Do Mobile Devices Change Shopping Behavior? An Eye-tracking Approach

Emergent Research Forum (ERF)

Kyuhong Park
KAIST
kyuhong@kaist.ac.kr

Dong-joo Lee
Hansung University
djlee@hansung.ac.kr

Joowon Lee
KAIST
jwlee1015@gmail.com

Jaehyeon Ju
McGill University
jaehyeon.ju@mcgill.ca

Jae-Hyeon Ahn
KAIST
jahn@kaist.ac.kr

Abstract

The proliferation of diverse mobile devices has had a significant impact on e-commerce. Due to the small size and ease of portability of mobile devices, mobile shopping is fundamentally different from traditional PC-based shopping. Existing studies based on survey methodology and clickstream data analysis have limitations in understanding shopping mechanism due to structural design and cognitive constraints of consumers. In this regard, this study aims to investigate the actual behavior of consumers in the processes from search to purchase in PC and mobile environment using Mobile Eye Tracker. Specifically, we will look at how attention decay changes in both environments, and how this varies with product placement and product type. Our findings will help us understand the different mechanisms for mobile and PC-based shopping. Also, these will help practitioners establish optimal product placement strategies based on the type of device and product.

Keywords

E-commerce, mobile, eye tracking, product placement, product type, visual attention

Introduction

The introduction of online channel has completely changed traditional commerce with catalogs and limited space. E-commerce, which was able to solve the problems presented by search costs and limited storage space, has changed not only the commerce aspect of industries but whole industries in their entirety. More products have been exposed to customers and more customers can shop more frequently, regardless of time and place (Ghose et al. 2013). The emergence of a variety of mobile devices, including smartphones and tablets, has changed e-commerce once again. Mobile commerce, which is more dependent on individual users, is able to make use of personal information, such as real-time locations, and has given operators greater opportunities. At the same time, mobile commerce has begun to take away stakes from PC channels, which account for most e-commerce transactions (eMarketer, 2016). So far, studies have been conducted on how the introduction of new channels affects the overall commerce industry. For instance, the impact of the adoption of PC channels on traditional commerce channels and customers (Brynjolfsson et al. 2003) and how mobile channels complement or sometimes replace PC channels has been studied (Bang et al. 2013).
As the online retail market becomes more and more intense due to the large number of participants and numerous alternative products, business stakeholders and marketers need to understand exactly what their customers’ purchasing and search patterns (Zhang et al. 2006) and product selection strategies (Sen et al. 2006) are. In particular, the paradox of choice due to the numerous alternatives that customers face with the “long tail” needs to be identified and responded to by considering the essential mechanisms of how customers choose their products. However, many studies on customer behaviors and purchase propensities were done with click through rate data and a survey approach. Survey methodology has limitations due to structural design and cognitive constraints of respondents (Fowler 1992). In the case of click through rate data, it is possible to check the record of selected products until the actual choice stage, but it is unable to find attention or interest related to products other than actual selection (Ahn et al. 2018). With the eye tracking methodology, it is possible to directly measure how users pay attention to the overall processes in actual situations. We attempt to reduce the research gap with eye tracking methodology because it enables analysis that conventional methodology cannot, including analysis of both consciousness and unconscious behavior.

Theoretical Backgrounds

Visual Attention

Attention is an important factor in the commercial sector in areas such as advertising effectiveness and product selection (Lee et al. 2015). Attention is the first step in the recognition phase. The fact that a product does not attract visual attention in commerce means that the product is not perceived or considered (Kim 2017). In addition, visual attention directly strengthens perception, and information processing operates after attention occurs. Attention is an important key to interpreting the information processing of consumers (Reynolds and Desimone 2000). Fixation duration and fixation count are the most effective variables to measure visual attention and cognitive process (Lee et al. 2015). Fixation duration is a variable that indicates how long a gaze has been fixed in the area. More fixation counts and longer fixation durations for AOIs (Areas of Interest) can be interpreted as the AOI being more attractive and captivating to customers (Jacob and Karn 2003, Luan et al. 2016). Also, attention can be divided into voluntary and involuntary attention (Kok 2000). Because human cognitive abilities are limited, humans selectively accept and use information (Ahn et al. 2018). Thus, in order to understand the customer's product selection mechanism, it is necessary to understand their voluntary attention in detail.

Channel Effect

The impact of introducing new channels in commerce is quite strong. As the existing brick and mortar operators first encountered the online channel, the era of the Pareto principle came to an end and the era of the long tail began. The long tail principle introduces niche products that had been previously neglected to customers and drastically changed the sales strategies of operators. In particular, the introduction of increasingly personalized and accessible mobile channels has changed the business models of various firms. Consumers are even using multiple channels at the same time, and studies on the simultaneous use of channels have been conducted (Verhoef et al. 2007). In particular, IS research focuses on additional changes in the long-tail rule due to the introduction of new online channels such as mobile channels. Doosti et al. (2017) insisted that adding a mobile channel would increase the variety of products sold. Other researchers argue that the introduction of mobile channels increased the volume of searches but actually reduced the sales of long tail product groups (Park et al. 2017). At this time, research is needed to find a direct and fundamental cause for these mixed results.

