

# A Study on the Shopping Life through Mobile Visual Search

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## Abstract

**Purpose** - To examine the influence of mobile visual search as a strategic technology service on consumer perceived economic value and customer commitments, which in turn affect consumer's usage intention of mobile visual search. This study also explores the moderating effect of different levels of consumer online shopping orientation.

**Design/methodology/approach** - One-by-one open-ended in-depth interview was first undertaken to 15 Korean consumers to figure the features of mobile visual search. Then a conceptual model was built to verify the hypotheses that indicate the impact of mobile visual search on consumer perceived economic value and customer commitment, which further influence consumer's usage intention.

**Findings** - The results show Convenience, Information quality, Personalization, Text-free search interface design and Visual communication of mobile visual search positively influence consumer perceived economic value and customer commitment and in turn positively affect consumer's usage intention. Moreover, the different levels of consumer online shopping orientation also found to have different effects on consumers' perception and behavior of using mobile visual search in online fashion shopping.

**Research implications or Originality** - The present study verified that mobile visual search is a service tool that consumers want to use in the online fashion shopping journey since it provides economic benefits.

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**Keywords:** Mobile Visual Search, On-line Fashion Retailing, Customer Commitment, Consumer Perceived Value, Usage Intention, Online Shopping Orientation

**JEL Classifications:** C83, M31

## I. Introduction

To improve the efficiency of product information search and reduce search cost, online consumers are looking for shopping malls which equipped with integrated information access technologies and decision aid tools (Wang *et al.*, 2018). Visual search emerged to be an important tool as it can help to bridge the gap between discovery and purchase in the consumer mobile online shopping journey. Especially, mobile visual search plays an important role as

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a search tool in the online fashion retailing sector. Shown in Pinterest, visual search is used most in the searching for products of the fashion category. Fashion retailers such as Asos, Zalando, Zara, and H&M have already adopted mobile visual search technology in their online business. Recently, interest and use of mobile visual search are also increasing in the field of fashion marketing. In particular, although the potential and importance of mobile visual search tools have shown recent trends, most of the existing related research (Zhai *et al.*, 2023; Jiang *et al.*, 2018; Zhang *et al.*, 2019; Shankar *et al.*, 2017; Lynch *et al.*, 2016) focuses only on the technical aspects that emphasize techniques. In particular, research on mobile visual search that focuses on fashion marketing is very necessary. The purpose of this research is to explore whether the mobile visual can serve as an effective marketing and service tool in online fashion retailing also examine the moderating effect of consumer online shopping orientation. There are four main aims of this research. The First is to figure out the features of mobile visual search from a consumer perspective; the second is to examine if the features of mobile visual search serve as the predictors in improving the value perception of using such service and in enhancing consumer's desire for maintaining the relationship with service providers; the third is to explore if the mobile visual search is an effective service tool that consumer wants to use in their online fashion shopping; the last forth is to inspect if different levels of consumer online shopping orientation have different impacts on consumer's perception and usage intention of mobile visual search.

## II. Literature Review

### 1. Mobile Visual Search in Online Fashion Retailing

#### 1.1. Concept of Mobile Visual Search

Visual search, a type of content-based image retrieval (CBIR) technology that works by retrieving relevant images that are related to the presented query image based on visual characteristics (Cho, 2023; Rashno and Sadri, 2017). In traditional, the concept of 'visual search' is different from the 'image search', as the query of 'visual search' is based on the image and the traditional image search refers to search image with the query that can be based on keywords (Chen and Zhai, 2023; Han *et al.*, 2022; Yee *et al.*, 2003). However, recently the term 'image search' also refers to 'use the image to search' (Lim *et al.*, 2019; Li *et al.*, 2020; Kim and Park, 2020), which represent the same concept of visual search. Visual search on the mobile device, which is called 'mobile visual search', enables the user to capture the object in visual proximity and search with image format in the mobile device environment (Sang *et al.*, 2013).

#### 1.2. Mobile Visual Search Adoption in Online Fashion Industry

Among different kinds of on-line retailers, mobile visual search service is much more necessary for the fashion sector. Users of mobile visual search technology use the target to be searched or use the image to obtain information related to the target to be photographed by searching a database of a pre-constructed image (Han *et al.*, 2022). In particular, in fashion

products, the number of cases of obtaining product information after searching using images is gradually increasing. First, consumers' buying decision of fashion products is mainly affected by products visual appearance (Han *et al.*, 2022). A search tool that conducting searching by analysing the visual features of products should be helpful in consumers' online fashion shopping because consumers can use products' visual appearance to search for ideal items. Second, the traditional text-based search method that being popular used is less effective, especially in the search of fashion products, since the visual content of products is difficult to be described detail and exactly in the text (Shankar *et al.*, 2017; Dan and Jing, 2018). Hence, to remove the obstacle of the textual description, adopting mobile visual search is crucial for on-line fashion retailers. Third, nowadays image-based SNS platforms such as Instagram and Pinterest play an important role in affecting consumer's fashion shopping (Aragoncillo and Orús, 2018) as getting fashion information is one of the motivations of image-sharing SNS usage (Casaló *et al.*, 2017). According to Cho(2023), Consumer's fashion information acquirement is through visual format images on these SNS platforms, it will make consumer's shopping process more convenient if online fashion brands allow consumers to search for products by directly using the visual information they see on these platforms.

### 1.3. Mobile Visual Search related features

In the construct of extended TAM (Technology acceptance model), characteristics of technology were added as antecedent external variables to see the effect on user adoption of new technology (Na and Jeong, 2013). It is obvious that in understanding user's perception and adoption of a specific technology, the characteristics or features of a technology play as the basic part.

Mobile visual search is said to be much more user -friendly because users would not be bothered by the express of visual intent of the search queries and the pronunciation of the things he or she wants to search, what's more, the search interface enables users to be free from the tedious job of typing and input keyword (Wang *et al.*, 2011; Sang *et al.*, 2013). Zhang *et al.* (2015) argue that mobile visual search is convenient that search can be conducted naturally and conveniently whenever the mobile devices are in the hand of the user. Jiang *et al.* (2018) also indicated that when consumers shopping in a mobile application, the typical search method which using textual keywords is not always sufficient for all different types of goods in the massive product database.

In the marketing discipline, Lim *et al.* (2019) researched the image search service of a mobile shopping mall and took ubiquity, usability, playfulness, and information quality as the service characteristics to observe users' perception and attitude toward using image search service. Lim *et al.* (2020) studied the impact of image search-related characteristics in mobile shopping malls by classified the characteristics of mobile image search into ubiquity, playfulness, information quality, and system quality. The effect of image search service on mobile shopping was also studied by Kim and Park (2020) who consider the ubiquity and information quality as the important characteristics.

