respond according to what they believe to be socially acceptable (Auger & Devinney, 2007; Chung & Monroe, 2003). Schoderbek and Deshpande (1996) explained that social desirability bias involves two dimensions: impression management and self-deception.

Impression management is a when participants consciously try to create a favorable impression by lying and faking. Self-deception, however, is an unconscious tendency to see oneself more favorably compared to one's peers (Schoderbek & Deshpande, 1996). Thus, consumers tend to give positive responses that may or may not match their purchasing behaviors. Sometimes, they may express socially-favored answers rather than truthful ones (Niinimäki, 2010).

On the other hand, researchers also argue that the eye-tracking method could provide beneficial additional information, such as response times on a moment-by-moment basis (Eckstein, Guerra-Carrillo, Singley, & Bunge, 2017). It could limit the chance that participants may adjust their behaviors to match experimenter expectations or social desirability biases (Graham, Orquin, & Visschers, 2012).

Diversity and types of eye-tracking applications

There are two main categories of eye-tracking applications: diagnostic and the interactive (Duchowski, 2007). Duchowski (2007) described that the diagnostic role of an eye tracker involves the objective and quantitative evidence of one's visual and attentional (overt) process. In the interactive eye-tracking system, the user is expected to respond or interact while equipped with an eye tracker as an input device. The interactive eye-tracking system is applied to several fields such as human-computer interaction, visual displays, and computer graphics (Duchowski, 2007).

On the other hand, the most widely used design of eye-tracker is video-based eye trackers (Holmqvist et al., 2011). Holmqvist et al. described that the video-based eye-trackers have one or two cameras that focus on one or both eyes to record and analyze the movement. These video-based eye trackers have two main categories: head-mounted systems and non-intrusive systems. The head-mounted system consists of a camera and a light-emitting diode, records several

images that represent the reflection of emitted light in the eyes. The non-intrusive system allows natural head movements and can be used with a wide variety of eye shapes, contact lenses or glasses. The system can use two kinds of light, such as ambient light and infrared or near-infrared light (Holmqvist et al., 2011).

Applications of ET technology in different fields

Scholars have utilized ET technology in different research domains, such as economics, marketing, and psychology (Reutskaja, Nagel, Camerer, & Rangel, 2011). For example, Reutskaja et al. (2011) mentioned that in economics, ET methods are used to study the computational process used to make strategic decisions. In marketing, several studies in marketing have used ET to study how consumers choose products from different types of displays (Reutskaja et al., 2011). In addition, ET was used to investigate the consumer behavior for online hotel marketing (Noone & Robson, 2014), and to investigate consumer behavior for horticulture marketing (Jones, 2014). Lastly, eye gaze metrics have also been used to determine the effect of food color on consumer decision-making (Jantathai et al., 2013). Eye-tracking technology can provide beneficial insight into many different fields.

In addition, ET has been utilized as a method to measure a valid, reliable, and sensitive measurement of human factors constructs such as workload and situation awareness in control room settings for over the decade (Kovesdi, Spielman, LeBlanc, & Rice, 2018). Scholars used eye-movement based measures and pupillometry to understand the situation awareness and expertise level of operators (Alkhaldi, Pathirage, & Kulatunga, 2017; Bhavsar, Srinivasan, & Srinivasan, 2016). The workload was found to be positively related to pupil diameter and negatively correlated to blink measures (Kovesdi et al., 2018). ET has been used in various

domains outside of studies related to the consumer. For example, eye trackers were used to assess different kinds of camouflage on different battlefields (Lin et al., 2014).

Eye-tracking technology in apparel

Eye-tracking technology has also been used to investigate quantitative information regarding consumer behavior that cannot be obtained from traditional forms of research. For a better understanding of consumer behavior, most of the studies used interviews and surveys to establish connections between eye-tracking data and self-reported data (Faria, Providencia, & Cunha, 2018). Researchers used eye-tracking technology to investigate how consumers evaluate an apparel product with eye-gaze data (Li, Wang, & Wang, 2017) and how they react to apparel during the purchasing process (Rahulan, Troynikov, Watson, Janta, & Senner, 2015). Li et al. (2017) utilized eye-tracking technology to discover that human psychology and behavior are significantly affected by product appearance. On the other hand, consumers interacted differently with apparel based on their age (Rahulan et al., 2015). For example, Rahulan et al. (2015) found that Baby Boomers are more confident with their choices, taking a shorter time to reach a purchase decision. Additionally, they are more concerned with aspects that protect the wearer. Consumers' behavior toward apparel is also influenced by external factors (Amatulli et al., 2016). For example, Amatulli et al. (2016) found that consumers' recognition of luxury fashion brands increased when the apparel was paired with other apparel made by fast fashion brands (Amatulli et al., 2016).

Researchers investigated the success of the organization of attributes of a website using eye-tracking technology to ascertain how consumers attended to attributes, such as images (Cyr & Head, 2013), price (Menon, Sigurdsson, Larsen, Fagerstrøm, & Foxall, 2016), and ads (Huang, 2018). Cyr and Head (2013) found that images significantly impact consumer attention,

especially when viewing time is brief. Additionally, consumer attention varies based on the placement of information. For example, placement of price on the left with a picture, rather than on the right, below the company details results in a significantly higher fixation on price (Menon et al., 2016). ET can also be used to determine the effect of models and sexual appeal on fashion advertisements (Fidelis et al., 2017, Ju & Johnson, 2010). The model can greatly influence the viewer (Ju & Johnson, 2010). However, the presence of images with sexual apparel does not have a fundamental role in advertisements (Fidelis et al., 2017).

Consumer gazing behavior and decision-making

Researchers have argued that, when confronted with several alternatives, the consumer will more often attend to the chosen option than other options (Pieters and Warlop, 1999; Vu, Tu, & Duerschmid, 2018). One's eyes are generally directed toward the object of one's thoughts (Eckstein et al., 2017). Individuals thus tend to gaze at information that has greater importance to their choice (Orquin & Loose, 2013). Eye gaze can provide a moment-to-moment measure of the focus of attention and can reveal aspects of attentional focus during visual processing (Eckstein et al., 2017). Eckstein et al. (2017) also described how eye gaze metrics can be used to reveal what parts of the displayed information are most important, and to what extent, and in what order, information is processed within a complex stimulus set. Also, these metrics reveal how several pieces of information are integrated or compared during a task (Eckstein et al., 2017). Duchowski (2007) explained that the stimulus of a subject is identified and determined by measuring the movement of the eye relative to the head. Thus, the eye movement measurement and analysis is used to understand the attentive behavior of the viewer. Then, the eye movement data is analyzed to further understand the quantitative inference of the user's visual and

attentional process. The measuring device used for measuring eye movements is known as an eye tracker (Duchowski, 2007).

To better understand eye-tracking technology, it is important to first understand how the eye takes in stimuli. In order to process a specific object or location in a visual stimulus, a person needs to move their eyes (Malhotra, 2008). The field of view in a visual stimulus is inspected piecemeal over small areas of interest through short fixations (Duchowski, 2007). Duchowski (2007) explained that fixations contribute approximately 90% of the viewing time, which can be characterized as a miniature eye movement, such as tremor, drift, and microsaccades. In fixation, the retina, which is located at the rear interior surface of the eye, attends to a stationary object of interest. The fixations indicate a desire to maintain the gaze on an object of interest (Duchowski, 2007). If a stimulus receives no fixation and is outside the perceptual span of the nearest fixation, then this stimulus will be unidentified to a decision-maker with an unfamiliar visual scene (Orquin & Loose, 2013). Through fixations, individuals take perceptions of detail through the fovea in their process of inspection (Duchowski, 2007). Orquin and Loose (2013) explained that perception is influenced by directing overt visual attention to a specific stimulus. Overt visual attention brings the stimulus into the fovea which has a higher density of sensory neurons for enhanced visual processing (Orquin & Loose, 2013). When a subject directs visual attention to a new area, the fovea is also repositioned by fast eye movements, which are known as saccades (Duchowski, 2007; Holmqvist et al., 2011). As the fovea has limited informational capacity, the authors explained that the eyes need to shift from point to point to scan the visual field so that the light from the object falls directly on the fovea.

Various studies used eye-movement data measured by an eye-tracking method to explain consumer behavior (Pieters and Warlop, 1999; Vu, Tu, & Duerrschmid, 2018). Researchers used

several parameters in an eye-tracking method to investigate the consumer behavior including fixation count, dwell time, and time to first fixation (Jantathai et al, 2013; Tullis & Albert, 2013; Ehmke & Wilson, 2007). It is reported that fixation count and dwell time are correlated with the consumer choice behavior and time to the first fixation indicates the attentional properties of an object (Jantathai et al, 2013; Tullis & Albert, 2013 ; Ehmke & Wilson, 2007).

Formulation of research question

Research question one

Casaló, Flavián, and Guinalú (2008) argued that the quality of a website influences the online purchasing behavior of the consumer. Flavian, Gurrea, and Orus (2008) explained the requirement of effective qualities of a website. They argued that the information on a web page provided by a retailer is one of the most influential factors to the compelling quality of a website. The high quality of specific information about a product will persuade the consumer to remain on the site (Flavian et al., 2008). However, Agarwal and Venkatesh (2002) stated that it is more important to investigate how consumers rate the importance of the content. The importance of this content from the consumer perspective varies according to the task they want to perform (Agarwal & Venkatesh, 2002). Orquin and Loose (2013) explained that, according to the top-down control of attention theory, when making decisions, consumers pay more attention to the stimuli that are relevant to their task. Thus, understanding consumers' visual attention patterns can illuminate which attributes consumers think important (Orquin & Loose, 2013). Therefore, to investigate the effect of attributes of an apparel website on consumers' purchase decision-making process, it is essential to investigate consumers' visual attention patterns when looking at that website.

Understanding consumers rank of attention on different attributes on a webpage can help to understand the critical attributes of a product that lead to an online purchase. Besides, the comparison in attention on attributes of webpage between a more sustainable apparel webpage and a less sustainable apparel webpage may provide insights into the understanding of consumer purchase decision making based on sustainability attributes of a webpage. Rothenberg and Matthews (2017) assessed the attributes of the T-shirt and classified the attributes in five categories. The authors conducted an experiment with 181 students and determined the order of importance of those attributes. Rothenberg and Matthews (2017) claimed that the order of importance of those attributes in buying a T-shirt is price, production (origin of the T-shirt), sustainability information, fabric and technology (dri-fit, fade-free, shrink-free, stain-resistant and wrinkle-free) respectively. In addition to the offline information, the apparel website may contain other information including brand name, product images, rating and reviews by the customer (Adidas, n.d.). Moreover, for sustainable apparel products, a website may provide additional sustainability attributes such as organic information, fair trade and footprint chronicles (Patagonia, n.d.). Therefore, based on these attributes and previous researches this study formulated the first research question to investigate the importance of the critical attributes of a web page, from the consumer's perspective, for making an online purchasing-decision for apparel.

Research question two

Rothenberg and Matthews (2017) demonstrated that when a younger consumer purchases an organic T-shirt in an offline shopping environment, they place more importance on sustainability, price, and production than on technology and fabric. Although sustainability seems to matter to the consumer, some scholars claim that sustainability information is not

always available. Joergens (2006) claimed that more information related to ethical apparel products should be provided to potential consumers to encourage more ethical judgment. However, there is no substantial evidence for this claim. Joergens (2006) conducted a focus group discussion in Germany and England on students between 21 and 25 years of age. The discussion revealed that most of the participants favor a label of ethical information, but few of the participants examine for that information on the label (Joergens, 2006). Thus, it is unknown, from all the information provided by a product, how much attention a potential consumer pays to the provided ethical information during the purchasing process. However, Drexler et al. (2018) claimed that providing organic product information with the organic food product label significantly draws the attention of the consumer and positively influences the consumer to purchase that organic product. Thus, it is expected that in online purchasing of sustainable apparel, the sustainability information of the apparel product will draw the attention of the consumer and therefore encourage ethical purchasing decisions. From this expectation, this study formulated the hypotheses that a participant who has a higher dwell time and higher fixation on sustainability attribute purchase more sustainable apparel than a consumer who has a lower dwell time on sustainability attributes.

Research question three

Hines, Hungerford, and Tomera (1987) argue that there is a positive, but low to moderate relationship, between environmental concerns and environmentally friendly behavior. Various researchers reported that there have been increasing concerns among consumers about the negative impact of the apparel industry, particularly the production and consumption of fast fashion on the environment (Kang & Kim, 2013, Shaw, Hogg, Hassan, Shiu, & Wilson, 2004). Currently, it is claimed that consumers more likely to buy sustainable apparel products to

minimize such negative impact (Goworek et al., 2012, Walter, 2009). Lee (2011) claimed that individuals who are more concerned about the environment tended to be more willing to pay more for sustainable apparel. Thus, it is reasonable to predict that a consumer with higher environmental concern for apparel industry impact pays more attention to the sustainability aspects of a product when presented with a product than a consumer with less environmental concern for apparel industry impact does. Based on this prediction, this study formulated the hypotheses that participants having higher environmental concern for apparel industry impact will have higher dwell time and higher number of fixation on the sustainable attributes of the web page of more sustainable apparel than the consumer who has less environmental concern for apparel industry impact.

Research question four

Eye-tracking experiments have long been used to analyze consumers' decision-making process (Khachatryan & Rihn, 2014). However, Khachatryan and Rihn (2014) argued that eye-tracking technology needs to be used with an additional data collection method, such as Likert scale to thoroughly analyze the recorded data. For example, the self-reported data of a consumer measured by Likert scales can be used to determine the willingness to purchase. By pairing this data with eye-tracking data, it is possible to investigate what information consumers visually inspect and use while making a purchase decision (Khachatryan & Rihn, 2014). Thus, the combined methods help to understand the relationship between a consumer's attention pattern and their purchase decision-making process (Krajina & Mladenović, 2018; Khachatryan & Rihn, 2014). However, there is no research demonstrating the combination of eye-tracking technology and retrospective interviews that investigates the online consumer's decision-making process for sustainable apparel. It is crucial to investigate the potential of the eye-tracking experiment as an

instrument to analyze the decision-making process of the potential consumer for purchasing sustainable apparel. Thus, this study formulated the research question to investigate the relationship between consumers self-reported apparel preferences and eye-tracking data

Chapter 3 - METHOD

This study has two stages: 1) Phase I: an online Survey; 2) Phase II: an onsite Eye-tracking session and an exit survey.

Phase I survey

The purpose of the Phase I was to understand the level of participant concern on the environmental impact of the apparel industry, to categorize the participant based on this concern level, and to understand the influence of concern level on participant apparel purchase behavior. Therefore, an online survey was developed and sent to potential participants to acquire their: 1) basic demographic information including age, gender, income, occupation, and education level; 2) current level of concern for the apparel industry; and 3) willingness to participate the Phase 2. This survey contained around twenty questions, which took about twenty minutes for a participant to complete.

Scholars utilized different numbers of statements to assess consumers' environmental concern. For instance, Zimmer, Stafford, and Stafford (1994) measured environmental concern by statements of seven dimensions, ranging from concerns of waste, wildlife, biosphere, health, energy, and environmental technology, to general issues such as social responsibility and education. On the other hand, Schultz (2001) assessed environmental concern by three factors such as concern for the self (egoistic), other people (altruistic) and the biosphere (biospheric). A more specific scale of concern for apparel industry issue was developed by work of Marcketti and Shelley (2009). They utilized a series of questions including, 'How concerned are you about counterfeiting?' and 'How concerned are you about sweatshops?'. However, that scale was mainly to measure the level of concern for counterfeit apparel. The Cronbach's alpha of that scale was found to be 0.868 which suggest that the scale was internally consistent.

The current study investigated the level of concern on the environmental impact of the apparel industry and was adopted based on Marcketti and Shelley's work. Five statements were drawn from this paper and updated to understand consumers' concerns regarding fast fashion clothing and the adverse impact of the clothing industry. Based on these statements, this study conducted a pilot survey on a small group of six participants to understand if the statements were understandable by the participant to serve the purpose of this study. Also, based on the findings of the pilot survey, this study finalized the statements for the online survey of Phase I. Participants were provided with the following statements: 'I am concerned about apparel industry issue such as fast fashion.'; 'I am concerned about the effect of pollution of clothing production on the environment.' and so on. Each statement used a 7-point Likert scale ranging from strongly disagree to agree strongly. According to Losby and Wetmore (2012), a Likert scale can assess someone's attitude, knowledge, and concern about a particular topic, which is a valuable and essential tool used in survey-based studies. Attachment 1 shows the details of this survey.

Participant Recruitment

Upon approval from the Committee for Research Involving Human Subjects at Kansas State University, multiple recruitment strategies were applied. This study used a convenience sampling strategy. It is a type of nonprobability sampling where members of the target population that meet certain practical criteria, including easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study (Etikan, Musa, & Alkassim, 2016). An email with a Qualtrics link of the Phase I survey was sent to more than 350 potential participants. Also, recruitment flyers were posted around the university campus and in local communities. In addition, a recruitment

advertisement was posted on a university-wide e-letter, and it was distributed through multiple email lists with administrators' permission.

In total, 163 participants completed the Phase I online survey. And 81.60% (133 participants) of them indicated their interests in participating the Phase II. Each participant's response to the five environmental concern statements was calculated. Then the summation of their scores was arranged from the lowest to the highest. Based on the median score, participants were divided into two groups: a higher concern group on the environmental impact of the apparel industry and a lower concern group on the environmental impact of the apparel industry. Then participants who had a score from the 33% in the lower concern group or a score from the 33% in the higher concern group were identified as being eligible to participate in Phase II.

On the other hand, at the end of the Phase I survey, participants were asked about their interests in participating in Phase II eye-tracking study. If their response was "yes," then they were requested to provide their contact information. Later, the researcher contacted/scheduled time with eligible participants. Once the date and time were confirmed by the participant, the participant came to the proposed university campus location to participate in an eye-tracking session. A gap of around two weeks was maintained between the Phase I survey and the Phase 2 eye-tracking study in order to minimize any influence of the survey on the participant in the eye-tracking study.

The age of the participant was at least 18. For technical reasons, people who wear glasses or have vision issues were excluded from this study.

In terms of participants compensation, two participants from Phase I was randomly drawn to receive an Amazon gift card of fifty dollars. Each Phase II participant received a twenty

dollar Amazon gift card for completing Phase II, which included completing both the eye-tracking study and filling out the exit survey.

Phase 2: Eye-tracking study and exit survey

Previous studies utilized a survey method to understand how important is environmental sustainability when contemplating the purchase of an apparel product in-store. It is found that using a survey might have social desirability bias, which might include some errors (Auger & Devinney, 2007; Chung & Monroe, 2003). Various studies used eye-tracking technology to understand consumers decision-making process to choose products from different types of displays (Reutskaja et al., 2011). Also, researchers investigated the online consumer decision-making process utilizing eye-tracking technology in various research domains including economics, marketing such as online hotel marketing (Robson & Noone, 2014). In order to understand the online decision-making process for sustainable apparel, it is crucial to investigate how consumers extract information on a website while making the purchase preference. The present study used Phase II which included eye-tracking study and an exit survey.

The current study used eye-tracking technology to measure visual attention for a better understanding of consumers' attention on different attributes of an apparel webpage during online apparel shopping. This study used fixation count and dwell time to measure participants' attention on a webpage. It is reported that a higher number of fixations in a particular region indicates stronger noticeability (Duchowski, 2007). It may also indicate that the areas of fixation are more important to a viewer than other areas (Lin, Chang, & Lee, 2014). On the other hand, high dwell time on a particular region indicates that viewers have a high level of interest in that region (Tullis & Albert, 2013). Additionally, higher dwell time on an area indicates that this area might be complex for a viewer to process the information. The greater the dwell time, the greater

the level of interest in an area (Tullis & Albert, 2013). The study also measured time to the first fixation which can provide attentional properties of an object or an area of interest such as image (Ehmke & Wilson, 2007). In addition, time to the first fixation may provide an idea of a viewer's searching process on a stimulus (Ares et al., 2013).

To determine what regions were of the most interest to observers, fixation proportions were computed. It was calculated by dividing the number of fixations for a region by the total number of fixations over the whole display (Yun, Peng, Samaras, Zelinsky, & Berg, 2013). Similarly, the proportion of dwell time was calculated to measure the interest of a participant on an object. However, unavoidably, large regions would, by chance alone, receive more fixations than small regions. Therefore, the researchers normalized the data of fixation and dwell time.

$$NF(I, a) = F(I, a) / B(I, a)$$

Here $NF(I, a)$ = Normalized proportion of fixation

$F(I, a)$ = Total fixation in a specific AOI/ Total fixation of a participant in all area of interest

$$B(I, a) = \text{Size of specific AOI} / \text{Size of all AOI}$$

Immediately after completing the eye-tracking recording, participant filled out an exit survey. The researcher provided each participant with an exit survey for investigating participants' eye-tracking experience, specifying their purchasing decision, and perception about the eye-tracking study. The exit survey contained around eight questions, which took about six to eight minutes to complete. Later, the researcher debriefed this study with the participant and rewarded them with a gift card.

Instrument

The eye-tracker used in this study is Tobii pro-eye-glasses 2, which is claimed to give the researchers a deep and objective insights into human behavior (tobii pro, n.d.) The specification of the Tobii Pro eye-tracking glasses are as follows

- Name of the eye tracker: Tobii Pro Glasses 2
- Gaze sampling frequency: 100Hz
- Tracking technique: Corneal reflection, binocular, dark pupil tracking
- Software used and Version: Tobii Pro Glasses Analyzer, version 1.46

Calibration of the instrument

Before entering the main eye-tracking recording, a seat was adjusted for the participant to have a comfortable position before starting the eye-tracking recording. The comfortable position allowed the eye tracker to have an unrestricted view of the participant's eyes. Seating was also adjusted to ensure that the face of the participant was a distance of approximately 70 cm from the eye tracker screen. A one-point calibration was performed to ensure quality eye-tracking data. Once the calibration was completed, the author commenced the main experiment.

Stimulus

One of the goals of this study was to investigate the influence of sustainability attributes and the level of consumers' concern on the online purchase decision of participants for sustainable apparel. For this purpose, the study investigated and compared the participants' attention on the webpage of a more sustainable apparel brand and a less sustainable apparel brand. Table 1 illustrates the details of the stimulus used in the eye-tracking study. The study provided visual stimulus from a more sustainable apparel brand and a less sustainable apparel brand, namely Adidas and Patagonia to participants in the eye-tracking study. Patagonia, Inc.

represented the sustainable apparel web page. Patagonia is one of the leading retailers known for their commitment to the environment (Meyer, 2001). Wang & Shen (2017) described Patagonia as a leading global outdoor sportswear retailer that tends to offer consumers high-quality, fashionable and sustainable outdoor sportswear. Most of Patagonia’s products are made by at least one eco-material (Wang & Shen, 2017). The mission of Patagonia is to cause no unnecessary harm and to use business to inspire and implement solutions to the environmental crisis (Patagonia, n.d.). In contrast, the Adidas web page represented less sustainable apparel. According to Seuring & Müller (2008), Adidas is one of the apparel distributors who has been criticized for problems occurring during the production of their clothing such as inhuman working conditions and contaminants to the environment.

Table 1 Details of stimulus used in eye-tracking study.

Gender	Brand	Item name	Price	No of slides
Female	Adidas	High Rise Long Tights	\$55	15
	Patagonia	Serenity Pants Regular	\$79	24
Male	Adidas	Supernova Long Tights	\$85	20
	Patagonia	Performance GI IV Pants	\$89	33

Pant, which is one of the basic clothing items, were the selected product category for this study. Men’s pants were presented to male participants, and women’s pants were presented to female participants to keep the environment of the online decision-making process approximately similar based on gender. The pants for each gender were selected so that the attributes, including the design of the product of that webpage, were approximately similar. Besides, the tone of the advertisement was approximately similar for both types of clothing.

The researchers intended to keep all the information in the form of screenshots. To keep the information and study environment consistent for all the participant, the study used screenshots instead of the original website. The screenshot of these web pages was presented

with a 17-inch thin-film LCD monitor with a 1280X1024 inch in resolution. Patagonia had the information of sustainability attributes including organic cotton information, footprint Chronicles, fair trade information which lead to higher slides of Patagonia than Adidas. One of the limitations of this stimulus was the higher price difference between Adidas and Patagonia for female items than the male items. To keep the design of the pant approximately similar for both Adidas and Patagonia, although there is a price difference, the study represented those items as a stimulus for the participant. The screenshots of the web pages of two brands were provided to participants in a random sequence to avoid any bias created by the order.

Pilot study

A pilot study was conducted to test both the stimulus materials and the functionality of the eye-tracker. Handling of participants and equipment for the study was also practiced. Three participants participated in the pilot studies. Participants were asked about how well they understood the task instructions. They reported no concern about the instruction and stimulus materials. The eye-tracking equipment, the controlling software, data files generated by the eye-tracking and the stimulus software proved to work correctly. Besides, based on the pilot studies, the lighting system, the arrangement of the participant sitting arrangement, the height of the monitor and distance from the monitor was adjusted for the main study.

Data recording

From each group of eligible participants, the authors invited 18 of them to Phase II. Among them, twelve participants in each group appeared and participated in the study. For technical reason including loss of the connection between the tablet and eye-tracking recorder, the study excluded one recording from each group.

A brief introduction to the eye-tracking study was provided to the participant once he/she showed up at the research site. If the participant agreed to participate in the eye-tracking study, they signed a consent form. All participants wore a pair of Tobii pro eyeglasses for eye-tracking data recording. Before entering the main eye-tracking recording, a seat was adjusted for the participant to have a comfortable position before starting the eye-tracking recording. The comfortable position allowed the eye-tracker to have an unrestricted view of the participant's eyes. Seating was also adjusted to ensure that the face of the participant was a distance of approximately 70 cm from the eye tracker screen. Then a one-point calibration was performed to ensure quality eye-tracking data. Once the calibration was complete, the author commenced the main recording of the eye-movement data.

Participants were instructed to evaluate and select one brand that they would be most likely to purchase when wearing a pair of eye-tracking glasses. During the process, the participants were instructed to look at these web pages in a relaxed way and not move too much. Moreover, they were requested to refrain from talking to maintain the accuracy of the detection result. There was no limit in decision time; however, the researcher anticipated that this session would be around twenty minutes in length.

Later, the researcher provided each participant with an exit survey to investigate participants' eye-tracking experience and perception about the eye-tracking study, as well as to specify their purchasing decision. The exit survey of Phase II contained around eight questions, which took about six to eight minutes to complete. Lastly, the researcher debriefed this study with the participant and rewarded them with a gift card.

Eye-tracking metrics and selection of Area of Interest (AOIs)

Tobii Pro Glasses Analyzer version 1.46 was used for processing, analyzing, and exporting eye-tracking data and videos made with the Tobii Pro Glasses 2 Eye Tracker. The software imports the recorded data and videos from the SD memory card used in a Tobii Pro Glasses 2 recording and enables the user to work with the data in a number of ways including replaying, data mapping to the snapshot, data visualizations, and data and metrics exporting (Tobii pro glass analyzer manual, 2016).

For each image, an outline was drawn around each region of interest of the snapshot of the screenshot of Adidas and Patagonia. Area of interest (AOI) allows eye-tracking researchers or analysts to further analysis quantitative eye movement measures such as fixation counts and dwell time (Holmqvist et al., 2011; Park, DeLong, & Woods, 2012). AOI tools in Tobii Pro glasses analyzer can draw a boundary around a feature or element of the eye-tracking stimulus either on a snapshot or on a video clip. The Tobii Pro glasses analyzer software can calculate the desired metrics within this boundary over the time interval of interest (Tobi pro glasses analyzer, 2018). Based on the pilot study and previous research (Bucklow et al., 2017), nine areas of interest (AOIs) for the webpage of more sustainable apparel were defined in the screenshots (snapshot) of Patagonia to facilitate data analysis. On the other hand, screenshots of Adidas had eight areas of interest as generally, they have no such identified areas which represented the sustainability attributes of the webpage. Table 2 lists the name of the area of interest and their representation areas. However, the stimulus of Adidas only contained eight AOIs without the sustainability attributes (AOI 6).

For each AOI, participants' gaze behavior was analyzed to investigate their attention in those interested areas. Researcher defined construction method was used to manufacture the

AOIs. In the researcher defined construction method, AOIs are constructed by a researcher involved with the study or an external expert to determine the most relevant area of the stimuli (Hessels, Kemner, van den Boomen, & Hooge, 2016). AOI was drawn by hand-drawn method (Hessels, Kemner, van den Boomen, & Hooge, 2016). Representation areas of AOIs were illustrated in table 2 and examples are shown in Figure 1 and Figure 2. The slides with definition of AOIs in every slide are attached as Appendix C.

Table 2 Representation areas of AOIs.

Areas of interest (AOI)	Representation area
AOI 1	Brand name
AOI 2	Product images
AOI 3	Consumer rating
AOI 4	Consumer reviews
AOI 5	Size and fit
AOI 6	Sustainability information (Including organic and fair-trade information)
AOI 7	Price
AOI 8	Shipping and return policy
AOI 9	Product feature (Including materials and fabric information, and care)

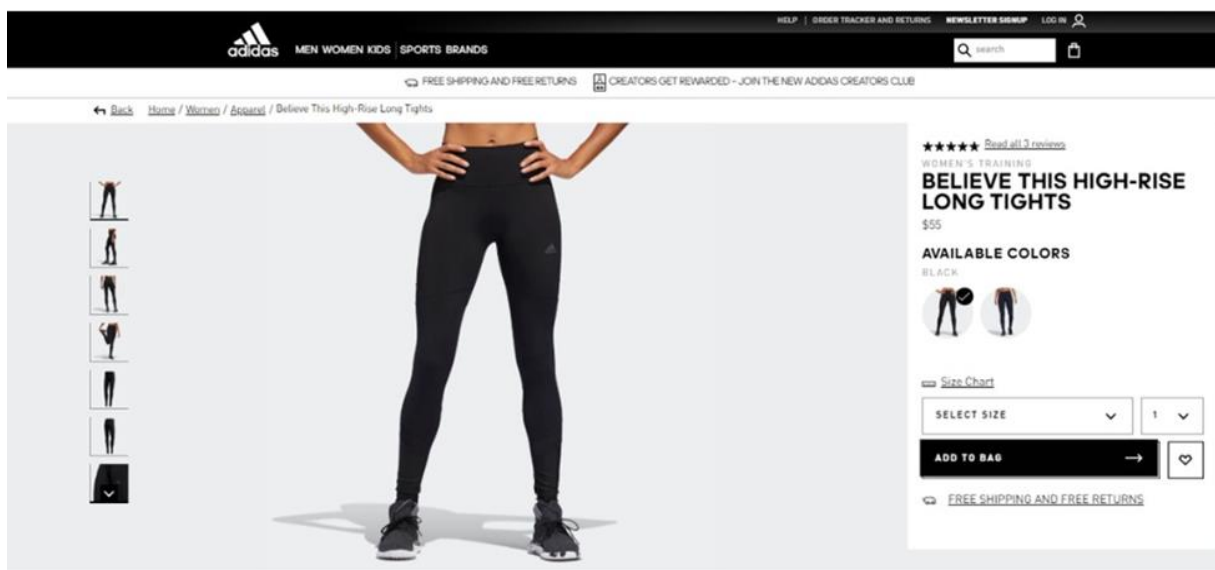


Figure 1 Example of screen-shot used as a stimulus for the participant in the eye-tracking study.