In addition, comparison of online channels with PC and mobile channels is taking place in various fields. This is especially so in human computer interaction (HCI), where attention is paid to differences in consumer behavior between channels, considering various aspects such as display size and operation method (i.e. mouse or touch) (Lagun et al. 2014). In particular, because of the direct effects of display size and absence of input device on search costs, various studies have been carried out to identify customer search behavior and eye tracking research has been actively conducted (Kim et al. 2011, Kamyar and Baluja 2006).
Hypotheses Development

Attention Decay

Because human cognitive abilities are limited, the first input stimulus remains in memory when multiple objects are gazed, so customers assign only a small amount of energy to the second stimulus. This phenomenon is called the attentional blink, and it is applied to the process of searching for multiple goods (Raymond et al. 1992). In most situations, the most attention is focused on the first few stimuli, and gradually decreases (Buscher et al. 2009; Ahn et al. 2018). Especially in the case of mobile channels, since the size of the screen is small, each product occupies a large area proportionate to the entire screen. Existing studies have also confirmed that the time spent on the first stimuli for mobile situations is longer than for PCs (Kim et al. 2015, Kim et al. 2016). It is also known that smartphones or tablets that do not have a physical input device such as a mouse or a keyboard which require more effort to retrieve information (Jones 2003).

H1. In a mobile phone environment, attention decay will appear more steeply than in a PC environment

Grid view vs. List view

There are many different ways to show search results on a web page. The list view, which is often used to show search results, causes many problems. The list layout, which shows each item one at a time from top to bottom, allows for more attention to be paid to the results in the top position. Search engine sites have tried to reduce the positional bias by using methods other than this single vertical method. Some related studies include those on the effects of tabular interfaces (Resnick et al. 2001, Rele and Duchowski 2005) and studies on the effect of introducing graphical overview of text (Salmerón et al. 2010). Kammerer and Gerjets (2012) have found that tabular interfaces could distract from attention with positioning and help participants to make more objective choices. Kammerer and Gerjets (2014) also have found that grid (gallery) view placement systems could reduce the effects of position in the search.

Based on previous research, it can be inferred that changes in product placement type in e-commerce can affect customer selection and retrieval. In particular, it can be expected that grid view systems will distribute the concentration of the eyes to a greater number of products, especially in the case of mobile channels where the area takes customers’ first attention is a large on the screen.

H2.1 In a grid view environment, attention distribution is be distributed more evenly than in a list view environment.

H2.2 In a mobile phone environment, differences in the attention distribution effect between a list view and a grid view would be more significant than in a PC environment.

Product Type

Categorizing products as search products that could be expected with only a given information and experience products that could be predicted through real experience was the most effective classification standard in online transactions for marketing purposes (Weathers et al. 2007). Because there are many factors to consider when choosing a product, various researches on consumer behavior considering the characteristics of products has been performed in e-commerce. The classification of experience / search as well as how often products are consumed and whether they are hedonic or necessities have also been considered (Bang et al. 2013, Park et al. 2017). Especially in the case of experiential goods, factors such as customer reviews are important, as the experiences of other consumers are an important factor in decision making process. In the case of search products, much attention is focused on information about the products (Luan et al 2016). Depending on the type of product, customers are expected to be mostly interested in different area in websites such as product description or customer reviews. In the case of search products, more products will attract attention in a mobile environment based on an environment in which fewer products on a screen can be deployed and observed more carefully.

H3.1 For search products, attention distribution would be more even than for experience products for both mobile and PC device types.

H3.2 In a mobile phone environment, more products would be observed in a search product shopping situation than in a PC environment.
Methodology and Experimental Procedure

We will deploy eye tracking methodology using virtual shopping sites created for experimentation. 80 e-commerce users will take part in the experiment, which uses both between and within subject experiment design. Each person will use a single device with a single type of placement in the experiment. A total of four groups will be created according to two kinds of devices (PC and Mobile) and two kinds of placement types (List view and Grid View), with 20 participants assigned to each group. Type of devices and placements is a between subject factor and product category is a within subject factor. All participants will be exposed to an explanation of attention renewal page settings and different product categories. Each group will have a similar distribution of actual users in the e-commerce area in age and gender.

To validate Hypothesis 1, we will control the total number of items used in the experiment (same 96 products), and the number of items displayed on one page will be adjusted (16 products per page). We will also use two types of product placement, list view and grid (gallery) view to validate Hypothesis 2. Four product categories will be used in the experiment, two experience goods (gloves and phone cases) and two search goods (dust masks and portable power banks).

The experiment will be performed in a laboratory without distractions. When the participants enter the room, they will be asked to wear Tobii Pro Glasses 2 eye-trackers. After a quick calibration, participants will be instructed to browse a web-page and select products for their wish list. The participants will be allowed to control the time they spend on the whole process. After they finish the experiment, they will choose one product from each product category. One of the chosen products will be provided to the participant as a reward. This rewarding process encourages the participant to select products in a more realistic situation. The participants will take part in choosing for all four product categories and a short webcomic will be given to participants to read between categories to refresh their attention. The whole experiment would take a total of 30–40 minutes per participant. Data on all participants will be collected throughout the experiment. With the eye-tracking device, fixation duration, and fixation counts will be measured. In order to control product involvement, centrality of visual product aesthetics, etc., a follow-up questionnaire including related items will be conducted after the experiment.

Contribution

Our research has both academic and practical contributions. Academically, this study is expected to find how visual attention and different types of product placement would affect product choice in limited cognitive situations in both PC and mobile channel. This study will help to identify the underlying mechanism of consumer choice behavior in e-commerce, which has yet to be confirmed due to the limitations of existing data analysis and survey methodology. In addition, mobile eye tracking equipment will be used to identify differences in consumer behaviors between mobile devices and PC devices, which have been relatively underdeveloped due to equipment limitations. This study will also help practitioners to establish optimal placement strategies based on product type and mobile device type.

Acknowledgements

This work was supported by Hansung University.

REFERENCES


Do Mobile Devices Change Shopping Behavior?