In this research, mobile visual search represents the mobile-based service provided to help consumers in searching for products and information. Therefore, characteristics of mobile service, mobile commerce, and information system mentioned in the previous literature should be relevant features of mobile visual search. In the study of Lee *et al.* (2016), security, local-

ization, convenience, personal innovation, interface, and reachability were mentioned as the characteristics mobile service. Kim *et al.* (2010) indicated that ubiquity, reachability, convenience, portability, instant connectivity, and personalization are the characteristics of mobile service.

In the mobile commerce literature, Müller-Veerse (1999) asserts ubiquity, reachability, security, convenience, localization, instant connectivity, and personalization to be the characteristics of mobile commerce. The characteristics of mobile phone shopping such as security, instant connectivity, and personalization were indicated in the study of Lee and Park's (2006). Also, the characteristics of mobile fashion shopping were defined as ubiquity, security, tangibility, and personalization (Ryou and Ahn, 2019).

Last, in IS (information system) researches, information quality and system quality are indicated to play a critical role in determining the success of an IS (DeLone and McLean, 1992) which impact on user's adoption and usage of IS (Saeed *et al.*, 2008).

## 2. Consumer Perceived Economic Value

Consumer perceived value refers to the net benefits that a customer perceived received from the product or service in comparison to the costs (Nguyen *et al.*, 2020). The economic value which includes quality and price has been regarded as an important part of consumer perceived value. The present research studies view consumer economic value as a bi-dimension construct that consists of efficiency and quality based on previous studies (Sánchez-Fernández and Iniesta-Bonillo, 2009; Nguyen *et al.*, 2020). The quality dimension lies in a consumer's admiration of a product or service for its ability in achieving a self-oriented goal or working out a function. And the efficiency dimension includes consumers' saving of time and effort. However, since mobile visual search is providing as a free service, the monetary cost will not appear in consumers' use of mobile visual search service. Though, the present research studies the efficiency dimension by excluding the monetary concept.

## 3. Customer Commitment and Usage Intention

Commitment is a phenomenon that makes a person constantly desire for a thing which leads to a desire to maintain a valued relationship (Chae *et al.*, 2021; Morgan and Hunt, 1994). Some scholars have recognized a multidimensional nature of customer commitment (Bansal *et al.*, 2004), whereas, there are also researchers who study commitment as a unidimensional construct, especially in online and technology service-related researches (Wang *et al.*, 2016; Agag and El-Masry, 2016).

Usage intention is based on the definition of behavior intention (Fishbein and Ajzen, 1975) which refers to the strength of a person's intention regarding performing a specific behavior in the future (Chao, 2019). In the IS context, usage intention represents the user's behavior intention to use a specific IS (Jackson *et al.*, 1997). Previous studies indicated that the understanding of consumers' usage intention is critical to information scientists and marketing managers in establishing strategic decisions and predicting sales of either the existed and new products or services (Karjaluoto *et al.*, 2019).

#### 4. Online Shopping Orientation

'Consumers' characteristics and goals influence their behaviors such as shopping, purchasing, revisiting intentions (Yen, Li and Cheng, 2014). Consumers' personality characteristics that lead to different shopping behaviors can be sort into two main orientations, which so-called utilitarian and hedonic (Babin *et al.*, 1994). In online shopping, when a consumer has higher hedonic shopping orientation, they undertake shopping to acquire inherent enjoyment from the shopping activities itself (Lee and Kim, 2010); however, for those who have higher utilitarian shopping orientation, they are more goal-oriented and concerned more on accomplish the task of buying thing or service rather than enjoy the shopping process itself (Yen *et al.*, 2014).

### III. Research Methods

Mobile visual search is a comparably new topic that seldom been studied in marketing area, figure the features of mobile visual search is an important part in order to understand its impact. Therefore, an inductive qualitative research is first adopted to analyze the text with an open mind to identify meaningful subjects to answer the research questions (Bengtsson, 2016). Since the in-depth interview is said to allow researchers to understand the essence of participants' experiences concerning a phenomenon deeply and effectively (Tieman, 2011), the one-by-one open-ended in-depth interview for pre-test was undertaken to understand the consumer's perception of mobile visual search. After that, a research model was built to conduct an exploratory study to verify the hypotheses that indicate the impact of mobile visual search on consumer perceived economic value and customer commitment, which further influence on consumer's usage intention.

#### 1. Preliminary test

The one-by-one in-depth interview was conducted on Aug 6<sup>th</sup> ~Aug 10<sup>th</sup>, through purposive sampling method and snowball sampling method Korean consumers who have the experience of mobile visual search. Before starting the interview, a simple introduction to this study was given to the participants. Subsequently, the participants' willingness of participating in the interview was tested. The interview was initiated as soon as the participation was confirmed. The interview questionnaire consisted of 6 topics, each of which was related to (1) the interviewee's age, gender and job, (2) interviewee's mobile phone, (3) interviewee's search experience on the mobile phone, (4) interviewee's experience of mobile visual search, (5) interviewee's feeling and thinking towards mobile visual search, as well as (6) interviewee's experience of using mobile visual search during online fashion shopping. The questions in the mentioned 6 topics were asked as the order from (1) to (6). A total of 27 questions were included in the interview questionnaire. (Table 1) presents the questionnaires. A total of 15 samples were collected and the minimum and maximum age of participants were 24 and 34 respectively with the median age of 29. Participants include both males (n=4) and females (n=11).

Based on the interview response, this study finds out 5 features of mobile visual search

from the perspective of consumers which are convenience, information quality, personalization, text-free search interface design, and visual communication .

'Convenience', which refers to the cost saving of time and effort (Shankar and Rishi, 2020), and the comfort, less of burden or ease in use (Guo *et al.*, 2018) was indicated by all the participants (n=15). This feature is corresponding to the characteristic of mobile service (Lee *et al.*, 2016; Kim *et al.*, 2010), and mobile commerce (Müller-Veerse, 1999). Interview participants indicated that mobile visual search helps to save time and effort in thinking or typing the search keyword, and also enable search without relevant information.