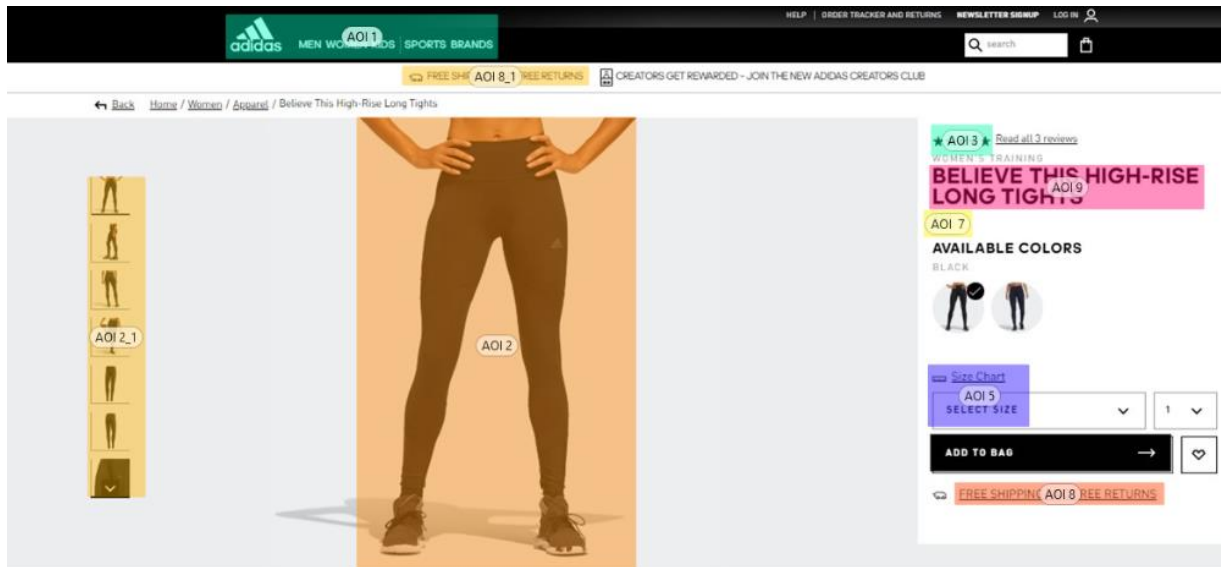


Figure 2 AOIs of a sample image.

Once AOIs were created in each snapshot of the stimulus, the gaze data from the recorded video of each participant was mapped onto the snapshot. Raw eye movement data imported from the eye tracker includes timestamps and gaze coordinates. The timestamp was shown in milliseconds and starts at zero (0) at the beginning of each recording (Tobii Pro, 2018). Gaze coordinates refer to the position measures of eye-tracking data including fixation data which are expressed as Cartesian (x, y)-coordinates in a two-dimensional space (Holmqvist et al., 2011). A data export output file includes data about which gaze points are located inside the defined AOIs. Raw fixation filter was used during mapping, which mapped the gaze point by gaze point. This filter can map all available data in all circumstances to the snapshot (Tobii pro glass analyzer manual, 2016). Figure 3 shows the mapping from recorded video to snapshot.

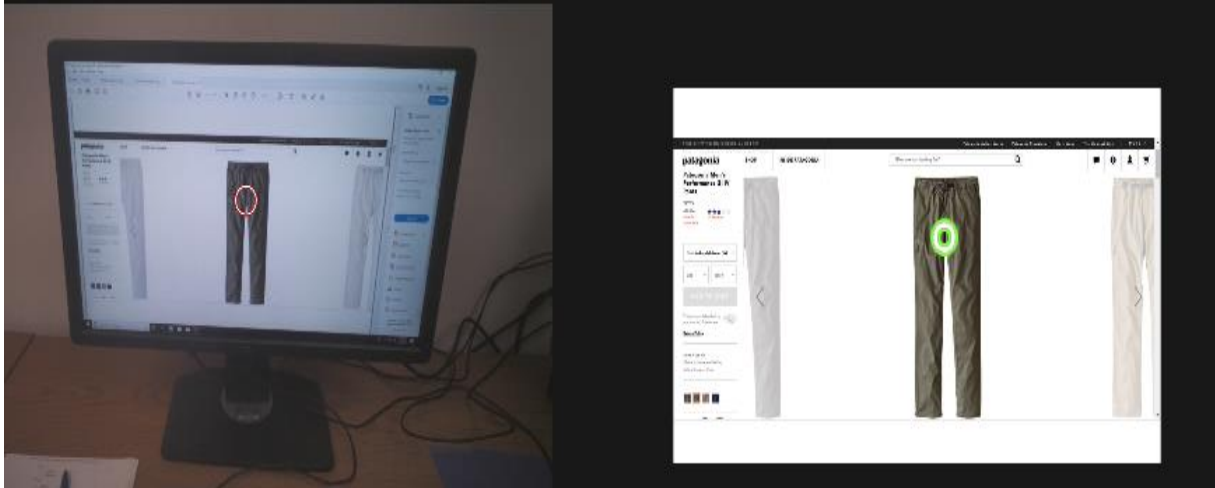


Figure 3 Mapping eye gaze data onto snapshot from recorded video.

To classify and calculate the fixation from the mapped gaze samples, Tobii I-VT Fixation Filter was used. Tobii I-VT Fixation Filter is suitable for controlled studies where only fixations and saccades are present in the collected data (Tobii pro glasses analyzer manual, 2016).

According to the manual of Tobii pro glasses analyzer (2016), Tobii I-VT Fixation Filter can classify eye movements based on the velocity of the directional shifts of the eye. Velocity is calculated in visual degrees per second. When the velocity of the eye movement is below a certain threshold, the samples are classified as part of a fixation. If the velocity is above the threshold, the samples are classified as a saccade. Minimum fixation duration was used in this Tobii I-VT Fixation filter is 60 ms and the velocity threshold was 30 degrees/second. The system is accurate to within 0.5° (Tobii pro glasses analyzer manual, 2016).

The function of the Raw fixation filter and the Tobii I-VT fixation filter can be illustrated by a gaze plot and a heat map. Tobii pro glass analyzer manual (2016) described that a gaze plot is a visualization showing the sequence and position of fixations (dots) on a Snapshot image. The size of the dots indicates the fixation duration (unless the same size setting has been selected, in which case all the gaze plot points will be the same size) and the numbers in the dots represent

the order of the fixations (Tobii pro glass analyzer manual, 2016). Drusch, Bastien, and Paris (2014) stated that heatmaps representations are widely used to represent eye-tracking data from several individuals. Typically, heatmaps aggregate fixations from a set of individuals where colors or opacity vary with the density of the number or duration of fixations (Drusch, Bastien, & Paris, 2014, Tobii pro glass analyzer manual, 2016). Examples showing the function of Raw gaze filter and the Tobii I-VT fixation filter as illustrated in figure 4 and 5 in the form of Gaze plot and figure 6 and 7 in the form of a heat map.



Figure 4 Gaze plot on a snapshot after mapping from a participant recorded video by using raw gaze filter.

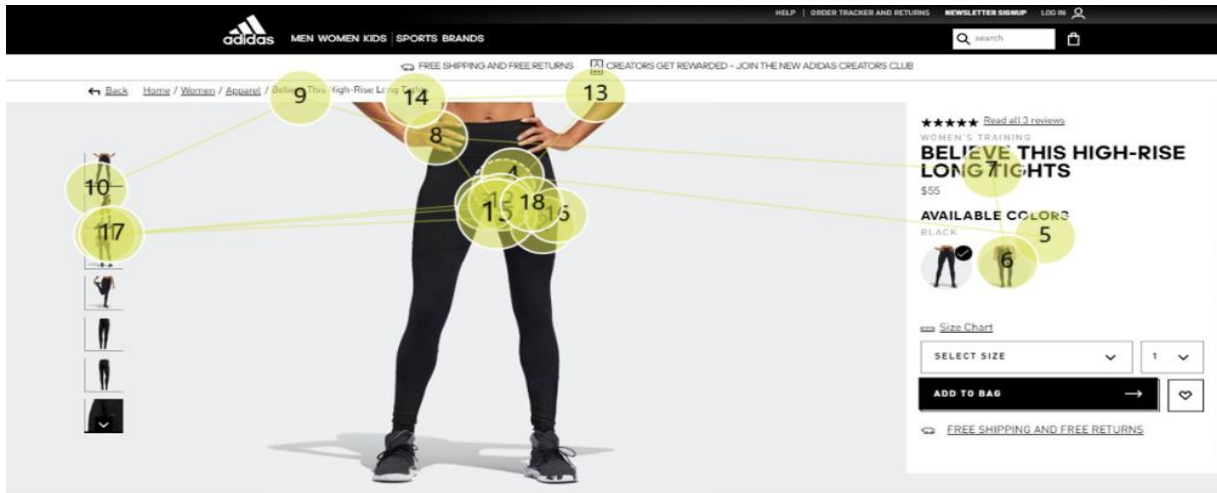


Figure 5 Gaze plot on a snapshot after mapping from a participant recorded video by using IV fixation filter.

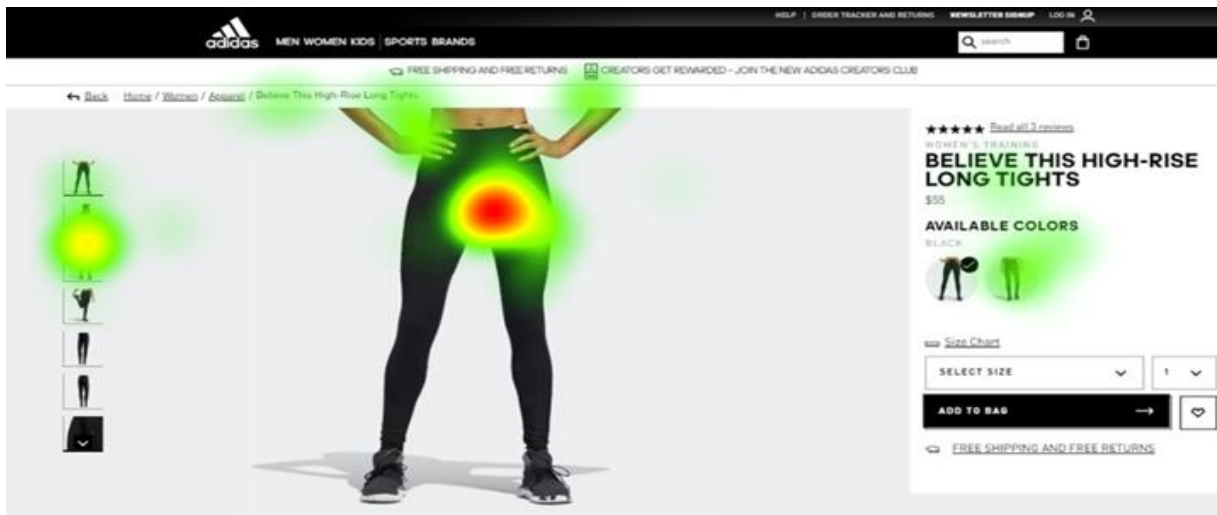


Figure 6 Heat map on a snapshot after mapping from a participant recorded video by using raw gaze filter.



Figure 7 Heat map on a snapshot after mapping from a participant recorded video by using IV fixation filter.

Data analysis

To investigate the research question, the metrics such as AOIs total dwell time, AOIs fixation count, and time to first fixation were calculated by Tobii pro glasses analyzer. Procedure for data collection and analysis for answering the research questions are provided below.

Research question one

For research question 1, the study calculated participant importance on different attributes from the survey of Phase I and in the exit survey, and the normalized proportion of fixation on all the defined AOIs of the webpage of Adidas and Patagonia. The different ranking of the importance of attributes by the participant from the survey of Phase I and exit survey was discussed. By comparing the normalized proportion of fixation, the attributes were ranked and compared between Adidas and Patagonia. Rank 1 of the attributes means that the attributes were highly attended and rank 9 means the attributes were least attended.

Research question two

In the study of Phase II, the exit survey provided the self-reported apparel preference of whether they selected the Adidas Pant or the Patagonia Pant during their eye-tracking study. The

study found two groups of the participant based on their apparel selection decision in where one group of participants intended to purchase more sustainable apparel, and the other group of participants intended to purchase less sustainable apparel. The study calculated the proportion of fixation and dwell time for these two groups and analyzed to investigate the influence of sustainability attributes in their purchase decision.

Research question three

The study invited the eligible participants from the lower concern group on the environmental impact of the apparel industry and from the higher concern group on the environmental impact of the apparel industry to participate in the study of Phase II to investigate the relationship between participants concern and their visual attention on sustainability attributes. Later, the study calculated and analyzed the proportion of fixations and proportion of dwell time on the sustainability attributes for both groups based on concern on the environmental impact of the apparel industry.

Research question four

The eye-tracking study provided the visual search behavior of each participant on the web page featuring sustainable apparel. The study calculated the time to the first fixation to identify the searching behavior and compared it between participants of higher concerned on the environmental impact of the apparel industry and lower concern on the environmental impact of the apparel industry. From this comparison, the study investigated the relationship between the level of concern from the survey of Phase I and eye-tracking data. In addition, participants of Phase II were asked about the importance of different attributes including, but are not limited to, product price, consumers product reviews which is evaluated by them in their purchase decision-making process. This self-reported data was then compared with consumers' eye-tracking data.

From the comparison, the study investigated the relationship between consumers visual attention pattern and self-reported data in the area of sustainable apparel.

Statistical analysis

After sorting and calculation, the metrics were exported in an interval-based TSV file for further analysis. Basic statistics such as average and median were obtained through Excel functions. Table 3 illustrates the number of tests used and their purpose in this study. In the study, the data distribution for some variable was normal, and for some variable, the distribution was not normal. Shapiro–Wilk (SW) tests of normality were used to test the normality of distribution (Öztuna, Elhan, & Tüccar, 2006). R-studio was used to conduct the normality test. SW test has been considered a preferred test of normality because of its excellent power properties as compared to a wide range of alternative tests (Öztuna, Elhan, & Tüccar, 2006). For normal data, to investigate the difference between two independent variable two-sample independent T-test was conducted. However, for non-normal data and small sample, a non-parametric test was conducted to compare two variables. To perform the non-parametric test for non-normal data, Mann-Whitney’ Wilcoxon test was conducted. For non-normal data, the accuracy of Mann-Whitney’ Wilcoxon test was considered better than the T-test (Huck, Cormier, & Bounds, 1974). Also, to measure the internal consistency, the Cronbach’s alpha values were calculated for the Likert scale used for the measurement of the level of concern on the environmental impact of the apparel industry.

Table 3 Description of the tests used in the study.

Statistical test (R studio was used)	Purpose
Shapiro–Wilk tests	Tests of normality
Independent samples T-test	Difference for normal distribution
Mann-Whitney’ Wilcoxon test	Difference for non-normal distribution
W, Kendall’s coefficient of concordance	Agreement between the ranks

The study included some comparison between ranks of some variables. To compare the agreement between the ranks, W, Kendall’s coefficient of concordance was calculated. The coefficient of W was used as a measure to determine whether a number of variables receive similar ranks by the participant or not. The value of W varies from zero (0) to one (1) (Holmqvist et al., 2011). Holmqvist et al., (2011) describes that zero (0) indicates an absence of agreement and one (1) indicates a perfect agreement. Friedman’s chi-square was calculated to determine whether W is significant or not.

Chapter 4 - RESULTS and ANALYSIS

Survey of Phase I

The primary purpose of the Phase I survey was to recruit and categorize participants based on their scores of concern on the environmental impact of the apparel industry. It was distributed and kept open for about one month. One hundred and sixty-three participants filled out the survey. The score of each item for concern on the environmental impact of the apparel industry was added up for each participant. The range of this score was 5 to 35 with an average of 25.60, and the median was 27. Based on the median, participants were divided into two groups: lower level of concern on the environmental impact of the apparel industry and a higher level of concern on the environmental impact of the apparel industry. Later, eligible participants from the 33% (54 participants) lower end in the lower level of concern on the environmental impact of the apparel industry group and 33% (54 participants) higher end in the higher level of concern on the environmental impact of the apparel industry group were selected and invited to participate in the second Phase.

The study used two samples independent t-test to study the difference between the concern scores of the two groups. Results show that in 95% level of confidence, the difference of the score between participants of higher concern on the environmental impact of the apparel industry (avg 31.23) and participants of lower concern on the environmental impact of the apparel industry (avg 19.95) was highly significant ($t = -17.914$, $df = 65.585$, $p\text{-value} < 2.2e-16$).

Table 4 illustrates the demographics of the participants participated in the Phase I survey. The median age of the participants filled out the survey of Phase I was 27 and the range was 18 to 64. Most of the participants filled out the survey were female (71.43%), and the rest of them

were male. The survey allows participants to select other gender categories such as non-binary. However, no one was appeared in the categories other than male and female.

Table 4 Demographics of Phase I participants.

Demographics	Categories	No of participant	Percentage
Gender	Male	46	28.57%
	Female	115	71.43%
	Binary	0	0
	Non-binary	0	0
Ethnicity	White	111	62%
	Hispanic, Latino, Spanish	17	10%
	Black or African American	11	6%
	Asian or Asian Indian	30	17%
	American Indian or Alaska Native	3	2%
	Middle Eastern or North African	4	2%
	Native Hawaiian or other Pacific Islander	1	1%
	Some other race or ethnicity	1	1%
Income	Less than \$15,000	76	49%
	\$15,000 to \$24,999	24	15%
	\$25,000 to \$34,999	19	12%
	\$35,000 to \$49,999	17	11%
	\$50,000 to \$74,999	13	8%
	\$75,000 to \$99,999	7	4%
Family income	Less than \$15,000	30	20%
	\$15,000 to \$24,999	25	17%
	\$25,000 to \$34,999	9	6%
	\$35,000 to \$49,999	13	9%
	\$50,000 to \$74,999	19	13%
	\$75,000 to \$99,999	23	15%
	100000 to 124999	13	9%
	\$125,000 to \$149,999	9	6%
	\$150,000 and over	8	5%
Education level	Less than high school degree	1	1%
	High school degree or equipment	10	6%
	Some college but no degree	38	25%
	Associate degree in college	6	4%
	Bachelor's degree in college (4-year)	35	23%
	Master's degree	47	31%
	Doctoral degree	12	8%
	Professional degree	1	1%
	Others	4	3%
Less than high school degree	1	1%	

Participants were asked about their ethnicity and race. Most of the Phase I survey participants were white American (62%). Hispanic, Latino, and Spanish group consists of 10% of the total population, and Asian or Asian Indian consists 17% of all the participant.

The survey asked participants about their personal annual income. Majority (47%) of them have personal annual income of less than \$15000. Only 1% of participants have annual personal income more than \$99,999. The survey asked participants about their family annual income as well. A large share (20%) of the participants reported their annual family income less than \$15,000. In terms of education level, the highest percentage of the participants (31%) have a Master's degree.

Cronbach's alpha

To measure the internal consistency, the Cronbach's alpha values were calculated for the Likert scale used for the measurement of the level of concern on the environmental impact of the apparel industry. The Cronbach's alpha values for the scales of concern was found 0.93. The value shows that the scale for the measurement of the level of concern on the environmental impact of the apparel industry (five items) was highly consistent. Cronbach's alpha values of concern are higher than those reported in Marcketti and Shelley (2009): 0.868 (concern for apparel industry issues).

Phase II Study

Because of the technical constraints of the eye-tracking glasses, eligible participants of the Phase II study must have no nearsighted or farsightedness. They must not wear glasses or lenses during browsing. Seventeen participants from the group of participants having a lower level of concern on the environmental impact of the apparel industry were invited to participate the Phase II, and sixteen participants from the group having a higher level of concern on the

environmental impact of the apparel industry were invited through emails. Twelve participants from each group responded and finally showed up at the research site for the eye-tracking study. Among them, the eye-tracking data of one participant from each group were not recorded due to the technical reason such as loss of network from the recording unit to the laptop. Out of twenty-two participants who actually completed an eye-tracking recording, fourteen participants were female and the rest of them are male. Table 5 illustrates the demographics of the participants participated in the Phase II study.

Table 5 Demographics of Phase II participants.

Demographics	Categories	LC	Percentage	HC	Percentage
Gender	Male	2	18.18%	6	54.55%
	Female	9	81.82%	5	45.45%
	Binary	0	0%	0	0%
	Non-binary	0	0%	0	0%
Ethnicity	White	5	45.45%	4	36.36%
	Hispanic, Latino, Spanish	0	0.00%	1	9.09%
	Black or African American	0	0.00%	0	0.00%
	Asian or Asian Indian	4	36.36%	4	36.36%
	American Indian or Alaska Native	0	0.00%	0	0.00%
	Middle Eastern or North African	1	9.09%	0	0.00%
	Native Hawaiian or other Pacific Islander	0	0.00%	0	0.00%
	Some other race or ethnicity	1	9.09%	2	18.18%
Income	Less than \$15,000	7	53.85%	7	63.64%
	\$15,000 to \$24,999	1	7.69%	2	18.18%
	\$25,000 to \$34,999	1	7.69%	1	9.09%
	\$35,000 to \$49,999	3	23.08%	0	0.00%
	\$50,000 to \$74,999	1	7.69%	1	9.09%
	\$75,000 to \$99,999	0	0.00%	0	0.00%
Family income	Less than \$15,000	0	0.00%	3	27.27%
	\$15,000 to \$24,999	4	44.44%	3	27.27%
	\$25,000 to \$34,999	0	0.00%	1	9.09%
	\$35,000 to \$49,999	3	33.33%	0	0.00%
	\$50,000 to \$74,999	1	11.11%	1	9.09%
	\$75,000 to \$99,999	1	11.11%	0	0.00%
	100000 to 124999	0	0.00%	0	0.00%
	\$125,000 to \$149,999	0	0.00%	2	18.18%
	\$150,000 and over	0	0.00%	1	9.09%
Education level	Less than high school degree	0	0.00%	0	0.00%
	High school degree or equipment	0	0.00%	0	0.00%
	Some college but no degree	0	0.00%	6	54.55%
	Associate degree in college	0	0.00%	0	0.00%
	Bachelor's degree in college (4-year)	3	25.00%	1	9.09%
	Master's degree	8	66.67%	2	18.18%
	Doctoral degree	1	8.33%	1	9.09%
	Professional degree	0	0.00%	1	9.09%
	Others	0	0.00%	0	0.00%
	Less than high school degree	0	0.00%	0	0.00%

Note LC= Lower concern on the environmental impact of the apparel industry,
 HC= Higher concern on the environmental impact of the apparel industry

The median age of the participants in the group of lower concern (LC) on the environmental impact of the apparel industry was 28, and the range was 21-38 whereas for the higher concern group (HC), it was 22 and the range was 20-38. The number of participants in the group of both lower and higher level of concern on the environmental impact of the apparel industry, who have age more than 38, was 20. Of them, 12 participants were not eligible for wearing glasses. Rest of them (8 participants) were invited for participating in the eye-tracking study, however they were not appeared in the study site. Most of the participants participated in Phase II were female (63.64%). For LC, 81.82% of the participants were female and for HC, 45.45% of the participants participated in Phase II were female.

Most of the participants participated in Phase II were white in ethnicity. For LC, 45.45% were white, and 36.36% were Asian and Asian Indian. On the other hand, for HC, white and Asian and Asian Indian were both 36.36%.

Most of the participants who participated in the study of Phase II have a personal annual income of less than \$15,000. A large share of the participants reported their annual family income from \$15,000 to \$24,999. Most of the participants (66.67%) participated in Phase II in the group of LC had Master's degree. However, for HC, most of them (54.55%) were in the group of some college but no degree.

In a comparison of the Phase I participants, none of the participants from the group of Hispanic, Latino, Spanish, and Black and African American participated in Phase II. However, similar to Phase I participants, most of the Phase II participants had less than \$15,000 personal annual income, because most of them were students. The median age of participants who participated in Phase II was 28, which is lower than the median age of participant of Phase I (27).

An eye-tracking session was about 45 minutes for filling out a consent form, completing an eye-tracking recording session, and filling out the exit survey of Phase II. On average, 93.59% (SD=4.58) gaze sample of a participant's eye movement was recorded. According to Tobii pro glasses analyzer user's manual (2016), the percentage of gaze sample is calculated by dividing the number of eye-tracking samples that were correctly identified by the theoretical maximum. In an eye tracker with a 50 HZ sampling frequency, there are 50 samples per second. If the software could use all samples to calculate the gaze points, the value in the gaze samples would be 100%. It is acceptable that some samples are missing due to a participant blinking or looking away from the monitor. Blinking can cause 5-10% data loss during an eye-tracking recording (Tobii pro glasses analyzer user's manual, 2016, p-8). The data loss in eye-tracking study was also stated by Holmqvist et al. (2011). They described that 2–5% of the data from a population of average non-pre-screened Europeans need to be excluded due to participant-specific tracking difficulties and which may be significantly varied (Holmqvist et al., 2011).

For analyzing eye-tracking data, the researcher calculated the average time spent on each slide of Patagonia and Adidas. On average, participants spent about eight seconds in browsing each screenshot of the Patagonia pants but only six seconds in browsing each screenshot of the Adidas pants during a decision making process. Figure 8 illustrates the average time spent on each slide of the two brands. Two samples independent t-test were performed to investigate the difference in the average time spent on each slide of Patagonia and Adidas. The difference was marginally significant ($t = 1.2628$, $p\text{-value} = 0.1056$). In addition, it was found that on average participants spent 7.49 seconds on the Patagonia slides that contain sustainability attributes.

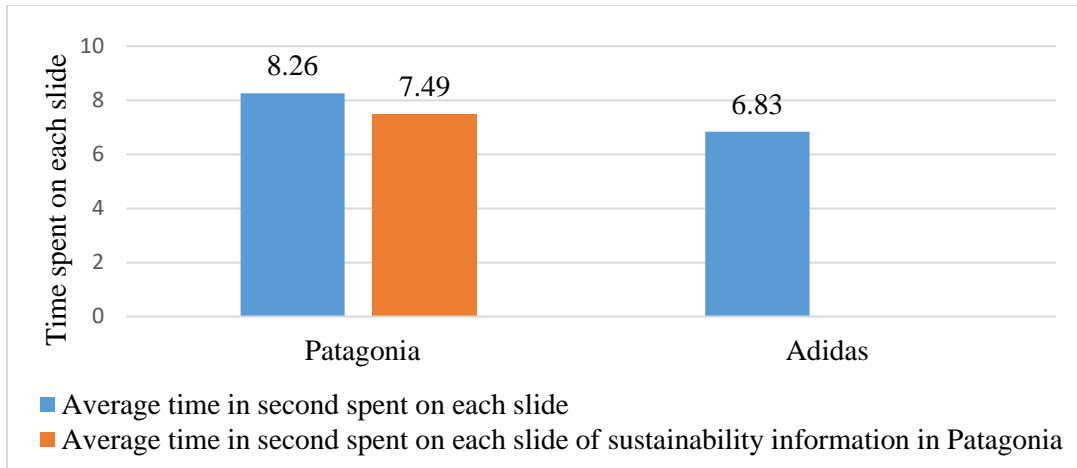


Figure 8 Average browsing time in each screenshot of Patagonia and Adidas.

Table 6 describes the breakdown of time spent on each slide of Patagonia and Adidas based on gender. From table 6, it is found that female participants tended to spend more time browsing for both products, particularly for sustainable apparel (Patagonia).

Table 6 Average browsing time based on gender.

Gender	Patagonia	Adidas
Male	7.48	6.81
Female	9.03	6.85

Immediately after completing the eye-tracking recording, a participant filled out the Phase II exit survey. Participants reported their pants purchase choice between the brands of Patagonia and Adidas. Only three participants selected more sustainable apparel (Patagonia pants). Rest of them selected the less sustainable apparel (Adidas pants). In addition, participants ranked web page attributes based on the importance upon which they selected the pants. They also expressed their thoughts on the purpose of the project and the eye-tracking experience. To most of them, the purpose of this study was to explore consumer behavior in online shopping, and the eye-tracking session was interesting and unique. On average, participants were moderately comfortable in the use of eye-tracking glasses and their performance with the glasses.

They thought that eye-tracking glasses had no effect on their performance and they expressed their interest further to participate in the eye-tracking study in the future.

Research question one

RQ 1. From a consumer's perspective, what is the relative importance of different web page attributes while a consumer attempts an online purchasing/preference decision?

RQ 1.1. From a consumer's perspective, what is the relative importance of different web page attributes toward a webpage highlighting more sustainable apparel while a consumer attempts an online purchasing/preference decision?

To address the research question 1.1, the researcher examined the results of the self-reported data in both Phase I and II surveys, as well as the eye-tracking data in Phase II (the browsing behavior of the stimulus of both Adidas and Patagonia pants). From the Phase I survey, Price was reported to be the most important attributes by the participants. The second important attribute was Fit and Aesthetics. Table 7 illustrates the ranks of different attributes reported from the Phase I survey and the exit survey. In this figure, rank 1 illustrates the highest importance and rank 8 illustrates the lowest importance. On the other hand, from the exit survey, Size and Fit was considered to be the most important attributes. The second most important attribute was product image and followed by Price. Interestingly, for both surveys, brand name was considered as the least or the second least important attributes in purchasing the apparel. On the other hand, sustainability attributes are not considered adequately important by participants in either survey.

Table 7 Ranks of different attributes reported in survey.

Rank	Attributes in Phase I survey	Attributes in exit survey
1	Size and fit	Price
2	Product images	Fit
3	Price	Aesthetics
4	Consumer reviews	Quality
5	Product feature	Fashionability
6	Consumer rating	Sustainability
7	Shipping and return policy	Durability, Brand name
8	Brand name	-
9	Sustainability information	-

Based on participants' eye-tracking gaze samples, the value of the normalized proportion of fixation on different area of interest (AOIs) was calculated, and then participants' attention on different AOIs was ranked accordingly. Based on consumer eye-tracking gaze behavior of the Patagonia pants (the normalized proportion of fixation on different AOIs), Table 7 indicates the rank of importance (amount of attention) of AOIs in the Patagonia stimulus. Results show that the normalized proportion of fixation of all participants during the browsing of Patagonia stimulus is the highest on the consumer rating (AOI 3) and lowest on brand name (AOI 1).

On the other hand, different patterns of fixations were found between female and male participants. For example, the female participant has the highest number of fixations on the consumer rating (AOI3). On the other hand, male participants have the highest number of fixations on the product feature. Also, results show that that the sustainability attributes (AOI 6) in the screenshots of Patagonia apparel website was ranked 8 for the female participants and 7 for male participants. Interestingly, the female participants have a lower number of fixation on the price (AOI 7) whereas the male participant has a higher number of fixation on price (AOI 7).

The amount of variation between the average rankings of the male and female participant in Patagonia was used to calculate W, Kendall's coefficient of concordance. Here for the table 8, the value of W between the male and female group was found 0.558, which indicates a fair

agreement between female and male in ranking the AOIs in Adidas. Friedman’s chi-square was calculated to determine whether W is significant or not. The value of Chisq (8) = 8.93 and p-value=0.348, which indicates that the agreement in ranking the AOIs between male and female participant is not significant.