**Table 1. Interview Questionnaires**

No.	Topic	Questions
1	Questions about interviewee's age, gender, and job.	(1) Please tell me about yourself. (a) How old are you? (b) What's your gender? (c) What's your job?
2	Questions about interviewee's mobile phone.	(2) Please tell me about your mobile phone. (a) Does your mobile phone equip with a camera function? (b) What type of mobile phone do you use?
3	Questions about interviewee's search experience on the mobile phone.	(3) Please tell me about your search experience on your mobile phone. (a) What categories did you search on your mobile phone?? (b) How often do you search using your mobile phone? (c) Do you consider your mobile phone a suitable device for searching? (d) If so, can you explain why you think/ don't think mobile phone is a suitable device for searching?
4	Questions about interviewee's experience of mobile visual search.	(4) Please tell me about your experience of mobile visual search. (a) How you got to know about the mobile visual search. (b) When do you use mobile visual search? (c) What do you mainly search for using mobile visual search? (d) Please describe the process of how you use mobile visual search? (e) Why do you want to use mobile visual search?
5	Questions about interviewee's feeling and thinking toward mobile visual search.	(5) Tell me about how you think about mobile visual search (a) What do you think is the difference between traditional search methods and visual search? (b) What do you think are the advantages of mobile visual search? (c) Do you consider mobile phone a suitable device for using mobile visual search? (d) If so, can you explain why you think/ don't think mobile phone is a suitable device for using mobile visual search? (e) Do you prefer mobile visual search? (f) What's the reason that you prefer /do not prefer mobile visual search?

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| 6 | Questions about interviewee's experience of using mobile visual search while online fashion shopping. | (6) Tell me about your experience of mobile visual search in your online fashion shopping.<br>(a) Have you ever used mobile visual search when shopping for fashion items online?<br>[If the respondent says yes, continues the interview]<br>[If the respondent says no, end the interview]<br>(i) When did you search for fashion items using mobile visual search during online shopping?<br>(ii) What fashion items did you search for at the time?<br>(iii) On which platform did you search for the (fashion item that respondents answered) using mobile visual search?<br>(iv) Why did you search for the (fashion item that respondents answered) using mobile visual search on the platform at the time?<br>(v) Can you describe the process of how you use the mobile visual search on the platform?<br>(vi) Do you prefer the mobile visual search on the platform?<br>(vii) What's the reason that you prefer /do not prefer the mobile visual search on the platform? |
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'Information Quality', which refers to the degree to which the user thinks that the provides information is accurate, timely, useful, complete, and relevant (Leon, 2018) was indicated 14 participants. This feature is corresponding to the characteristics of mobile image search (Lim *et al.*, 2020; Lim *et al.*, 2019) and information system (Saeed and Abdinnour-Helm, 2008; DeLone and McLean, 1992; Nelson *et al.*, 2005). Interview participants respond that mobile visual search provides them with accurate results and useful, relevant information.

'Personalization' that represents a characteristic of providing customized content, products or service match the user's tastes based on the personal information already provided by the user (Chae, 2016) was indicated by 7 participants. This feature is corresponding to the characteristics of mobile service (Kim *et al.*, 2010), mobile commerce (Müller-Veerse, 1999), mobile phone shopping (Lee and Park, 2006), and mobile fashion shopping (Ryou and Ahn, 2019). The mobile visual search system collects and analyze customer data from the input image and offering result and recommendations in real-time online based on the consumer's need (Yutian, *et al.*, 2017). In the interview, participants mentioned that mobile visual search enables them to check the search results which match what they wanted and also provides them recommendation according to their needs.

'Text-free Search Interface Design' is the special feature found out in this study which indicated by 8 participants. Mobile visual search which has a text-free search interface is more user-friendly that can remove the literacy-related problem such as typing, spelling, pronouncing, and describing the search query by text or words (Wang *et al.*, 2011; Sang *et al.*, 2013; Zhang *et al.*, 2015). Participants in this study mentioned that mobile visual search enables them to search for information and products without using any text to describe. Also, situations such as not knowing the appropriate keyword or having difficulty in describing the thing is not exist anymore when using mobile visual search.

'Visual Communication', which indicated by 10 participants, refers to the transfer of information and ideas is through the format of symbols and imagery (Kujur and Singh, 2020; Hellberg, 2015). Visualized information is said to enable searchers to perceive, clarify and un-

derstand the information available throughout the search process (Ware, 2019) which makes the information retrieve more interactive (Hoeber, 2018). Participants indicated that the visualized search result display makes the comparison more efficient, and confirm the result in a visual format is more certain than in text. Also, mobile visual search enables users to use pictures and image from any source to conduct a search.

The mentioned 5 features of mobile visual search were adopted in the research model in next part to conduct an exploratory research.

## 2. Main Test

A quantitative analysis was then conducted in the main study. This study aims to investigate the impact of features of mobile visual search on consumer perceived economic value and customer commitment, which leading to the usage intention of the mobile visual search service. Moreover, the study observed the effects of consumer online shopping orientation on the relationship of consumer perceived economic value, customer commitments, and usage intention of mobile visual search service.

### 2.1. Hypotheses Design

Based on the technology acceptance model (TAM) (Davis, 1989), features of technology play an important part in affecting the user's perception of the technology. Also, the functional performance of the features of technology is expected to have a direct influence on consumers' judgments of overall value perceptions (Sirdeshmukh *et al.*, 2018). Accordingly, features of mobile visual search should have impact on consumers' judgments of value perceptions such as economic value. Convenience is related to the costs aroused through the spending of time, energy, and money to overcome time and space constraints when obtaining goods and services (Kelley, 1958). That is, a convenient service can help consumers in saving time and effort, which brings them economic benefits (Pham *et al.*, 2018). Besides, in an online shopping website, higher information quality offers will help consumers save time and physical costs with fewer searches to find products. What's more, in a consumer's information system using, the personalization function helps users deal with the abundance of available information more quickly and efficiently, preventing information-overloaded. Personalization was found to affects the efficiency of consumer information searching in the research of Choi, Kwon, and Shin (2017). Moreover, a well-designed system interface can make use's information processing easier and more effortless (Cho *et al.*, 2009). A text-free search interface needs no queries in word to match for the right result can bring users benefits of time and effort saving. Last, when information is presented visually in the communication between users and systems, users can spend less effort and time to see the presented contents (Hoeber, 2018; Kuju and Singh, 2020). From this point of view, the following hypotheses are purposed:

**H1:** Mobile visual search features positively effect on consumer perceived economic value.

**H1a:** Convenience positively effects on consumer perceived economic value.

**H1b:** Information Quality positively effects on consumer perceived economic value.

**H1c:** Personalization positively effects on consumer economic perceived value.



**H1d:** Text-free search interface design positively effects on consumer economic perceived value.

**H1e:** Visual communication positively effects on consumer perceived economic value.

Previous research indicated that the features of information technology affect customer commitment (Ahn *et al.*, 2014; Boateng, 2019). The convience of service is said to play a critical role in the relationship between consumer and service providers since it can strengthen the relationship (Duarte *et al.*, 2018). Also, information quality on an online community found to affects consumer's commitment (Jang *et al.*, 2008). Besides, in the online environment, the personalization of technology which enables firms to offers tailored products or services to customers allows to bring about a relationship of trust and customer loyalty (Li and Unger, 2012). What's more, consumers are willing to maintain a relationship with the online store when the cost of information search can be reduced trough continue using the text-free search interface (Sheth and Parvatiyar, 1995). Moreover, by engaging consumers with visual contents, it can strengthen the bond between the content's providers and viewer (Kujur and Singh, 2020). From this point of view, the following hypotheses are purposed:

**H2:** Mobile visual search features positively effects on customer commitment.

**H2a:** Convenience positively effects on customer commitment.

**H2b:** Information Quality positively effects on customer commitment.

**H2c:** Personalization positively effects on customer commitment.

**H2d:** Text-free search interface design positively effects on customer commitment.

**H2e:** Visual communication positively effects on customer commitment.

The long-term relation exchanges between firms and customers in the services marketing area is established, improved, or maintained (Hunt *et al.*, 2006) when consumers received benefits and values from using the service (Radzi *et al.*, 2018). That is, the higher a customer perceived the value of a thing, the more he or she wants to maintain the relationship with the thing. In the same vein, when consumers perceiving received value with lower cost, they might prefer to main the relationship (Sheth and Parvatiyar, 2000). From this point of view, the following hypothesis is purposed:

**H3:** Consumer economic perceived value positively effects on customer commitment.

Customers being more likely to use the service when firms provide them with a higher perceived value (Stamenkov and Dika, 2016). The benefit of time and effort saving have been proven to positively impact on consumer's behavior intention of using or purchasing a service (Yeo *et al.*, 2017). With the above reviews, the following hypothesis is purposed:

**H4:** Consumer perceived economic value positively effects on usage intention.

Scholars suggested that higher customer commitment makes the consumer want to stay in a relationship with the service provider, which reduces customers' intention to use alternative services (Thaichon and Jebarajakirthy, 2016) and continued their use intention of the service (Yuan *et al.*, 2019). From this point of view, the following hypothesis is purposed:

**H5:** Customer commitment positively effects on usage intention.

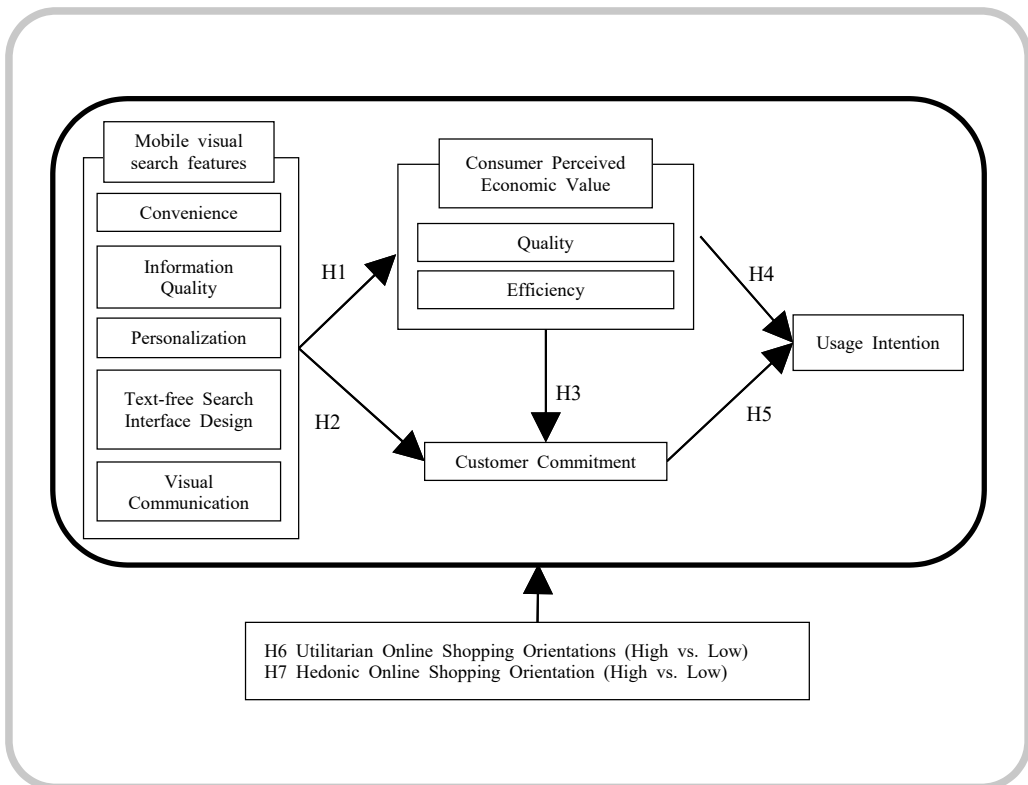
Consumers’ characteristics such as “shopping orientation” should make consumer shop differently (Yen *et al.*, 2014). In online shopping, consumers with a high tendency of utilitarian shopping orientation emphasizes finishing the task of finding out and obtaining needed products or services, those who with a high tendency of hedonic shopping orientation focus on the enjoyment of the process of shopping such as browsing and exploring products online. Based on previous literatures, the following hypotheses are purposed:

**H6:** The relationship among mobile visual search features, consumer perceived economic value, customer commitment, and the usage intention will be different by the high and low level of utilitarian online shopping orientations.

**H7:** The relationship among mobile visual search features, consumer perceived economic value, customer commitment, and the usage intention will be different by the high and low level of hedonic online shopping orientations.

The research hypotheses are set through previous studies investigation and shown as in (Fig 1).

**Fig. 1.** Conceptual Research Model.



## 2.2. Data Collection and Analysis

The population of this study was sampled through Korean online survey panel 'Invight' using a random sampling method. The target sample of the present study is consumers aged 20–39 years old who has online fashion shopping experience through mobile phone in one year. People in their 20's and 30's are selected as our target sample because consumers in this group of age are heavy online shoppers (Priporas *et al.*, 2017). Also, they have more interested in and familiar with technology using (Skinner *et al.*, 2018). An explanation about the concept of mobile visual search and the mobile visual search service in the mobile app of Korea fashion shopping platform 'Sta1.com' was given to the respondents at the first. After that, survey participants are asked to download the Sta1.com mobile app and test the visual search service before answering the questionnaire.