Table 8 Rank of the importance of AOIs in Patagonia stimulus.

AOIs on Patagonia screenshot	Rank of importance	Rank of importance by Female	Rank of importance by Male
AOI 1 Brand name	9	6	9
AOI 2 Product images	2	2	5
AOI 3 Consumer rating	1	1	3
AOI 4 Consumer reviews	5	4	8
AOI 5 Size and fit	3	3	4
AOI 6 Sustainability information	8	8	7
AOI 7 Price	6	9	2
AOI 8 Shipping and return policy	7	7	6
AOI 9 Product feature	4	5	1

RQ 1.2. From a consumer’s perspective, what is the difference in the relative importance of web page attributes between a webpage highlighting more sustainable products and a webpage highlighting less sustainable apparel products while a consumer attempts an online purchasing/preference decision?

To address the research question 1.2, the researcher examined the normalized proportion of fixation, the rank of importance of AOI on the stimulus of Adidas, and then compared those values with the proportion of fixation and rank of importance of AOI on the stimulus of Patagonia. Based on consumer eye-tracking gaze behavior of the Adidas pants (the normalized proportion of fixation on different AOIs), Table 9 indicates the rank of importance (amount of attention) of AOIs in the Adidas stimulus. Results show that the overall normalized fixation proportion of all participants during the browsing of Adidas stimulus is the highest on the consumer reviews (AOI 3) and lowest on brand name (AOI 1). The rank of importance of price (AOI 7) for both the male and female participants was the same. However, different patterns

were found between female and male participants for some other AOIs. For example, the female participant has the highest number of fixations on consumer reviews (AOI 4). On the other hand, male participants have the highest number of fixations on the consumer rating (AOI 3).

The amount of variation between the average rankings of the male and female participant in Adidas was used to calculate W, Kendall’s coefficient of concordance. Here for table 9, the value of W between the male and female group was found 0.964, which indicates a huge agreement between female and male in ranking the AOIs in Adidas. Friedman’s chi-square was calculated to determine whether W is significant or not. The value of Chisq (8) = 13.5 and p-value=0.0608, which indicates that the agreement is significant at 10% level of significance.

Table 9 Rank of the importance of AOIs in Adidas stimulus.

AOIs on Adidas screenshot	Rank of importance	Rank of importance by Female	Rank of importance by Male
AOI 1 Brand name	8	8	8
AOI 2 Product images	6	6	6
AOI 3 Consumer rating	2	1	1
AOI 4 Consumer reviews	1	3	3
AOI 5 Size and fit	5	5	5
AOI 6 Sustainability information	-	-	-
AOI 7 Price	7	7	7
AOI 8 Shipping and return policy	4	4	4
AOI 9 Product feature	3	2	2

In comparing the participants’ ranking of AOIs for Patagonia with the ranking of AOIs for Adidas, results indicate different attention patterns for the two brands. Table 10 compares the ranking of AOIs for Patagonia and Adidas apparel website. In Patagonia, participants had the highest normalized proportion of fixation on consumer rating (AOI 3) whereas in Adidas consumers highest normalized proportion of fixation was on consumer reviews (AOI 4). On the other hand, one of the major differences in the attention of two brands is that consumer reviews (AOI 4) was ranked as 5 for Patagonia whereas it was ranked as the highest one for Adidas.

Besides, participants had higher attention on product image (AOI 2) of Patagonia than the product image (AOI 2) of Adidas.

Table 10 Normalized proportion of fixations on various AOI during browsing on Adidas and Patagonia stimulus.

Area of interest	AOI 1	AOI 2	AOI 3	AOI 4	AOI 5	AOI 6	AOI 7	AOI 8	AOI 9
Patagonia	9	2	1	5	3	8	6	7	4
Adidas	8	6	2	1	5	N/A	7	4	3

Note AOI 1=Brand name, AOI 2=Product images, AOI 3=Consumer rating, AOI 4= Consumer reviews, AOI 5=Size and fit, AOI 6=Sustainability information, AOI 7=Price, AOI 8=Shipping and return policy, AOI 9=Product feature

Similarly, the amount of variation between the average rankings of participant between Patagonia and Adidas was used to calculate W, Kendall’s coefficient of concordance. The value of W between Patagonia and Adidas was found 0.714, which indicates a fair agreement between in ranking the AOIs between Adidas and Patagonia. Friedman’s chi-square was calculated to determine whether W is significant or not. The value of $\chi^2(8) = 10$ and $p\text{-value} = 0.189 > 0.05$ which indicates that the agreement in Patagonia and Adidas in ranking the AOIs is not significant.

Research question two

RQ 2. How does the presence of sustainability attributes affect the online decision-making process of a consumer who intends to purchase of apparel?

Hypotheses 2.1. A consumer who has a higher dwell time on sustainability attributes likely to purchase more sustainable apparel than a consumer who has a lower dwell time on sustainability attributes.

To address the research hypothesis 2.1, the researcher examined the dwell time proportion on the sustainability attributes of Patagonia and compared the proportion between participants who selected more sustainable apparel and who selected less sustainable apparel. The dwell time proportion on sustainability attribute for each participant was calculated by

dividing the dwell time into sustainability attributes (AOI 6) on Patagonia with the total dwell time on all area of interest of Patagonia. Table 11 illustrates the proportion of dwell time on sustainability attributes for participants who selected more sustainable apparel (Patagonia) and participants who selected less sustainable apparel (Adidas). From the table 10, it is found that the average dwell time proportion for participants selected more sustainable apparel is 0.31 whereas the average dwell time proportion for participants who selected less sustainable apparel is 0.1. Interestingly, two participants from the group of selecting less sustainable apparel spent no time on sustainability attributes.

Table 11 Distribution of dwell time on sustainability attributes (AOI 6).

Participants who selected more sustainable apparel				Participants who selected less sustainable apparel			
Participant	Dwell time	Total dwell time	Dwell time proportion Mean =0.31 (SD=0.2)	Participant	Dwell time	Total dwell time	Dwell time proportion Mean =0.1 (SD=0.06)
1	97.68	177.02	0.55	1	72.46	314.92	0.23
2	42.80	136	0.31	2	9.83	83.75	0.12
3	6.44	104.24	0.06	3	3.44	75.76	0.05
-	-	-	-	4	3.14	21.65	0.14
-	-	-	-	5	48.95	331.5	0.15
-	-	-	-	6	0.00	3.48	0.00
-	-	-	-	7	2.48	79.31	0.03
-	-	-	-	8	2.50	28.62	0.09
-	-	-	-	9	49.31	623.45	0.08
-	-	-	-	10	17.25	245.36	0.07
-	-	-	-	11	4.86	72.36	0.07
-	-	-	-	12	10.43	70.06	0.15
-	-	-	-	13	0.00	9.25	0.00
-	-	-	-	14	119.71	503.88	0.24
-	-	-	-	15	9.63	158.73	0.06
-	-	-	-	16	36.06	237.82	0.15
-	-	-	-	17	6.70	107.4	0.06
-	-	-	-	18	8.81	64.84	0.14
-	-	-	-	19	0.16	16.85	0.01

Shapiro–Wilk tests of normality revealed that data of dwell time proportion from participants who selected more sustainable apparel and who selected less sustainable apparel were non-normally distributed. To explore the difference in dwell time proportion between participants selected more sustainable apparel (Patagonia) and selected less sustainable apparel (Adidas), the Mann-Whitney Wilcoxon Test was conducted. For 90% level of confidence, participant selected more sustainable apparel (Patagonia)(Median=0.31) have significantly higher dwell time proportion on sustainability attributes than participant preferred less sustainable apparel (Adidas) (Median = 0.08), W value=46, P=0.05188.

Table 12 illustrates the relationship between the participants' dwell time proportion on the Sustainability attribute (AOI 6 in Patagonia Stimulus) and their product choices. It is found that two male participants who had the highest dwell time proportion on the sustainability attributes actually chose the Patagonia pants in the Phase II exit survey. On the other hand, no similar relationship was found for the female participant who selected the Patagonia pants in the Phase II exit survey.

Table 12 Participants choices and dwell time proportion on sustainability attributes.

Male participants		Female participants	
Participants choices	Dwell time proportion on Sustainability attribute (AOI 6)	Participants choices	Dwell time proportion on Sustainability attribute (AOI 6)
<i>Patagonia</i>	0.55	Adidas	0.15
<i>Patagonia</i>	0.31	Adidas	0.15
Adidas	0.24	Adidas	0.14
Adidas	0.23	Adidas	0.14
Adidas	0.15	Adidas	0.09
Adidas	0.12	Adidas	0.08
Adidas	0.07	Adidas	0.07
Adidas	0.00	Adidas	0.06
-	-	<i>Patagonia</i>	0.06
-	-	Adidas	0.06
-	-	Adidas	0.05
-	-	Adidas	0.03
-	-	Adidas	0.01
-	-	Adidas	0.00

Hypothesis 2.2. A consumer who has a higher fixation on sustainability attributes purchases more sustainable apparel than a consumer who has a lower fixation on sustainability attributes.

To address the research hypothesis 2.2, the researcher examined the fixation proportion on the sustainability attributes of Patagonia and compared the proportion between participants who selected more sustainable apparel and who selected less sustainable apparel. The fixation proportion on sustainability attributes for each participant was calculated by dividing the number of fixations into sustainability attributes (AOI 6) on Patagonia with the total number of fixation on all area of interest of Patagonia. Table 13 illustrates the number of fixation of participants on sustainability attributes, the total number of fixations of a participant in all areas of interest, and fixation proportion on sustainability attributes for participants who selected more sustainable apparel (Patagonia) and participants who selected less sustainable apparel (Adidas). From table 13, the average fixation proportion for participants who selected more sustainable apparel was

0.32, whereas the average fixation proportion for participants who selected less sustainable apparel is 0.11. Interestingly, two participants from the group of selecting less sustainable apparel have no fixation on sustainability attributes.

Table 13 Distribution of fixation on sustainability attributes (AOI 6).

Participants selected more sustainable apparel				Participants selected less sustainable apparel			
Participant	Fixation	Total fixations	Fixation proportion Mean =0.32 (SD=0.19)	Participant	Fixation	Total fixations	Fixation proportion Mean =0.11 (SD=0.07)
1	416	0.54	416	1	214	831	0.26
2	337	0.35	337	2	38	246	0.15
3	228	0.08	228	3	13	273	0.05
-	-	-	-	4	9	73	0.12
-	-	-	-	5	114	777	0.15
-	-	-	-	6	0	6	0.00
-	-	-	-	7	10	167	0.06
-	-	-	-	8	9	96	0.09
-	-	-	-	9	103	954	0.11
-	-	-	-	10	36	524	0.07
-	-	-	-	11	17	137	0.12
-	-	-	-	12	45	215	0.21
-	-	-	-	13	0	33	0.00
-	-	-	-	14	198	715	0.28
-	-	-	-	15	26	380	0.07
-	-	-	-	16	73	417	0.18
-	-	-	-	17	21	283	0.07
-	-	-	-	18	24	196	0.12
-	-	-	-	19	1	46	0.02

Shapiro–Wilk tests of normality revealed that data of fixation proportion from participants who selected more sustainable apparel and who selected less sustainable apparel were non-normally distributed. To explore the difference in fixation proportion between participants selected more sustainable apparel (Patagonia) and selected less sustainable apparel (Adidas), the Mann-Whitney Wilcoxon Test was conducted. For 90% level of confidence, participant preferred more sustainable apparel (Patagonia)(Median=0.11) have significantly more

fixation proportion on sustainability attributes than participant selected less sustainable apparel (Adidas) (Median = 0.08), W value=44, P=0.07557.

Table 14 illustrates the ranking of fixation proportion of different participants and their decision. It was found that the two male participants who had the highest fixation proportion on sustainability attributes actually selected the more sustainable Patagonia pants in the Exit survey. On the other hand, no similar relationship was found for the female participant who chose the more sustainable Patagonia pants in the Phase II exit survey.

Table 14 Participants choices and the fixation proportion on sustainability attributes.

Participants based on preference decision	Fixation proportion	Participants based on preference decision	Fixation proportion
<i>Patagonia</i>	0.54	Adidas	0.18
<i>Patagonia</i>	0.35	Adidas	0.15
Adidas	0.28	Adidas	0.12
Adidas	0.26	Adidas	0.12
Adidas	0.21	Adidas	0.11
Adidas	0.15	Adidas	0.09
Adidas	0.12	<i>Patagonia</i>	0.08
Adidas	0.00	Adidas	0.07
-	-	Adidas	0.07
-	-	Adidas	0.07
-	-	Adidas	0.06
-	-	Adidas	0.05
-	-	Adidas	0.02
-	-	Adidas	0.00

This study further investigated closely the proportion of fixation on each AOIs of all the female participants. Then this study compared the proportion of fixation of the female participants who selected the more sustainable Patagonia pants and with all the other female participants. The female participant who selected the Patagonia pants placed higher fixation on consumer review (AOI 4), brand name (AOI 1), and product image (AOI 2) than the other female participants did, but she placed less fixation on sustainability attributes (AOI 6) and size and fit (AOI 5) than other participants did. Table 15 shows more details.

Table 15 Percentage of fixation on all AOIs of Patagonia pants – Female participants.

AOIs	Percentage of average fixation of all female participants	Percentage of fixation of the female participant who selected the Patagonia Pants
AOI 1 Brand name,	0%	1%
AOI 2 Product images	7%	8%
AOI 3 Consumer rating	1%	1%
AOI 4 Consumer reviews	52%	58%
AOI 5 Size and fit	8%	5%
AOI 6 Sustainability information	10%	5%
AOI 7 Price	0%	0%
AOI 8 Shipping and return policy	17%	17%
AOI 9 Product feature	4%	4%

Research question three

RQ 3. What is the relationship between consumers' level of concern on the environmental impact of the apparel industry and his/her visual attention pattern such as dwell time and eye fixation on the sustainability information provided on a sustainable apparel product in the online retailing setting?

Hypothesis 3.1. *Consumers having higher concern on the environmental impact of the apparel industry will have higher dwell time on the sustainable attributes of the web page of more sustainable apparel than the consumer who has less environmental concerns.*

To address the research hypothesis 3.1, the researcher examined the dwell time proportion on the sustainability attributes of Patagonia and compared the proportion between participants having a higher level of concern on the environmental impact of the apparel industry and participants having a lower level of on the environmental impact of the apparel industry.

Table 16 illustrates the dwell time of participants on sustainability attributes, the total dwell time of a participant in all areas of interest, and proportion of dwell time on sustainability attributes for participants having lower concern and participants having a higher concern. From table 16, it

is found that the average dwell time proportion for participants having lower concern is 0.09 whereas the average dwell time proportion for participants having higher concern is 0.1.

Table 16 Distribution of dwell time on sustainability attributes (AOI 6) based on level of concern on the environmental impact of the apparel industry.

Lower level of concern on the environmental impact of the apparel industry				Higher level of concern on the environmental impact of the apparel industry			
Participant NO.	Dwell time	Total dwell time	Dwell time proportion Mean =0.09 (SD=0.06)	Participant NO.	Dwell time	Total dwell time	Dwell time proportion Mean =0.16 (SD=0.15)
1	72.46	314.92	0.23	1	4.86	72.36	0.07
2	9.83	83.75	0.12	2	97.68	177.02	0.55
3	6.44	104.24	0.06	3	10.43	70.06	0.15
4	3.44	75.76	0.05	4	42.80	136	0.31
5	3.14	21.65	0.14	5	0.00	9.25	0.00
6	48.95	331.5	0.15	6	119.71	503.88	0.24
7	0.00	3.48	0.00	7	9.63	158.73	0.06
8	2.48	79.31	0.03	8	36.06	237.82	0.15
9	2.50	28.62	0.09	9	6.70	107.4	0.06
10	49.31	623.45	0.08	10	8.81	64.84	0.14
11	17.25	245.36	0.07	11	0.16	16.85	0.01

Shapiro–Wilk tests of normality revealed that data of dwell time proportion from participants having a lower level of concern on the environmental impact of the apparel industry and participants having a higher level of concern on the environmental impact of the apparel industry were non-normally distributed. To explore the difference in dwell time proportion between participants having higher concern and participant having a lower concern on the environmental impact of the apparel industry, the Mann-Whitney Wilcoxon Test was conducted. For a 95% level of confidence, there was no significant difference in dwell time proportion on sustainability attributes found between participants having a higher concern (Median=0.11) and participants having a lower concern on the environmental impact of the apparel industry (Median = 0.08). W value=73.5, P=0.2058.

Hypothesis 3.2. *Consumers having higher concern for apparel industry will have higher eye fixation on the sustainable attributes of the web page of more sustainable apparel than the consumer who has lower concerns on the environmental impact of the apparel industry.*

To address the research hypothesis 3.2, the researcher examined the fixation proportion on the sustainability attributes of Patagonia and compared the fixation proportion between participants having a higher concern on the environmental impact of the apparel industry and participants having a lower concern on the environmental impact of the apparel industry. Table 17 illustrates the number of fixation of participants on sustainability attributes, the total number of fixation of a participant on all areas of interest, and fixation proportion on sustainability attributes (AOI 6) for participants having lower concern on the environmental impact of the apparel industry and participants having a higher concern for apparel industry impact. From table 17, it is found that the average fixation proportion for participants having a lower concern on the environmental impact of the apparel industry is 0.07 whereas the average dwell time proportion for participants having higher concern for apparel industry impact is 0.18.

Table 17 Distribution of fixation on sustainability attributes (AOI 6) based on level of concern on the environmental impact of the apparel industry .

Lower level of concern on the environmental impact of the apparel industry				Higher level of concern on the environmental impact of the apparel industry			
Participant NO.	Number of Fixation	Total number of fixation	Fixation proportion Mean=0.1 (SD=0.07)	Participant NO.	Number of Fixation	Total number of fixation	Fixation proportion Mean =0.18 (SD=0.15)
1	214	831	0.26	1	17	137	0.12
2	38	246	0.15	2	226	416	0.54
3	18	228	0.08	3	45	215	0.21
4	13	273	0.05	4	118	337	0.35
5	9	73	0.12	5	0	33	0.00
6	114	777	0.15	6	198	715	0.28
7	0	6	0.00	7	26	380	0.07
8	10	167	0.06	8	73	417	0.18
9	9	96	0.09	9	21	283	0.07
10	103	954	0.11	10	24	196	0.12
11	36	524	0.07	11	1	46	0.02

Shapiro–Wilk tests of normality revealed that data of fixation proportion from participants having lower concern on the environmental impact of the apparel industry and participants having higher concern on the environmental impact of the apparel industry were non-normally distributed. To explore the difference of fixation proportion between participants having higher concern for apparel industry impact and participant having lower concern on the environmental impact of the apparel industry, the Mann-Whitney Wilcoxon Test was conducted. For 95% confidence interval, no significant difference in fixation proportion on sustainability attributes were found between the participants having higher concern on the environmental impact of the apparel industry (Median=0.09) and the participants having lower concern on the environmental impact of the apparel industry (Median = 0.12). W value=44.5, P=0.8608.

Research question four

RQ 4. Is eye-tracking technology a potential instrument/experimental tool for explaining consumers' self-reported data in the area of sustainable apparel?

The research question examined both the participants' eye-tracking behavior and self-reported data. The research question has two sub-questions.

RQ. 4.1. *What is the relationship between participants' environmental concern reported from the survey of Phase I and their visual pattern on sustainability attributes?*

The average time to the first fixation to the sustainability attributes (AOI 6) was calculated for the participants of both the higher level of concern on the environmental impact of the apparel industry and the lower level of concern on the environmental impact of the apparel industry. Table 18 illustrates the average time to the first fixation on sustainability attributes based on the level of concern on the environmental impact of the apparel industry. One participant from the group of higher concern on the environmental impact of the apparel industry and three participants from the group of lower concern on the environmental impact of the apparel industry did not focus on the sustainability AOI of the screenshot of Patagonia.

Table 18 Average time to the first fixation on sustainability AOI based on level of concern on the environmental impact of the apparel industry .

Participant	Average time to first fixation on sustainability AOI – Higher concern (M=0.329, SD=0.250)	Average time to first fixation on sustainability AOI – Lower concern (M=.045, SD= 0.063)
1	0.430	0.080
2	0.645	0.000
3	0.077	0.000
4	0.049	0.020
5	0.512	0.195
6	0.040	0.007
7	0.725	0.000
8	0.060	0.060
9	0.273	-
10	0.480	-
11	-	-

To explore the difference of average time to the first fixation on sustainability attributes between participants having a higher concern on the environmental impact of the apparel industry and participants having a lower concern on the environmental impact of the apparel industry, the Mann-Whitney Wilcoxon Test was conducted. For a 95% confidence level, the participant having a higher level of concern (Median=0.09) has a significantly more average time to the first fixation than participant having a lower concern (Median = 0.12). W value=69.5, P=.004892.

RQ. 4.2. What is the relationship between consumers' self-reported apparel preferences from the exit survey and their eye-tracking data while they consider purchasing sustainable apparel online?

The Phase II survey asked participants to rank web page AOIs in their perceived order of importance (from the most important to the least important) by reflecting on their browsing experience of the two pairs of pants in the eye-tracking session. The choices of AOIs included brand name (AOI 1), product image (AOI 2), consumer rating (AOI 3), consumer reviews (AOI 4), size and fit (AOI 5), sustainability information (AOI 6), price (AOI 7), shipping and return policy (AOI 8), and product features (AOI 9). The position of each attribute from self-reported data was added up for all the participants who participated in the eye-tracking study. The lowest score of an attribute indicates that the attribute is the most important, and the highest score of an attribute indicates that the attribute is least important. By arranging the score of each attribute from lowest to highest, the rank of the attributes were calculated from the Phase II exit survey.

Table 19 compares the rank of AOIs from self-reported data and that from eye-tracking data. It was found that participants ranked the size and fit as the most important attribute in their Phase II exit survey. On the other hand, based on the eye-tracking data, consumers' highest

attention went on consumer rating for Patagonia, and their highest attention went on consumer reviews for Adidas. From table 19, it is found that the rank of AOIs based on the exit survey were approximately similar to the ranks of AOIs of Patagonia based on eye-tracking data. For example, the ranks of the AOIs including product images, consumer reviews, shipping and return policy and product feature in the exit survey and the eye-tracking data are closer for Patagonia than Adidas.

Table 19 Comparison of the ranks of AOIs reported from the exit survey and the eye-tracking data.

AOIs	Rank of AOIs based on the exit survey	Rank of AOIs – Patagonia	Rank of AOIs – Adidas
AOI 1 Brand name,	8	9	8
AOI 2 Product images	2	2	6
AOI 3 Consumer rating	6	1	2
AOI 4 Consumer reviews	4	5	1
AOI 5 Size and fit	1	3	5
AOI 6 Sustainability information	9	8	-
AOI 7 Price	3	6	7
AOI 8 Shipping and return policy	7	7	4
AOI 9 Product feature	5	4	3

The amount of variation between the rank of AOIs in the exit survey and the rank of AOIs from the fixation proportion information on the screenshot of Patagonia collected in eye-tracking sessions was used to calculate W, Kendall’s coefficient of concordance. The coefficient of W was used as a measure to determine whether a number of AOIs receive similar rank by the participant self-reported data and their eye gaze behavior. The value of W was found 0.825, which suggest that the AOIs were ranked in more or less the same order by the participants. Friedman’s chi-square was calculated to determine whether W is significant or not. The value of $\chi^2(9) = 13.2$ and $p\text{-value} = 0.10$, which indicates that the agreement is marginally significant.

The amount of variation between the rank of AOIs in the exit survey and the rank of AOIs from the fixation proportion information on the screenshot of Adidas collected in eye-tracking sessions was used to calculate W, Kendall’s coefficient of concordance. The value of W was found 0.558, which suggest that the AOIs were ranked in moderately the same order by the

participants. Friedman's chi-square was calculated to determine whether W is significant or not. The value of $\text{Chisq}(8) = 8.98$ and $p\text{-value} = 0.348$, which indicates that the agreement is not significant.

Chapter 5 - DISCUSSION

This chapter consists of a summary of the study, discussion of the findings, and the implication of the findings, limitation, as well as recommendations for future research.

Summary of the study

Over the years, awareness in sustainable apparel production and marketing have been increasing, however, the successful marketing of sustainable apparel products has not been fully realized by the potential market (Han, Henninger, Apeageyi, & Tyler, 2017; Rex & Baumann, 2007). Marketing of sustainable apparel product could have several inherent barriers no matter how hard marketers try to persuade consumers by attracting their attention to the sustainable dimension of the product. No existing research has explored the effect of the online presentation of sustainability attributes for an online product and how that presentation influences consumers' online purchasing behaviors. Besides, an understanding of the concern on the environmental impact of the apparel industry that influences the decision-making process of the consumer can provide insights into how to effectively present sustainability attributes, study target market, and educate potential consumers. Thus, this study first investigated how web page attributes of online apparel products including sustainability information influence consumers' purchase decisions, particularly when taking consideration of the way a participant's existing concern on the environmental impact of the apparel industry influences his/her decision. The second purpose of this study was to explore the potential use and effectiveness of eye-tracking technology in examining the content of a website for effective marketing of sustainable apparel.

This study intends to expand the current understanding of online marketing for sustainable apparel. It will provide apparel companies which are focusing on sustainable apparel with marketing insights such as better understanding consumer behavior, more effective

selection of appropriate information for the website of sustainable apparel, and better web page layout. It will also provide insights on what kind of information eye-tracking technology could provide to improve the of sustainable apparel.

An online Qualtrics survey was first administered to participants of 18-65 years old to collect their demographic information and to investigate their purchasing behavior, concern on the environmental impact of the apparel industry. Based on the score of concern, the median score of all the respondents was calculated and the respondents were categorized into a lower concern and a higher concern group. Later, eligible participants from the top 33% of the list from the higher end in the lower concern group and with a score from the lower 33% in the lower concern group were selected and invited to participate in the eye-tracking study. Twelve participants with a score from the upper end in the higher concern group and twelve participants with a score from the lower end in the lower concern group participated in the eye-tracking study. Participants were provided with the webpages screenshots of two apparel brands including Patagonia and Adidas for pants. Invited participants were instructed to evaluate and select the one apparel product they would most likely to purchase from those two brands when wearing eye-tracking glasses. Later, they participated in an exit survey where they were asked to respond to the questions about their eye-tracking experience, purchase decisions, and perception about the eye-tracking study.

Findings of the results indicate that there is a significant difference in the time spent on each slide of Patagonia and Adidas. One of the possible reasons may be that participants are more interested in the information of Patagonia than in that of Adidas (Rahulan, Troynikov, Watson, Janta, & Senner, 2015). On the other hand, another possible reason is that participants

had more difficulty in extracting the information from the slide of Patagonia than from that of the Adidas (Duchowski, 2007).

Discussion of research question one

RQ 1. From a consumer's perspective, what is the relative importance of different web page attributes while a consumer attempts an online purchasing/preference decision?

RQ 1.1. From a consumer's perspective, what is the relative importance of different web page attributes toward a webpage highlighting more sustainable apparel while a consumer attempts an online purchasing/preference decision?

From the Phase I survey, price is found to be more important than other attributes including Fit, Aesthetics, Quality, and Fashionability, etc. This finding is consistent with the previous findings where the price was found to be one of the most important attributes (Donthu & Gracia, 1999; Nazir et al., 2012; Rothenberg and Matthews, 2017; Singla et al., 2016). However, in the exit survey of the current study, price was reported to be less important than other attributes such as size and fit, product images. Besides, in the eye-tracking study, participants showed low attention on price. One of the possible reasons for this lower attention on price is that the area of AOI for price is the smallest among other AOIs. Due to this smallest area, the participant might have fewer fixations on the AOI represented the price.

Findings from the Phase I survey and the exit survey indicate that sustainability attributes may be of little important to the participants. Gaze behavior from the eye-tracking data also shows that sustainability attributes might be very less attended by both male and female participants. These findings are not consistent with the previous research in organic apparel in an offline context. For example, Rothenberg and Matthews (2017) illustrated that sustainability is one of the most important attributes considered by consumers. However, Rothenberg and

Matthews (2017) conducted the study on the young consumers of college students in which the mean age was 20.3 years whereas the mean age of the participants of the present study was 30.77 for Phase I survey and 27 for eye-tracking study. This younger participant in the study of Rothenberg and Matthews (2017) might be of more civic-minded (McGlone, Spain, & McGlone, 2011) which led them to purchase more organic apparel (Ellis, McCracken, & Skuza, 2012). Another possible reason might be that traditional offline shopping is different from online shopping. Online environment for a consumer could be very different from the traditional information environment (Djamasbi et al., 2010). For example, in online shopping, consumers search more information in their decision-making process (Djamasbi et al., 2010). Another possible reason might be that the information was presented in the form of a screenshot, which was not completely similar to online marketing. This difference in the presentation of sustainability information for the pants of the current study might limit the consumer's attention on these attributes.

Results show that there may be no significant agreement in the attention on the attributes of Patagonia based on gender. The findings indicate that probably the male and female participants search for information on a more sustainable apparel website using different approaches. For the female participant, the rank of attention on consumer rating was 1 on Patagonia, and the rank of attention on consumer reviews was 4. However, for the male participant, the rank of attention on consumer rating was 3, and consumer reviews were 8. The higher attention of both male and female participants on consumer rating of Patagonia screenshot is partially supported by previous research conducted by Menon, Sigurdsson, Larsen, Fagerstrøm, & Foxall (2016). Participants use ratings as a “shortcut” to assess the quality of the product, particularly when the ratings are high (Menon et al., 2016). On the other hand, Menon et

al. reported that, even when the consumer rating is low, consumers may have high attention on consumer reviews when the price is low for those consumers. In the present study, the price of the Patagonia pants is higher than that Adidas for male participants. This higher price of Patagonia pant may limit the attention of the male participant on consumer review (Menon, Sigurdsson, Larsen, Fagerstrøm, & Foxall, 2016). In addition, the attention on prices was found to be lower for the female participant (rank 9) than the male participant (rank 2). This finding is consistent with the previous study conducted by Lai, Henninger, and Alevizou (2017), which claimed that male participants are more price-sensitive than the female participants.

RQ 1.2. From a consumer's perspective, what is the difference in the relative importance of web page attributes between a webpage highlighting more sustainable products and a webpage highlighting less sustainable apparel products while a consumer attempts an online purchasing/preference decision?

The results from research question 1.2 indicate that there was no significant agreement in the ranking of AOIs between the Adidas and Patagonia web pages. This lack of agreement in the ranking of AOIs between the Adidas and Patagonia web pages indicates that participants might use different approaches to the attention of information between these websites. One of the possible reasons for this difference in approaches might be that the design of the product, the content, and representation of the information is different between these two brands.

For Patagonia, participants mostly attended to consumer rating, whereas for Adidas, they mostly attended to consumer reviews. One of the major differences in ranking of AOIs between the two brands is that for Patagonia, participants' second-highest attention was on the image of the product whereas for Adidas consumers paid less attention to the image. More attention on the image of Patagonia was indirectly consistent with the previous research conducted by Lai,

Henninger, & Alevizou (2017) which indicated a higher design sensitivity of the consumers toward the more sustainable apparel than the less sustainable apparel. However, more researches with larger sample size and with various apparel items are needed for studying the consumers' attention on product images for both a more sustainable apparel website and a less sustainable apparel website.