The survey of this study was conducted from Nov 13th to Nov 19, 2022, with 400 effective samples finally collected to be used in the final analysis. Statistic programs SPSS 25.0 and Amos 22.0 were used to analyse the collected data. The questions used in the questionnaire include 4 items about convenience (Kim and Park, 2020; Lin and Hsieh, 2007), 5 items about information quality (Lim *et al.*, 2020; Lim *et al.*, 2019; Ahn *et al.*, 2004), 6 items about personalization (Chae, 2016; Lin and Hsieh, 2011), 4 items about text-free search interface design (Mouakket and Bettayeb, 2015), 5 items about visual communication (Kujur and Singh, 2020), 3 items about quality (Yang *et al.*, 2005), 10 items about efficiency (Sánchez-Fernández and Iniesta-Bonillo, 2009; Mathwick *et al.*, 2002), 6 items about customer commitment (Wang *et al.*, 2016), 5 items about usage intention (Yang and Jolly, 2009; Hur *et al.*, 2017), 5 items about utilitarian online shopping orientation and 7 items about hedonic online shopping orientation (Sambargi and Gopal, 2016; Delafrooz, Paim and Khatibi, 2009). The measurements were derived from previous literature and modified to fit within the present study. A seven-point Likert scale (1= "Strongly disagree" to 7= "Strongly agree") was adapted to all the measurements. The items used in the questionnaire and are shown in (Table 2).

**Table 2.** Results of Confirmatory Factor Analysis

Variable	Constructs	Items#	Questionnaire	Standardized Factor Loading	AVE	CR	Cronbach's $\alpha$
Mobile visual search features	Convenience	1	The process of uploading an image to search for fashion items by using the mobile visual search service is convenient.	.747	.622	.867	.860
		2	Access to the mobile visual search service on my mobile phone is convenient	.737			
		3	The procedures of uploading an image to search for fashion items by using the mobile visual search service is easy.	.908			
		4	Mobile visual search service can be used to search for fashion items with minimal effort.	.751			
	Information Quality	1	The mobile visual search service provides optimal information related to the fashion items I searched.	.755	.581	.846	.842

	2	The mobile visual search service provides clear information about the color, design, brand and price of the fashion items I searched.	.842			
	3	The mobile visual search service provides enough information about the color, design, brand and price of the fashion items I searched.	.737			
	5	The mobile visual search service provides well-explained information about the color, design, brand and price of the fashion items I searched.	.707			
Personalization	1	Mobile visual search service suggests the right fashion product which satisfied my needs.	.758			
	2	Mobile visual search service provides an impromptu result for my search	.743			
	3	Mobile visual search service is customized to me for my fashion items searching.	.714	.592	.878	.876
	4	Mobile visual search service understands my specific needs in searching for fashion items.	.751			
	6	Mobile visual search service has features that are personalized for my fashion item searching.	.872			
Text-free Search Interface Design	1	The search interface design of the mobile visual search service is user-friendly that I don't have to use a textual description when searching for fashion items.	.750			
	2	The interface design of the mobile visual search service that does not need any text or word in searching fashion items is in a good structure.	.726			
	3	Overall, I am satisfied with the interface design of the mobile visual search service which needs no text or word in searching.	.846	.581	.846	.842
	4	The search interface design of mobile visual search service which need no textual description when searching makes it easy to search for fashion items.	.718			
Visual Communication	1	I think the entire fashion product search process can be completed with only visual content through mobile visual search.	.788			
	2	When searching for fashion product through mobile visual search service, I can use fashion product images from any source.	.877	.625	.893	.890
	3	I can easily confirm the search results of fashion products through the presentation of visual content.	.762			
	4	Mobile visual search service provides visualized search results.	.746			

		5	Compared with the textual format results demonstration, the mobile visual search service's visualized search result demonstration enables information to be delivered to me more quickly.	.774			
Consumer perceived economic value	Quality	1	Overall, the mobile visual search services have excellent quality.	.892			
		2	The mobile visual search services quality matches my expectations.	.796	.672	.860	.852
		3	The mobile visual search services offerings are very competitive.	.766			
	Efficiency	1	Searching fashion items using mobile visual search services is an efficient way to manage my time.	.725			
		2	Searching for fashion items using mobile visual search services make my life easier.	.697			
		4	I was able to get the benefits of searching for fashion items using mobile visual search services with minimal effort.	.745			
		5	Searching fashion items using mobile visual search services was easy.	.689			
		6	The time required to receive the benefits of searching fashion items using mobile visual search services was appropriate.	.889	.554	.908	.907
		8	I could find the fashion items I wanted without having to look elsewhere by using mobile visual search services.	.738			
		9	The mobile visual search services provided useful information about the fashion items I searched.	.710			
		10	It was easy to get the information I needed to make my purchase decision by using mobile visual search services	.740			
Customer Commitment		1	I want mobile visual search services to be available for a long time.	.774	.584	.848	.848
		2	The relationship that I have with the mobile visual search services is worth my maximum effort to maintain.	.758			
		3	I would feel very upset if mobile visual search services were to disappear in the future.	.802			
		6	I am oriented toward the long-term future of mobile visual search services.	.719			
Usage Intention		1	Given the chance, I intend to use the mobile visual search service in online fashion shopping.	.746	.591	.878	.875
		2	I expect my use of the mobile visual search service in in online fashion shopping to continue in the future.	.751			

		3	I intend to search or purchase products via the mobile visual search service in online fashion shopping.	.734			
		4	I have an intention to utilize the mobile visual search service in online fashion shopping.	.740			
		5	I have the intention to recommend the mobile visual search service to my friends.	.864			
Online shopping orientation	Utilitarian Online Shopping Orientation	1	Online shopping is convenient.	.906	.649	.880	.879
		2	I usually find items that I'm looking for through online shopping.	.777			
		4	I can find most of the time what I need, online.	.788			
		5	I shop online for product that I need only.	.742			
		2	When online shopping, I'm able to forget my problem.	.746	.611	.904	.903
	Hedonic Online Shopping Orientation	3	When online shopping, I feel a sense of adventure compares to traditional shopping.	.731			
4		Online shopping is one of my favorite leisure activities.	.722				
5		I enjoy being immersed in exciting virtual experience during online shopping.	.912				
6		Online shopping is truly an enjoyment.	.755				
7		During online shopping, I feel the excitement of the hunt.	.808				
Model Fit: $\chi^2=1750.73$ , $df=1219$ ( $\chi^2/df=1.436$ ), $p=0.000$ , $IFI=0.955$ , $TLI=0.950$ , $CFI=0.954$ , $RMSEA=0.033$							

## IV. Results

### 1. Sample Characteristics, Validity, and Reliability Test

This present study has gathered data upon 400 effective respondents who has online fashion shopping experience through mobile phone at least one year. The average age of the respondents is 30.8831 (SD= 5.157) years old. In regards to gender, females formed 51.7% (n=207) of the sample, and males hold 48.3% (n=193) of the sample. Among 400 respondents, 245 are office workers which occupied 61.3% of the samples.

To test the single dimensionality of each research variable, the remained factors resulted from the exploratory factor analysis (EFA) were used to conduct the Confirmatory Factor Analysis (CFA) and validity tests. The result of CFA in (Table 2) indicated that the measurement model has showed acceptable levels of fit ( $\chi^2=1750.730$ ,  $p=.000$ ,  $df=1219$ ,  $IFI=0.955$ ,  $TLI=0.950$ ,  $CFI=0.954$ ,  $RMSEA=0.033$ ). The Cronbach's  $\alpha$  value of all variables was in between 0.846-0.908, which also meet the standard. Besides, the AVE (Average Variance Extracted) was above 0.5, and the CR values are all over 0.7 which all met the recommended standards

as well. Also, a correlation analysis was administrated to test discriminant validity through comparing the AVE value with the squared value of the correlation coefficient between constructs. As a result, all the values of the correlation coefficient do not exceed the AVE value. Therefore, discriminant validity was achieved.

## 2. Hypothesis Testing

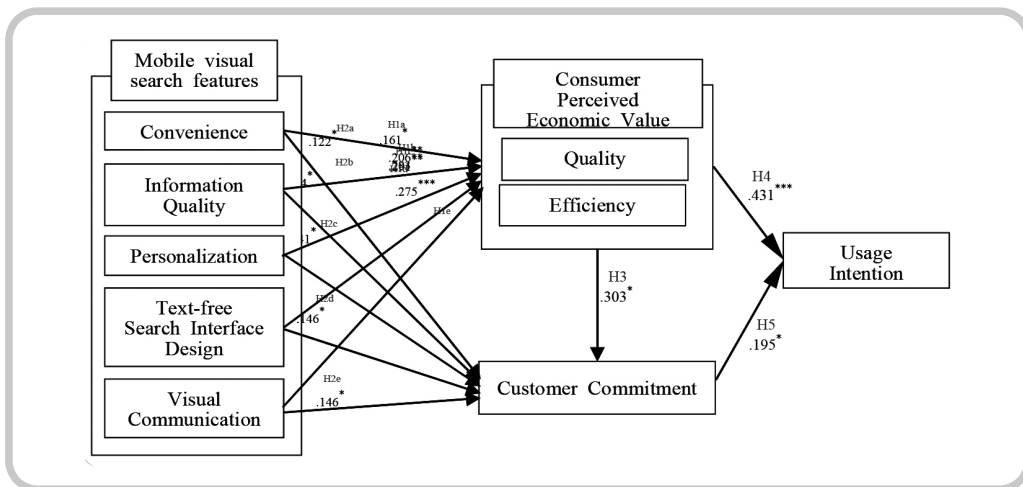
A structural equation model (SEM) was constructed to test the hypotheses and explore the relationship between variables in the conceptual model. The model fit shows  $\chi^2=1282.992$  ( $p < 0.001$ ,  $df=794$ ),  $IFI=0.947$ ,  $CFI=0.946$ ,  $TLI=0.942$ , and  $RMSEA=0.039$ , which fell within the acceptable range. The path result of SEM is show in (Fig 2), and (Table 3) presents the result of SEM in summary. The results of the hypothesis tests are as follows.

First, the testing of the relationship among mobile visual search features and consumer perceived economic value show significant positive result. Convenience, information quality, personalization, text-free search interface design, and visual communication significantly affects perceived economic value (convenience:  $\beta=.161$ ,  $p < 0.05$ ; information quality:  $\beta=.219$ ,  $p < 0.01$ ; personalization:  $\beta=.206$ ,  $p < 0.01$ ; text-free search interface design:  $\beta=.283$ ,  $p < 0.001$ ; visual communication:  $\beta=.275$ ,  $p < 0.001$ ). Thus, H1a, H1b, H1c, H1d, and H1e were supported.

Second, the testing result revealed mobile visual search features named convenience ( $\beta=.122$ ,  $p < 0.05$ ), information quality ( $\beta=.134$ ,  $p < 0.05$ ), personalization ( $\beta=.141$ ,  $p < 0.05$ ), text-free search interface design ( $\beta=.146$ ,  $p < 0.05$ ), and visual communication ( $\beta=.145$ ,  $p < 0.05$ ) positively impact customer commitment. Therefore, H2a, H2a, H2c, H2d, and H2e were supported.

Third, consumer perceived economic value also shows a significant positive influence on customer commitment as  $\beta=.303$ ,  $p < 0.05$ . Thus, H3 was supported.

Fig. 2. Path Results of Structural Equation Model



Estimate: Standard regression weight

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

The multi-group analysis was implemented to see the moderating effect of consumer online shopping orientation (utilitarian online shopping orientation and hedonic online shopping orientation) on the relationship among mobile visual search features (convenience, information quality, text-free search interface design, instant connectivity, ubiquity), consumer perceived economic value, customer commitment, and usage intention. <Table 4> shows the results of utilitarian online shopping orientation in different groups, and <Table 5> shows the results of hedonic online shopping orientation in different groups.

Results show, the relationship of information quality and customer ( $\gamma 7$ ) commitment, and text-free search interface design and customer commitment ( $\gamma 9$ ) only shows a significant difference in the utilitarian online shopping orientation groups ( $\gamma 7$ :  $\Delta x^2=8.739$ ,  $p < 0.01$ ;  $\Delta x^2=4.796$ ,  $p < 0.05$ ).

**Table 3. Result of Structural Equation Model**

No	Hypothesis	Estimate ( $\beta$ )	S.E.	t-value	Result
H1a	Convenience → Consumer perceived economic value	.161	.061	2.325*	Supported
H1b	Information quality → Consumer perceived economic value	.219	.070	3.031**	Supported
H1c	Personalization → Consumer perceived economic value	.206	.045	2.731**	Supported
H1d	Text-free search interface design → Consumer perceived economic value	.283	.070	3.646***	Supported
H1e	Visual communication → Consumer perceived economic value	.275	.062	3.726***	Supported
H2a	Convenience → Customer commitment	.122	.051	2.110*	Supported
H2b	Information quality → Customer commitment	.134	.062	2.117*	Supported
H2c	Personalization → Customer commitment	.141	.039	2.180*	Supported
H2d	Text-free search interface design → Customer commitment	.146	.065	2.042*	Supported
H2e	Visual communication → Customer commitment	.145	.058	2.120*	Supported
H3	Consumer perceived economic value → Customer commitment	.303	.154	1.982*	Supported
H4	Consumer perceived economic value → Usage intention	.431	.128	3.810***	Supported
H5	Customer commitment → Usage intention	.195	.108	2.032*	Supported

Estimate: Standard regression weight

Model Fit: 1282.992,  $df=794$  ( $Jdf=1.616$ ,  $p=.000$ ), IFI=.947, TLI=.942, CFI=.946, RMSEA=.039

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$



Forth, the testing results show that both consumers perceived economic value ( $\beta=.431$ ,  $p < 0.001$ ) and customer commitment ( $\beta=.195$ ,  $p < 0.05$ ) have a positive impact on consumer's usage intention of mobile visual search. In consequence, H4 and H5 were supported.