In addition, the study found that there was no significant agreement in the attention on the web page attributes of Patagonia between the male participant and female participant. Whereas, the agreement in the attention on the webpage attributes of Adidas between the male and female participant was significant. One of the possible reasons might be that the consumer rating of pants for both male and female items of Adidas was similar. Another possible reason might be that the difference in the design of the pants between male and female participant may be lower than that of Patagonia.

Discussion of research question two

RQ 2. How does the presence of sustainability attributes affect the online decision-making process of a consumer who intends to purchase of apparel?

H 2.1. A consumer who has a higher dwell time on sustainability attributes likely to purchase more sustainable apparel than a consumer who has a lower dwell time on sustainability attributes

H 2.2. A consumer who has a higher fixation on sustainability attributes likely to purchase more sustainable apparel than a consumer who has a lower fixation on sustainability attributes.

This research question intended to study the importance of sustainability attributes in the purchasing decision of sustainable apparel. The findings of this study indicate a potential

relationship among participants dwell time on the sustainability attributes and their selection decision of apparel in the exit survey. Similarly, the findings of the study also indicate a relationship between the participant's proportion of fixation on the sustainability attributes and their selection decision of the apparel in the exit survey.

Results indicate that the two male participants who selected the Patagonia pants have a higher proportion of fixation and dwell time on sustainability attributes of the screenshot of Patagonia (ranked 1 and 2) than other male participants of this study. The more dwell time and a higher proportion of fixation of those two participants might motivate them to select the more sustainable pants. These findings were consistent with the previous study conducted by Drexler et al., (2018). Drexler et al. claimed that consumers have significantly higher attention on the ecolabelling of food products although this addition of ecolabels and certification of the product does not guarantee increased sales (Drexler et al., 2018).

Result also shows that those two male participants who selected Patagonia pant were from the group of higher concern on the environmental impact of the apparel industry. This indicates that when a participant who has high environmental concern places adequate attention to sustainability attributes, he is likely to engage in sustainable consumption. Based on the findings of this study, it can be assumed that firms could provide sustainability information on the website, which may draw adequate attention of male consumers. This adequate attention may motivate the male consumers, who have a higher concern on the environmental impact of the apparel industry, toward the consumption of sustainable apparel products accordingly.

On the other hand, the third participant who selected the more sustainable Patagonia pants was female and of lower concern on the environmental impact of the apparel industry. Results show that this female participant focused more on consumer review than other female

participants did. Findings indicate the importance of consumer review in the decision-making process for sustainable apparel, particularly participants who have lower level of concern on the environmental impact of the apparel industry. This is in line with previous researches on hotel booking, which reported the importance of consumer review on consumers' decision-making process. An individual can express his /her point of view through consumers review, which generally is considered to be able to give a more in-depth insight into a product (Buus et al., 2017).

Discussion of research question three

RQ 3. What is the relationship between consumers' concern level on the environmental impact of the apparel industry and his/her visual attention pattern such as dwell time and eye fixation on the sustainability information provided on a sustainable apparel product in the online retailing setting?

H. 3.1. Consumers having higher concerns on the environmental impact of the apparel industry will have higher dwell time on the sustainable attributes of the web page of more sustainable apparel than the consumer who has lower concerns.

H. 3.2. Consumers having higher concerns on the environmental impact of the apparel industry will have higher eye fixation on the sustainable attributes of the web page of more sustainable apparel than the consumer who has lower concerns on the environmental impact of the apparel industry.

The result of this study indicates that there was no significant difference in the proportion of dwell time on the sustainability attributes between participants having a lower level of concern and a higher level of concern on the environmental impact of the apparel industry. Similarly, no significant difference was found in the proportion of fixation on the sustainability attributes

between participants having a lower level of concern and a higher level of concern on the environmental impact of the apparel industry. These findings indicate that the existing concern level on the environmental impact of the apparel industry has no significant effect on the attention of participants on sustainability attributes. As participants' environmental concern are significantly correlated with participants' attitude toward environmentally friendly behavior (Bang, Ellinger, Hadjimarcou, & Traichal, 2000), the findings of the research question three are indirectly consistent with the attitude-behavior gap described by Bucklow, Perry, and Ritch (2017). According to this behavioral gap, attitude and growing environmental concerns do not always translate into purchase behavior (Bucklow, Perry, & Ritch, 2017).

There might be several explanations for no significant influence of concern on the environmental impact of the apparel industry on the consumers' online apparel purchase decision. One possible reason is that consumers might have a lack of trust in the sustainability information provided by a brand (Kangun, Carlson, and Grove 1991, Thøgersen 2002). Another possible reason is that most of the slides containing sustainability attributes appeared after 7 to 8 slides on average. This can cause the loss of expected attention from a consumer of the higher level of concern on the environmental impact of the apparel industry.

Discussion of research question four

RQ 4. Is eye-tracking technology a potential instrument/experimental tool for explaining consumers' self-reported data in the area of sustainable apparel?

RQ. 4.1. What is the relationship between participants' environmental concern reported from the survey of Phase I and their visual pattern on sustainability attributes?

The average time to the first fixation on sustainability attributes was compared between the participants having a higher level of concern and the participants having a lower level of

concern on the environmental impact of the apparel industry. The results of this study indicate that participants who have a higher level of concern need significantly more time to the first fixation on the sustainability attributes than the participants having a lower level of concern did. These results indicate that visual processing of sustainability attributes might be most likely determined by top-down attentional capture by the participants having a higher concern on the environmental impact of the apparel industry.

In top-down attentional capture, consumers looked at specific areas of the information in a voluntary manner, whereas bottom-up attentional capture is rapid and automatic (Ares et al., 2013). Findings indicated that, in compared to participants of lower concern on the environmental impact of the apparel industry, participants of higher concern may be more informed about the information provided by the more sustainable apparel website. Bang, Ellinger, Hadjimarcou, & Traichal, (2000) claimed that consumers who are more concerned about the environment tend to be more knowledgeable about renewable energy than consumers having less concern are. Thus, it is expected that participants who are highly concerned on the environmental impact of the apparel industry may be more knowledgeable in various sustainability issues related to apparel. This findings of the study may provide insights into the understanding of the visual behavior of the participants based on the level of concern on the environmental impact of the apparel industry.

RQ. 4.2. What is the relationship between consumers' self-reported apparel preferences from the exit survey and their eye-tracking data while they consider purchasing sustainable apparel online?

The results of the study indicated that there is a marginally significant agreement between the ranks of different AOIs of the Patagonia webpage obtained from the eye-tracking data and

the self-reported data in the exit survey. However, no significant agreement found between the ranks of different AOIs of the Adidas webpage obtained from the eye-tracking data and the self-reported data in the exit survey. One of the possible reasons for this difference might be that participants on average spent more time on the screenshot of Patagonia than the Adidas. The higher time spending on the screenshot indicates that participants might have more attention on the Patagonia screenshot than Adidas which was reflected in the thoughts of participant reported in the exit survey.

There are previous research, for example, the study conducted by Song et al. (2019), where eye-tracking data and self-reported data were found consistent. Song et al. (2019) examined the ecolabel role in informing sustainable consumption. Their participants participated in shopping in a brick-and-mortar store wearing a pair of eye-tracking glasses. Eye-tracking data indicated that consumers did not rely on ecolabels to make product purchase decisions, which were consistent with findings from the survey of that study. However, in some research including Vraga, Bode, and Troller-Renfree (2016), there is no agreement between eye-tracking data and self-reported data. Vraga, Bode, and Troller-Renfree (2016) stated that researchers should be cautious in relying on self-reports, particularly in the realm of exposure and attention to social media content. However, the findings of the present study from the phase I survey, the exit survey and the eye-tracking study indicated that the researchers may rely on self-reports in the area of sustainable apparel. One possible reason for a small agreement in the ranking between self-reported data and eye-tracking data in this study is that the stimulus was in the form of a screenshot. The representation of information in the screenshot might be comfortable for a participant to remember in exit survey than a completely online environment.

Implication for practice

Successful sustainable products should address environmental attributes and fulfill market requirements at the same time (Berchicci & Bodewes, 2005). To meet market requirements, individuals related to sustainable apparel marketing need to understand consumers' purchasing behaviors of sustainable products (Berchicci & Bodewes, 2005). This study intended to provide insights into sustainable apparel marketing by examining the online purchasing behaviors of consumers.

The findings of this study provide implications for individuals interested in the marketing of sustainable apparel. An individual who is interested in website design, fashion design, research, environmental awareness programmer for sustainable apparel may find some insights in their work for sustainable apparel marketing.

For a website designer, this study offers insight into a better understanding of how consumers' attention works in reaching their decision-making process for online apparel marketing. The study also gives website designers an idea on how to structure sustainability information such as organic and fair trade information of a website and how to approach consumers having a lower concern and having a higher concern differently.

For a researcher, this study is useful in utilizing eye-tracking technology for researching the online marketing of sustainable apparel. Many previous researchers did not find an agreement between eye-tracking technology and self-reported data participant (Vraga, Bode, & Troller-Renfree, 2016). However, this study found some agreement in participants' visual behavior and their self-reported behavior. Thus this study can provide insights into the validation/effectiveness of the eye-tracking technology in comparing to the self-reported data such as a survey in the research of sustainable apparel marketing.

The findings of this study may help a website designer to represent sustainability information more effectively on the website. The attention pattern on sustainability attributes based on gender may provide insights into understanding the representation of sustainability information on the webpage based on gender. The importance for high attention on sustainability attributes is that even if the sustainability attributes do not cause the consumer to purchase it, the attention still sends a certain message about the product which may influence a positive intention of purchasing eco-products in the future (Atkinson & Rosenthal,2014).

Limitations and recommendation for further research

One of the limitations of this study was the design of the study. In our study, we used the screenshots of the websites of two selected brands. This might provide an experience different from browsing on real online apparel website. However, there are two reasons for the researchers to use screenshots instead of actual websites. Primarily, the researchers intended to utilize the actual websites of the two brands. However, if the selected pants were sold out, there might be an inconsistency in the website content. Second, it took about two hours in recording and transferring each set of the eye-tracking data, and even more time in mapping on to the AOIs of a stimulus. For this time constraint, the researchers used screenshots for better AOIs control and consistency of information for every participant. However, using screenshots as a stimulus may result in some variation of participants gaze behavior. Therefore, in future research in this context may use the original websites instead.

Another limitation of this study is the variation of the design and price of the pants between the two selected brands. The researchers intended to keep the stimulus approximately similar. As the study used the original pants of the two brands, there were some differences in

the style of the pants and price. Future research in this subject should consider minimizing such differences in their stimulus to improve the accuracy of the eye-tracking data.

In addition, this study was only based on the pants of the two brands. The eye-tracking data and self-reported data from the exit survey might be different for other items such as T-shirts and for other brands. Future research on this subject could look at different product categories and/or brands.

Furthermore, this study had a small observation. Due to some eligibility constraint for the eye-tracking study, the researcher had a limited number of participants to invite to the eye-tracking study. For the small observation, the distribution of some data was not normal. Besides, this study used a convenience sampling strategy for the survey of Phase I. One of the limitations of the convenience sampling is its high vulnerability to severe hidden biases which limit this sampling be taken to be representative of the population (Etikan, Musa, & Alkassim, 2016). In this context, although the researcher used a non-parametric test for some data, the findings may not be generalized for a different or larger population. It is reported that the degree of power for the non-parametric test is lower than the parametric test. However, there are some previous researches where the authors used 6 to 32 participants in their study (Goldberg & Wichansky, 2003). Apart from that, this Phase II study does not represent all the participants of the Phase I survey as the eye-tracking study excluded a major part of participants who had vision issues. It is possible that participants who have vision issues have a different approach in their purchase decision from those who do not have any vision issue. However, as an exploratory study, this study can be considered as a good start. Future study in this area of eye-tracking technology may consider the eligibility constraint of participants and involve a larger and well-sampled observation for the study.

The study is also useful to a fashion designer who is interested in designing sustainable apparel. Many researchers found that more sustainable fashion is perceived as less fashionable than less sustainable apparel (Henninger et al., (2017). It is important to explore why sustainable fashion is considered as less fashionable and how that impression of the consumer can be solved by improving the design of sustainable apparel. This study has some preliminary data which may be utilized in a future study to investigate the relationship between the design of sustainable fashion and consumer impression.

Lastly, another limitation of an eye-tracking study is the dissociation of attention from ocular (visual) fixation, which is known as covert attention (Duchowski, 2007). It is possible for a participant to fix his/her gaze at a specific point but to move his/her attention to a nearby region. An individual can covertly attend to objects outside the fovea (Orquin & Loose, 2013). In an eye-tracking study, usually, a researcher conducts an eye-tracking experiment assuming that the visual attention of a subject is associated with a fixation point (Duchowski, 2007). Duchowski explained that this attention is known as overt attention, which is a component of visual attention. An eye tracker can measure the overt attention which is most likely the default state (Orquin & Loose, 2013). Duchowski (2002) mentioned that during scanning, there is no additional covert attention occurs when viewers are free to move their eyes. Without explicit instruction to prevent eye movements, an individual has a natural propensity to move their eyes even in situations in which it would be more efficient not to do so (Duchowski, 2002).

Conclusion

The goal of this study was to investigate how sustainability attributes of apparel products presented on a website influence consumers' purchase decision, and how consumers' level of concern on the environmental impact of the apparel industry influence their purchase decision. Besides, this study intended to explore the potential usage of eye-tracking technology (ET) as a tool for investigating consumers' online purchasing decision-making process, particularly for sustainable apparel.

The study consists of two Phases. The first Phase was an online survey (Phase I Survey), and the second Phase was an eye-tracking study plus an exit survey (Phase II exit survey).

In summary, the findings of this study expanded the existing understanding of previous researches in the areas of consumers' environmental concern, online purchase-decision behavior, and sustainability attributes of apparel products. Findings indicate that participants may have different visual behavior on different apparel websites based on various variables including but not limited to the attributes represented on those websites such as price, consumer review, etc., participants' existing level of concern on the environmental impact of the apparel industry, and gender. The presentation of sustainability attributes may influence consumers' purchase decision when a consumer has a higher existing environmental concern level and places adequate attention to these sustainability attributes. In addition, findings indicate that consumers' existing concerns on the environmental impact of the apparel industry has no significant influence on consumers' decision-making process or their purchase decision of sustainable apparel in an online setting.

This study utilized both consumers' self-reported data from surveys and their gaze behavior recorded by an eye-tracker to investigate their decision-making process and purchase

decision. Utilizing eye-tracking technology in the field of sustainable apparel may expand new research avenues.

Although this research has some interesting and novel findings, it has its own limitations. One major limitation is the use of convenience samples and the relatively small sample size. Therefore, the findings of this study may not be generalized to a different population. Further investigation utilizing a large sample size and with various apparel items may provide a more comprehensive understanding of related topics.

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Appendix A - Survey of Phase I

Thank you for participating in our study...

The following questionnaire is for the survey of Phase I to understand consumer behavior. It will take approximately 20 minutes to complete. Your responses will not be linked to your name. We would like you to answer questions as completely as possible, but if you feel uncomfortable answering a question, you do not have to answer it. Questions regarding this study may be directed to: Md Mayedul Islam at mdmayedi@ksu.edu.

1. What is your birthdate?

2. What is your gender?
 - Male
 - Female
 - Binary
 - Non-Binary

3. How will you describe yourself? (Select all that apply)
 - White
 - Hispanic, Latino, or Spanish
 - Black or African American
 - Asian or Asian Indian
 - American Indian or Alaska Native
 - Middle Eastern or North African
 - Native Hawaiian or other Pacific Islander
 - Some other race or ethnicity (Please specify _____)

4. What is your occupation?

5. Personal annual income
 - Less than \$15,000
 - \$15,000 to \$24,999
 - \$25,000 to \$34,999
 - \$35,000 to \$49,999
 - \$50,000 to \$74,999
 - \$75,000 to \$99,999
 - Over \$99,999

6. Household annual income

- Less than \$15,000
- \$15,000 to \$24,999
- \$25,000 to \$34,999
- \$35,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$124,999
- \$125,000 to \$149,999
- \$150,000 and over

7. Education level

- Less than high school degree
- High school degree or equivalent (e.g. GED)
- Some college but no degree
- Associate degree in college (Two years of full-time course work at community colleges, vocational schools, and technical colleges e.g. AA, AS)
- Bachelor's degree in college (4-year)
- Master's degree
- Doctoral degree
- Professional degree (JD, MD)
- Others (Please specify _____)

8. On average, how often do you shop for apparel?

- More than three times a week
- Once or twice a week
- Very other week
- Once a month
- Less than once a month
- Never

9. On average, how often do you shop for more sustainable apparel (More sustainable apparel are developed using materials and processes that have less adverse impact on people or the planet)?

- Multiple times a week
- Once a week
- Every other week
- Once a month
- Less than once a month
- Never

10. Generally, where do you prefer to shop most of your apparel?
- In-store
 - Online
 - Other (Please specify)
11. On average, how often do you shop online for apparel?
- Multiple times a week
 - Once a week
 - Every other week
 - Once a month
 - Less than once a month
 - Never
12. On average, how often do you shop online for sustainable apparel?
- Multiple times a week
 - Once a week
 - Every other week
 - Once a month
 - Less than once a month
 - Never
13. When was your last online apparel purchase?
- Last week
 - Last month
 - Last year
 - Before last year
 - Never
14. When did you do your last online purchase for more sustainable apparel?
- Last week
 - Last month
 - Last year
 - Before last year
 - Never

15. Which of the following factors are most important to your apparel shopping experience? **(Please pick three)**

- Price
- Quality
- Durability
- Fit
- Sustainability (e.g. Organic materials, Fair trade)
- Brand name
- Aesthetics (e.g. Design and color)
- Fashionability
- Others (Please specify)

16. Which of the following factors are most important to your online shopping experience for apparel? (Please pick three)

- Promotions/Sales
- Ease of returns/return policy
- Ease of website navigation
- Selection of items
- Customer service
- In-store pickup option
- Aesthetic/Visual appeal of website
- Shipping cost
- Delivery time
- Others(Please specify _____)

17. How comfortable are you with shopping online?

- Extremely comfortable
- Moderately comfortable
- Slightly comfortable
- Neither comfortable nor uncomfortable
- Slightly uncomfortable
- Moderately uncomfortable
- Extremely uncomfortable

18. How much do you agree with following STATEMENTS?

	Not at all	Disagree	A little bit disagree	Neutral	A little bit agree	Agree	Strongly agree	Strongly agree
I know about sustainable apparel.								
I know about fast fashion apparel.								
I know about the environmental impacts of the apparel industry.								
I know about the relationship between the apparel industry and climate change.								
I know about the water consumption in apparel industry.								

19. How much do you agree with following STATEMENTS?

	Not at all	Disagree	A little bit disagree	Neutral	A little bit agree	Agree	Strongly agree	Strongly agree
I am concerned about the environmental impacts of the apparel industry in general.								
I am concerned about the pollution impacts of apparel production.								
I am concerned about the water consumption impacts of apparel production.								
I am concerned about fast fashion, including its relationship with climate change.								
I am concerned about the discard of fast fashion apparel to the landfill.								

20. How much do you agree with following STATEMENTS?

	Not at all	Disagree	A little bit disagree	Neutral	A little bit agree	Agree	Strongly agree	Strongly agree
I would be delighted to own a sustainable apparel item.								
I will buy sustainable apparel product in the next 12 months.								
I like sustainable apparel.								
Buying sustainable apparel makes sense to me.								

21. Are you nearsighted or farsighted?

- Yes
- No

22. Generally do you wear glasses or lenses during online browsing?

- Yes
- No

23. Do you want to participate in an eye-tracking study?

- Yes
- No
- N/A

24. What is your email address? This information will only be used to contact you if you are eligible for the gift card or you are interested in participating in eye-tracking study.

The end!

Thank you very much for your participation!

Appendix B - Exit survey

Congratulations on completing this eye tracking study! Now we would love to hear your experience of this study for improving the design of this type of eye-tracking study in the future. Thank you for your feedback!

Participant ID:

1. Which one of the products do you most likely to purchase?

	Adidas	Patagonia
Pants		
T-Shirt		

2. What do you think about the purpose of the project?

3. Please rank, in order of importance to you from most important to least important, the following attributes for your preference to buy that product.

- Brand name
- Product images
- Consumer rating
- Consumer reviews
- Size and fit
- Organic information
- Price
- Shipping and return policy
- Others(Please specify)
- Fair-trade information
- Materials
- Product features

4. How comfortable were the eye-tracking glasses and associated equipment?

- Extremely comfortable
- Moderately comfortable
- Slightly comfortable
- Neither comfortable nor uncomfortable
- Slightly uncomfortable
- Moderately uncomfortable
- Extremely uncomfortable

5. Did the eye tracking glasses affect your performance?

6. If your response of the question 5 is “Yes”, please explain details here:

7. Would you be willing to wear the eye trackers for future studies?

- Yes
- No
- Neutral
- N/A

The end!

Thank you very much for your participation!