In online shopping, the effectiveness of search service should help in improving the efficiency of consumers' task complement (Kaltcheva and Weitz, 2006), which can enhance utilitarian-oriented consumers' desire for maintaining the relationship with the service provider, however, the results indicated that  $\gamma 7$  and  $\gamma 9$  show a significant difference in the low utilitarian online shopping orientation group (information quality:  $\beta=.286$ ,  $p < 0.01$ ; text-free search interface design:  $\beta=.297$ ,  $p < 0.05$ ) rather than the high utilitarian online shopping orientation group. This result might come out because an individual's shopping orientation differs based on the product category, and shopping for fashion products is more entertaining than task-oriented (Blázquez, 2014).

It is worth mentioning that the relationship between consumer perceived economic value and customer commitment ( $\gamma 11$ ), consumer perceived economic value and usage intention ( $\gamma 12$ ), and customer commitment and usage intention ( $\gamma 13$ ) shows significant difference in both utilitarian online shopping group ( $\gamma 11$ :  $\Delta x^2=4.763$ ,  $p < 0.01$ ;  $\gamma 12$ :  $\Delta x^2=8.558$ ,  $p < 0.01$ ;  $\gamma 13$ :  $\Delta x^2=11.684$ ,  $p < 0.01$ ) and hedonic online shopping orientation group ( $\gamma 11$ :  $\Delta x^2=4.617$ ,  $p < 0.05$ ;  $\gamma 12$ :  $\Delta x^2=7.382$ ,  $p < 0.01$ ;  $\gamma 13$ :  $\Delta x^2=11.220$ ,  $p < 0.01$ ). In online shopping, both consumers' utilitarian and hedonic orientation are related to their value perceptions (Scarpi, 2020), and these shopping orientations cause different shopping behavior of consumers (Jose, 2019). When the product one's looking for can be searched efficiently, consumers who are more utilitarian oriented might be driven by the savings related to time and efforts (Griffin *et al.*, 2000). Yet, the results indicated that  $\gamma 12$  and  $\gamma 13$  show significant difference only in the low utilitarian online shopping orientation group ( $\gamma 12$ :  $\beta=.282$ ,  $p < 0.001$ ;  $\gamma 13$ :  $\beta=.480$ ,  $p < 0.001$ ). The reason for this result might also due to the category of the target product in this study. Since shopping for fashion products is less task-oriented activity compare to shopping for other product categories. As for the hedonic online shopping orientated group, the path of  $\gamma 11$  and  $\gamma 12$  indicates that there is a more positive effect existing in the higher group ( $\gamma 11$ :  $\beta=1.148$ ,  $p < 0.001$ ;  $\gamma 12$ :  $\beta=1.671$ ,  $p < 0.001$ ). For hedonic-oriented shoppers, when they had a positive time and feel pleasure in the shopping process (including the searching), they might have a more positive value perception (Casaló *et al.*, 2017). When hedonic-oriented shoppers using mobile visual search to find fashion products, they might have pleasure time in the exploration of the search results or feel interesting in the comparison of the useful information that provided which future trigger their intention for using mobile visual search service for more pleasant shopping experience. Besides, a previous study indicated that customer commitment accrued when a consumer sees value in a relationship (Ryu and Park, 2020). From this point of view, customer commitment would be distinct between consumers with utilitarian and hedonic shopping orientations since the value obtained is perceived differently by consumers with different shopping orientations (Scarpi, 2020). In online fashion shopping, though both of the consumers who shop hedonically and who shop in a utilitarian way shows desire for maintaining the relationship with the service provider, the value perception of using mobile visual search dissimilarly from each of the orientation groups naturally.

**Table 4.** Results of Multi-group Analysis of Utilitarian Online Shopping Orientation Group

Path	Low(N=183)			High(N=217)			$\Delta\chi^2(\Delta df=1)$
	Estimate	SE	T-value	Estimate	SE	T-value	
$\gamma_1$	-.012	.101	-.122	.197	.058	3.375	2.992
$\gamma_2$	.219	.113	1.939	.202	.069	2.908	.018
$\gamma_3$	.052	.073	.714	.119	.043	2.780	.610
$\gamma_4$	.399	.113	3.526***	.207	.069	3.000	2.080
$\gamma_5$	.289	.097	2.988**	.196	.064	3.085	.647
$\gamma_6$	.154	.075	2.069*	-.057	.058	-.991	3.355
$\gamma_7$	.286	.102	2.793**	-.084	.067	-1.254	8.739**
$\gamma_8$	.167	.055	3.017**	-.037	.041	-.908	8.683**
$\gamma_9$	.297	.132	2.256*	-.033	.067	-.492	4.796*
$\gamma_{10}$	.222	.101	2.189*	-.037	.041	-.908	1.885
$\gamma_{11}$	-.285	.260	-1.097	1.127	.232	4.864	4.763*
$\gamma_{12}$	.282	.108	2.601**	1.971	.808	2.438	8.558**
$\gamma_{13}$	.480	.103	4.666***	-1.212	.706	-1.717	11.684**

Notes: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

$\gamma_1$ : Convenience → Consumer perceived economic value

$\gamma_2$ : Information quality → Consumer perceived economic value

$\gamma_3$ : Personalization → Consumer perceived economic value

$\gamma_4$ : Text-free search interface design → Consumer perceived economic value