Appendix C - Slide used in eye-tracking study

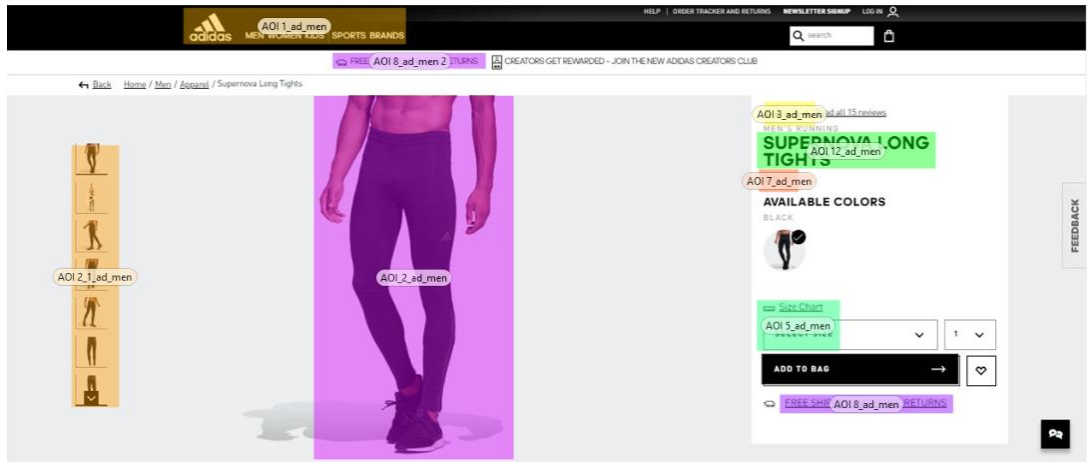


Figure 1 Adidas_Men slide 1

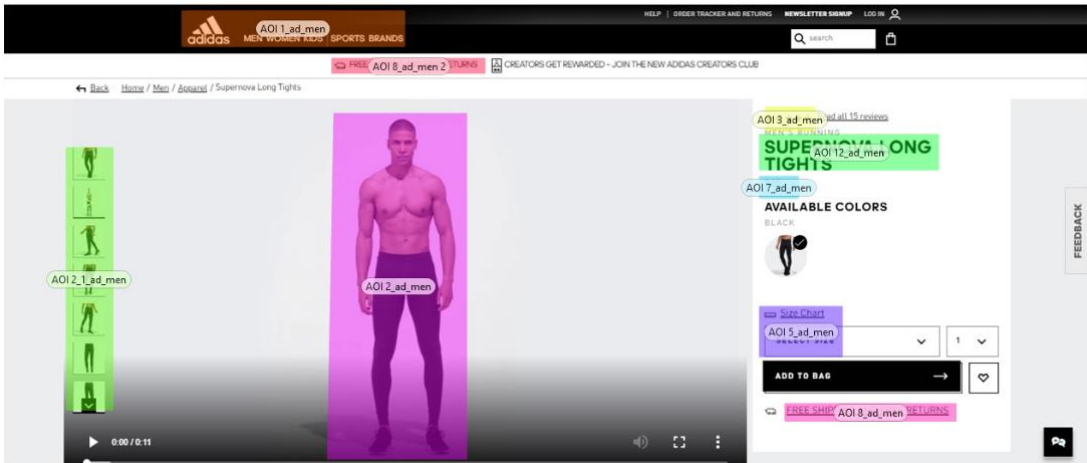


Figure 2 Adidas_Men slide 2

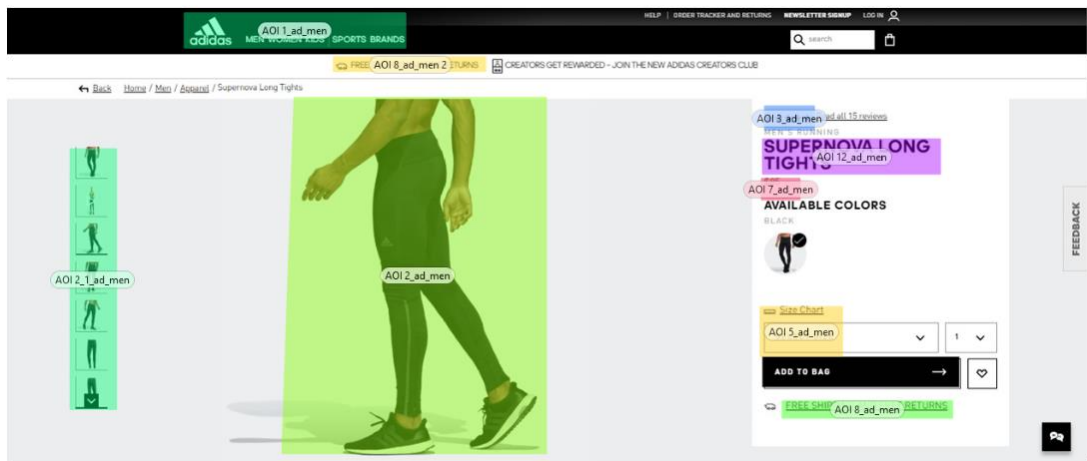


Figure 3 Adidas_Men slide 3

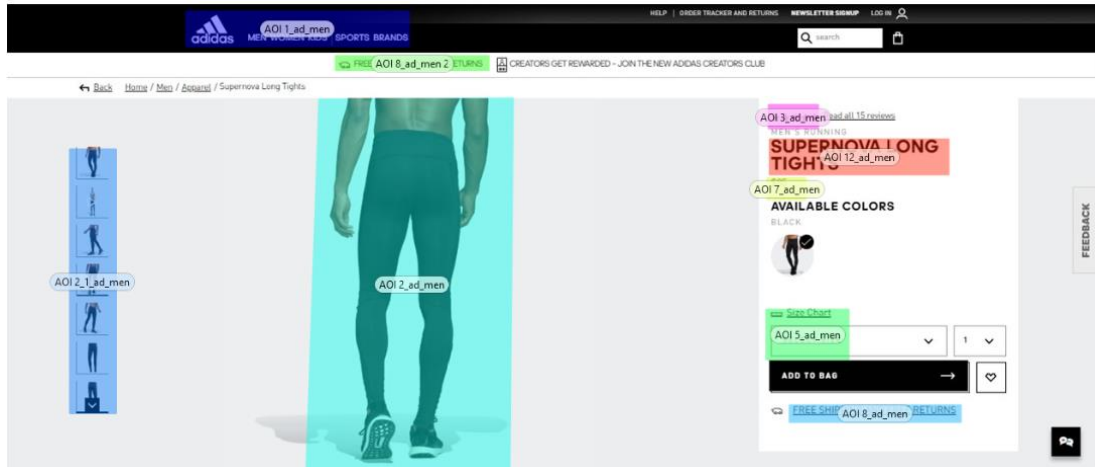


Figure 4 Adidas_Men 4

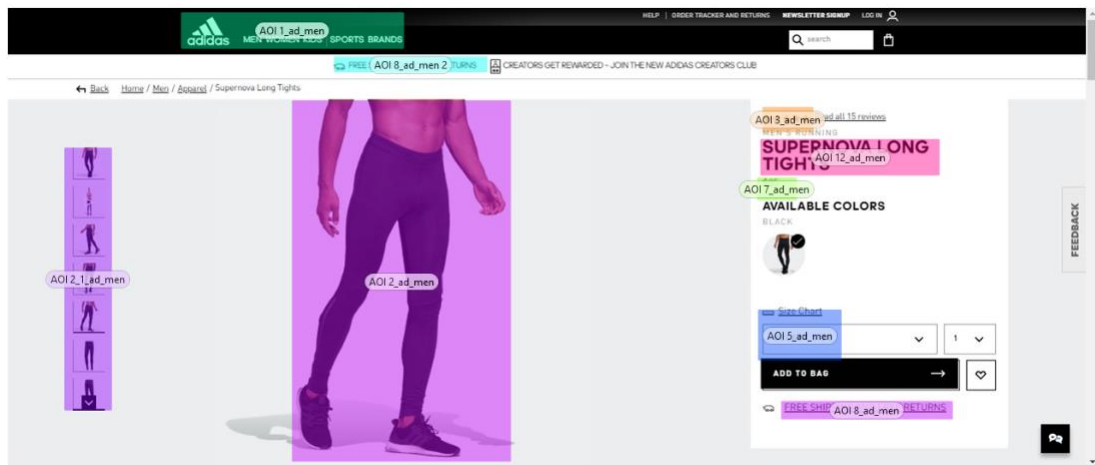


Figure 5 Adidas_Men 5

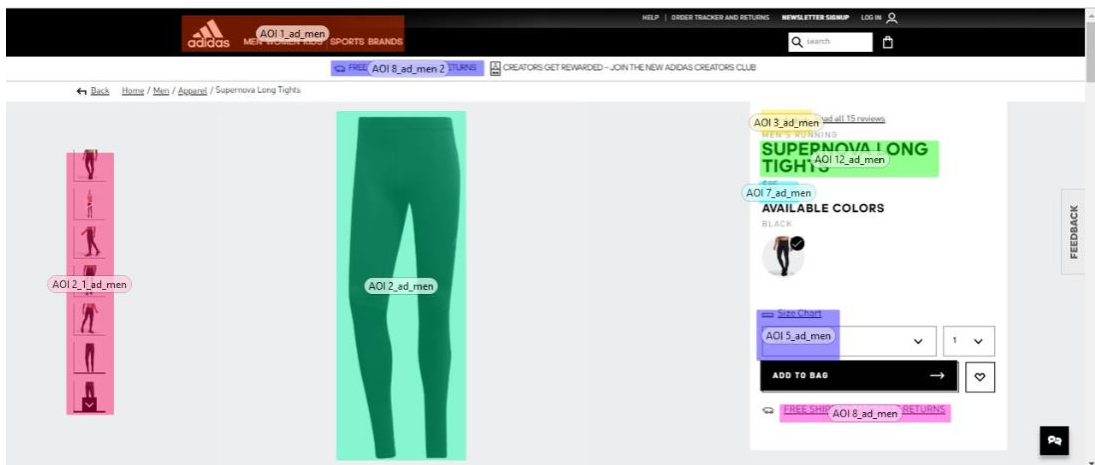


Figure 6 Adidas_Men 6

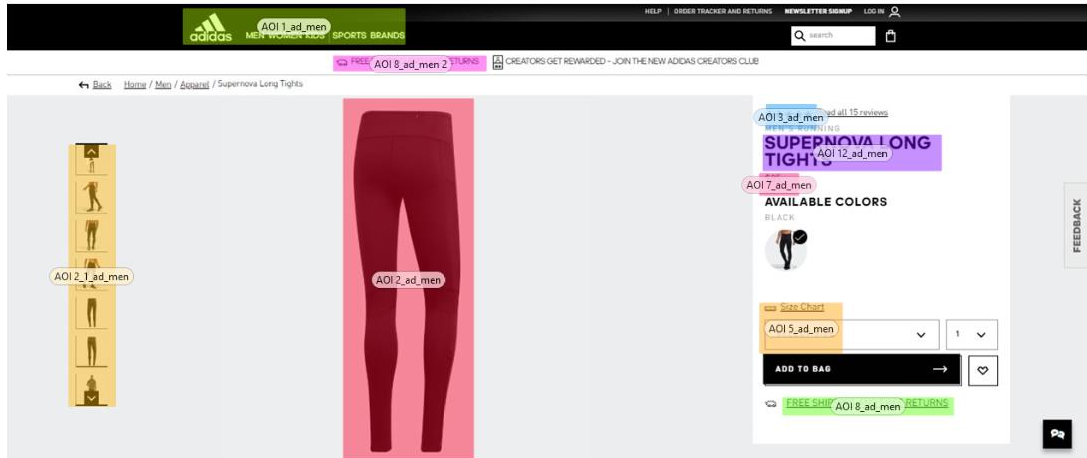


Figure 7 Adidas_Men 7

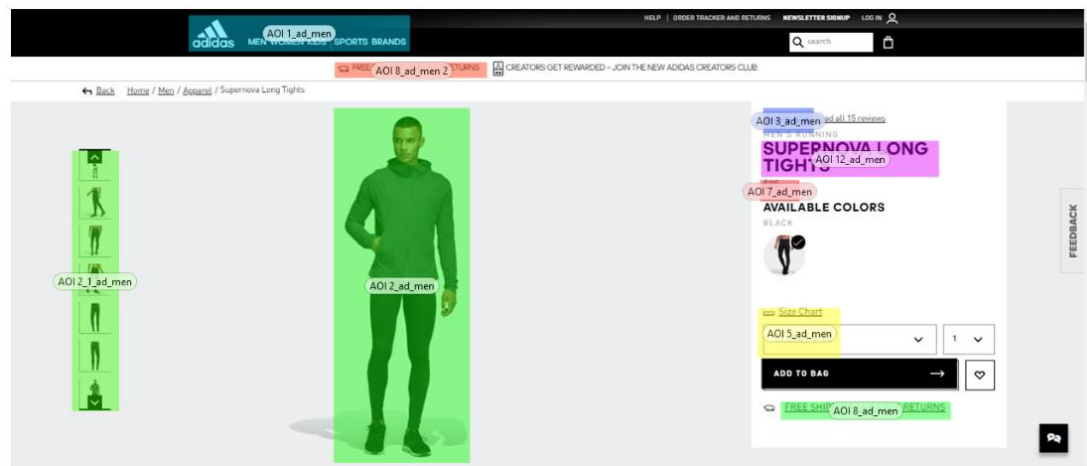


Figure 8 Adidas_Men 8

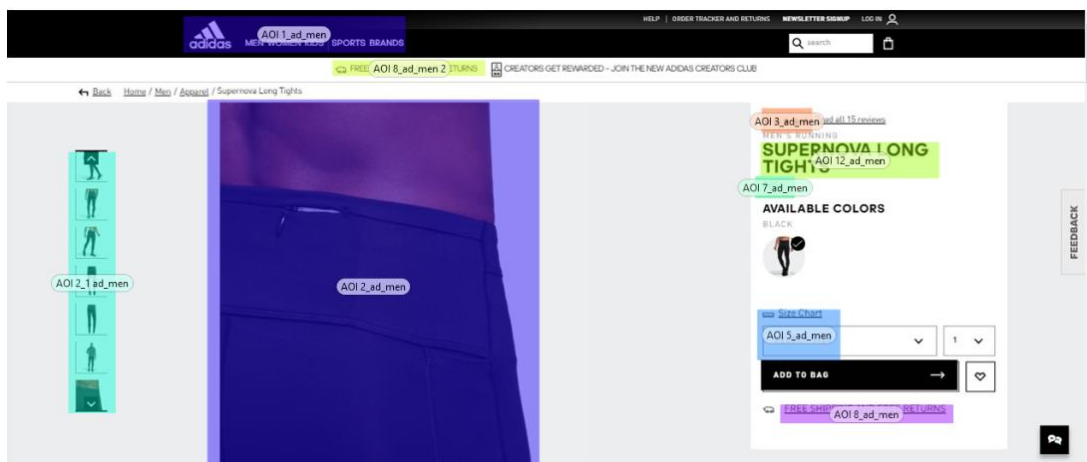


Figure 9 Adidas_Men 9

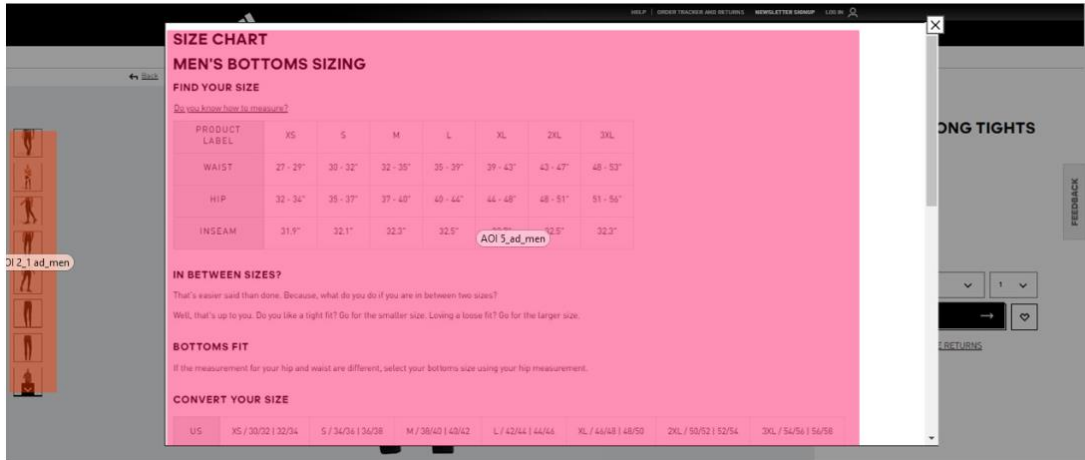


Figure 10 Adidas_Men 10

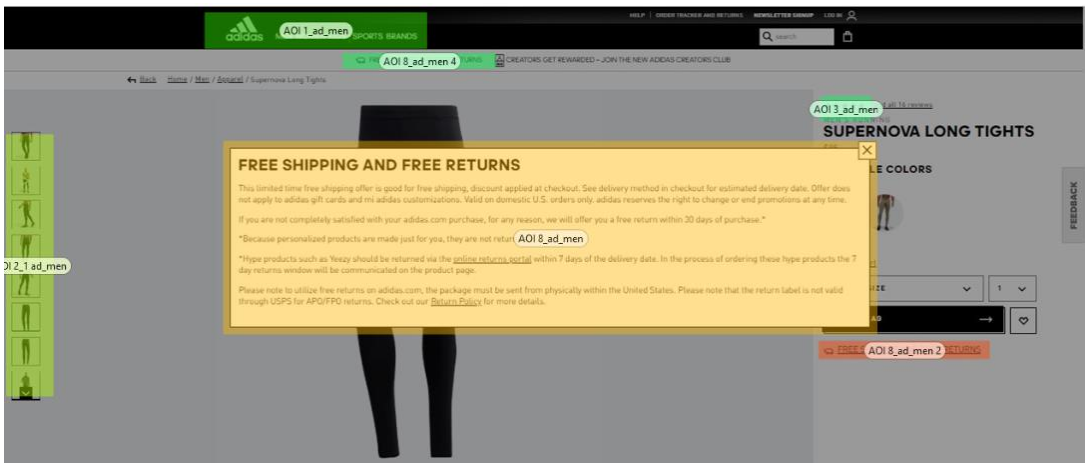


Figure 11 Adidas_Men 11

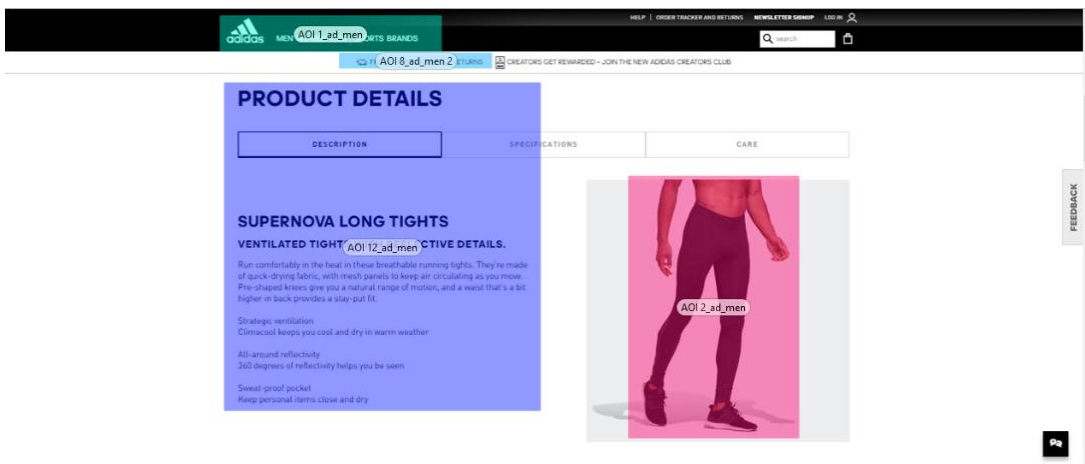


Figure 12 Adidas_Men 12

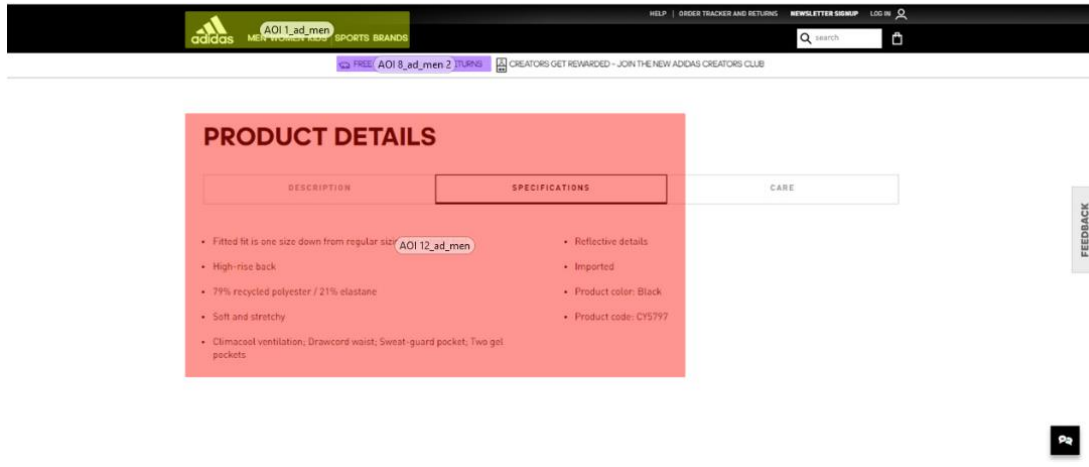


Figure 13 Adidas_Men 13

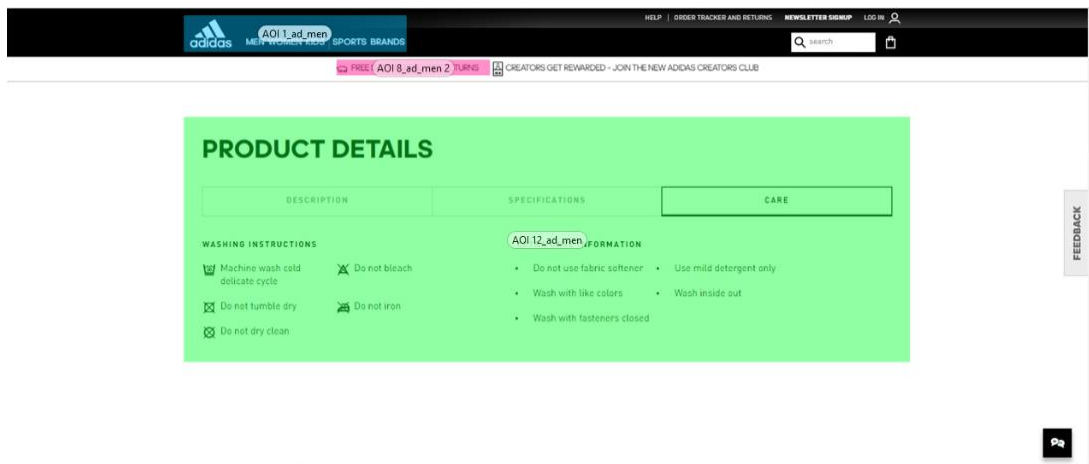


Figure 14 Adidas_Men 14

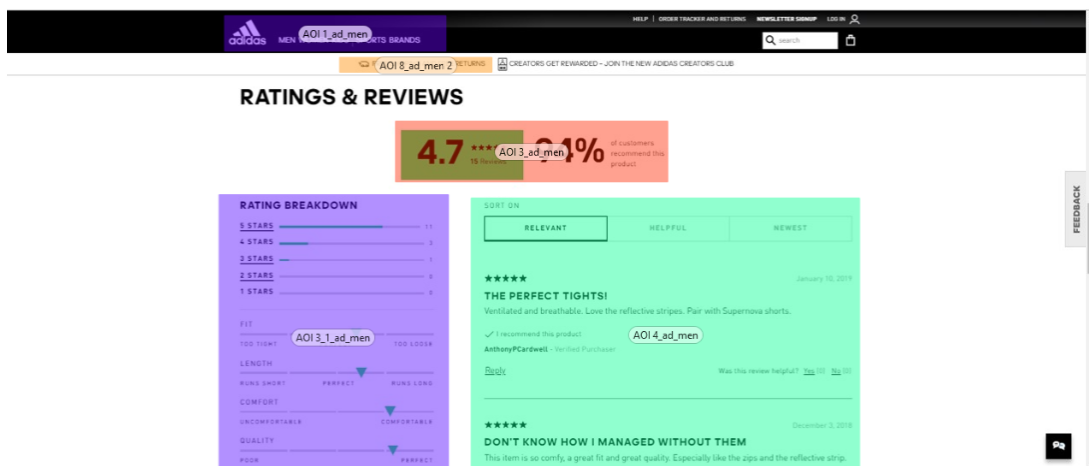


Figure 15 Adidas_Men 15

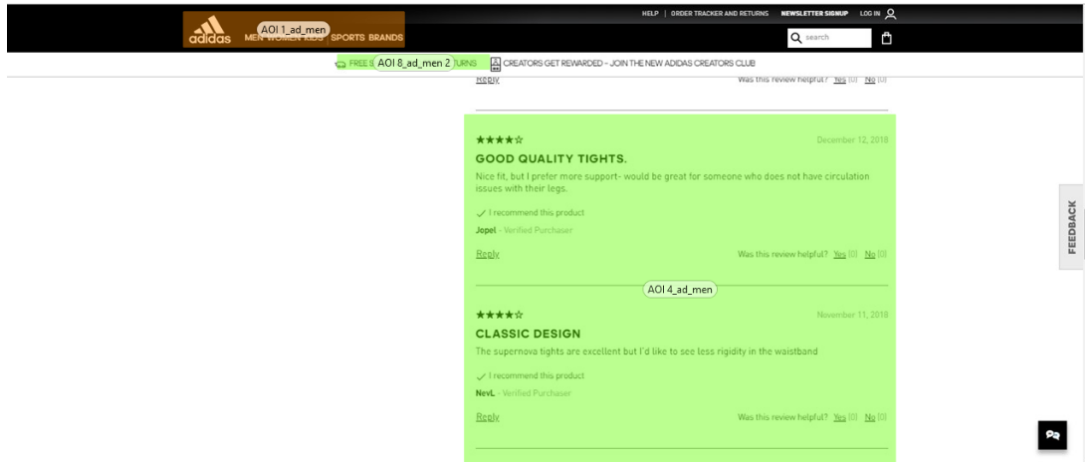


Figure 16 Adidas_Men 16

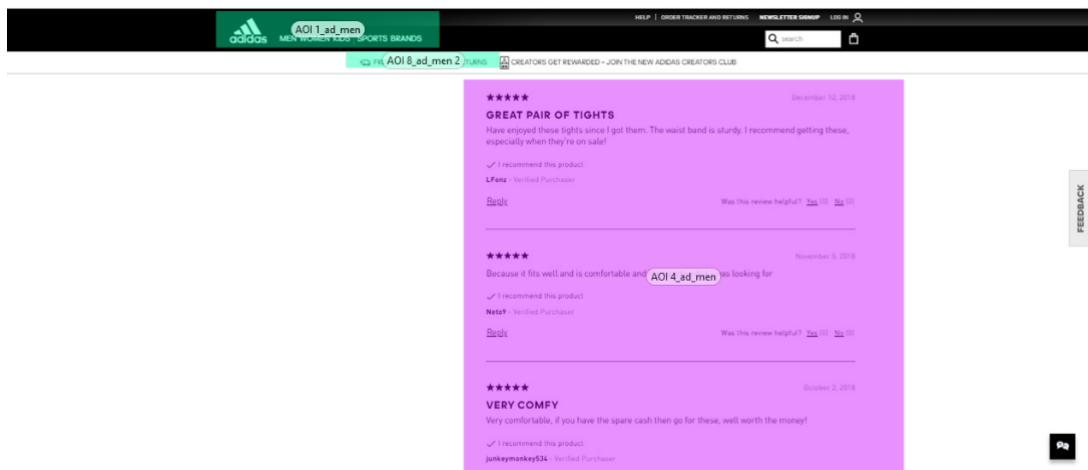


Figure 17 Adidas_Men 17

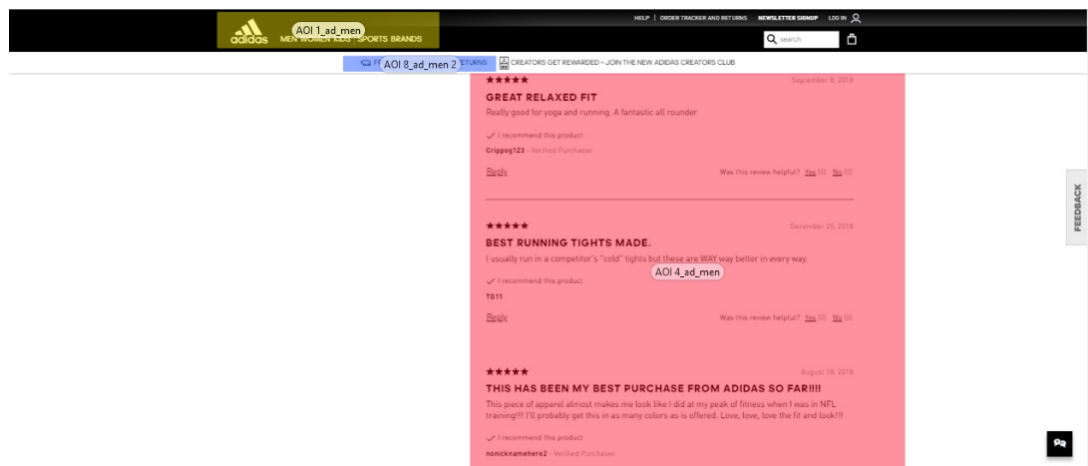


Figure 18 Adidas_Men 18

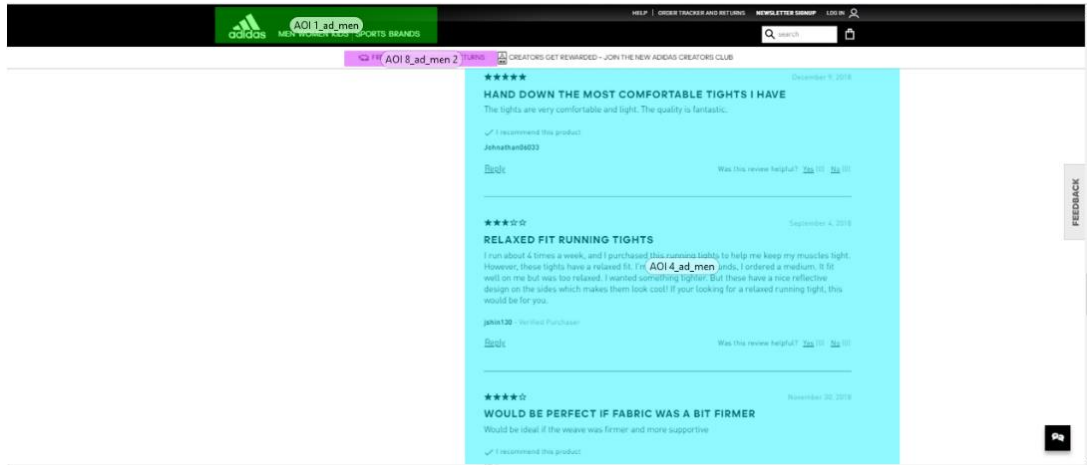


Figure 19 Adidas_Men 19

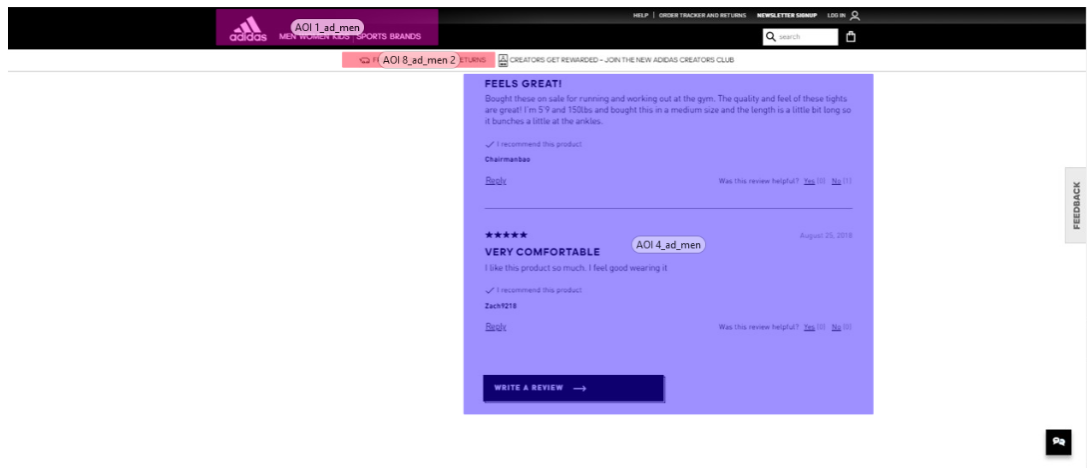


Figure 20 Adidas_Men 20

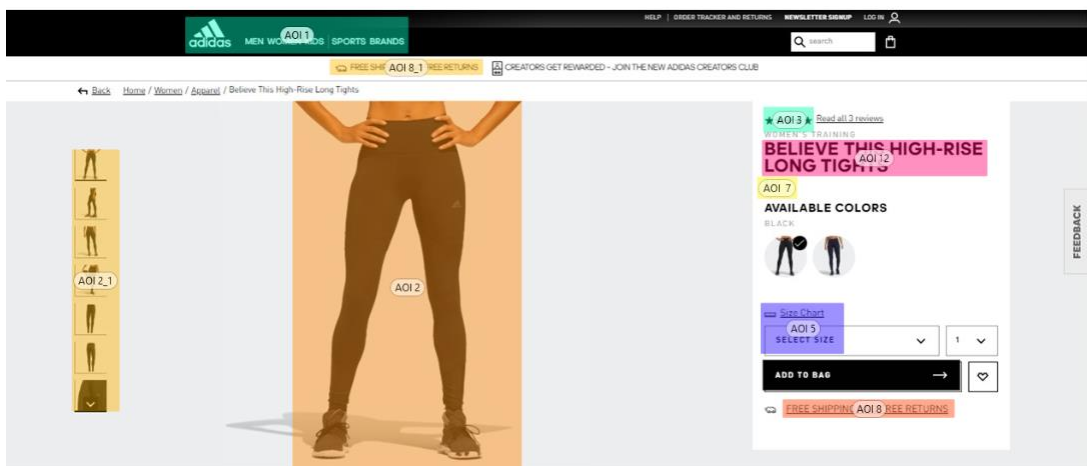


Figure 21 Adidas_Women 1

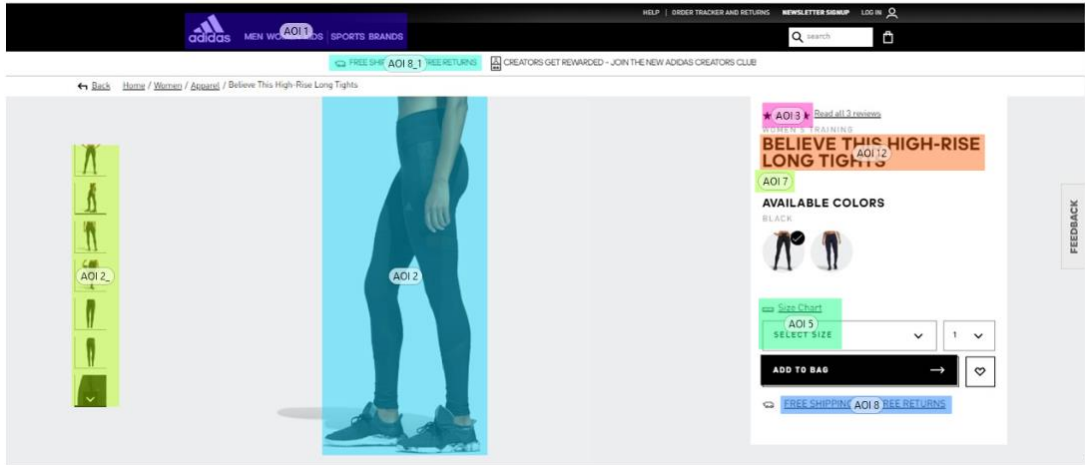


Figure 22 Adidas_Women 2

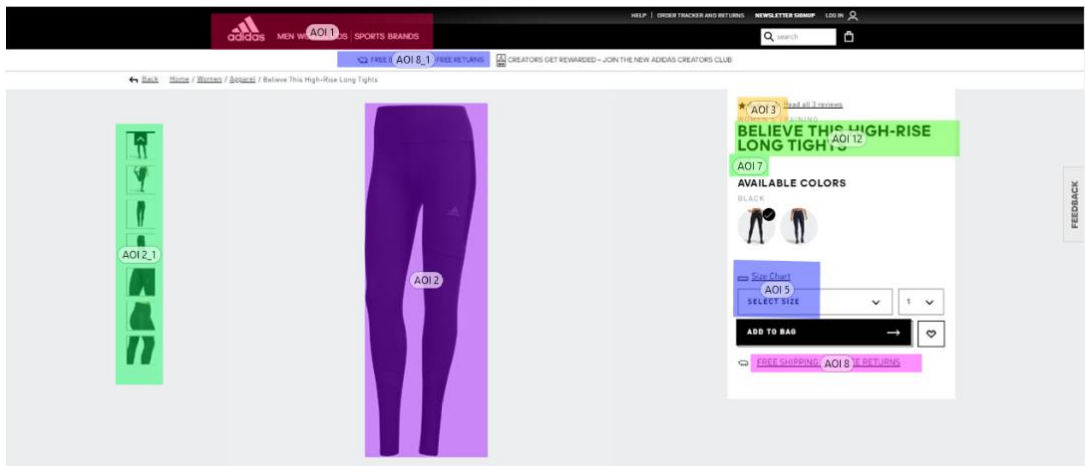


Figure 23 Adidas_Women 3

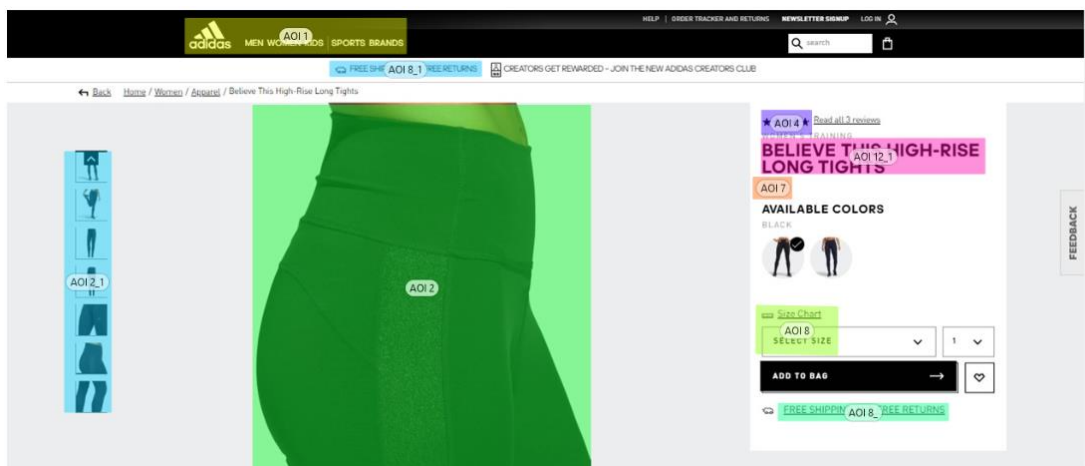


Figure 24 Adidas_Women 4

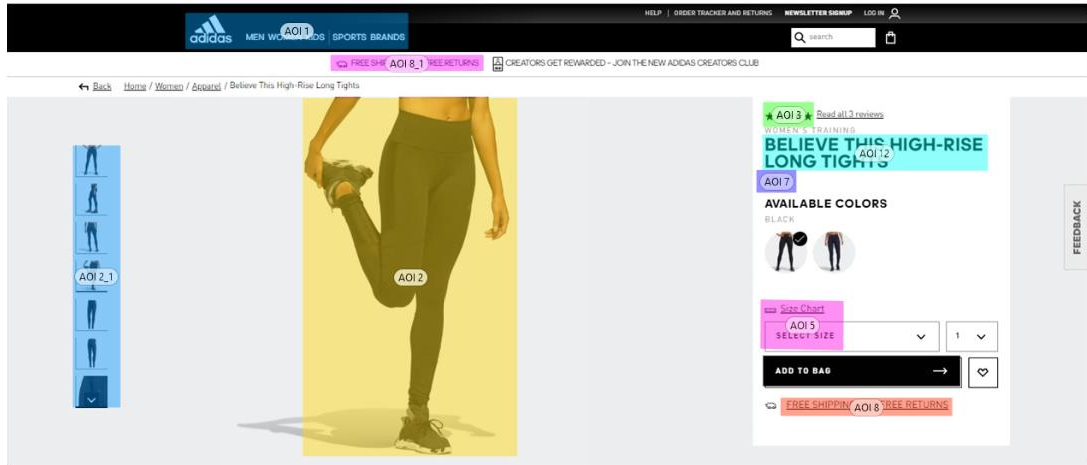


Figure 25 Adidas_Women 5

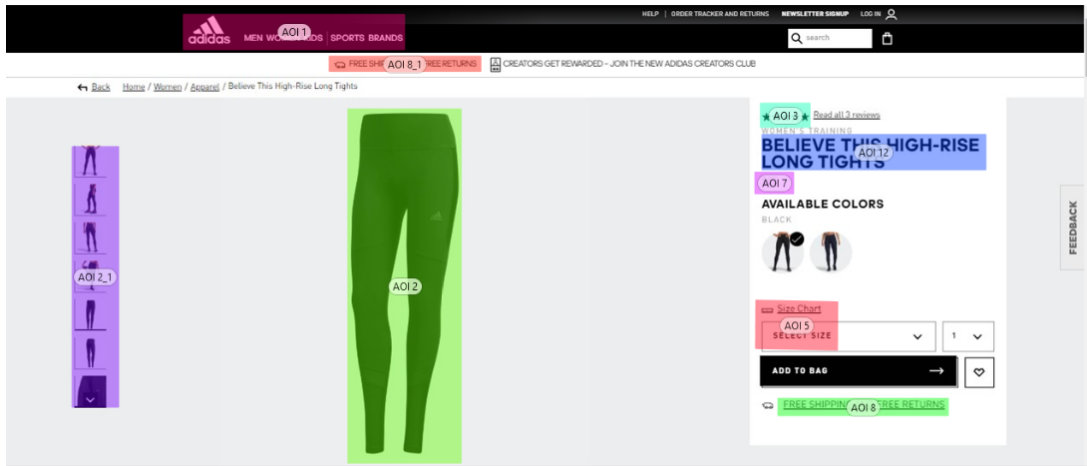


Figure 26 Adidas_Women 6

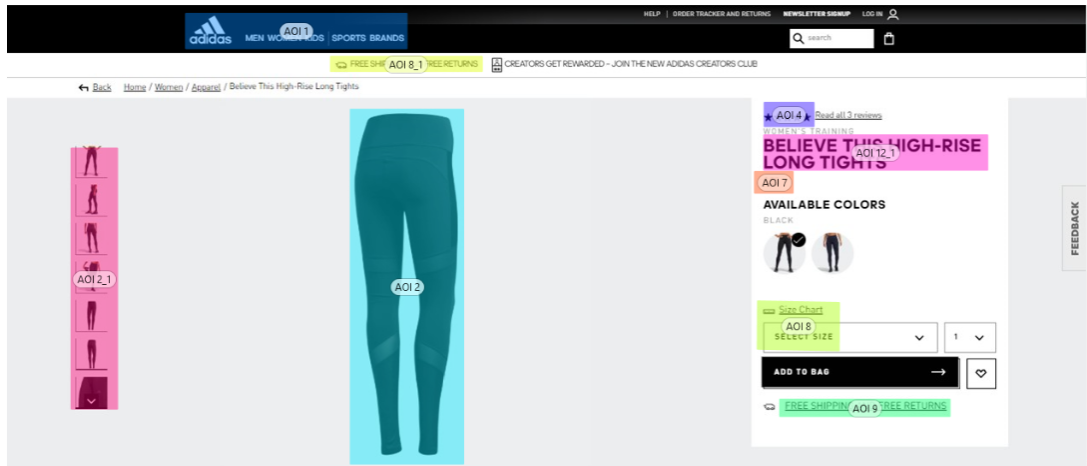


Figure 27 Adidas_Women 7

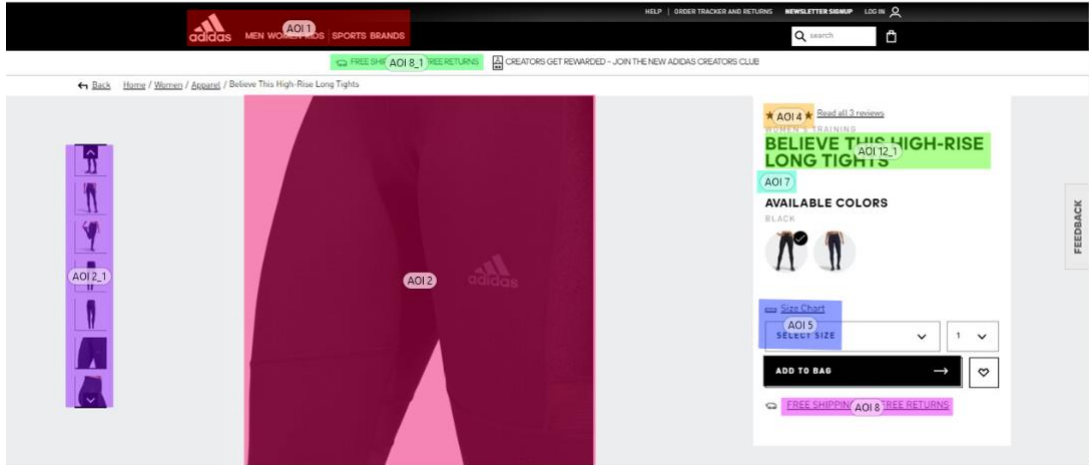


Figure 28 Adidas_Women 8

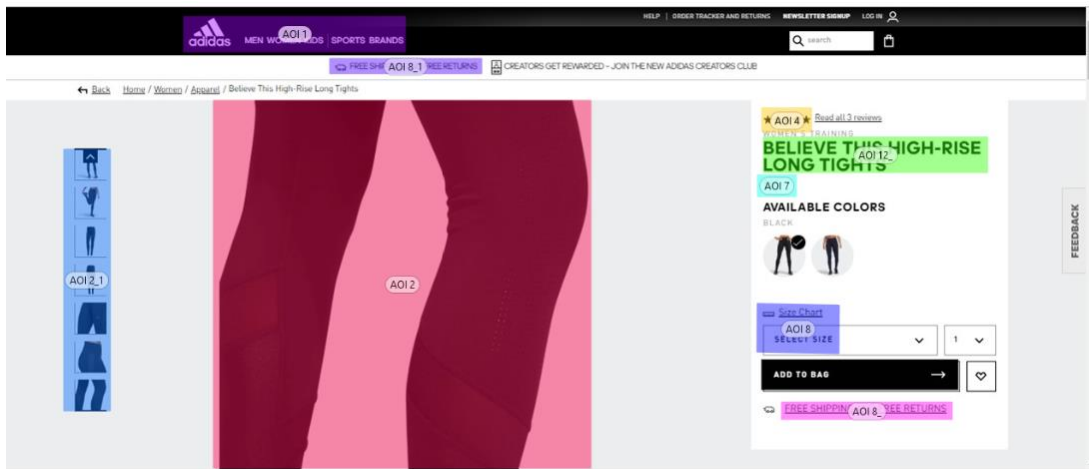


Figure 29 Adidas_Women 9

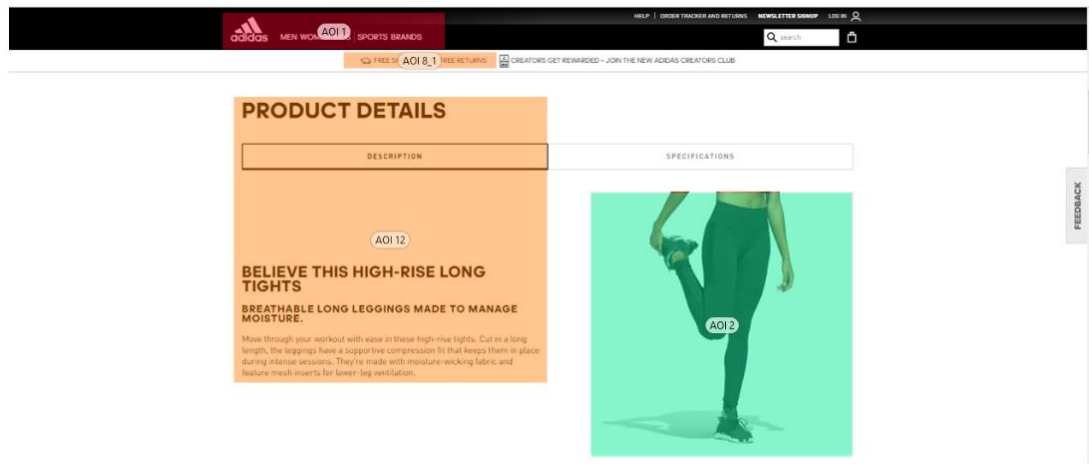


Figure 30 Adidas_Women 10

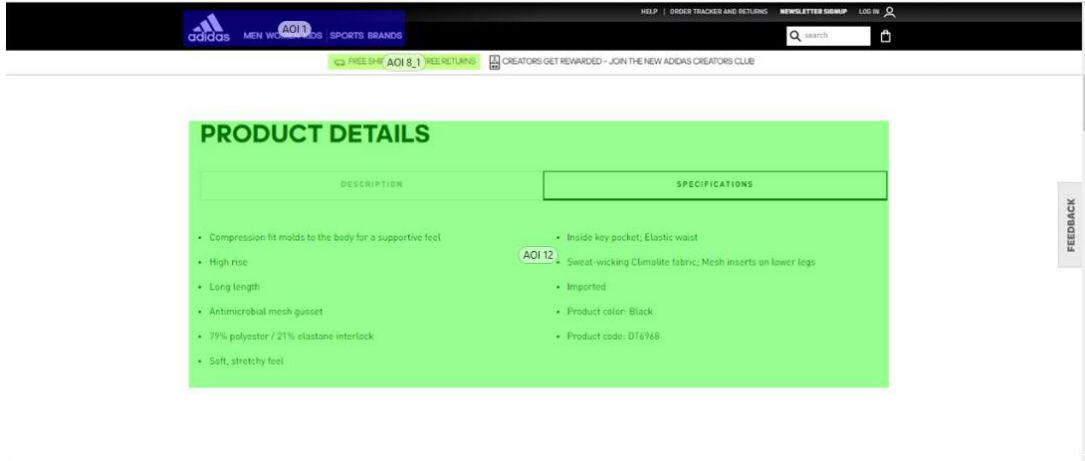


Figure 31 Adidas_Women 11

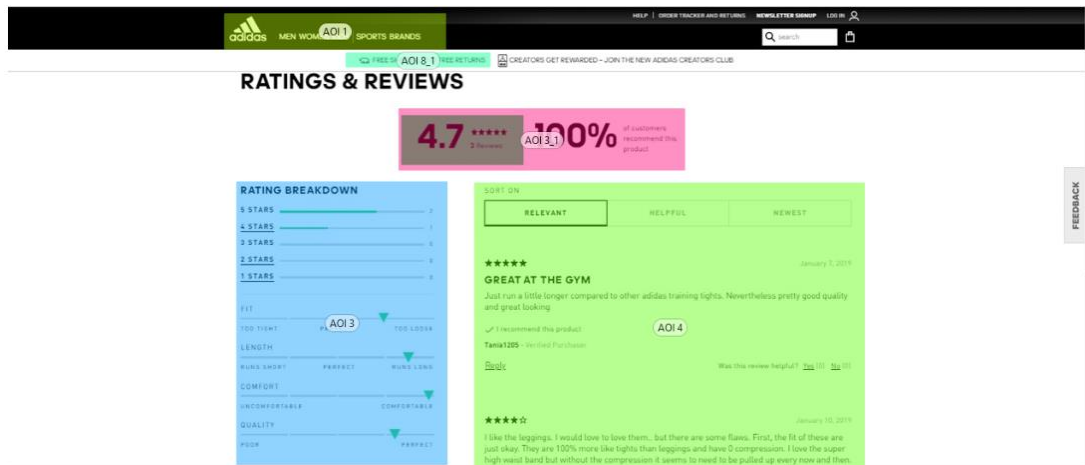


Figure 32 Adidas_Women 12

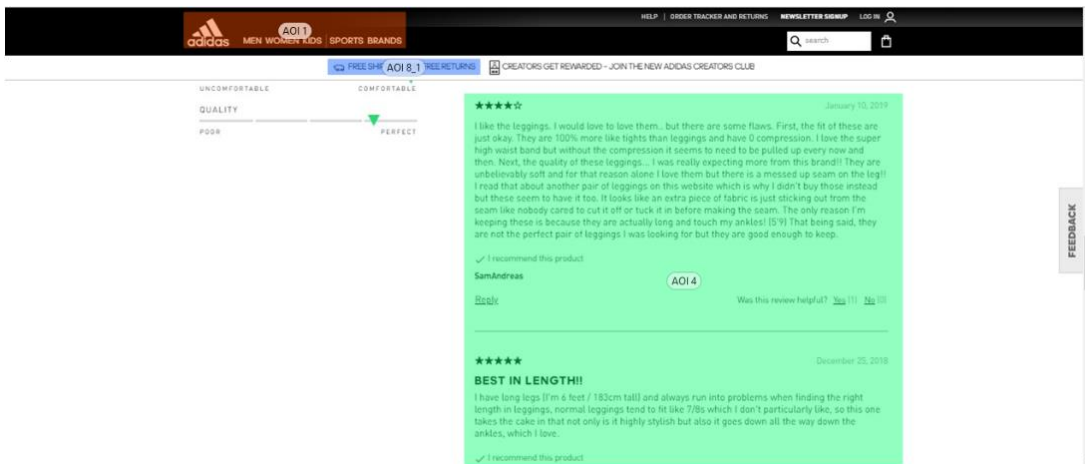


Figure 33 Adidas_Women 13



Figure 34 Patagonia_men 1

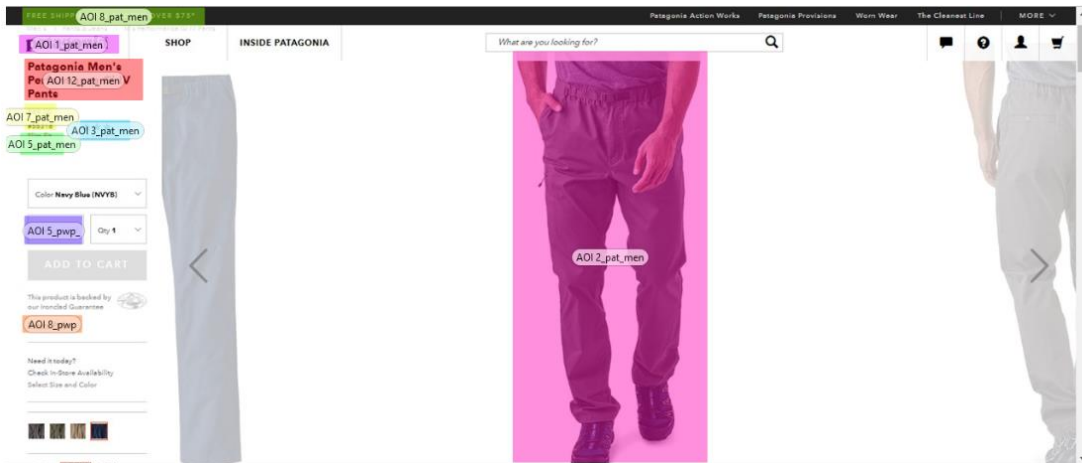


Figure 35 Patagonia_men 2

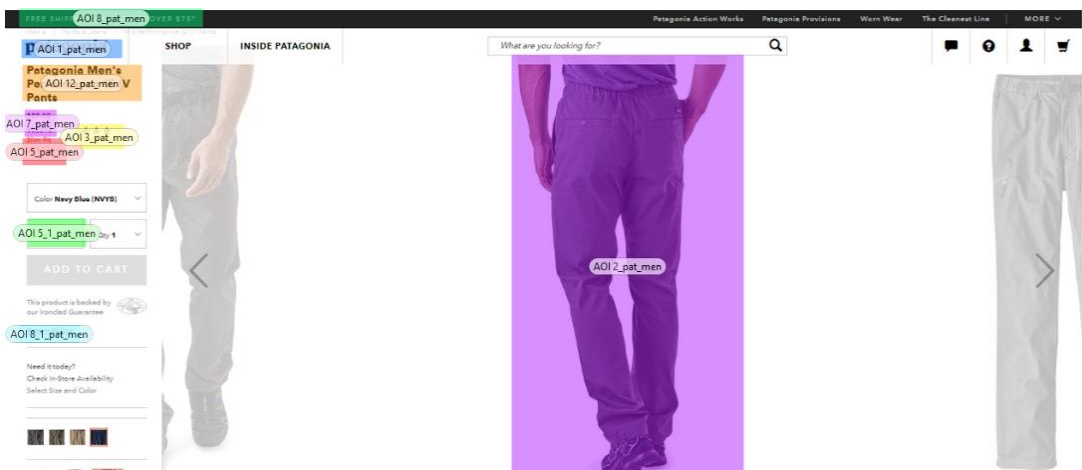


Figure 36 Patagonia_men 3

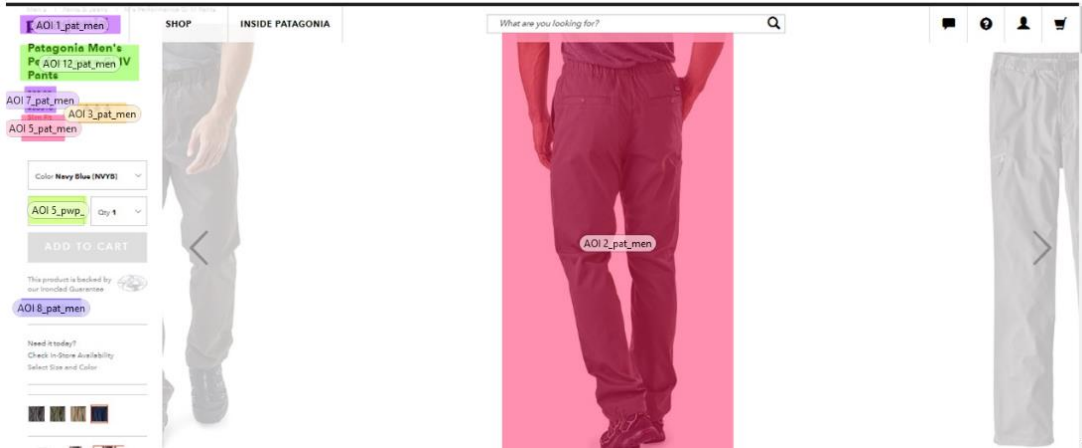


Figure 37 Patagonia_men 4

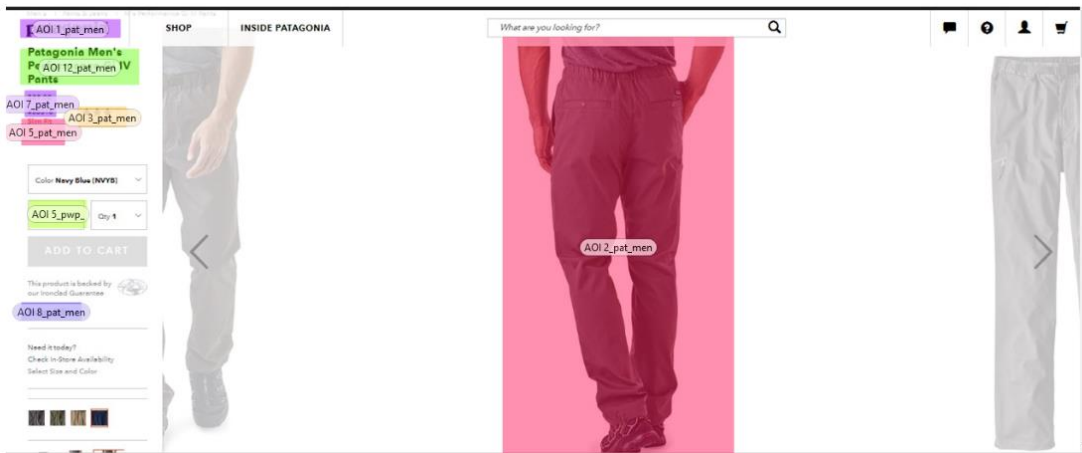


Figure 38 Patagonia_men 5

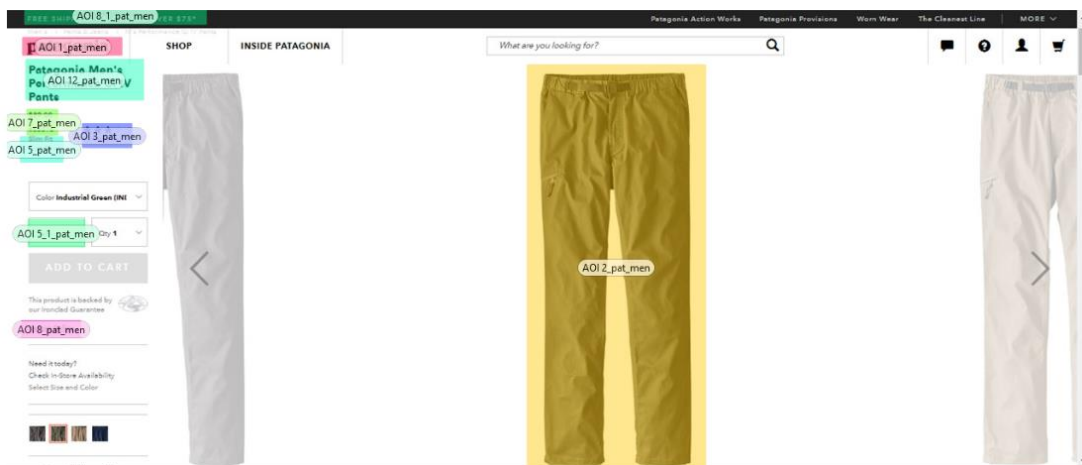


Figure 39 Patagonia_men 6

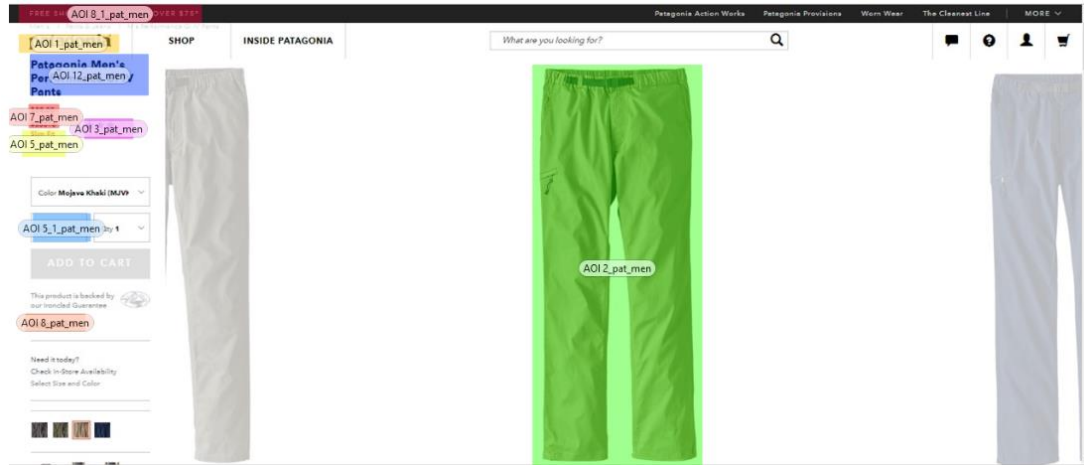


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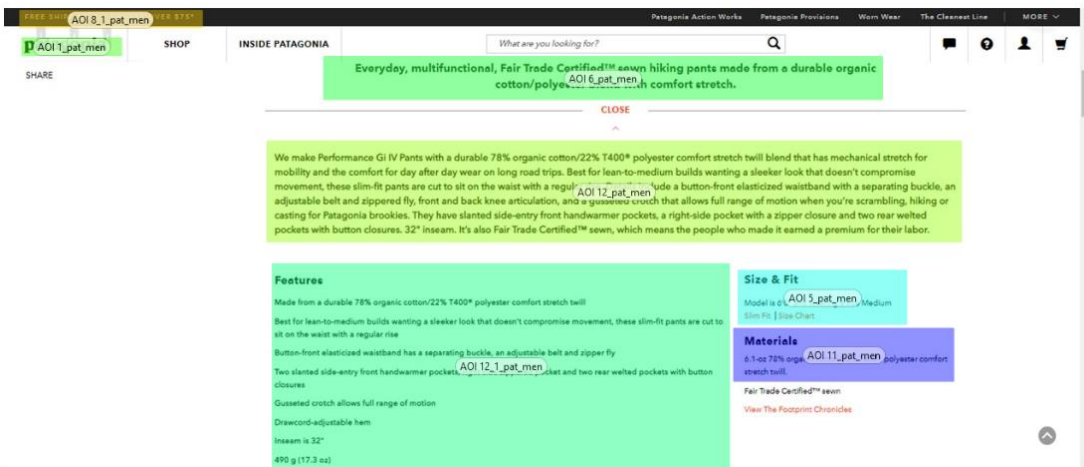


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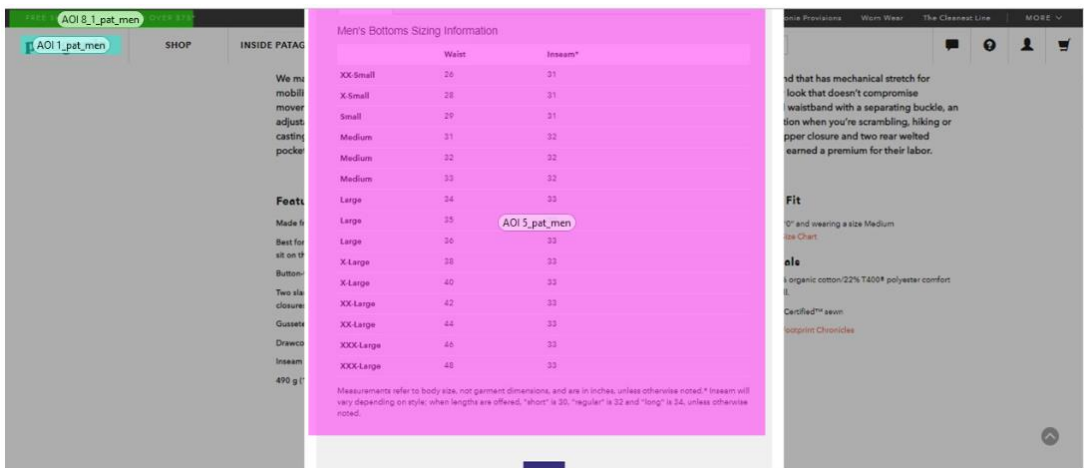


Figure 42 Patagonia_men 9



Figure 43 Patagonia_men 10

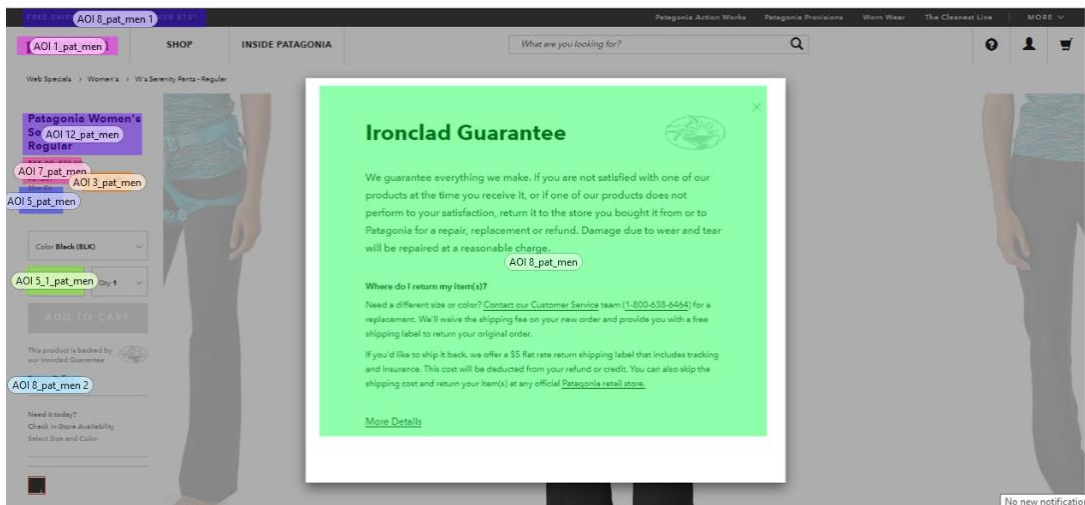


Figure 44 Patagonia_men 11

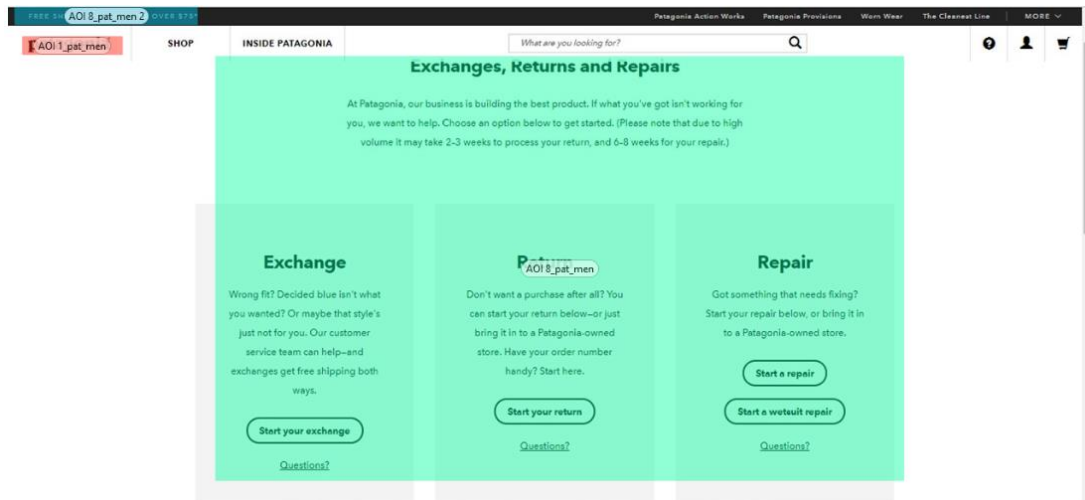


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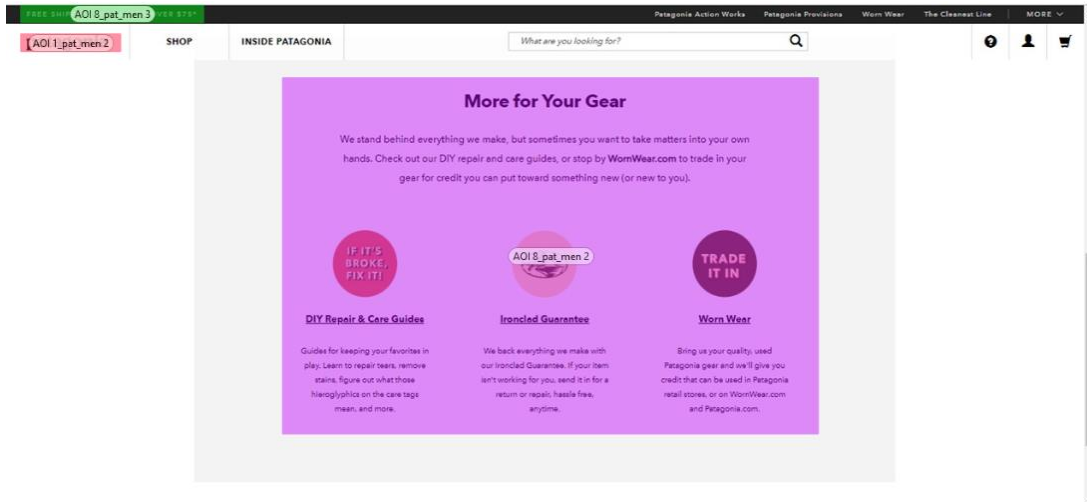


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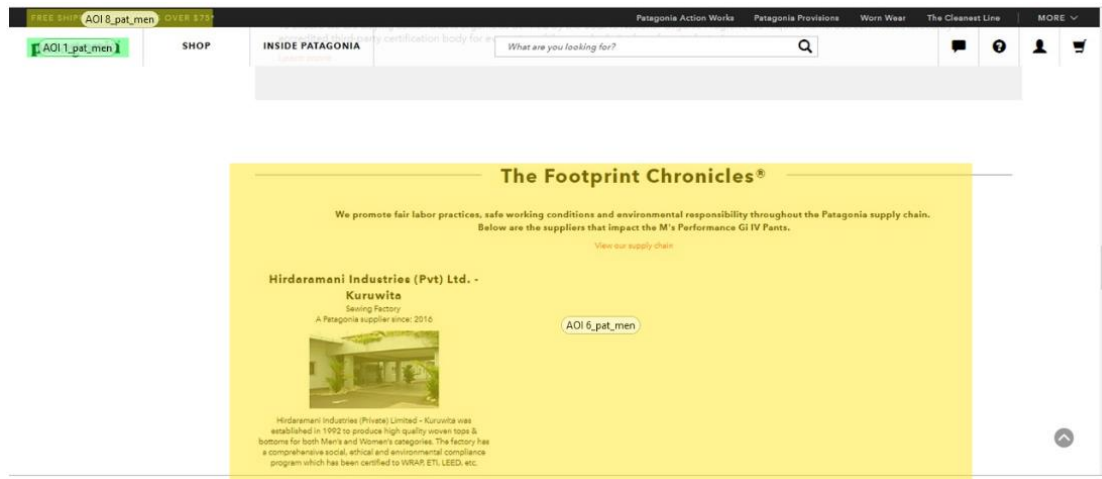


Figure 47 Patagonia_men 14



Figure 48 Patagonia_men 15

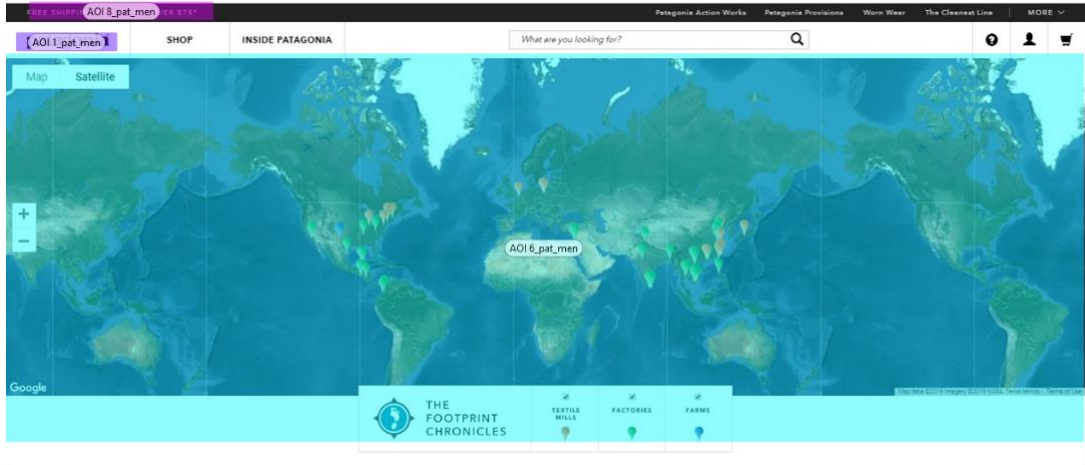


Figure 49 Patagonia_men 16

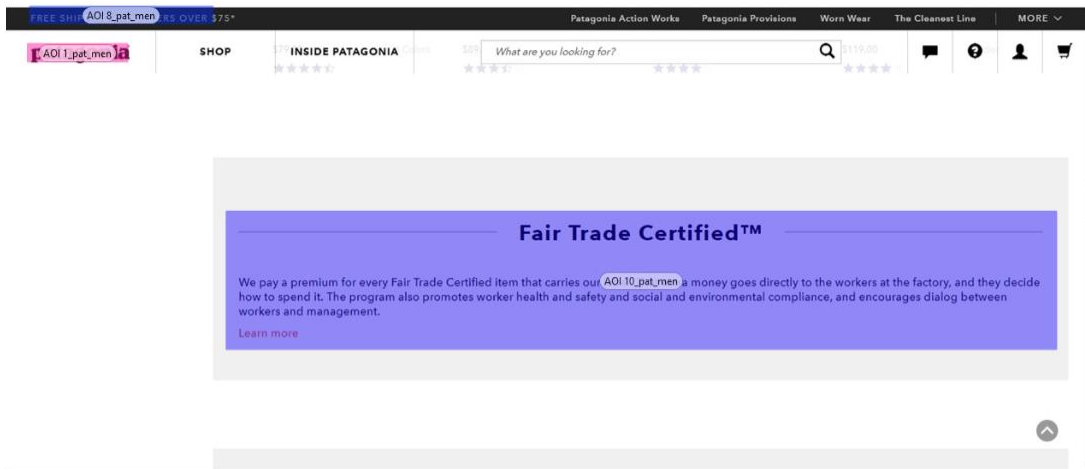


Figure 50 Patagonia_men 17

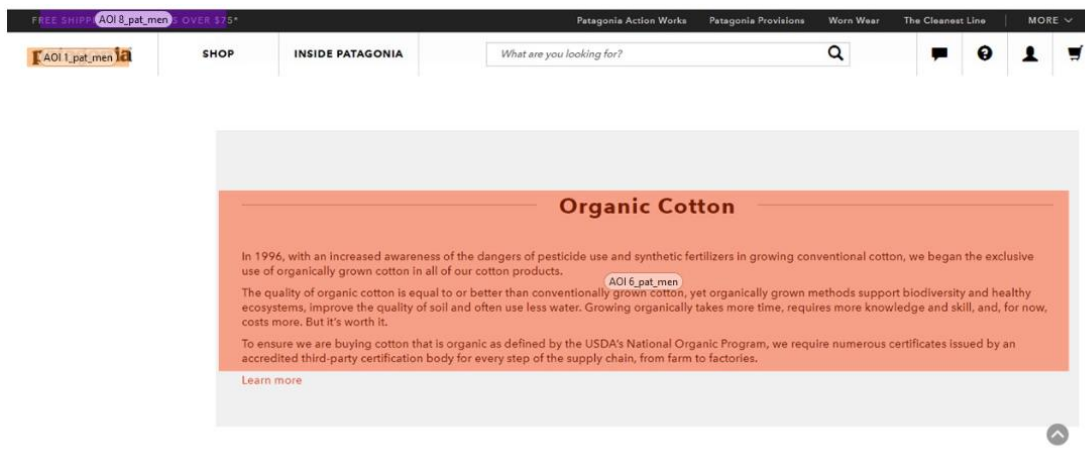


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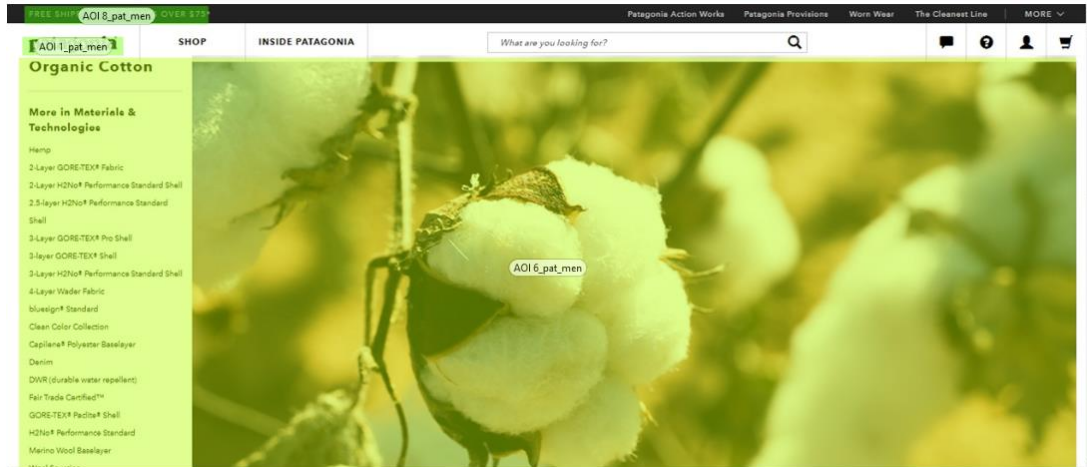


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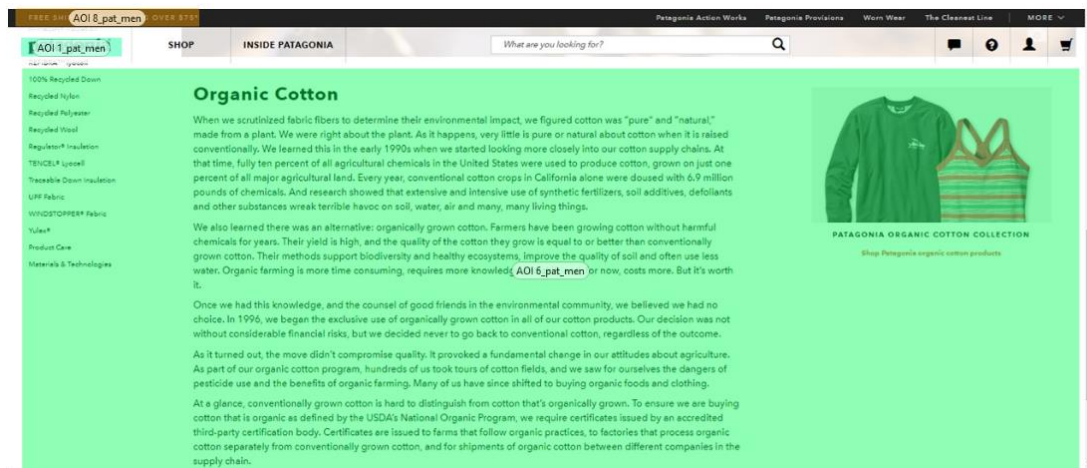


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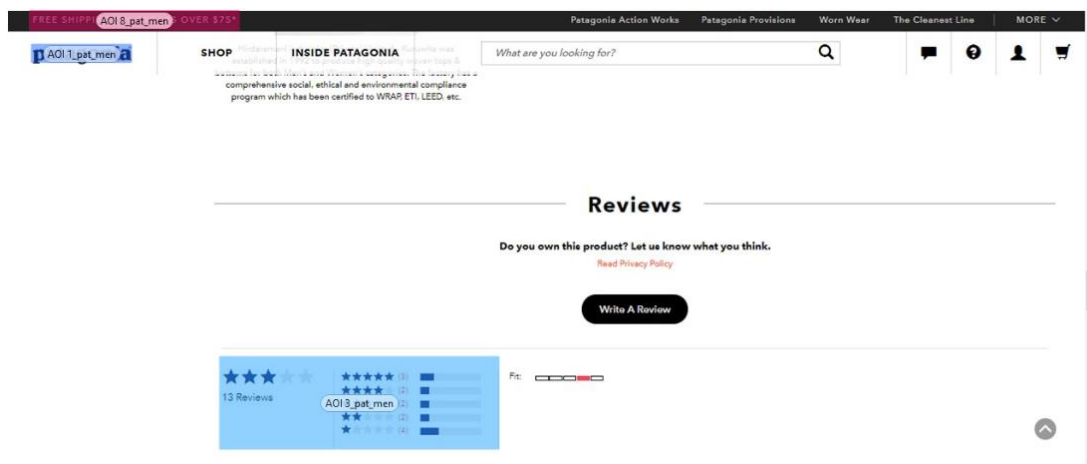


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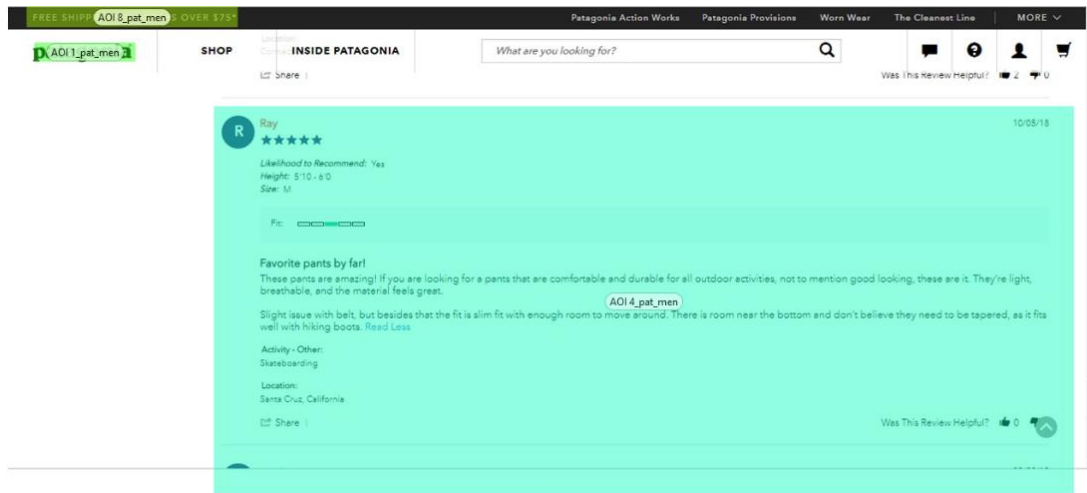


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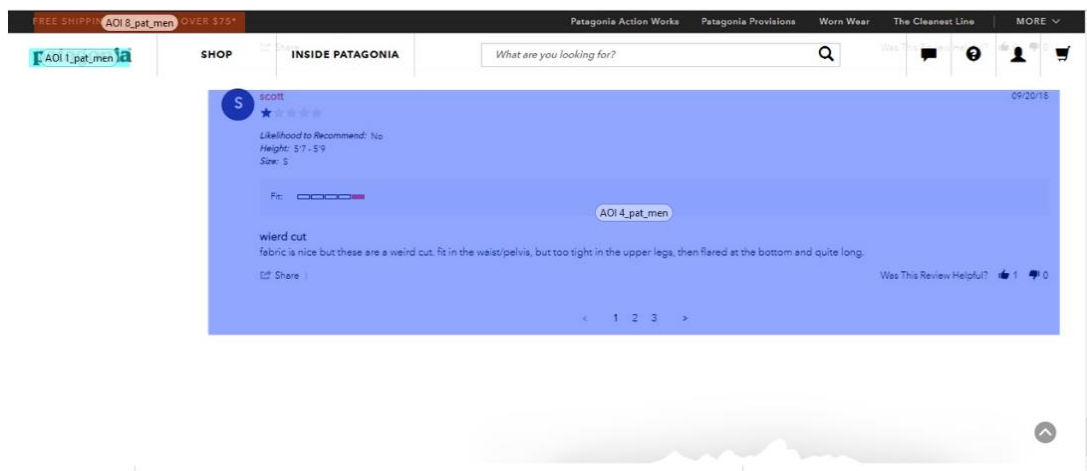


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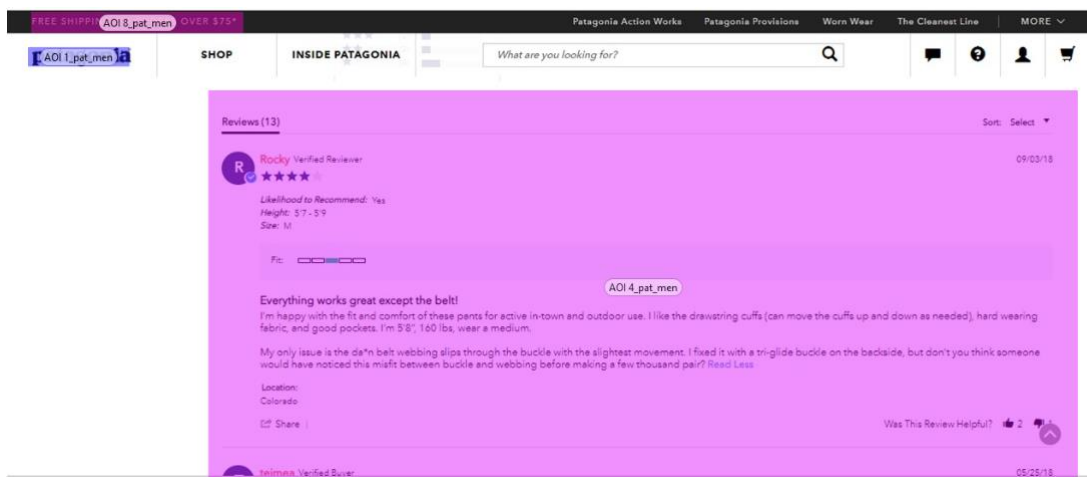


Figure 60 Patagonia_men 27

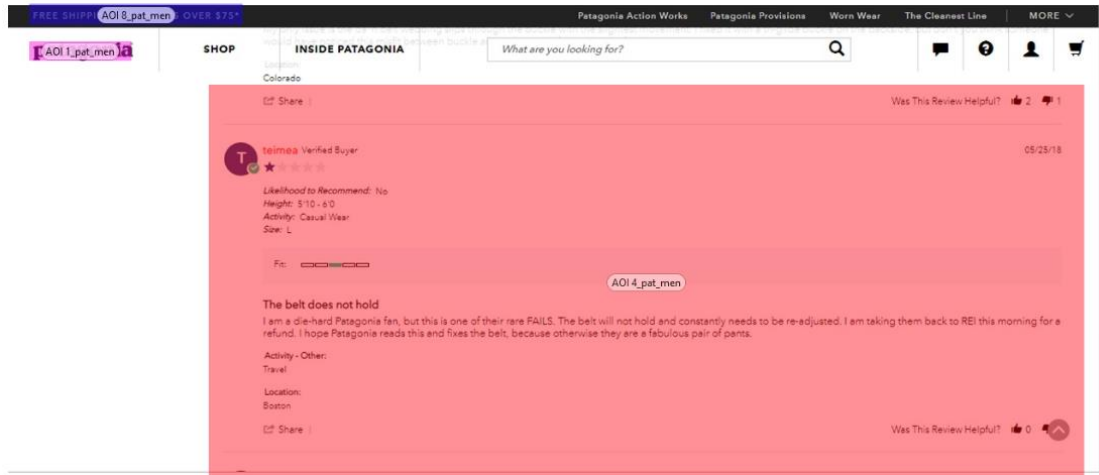


Figure 61 Patagonia_men 28

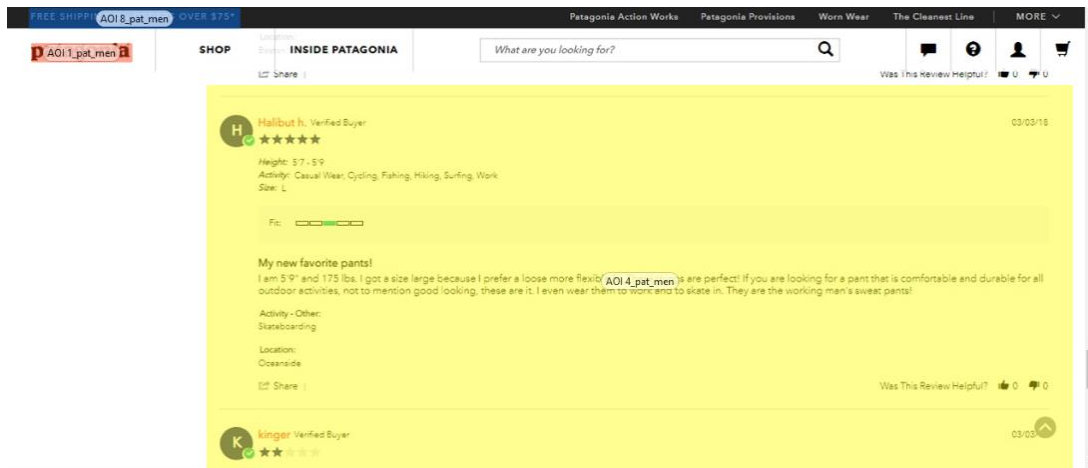


Figure 62 Patagonia_men 29

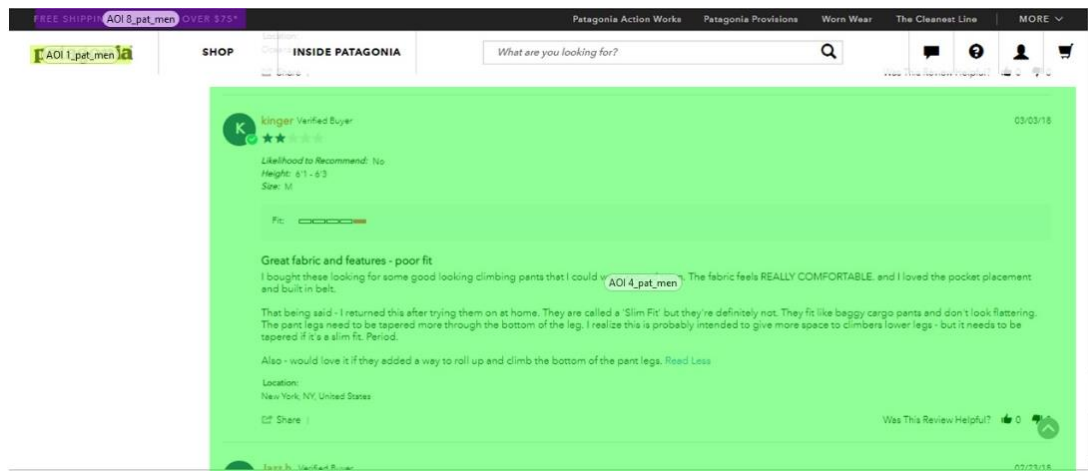


Figure 63 Patagonia_men 30

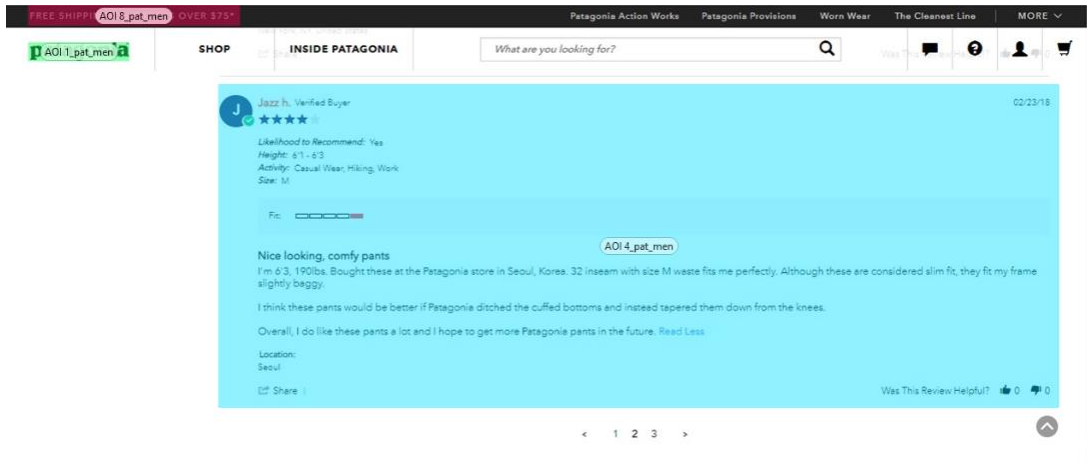


Figure 64 Patagonia_men 31

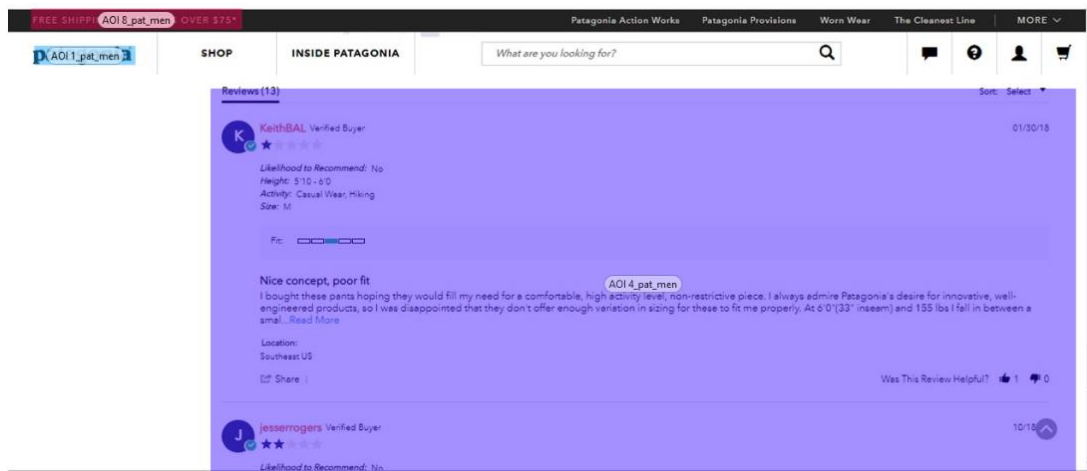


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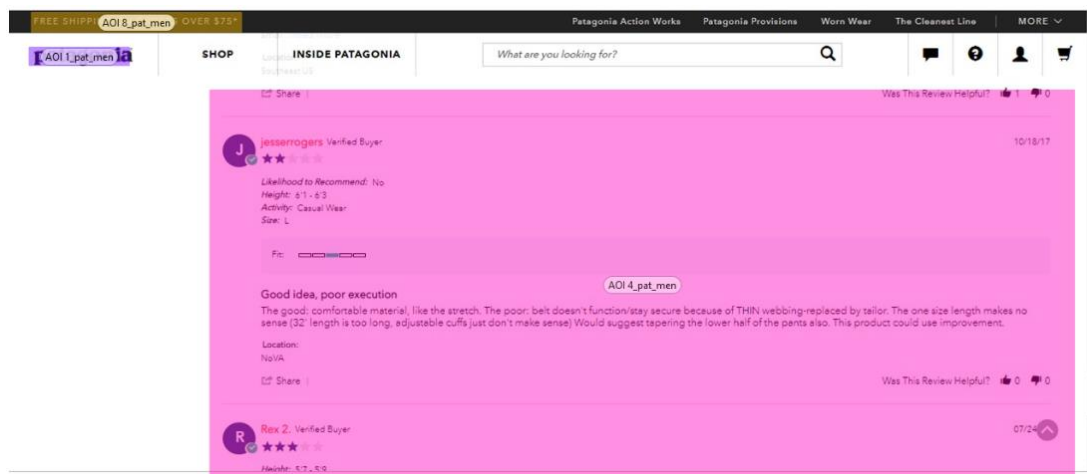


Figure 66 Patagonia_men 33

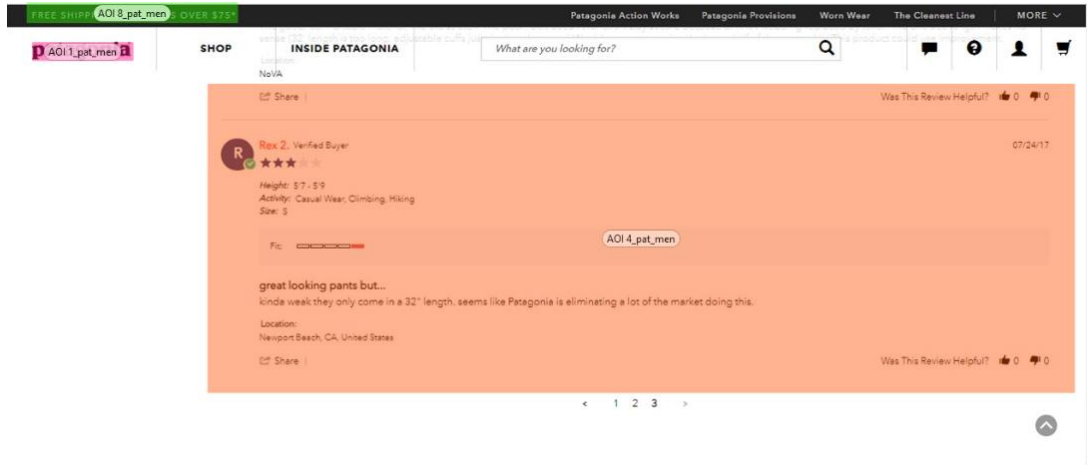


Figure 67 Patagonia_men 34

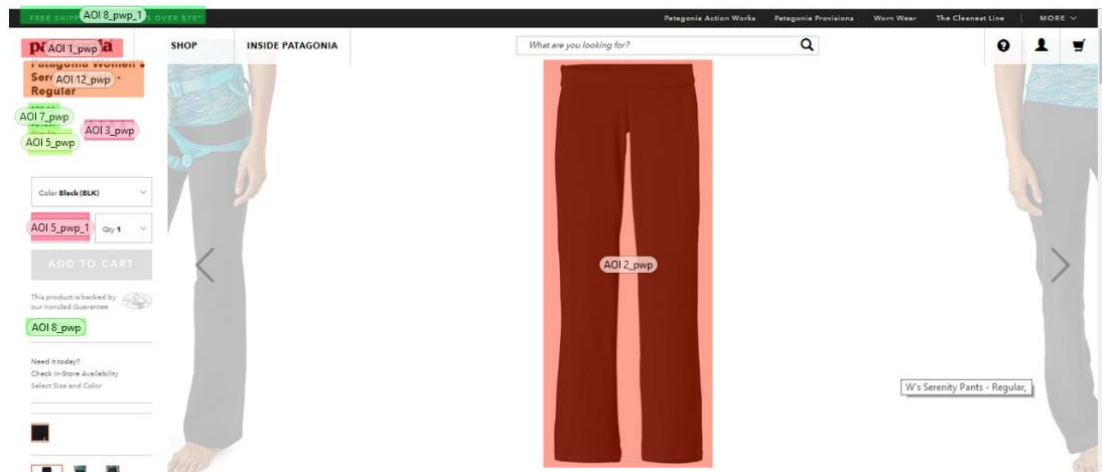


Figure 68 Patagonia_women 1



Figure 69 Patagonia_women 2

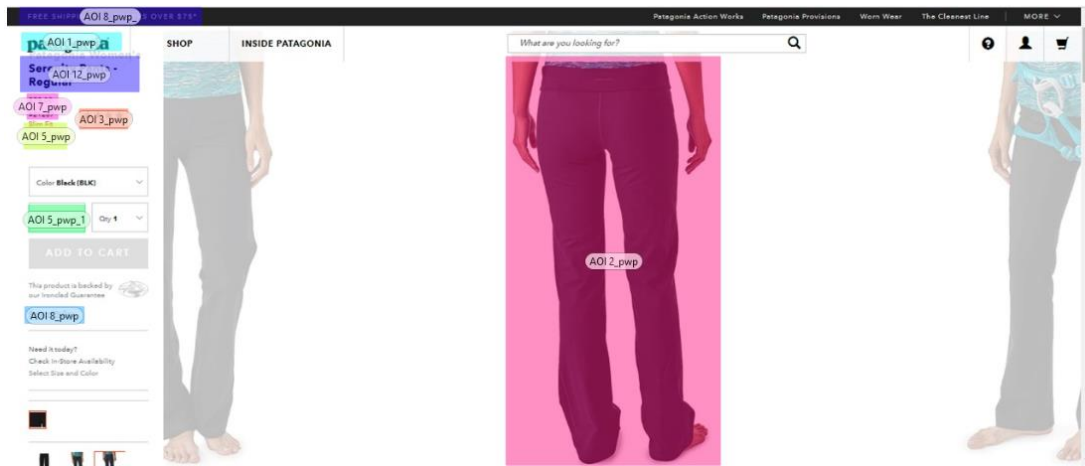


Figure 70 Patagonia_women 3

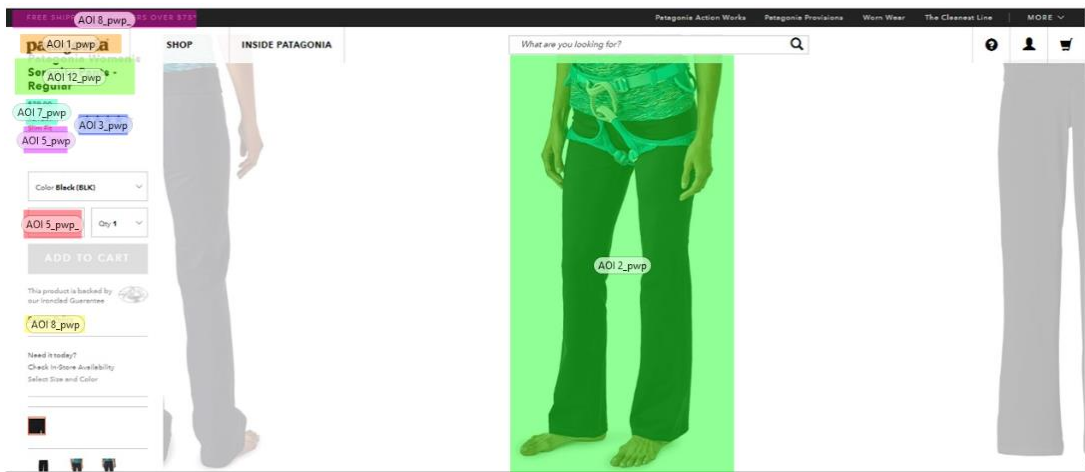


Figure 71 Patagonia_women 4

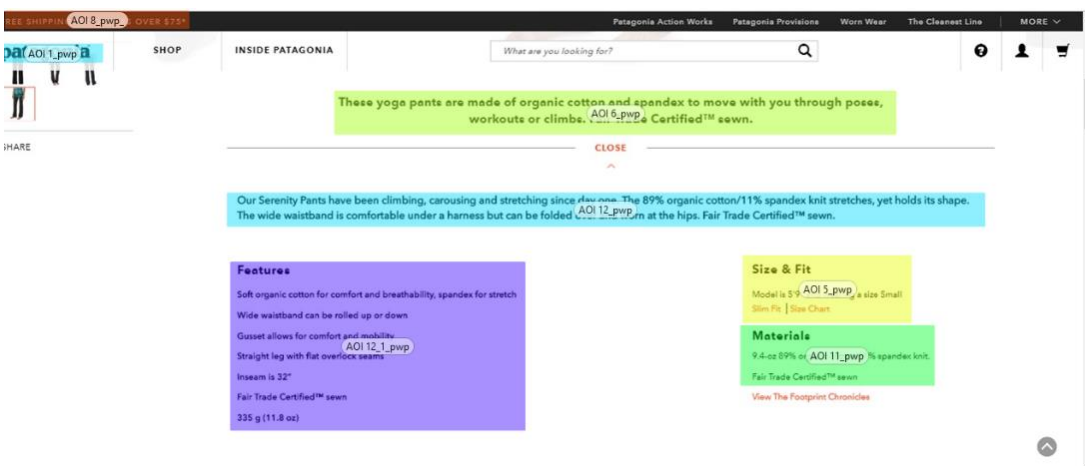


Figure 72 Patagonia_women 5

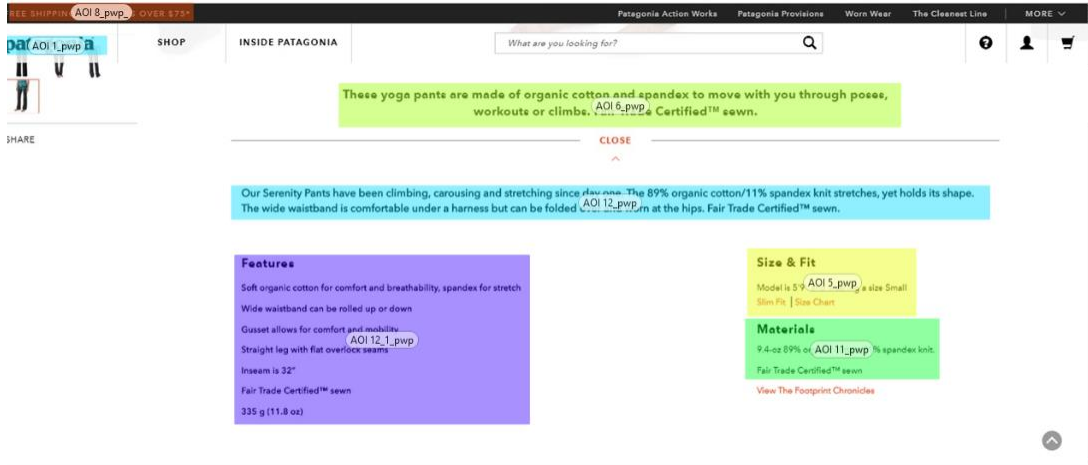


Figure 63

Figure 73 Patagonia_women 6

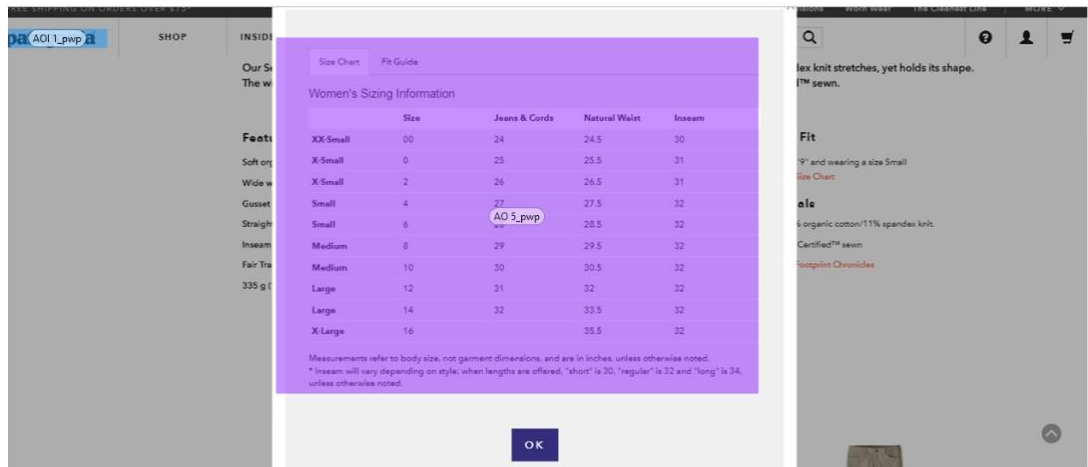


Figure 74 Patagonia_women 7

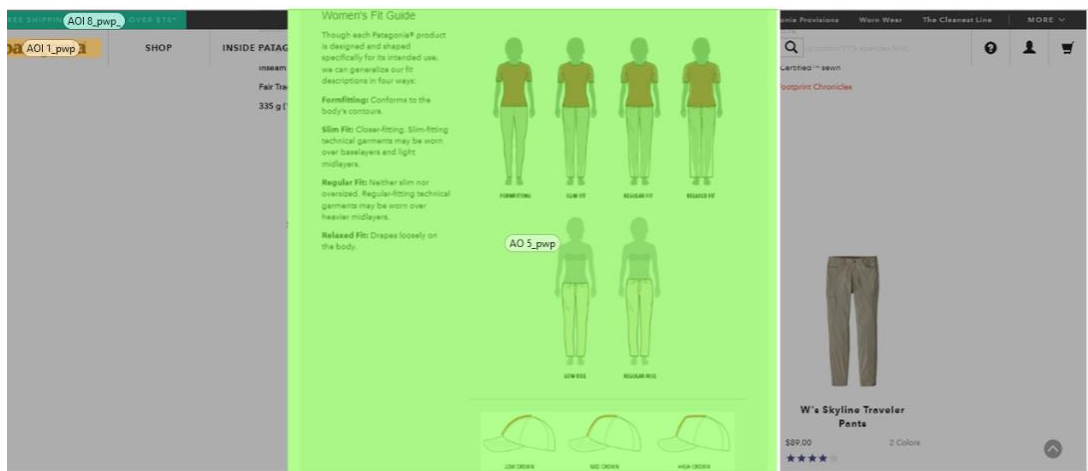


Figure 75 Patagonia_women 8

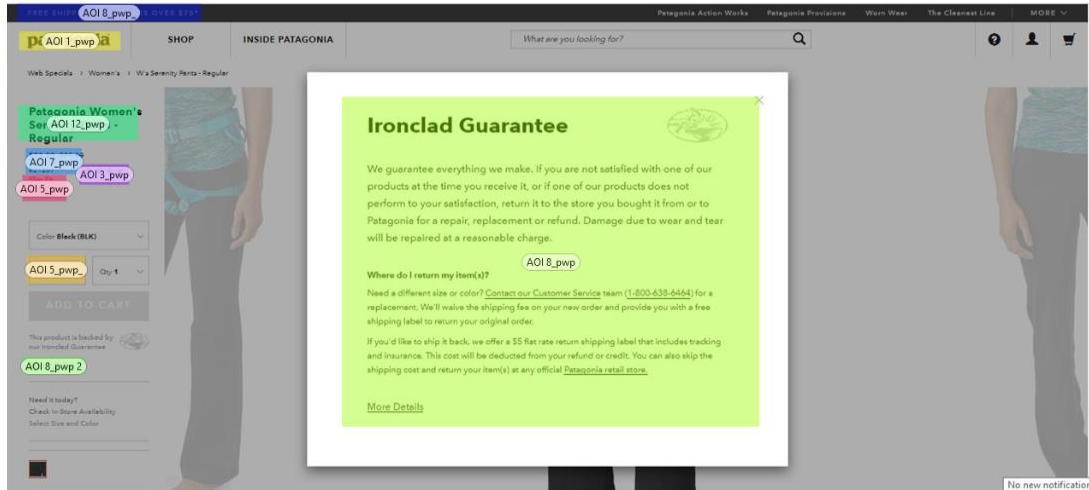


Figure 76 Patagonia_women 9

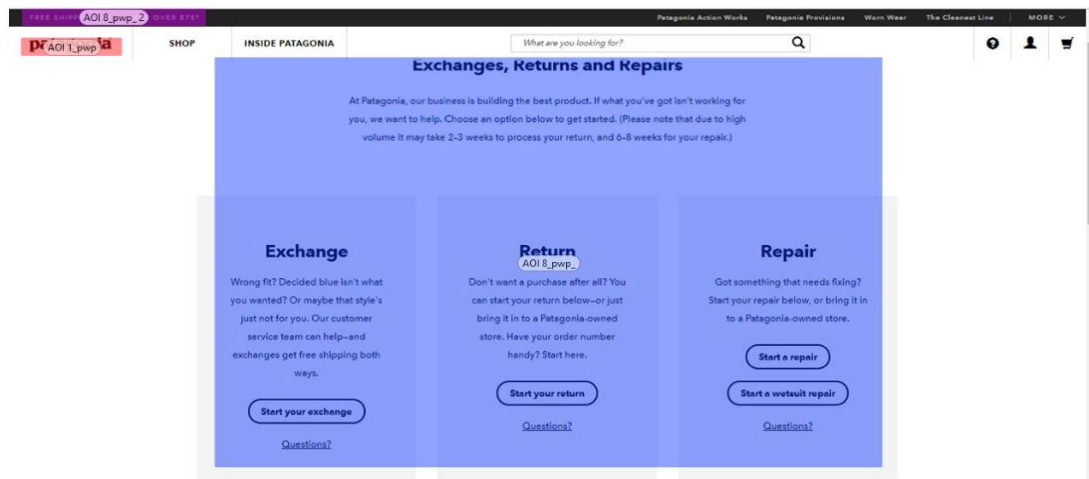


Figure 77 Patagonia_women 10

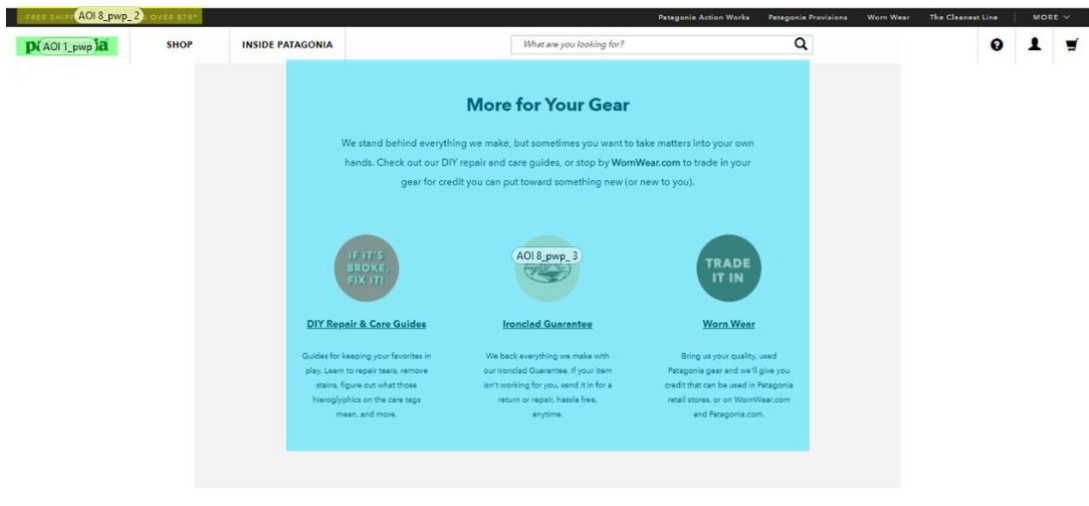


Figure 78 Patagonia_women 11

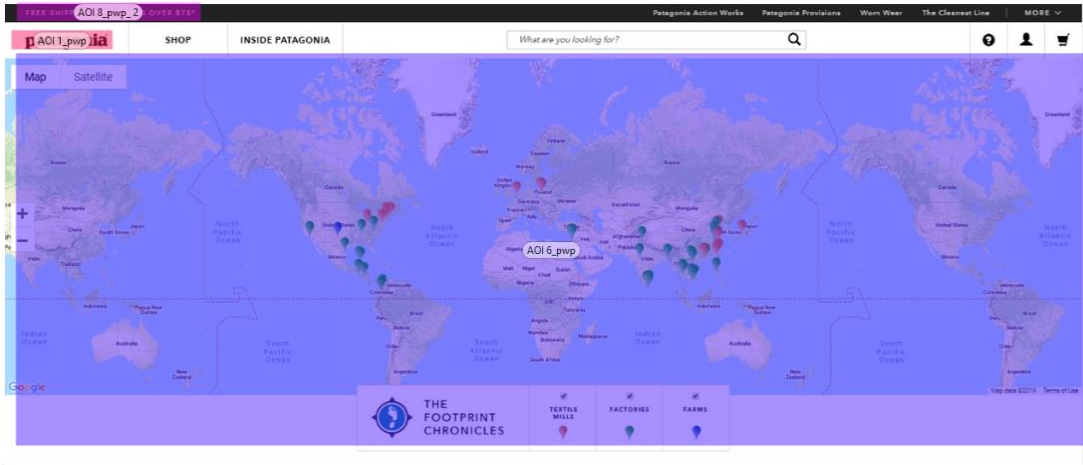


Figure 79 Patagonia_women 12

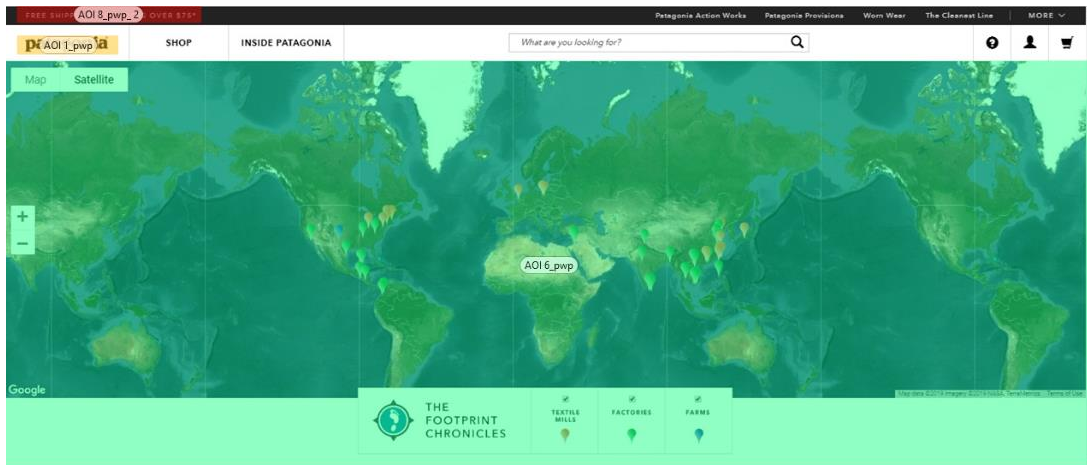


Figure 80 Patagonia_women 13



Figure 81 Patagonia_women 14

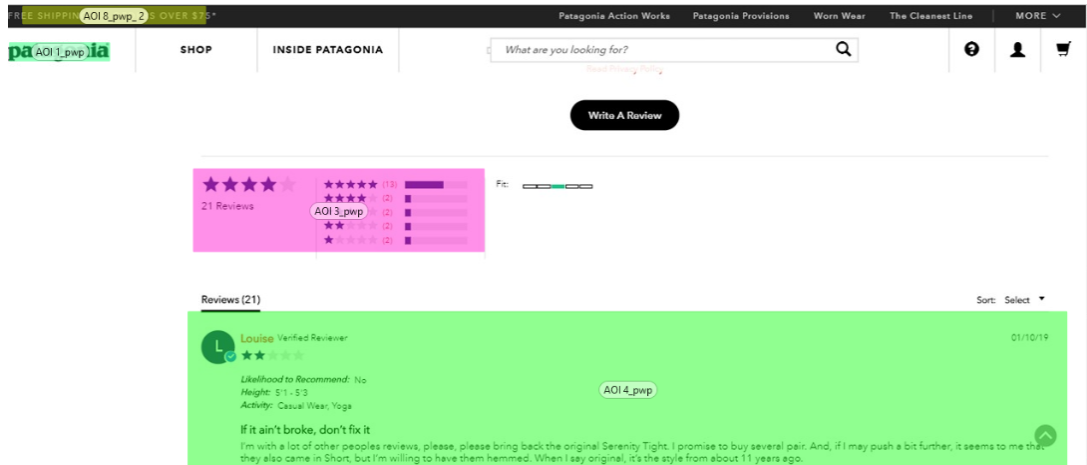


Figure 82 Patagonia_women 15

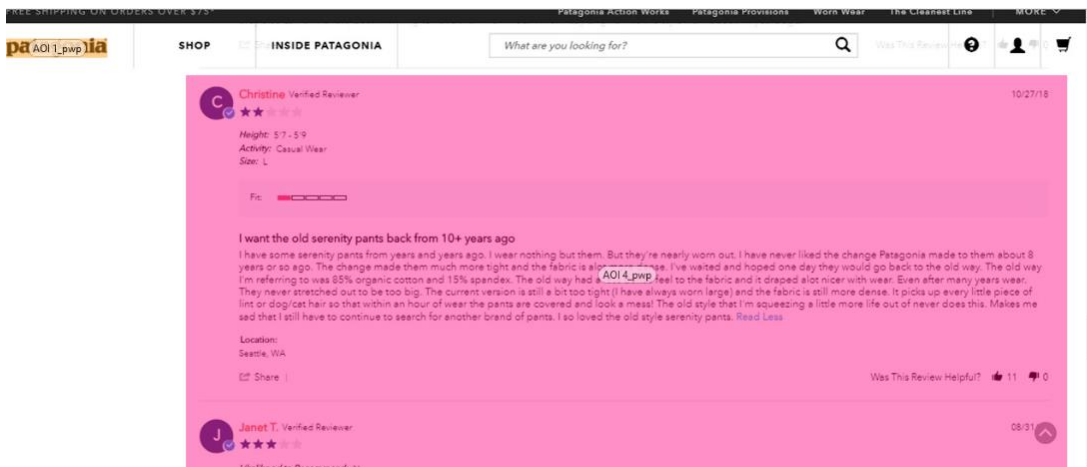


Figure 83 Patagonia_women 16

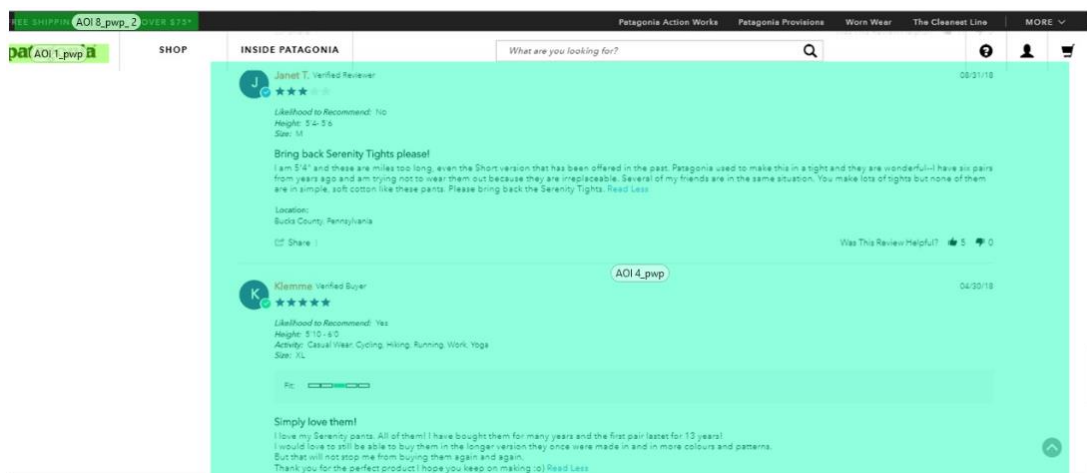


Figure 84 Patagonia_women 17

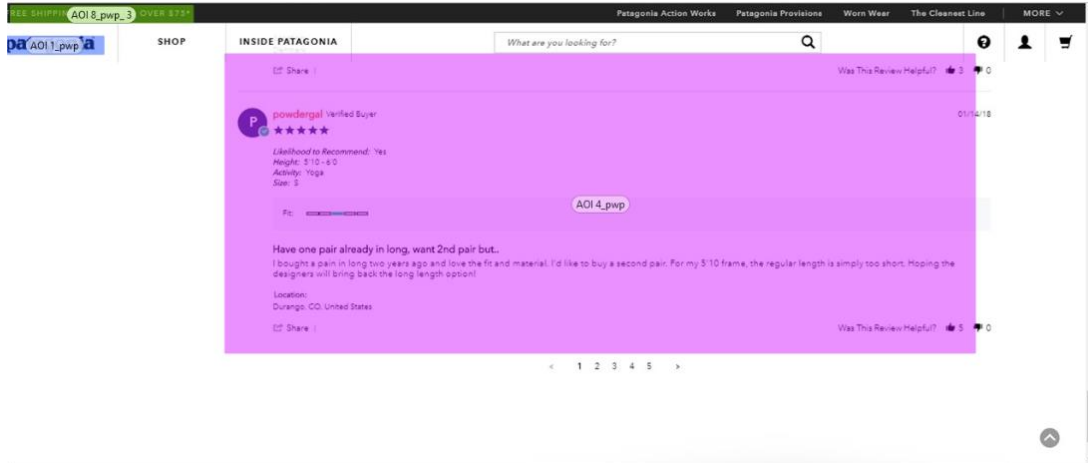


Figure 85 Patagonia_women 18

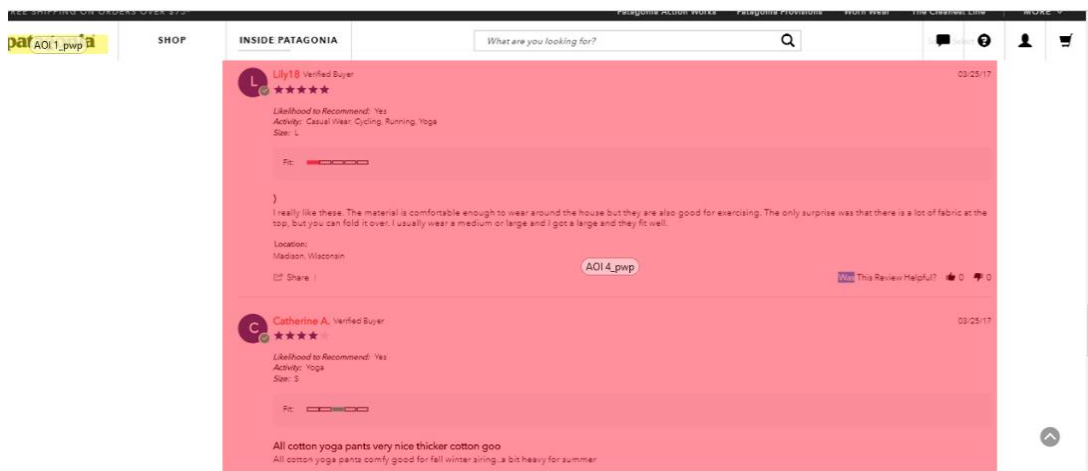


Figure 86 Patagonia_women 19

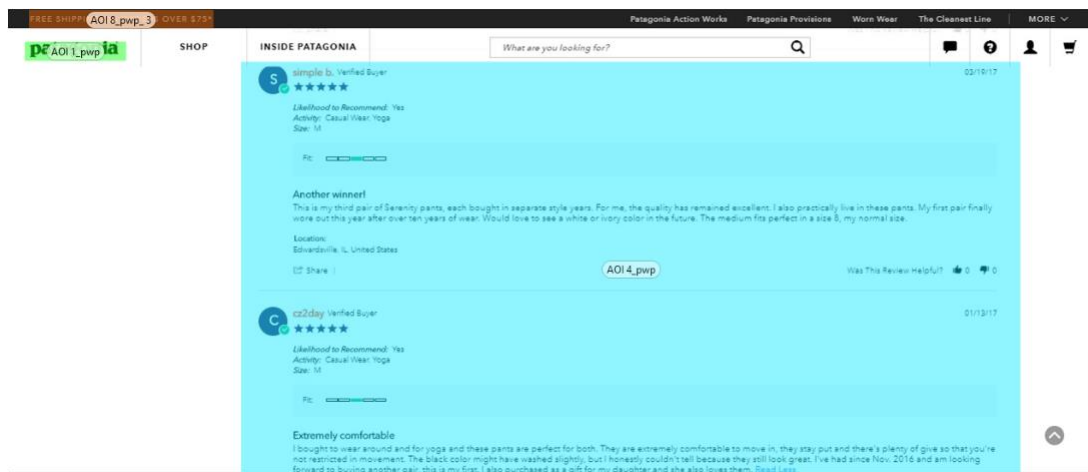


Figure 87 Patagonia_women 20

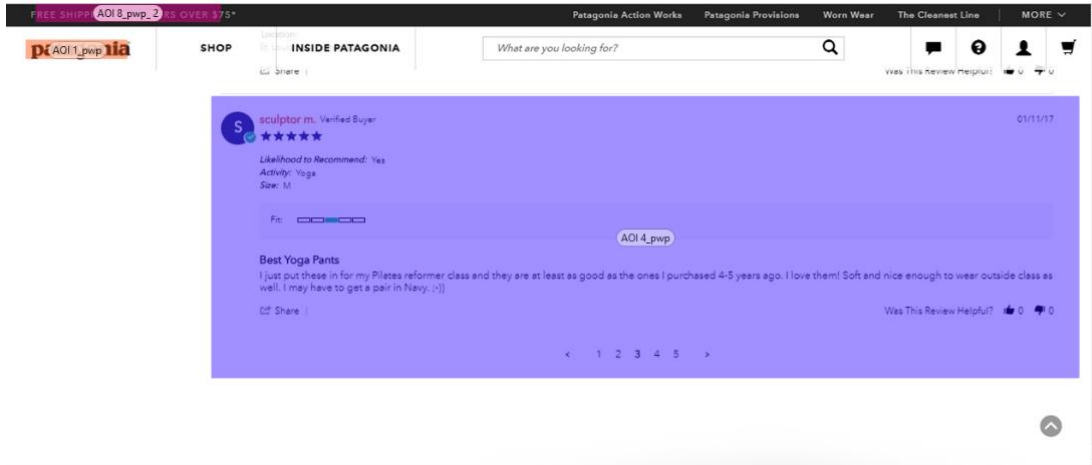


Figure 88 Patagonia_women 21

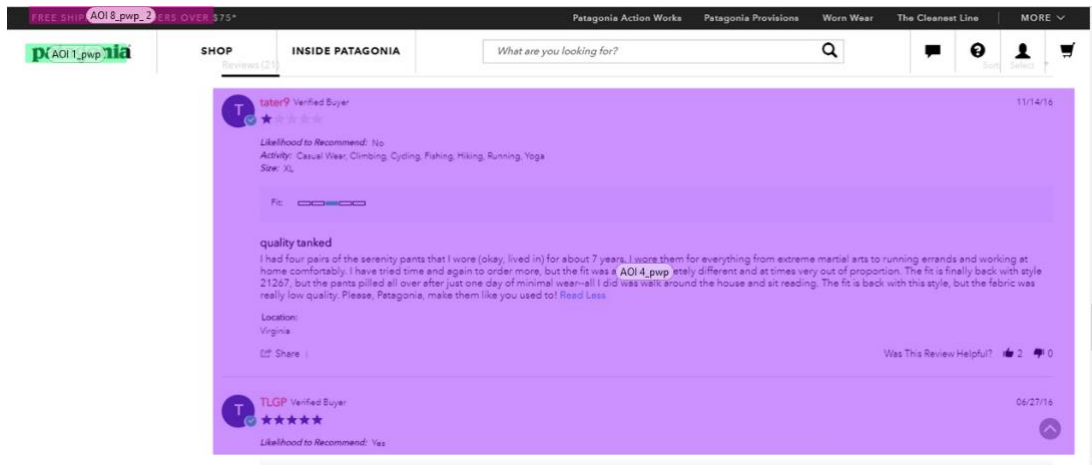


Figure 89 Patagonia_women 22



Figure 90 Patagonia_women 23