$\gamma_5$ : Visual communication → Consumer perceived economic value

$\gamma_6$ : Convenience → Customer commitment

$\gamma_7$ : Information quality → Customer commitment

$\gamma_8$ : Personalization → Customer commitment

$\gamma_9$ : Text-free search interface design → Customer commitment

$\gamma_{10}$ : Visual communication → Customer commitment

$\gamma_{11}$ : Consumer perceived economic value → Customer commitment

$\gamma_{12}$ : Consumer perceived economic value → Usage intention

$\gamma_{13}$ : Customer commitment → Usage intention

**Table 5.** Results of Multi-group Analysis of Hedonic Online Shopping Orientation Group

Path	Low(N=169)			High(N=231)			$\Delta\chi^2(\Delta df=1)$
	Estimate	SE	T-value	Estimate	SE	T-value	
$\gamma_1$	-.030	.109	-.277	.197	.058	3.417***	3.159
$\gamma_2$	.234	.123	1.908	.223	.066	3.408***	.007
$\gamma_3$	.064	.076	.841	.121	.042	2.881**	.422
$\gamma_4$	.384	.118	3.247**	.194	.065	2.977**	2.016
$\gamma_5$	.254	.102	2.496*	.189	.058	3.249**	.299
$\gamma_6$	.171	.080	2.126*	-.083	.068	-1.224	3.753
$\gamma_7$	.223	.106	2.108*	-.053	.077	-.685	3.815
$\gamma_8$	.169	.058	2.913	-.040	.047	-.843	7.297**
$\gamma_9$	.278	.125	2.223*	-.016	.075	-.208	3.578
$\gamma_{10}$	.254	.102	2.496**	.024	.070	.346	2.205
$\gamma_{11}$	-.199	.240	-.830	1.148	.276	4.164***	4.617*
$\gamma_{12}$	.302	.119	2.537**	1.671	.603	2.773**	7.382**
$\gamma_{13}$	.487	.108	4.508***	-.905	.504	-1.796	11.220**

Notes: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

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$\gamma_1$ : Convenience	→	Consumer perceived economic value
$\gamma_2$ : Information quality	→	Consumer perceived economic value
$\gamma_3$ : Personalization	→	Consumer perceived economic value
$\gamma_4$ : Text-free search interface design	→	Consumer perceived economic value
$\gamma_5$ : Visual communication	→	Consumer perceived economic value
$\gamma_6$ : Convenience	→	Customer commitment
$\gamma_7$ : Information quality	→	Customer commitment
$\gamma_8$ : Personalization	→	Customer commitment
$\gamma_9$ : Text-free search interface design	→	Customer commitment
$\gamma_{10}$ : Visual communication	→	Customer commitment
$\gamma_{11}$ : Consumer perceived economic value	→	Customer commitment
$\gamma_{12}$ : Consumer perceived economic value	→	Usage intention
$\gamma_{13}$ : Customer commitment	→	Usage intention

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## V. Conclusions

The purpose of this research is to explore the features of mobile visual search and to examine its effect on consumers' intention through customer commitment and consumer perceived economic value. Also, another aim is to understand whether different levels of consumer online shopping orientation affect differently consumer's perception and usage intention of mobile visual search in online fashion shopping. The finding of this research is summarized as follow.

First, since features of the mobile visual search were figured out from a consumer perspective, they should be the features which consumers really perceived and care about when using the mobile visual search or mobile image search. In addition, by comparing mobile visual search's five features with traditional text search commonly used in the retail environments, this study gave the evidence that mobile visual search can be a more effective and efficient search service in online retailing.

Second, mobile visual search owns the power of enhancing economic value perception of consumers. Especially, with its text-free search interface design and visual communication, it provides more economic value for consumers in online fashion shopping. When consumers search for idea fashion items by using the appearance of the specific item as a search query without having to input any keyword and check results by browsing through relative products images, time and effort costs in the shopping process are reduced. Especially, as fashion products' appearance are comparably hard to be described in detail, a well-designed text-free search interface of mobile visual search should help to remove the literacy- problems (Wang *et al.*, 2011; Sang, *et al.*, 2013; Zhang *et al.*, 2015), which enable the consumer to gain benefits of effort saving (Hoque and Lohse, 1999) in their online fashion shopping.

Third, text-free search interface design and visual communication of mobile visual search play the most important role in effecting customer commitment to the mobile visual search service. As the interaction with the service system is in a visual and non-text way, consumers can convey their needs with images and obtain information at a glance. Visual content interaction of mobile visual search enhances the relationship bond between the online fashion shoppers and service providers (Kujur and Singh, 2020). Therefore, for the online fashion retail industry, the visual interaction and communication in product searching would also be a good new way to engage the consumer to strengthens the bond between consumers and businesses.

Forth, given the conclusion above, mobile visual search is comparatively advantageous as a service tool in online fashion retailing since fashion products are more experiential compare to other products categories (Crow ley *et al.*, 1992) and comparably hard to describe the detail and exactly in words (Shankar *et al.*, 2017; Dan and Jing, 2018). The benefits of text-free search interface design and visual communication can satisfy consumers by enabling them to convey their needs directly and easily in the fashion products shopping process.

Fifth, it is wise for online fashion retailers who provide mobile visual search tool since the benefits of cost-saving in shopping comes automatically to consumers, which brings favorable relation back to the service provider naturally. Such a virtuous cycle is valuable for fashion firms.

Last, the present study verifies that consumers' perception and behavior of using a searching tool, which is part of the shopping process, can also be differed based on the different online shopping orientations. By providing mobile visual search service, online fashion retailers not can only attract task-oriented consumers by the efficiency of the search tool, they can appeal to both low utilitarian- orientated and high hedonic-orientated consumers by offering them interesting search experience.

## **VI. Implications and Future Research**

This research studied mobile visual search, a new effective service tool in the fashion industry, by exploring its' effect in online fashion retailing. The present study makes up for the gap in the marketing literature of mobile visual search and provides theoretical supports for the mobile visual search in fashion marketing. Regarding practical implication, the present study has addressed the importance of mobile visual search in the fashion industry. Mobile visual search has emerged as a tool to help consumers in their online fashion shopping journey and is used by firms to maintain a valuable relationship with their users. Therefore, it becomes very crucial to the fashion platforms to adopt or improve mobile visual search service system so that they can provide the correct and valuable products information which might motivate consumer-brand interaction and product purchasing. Besides, fashion platforms who provides mobile visual search service have to concentrate on enhancing the power of the features of the service by cooperating with technology companies who are excellent in developing powerful visual search service. Also, by adopting mobile visual search technology as a service tool, fashion firms can easily grasp consumers' preferences such as style, color, pattern, etc. based on the consumer input images, which is helpful for fashion firms to analyze and forecast future trend and prepare for new product collections. In summary, providing mobile visual search as a service would be a win-win for both firms and consumers.

This research is in possesses some limitations that worth further research. First, mobile visual search is still a new topic in the marketing discipline, which made it hard to do a literature review. Marketing scholars who are interested in technology adoption in the fashion industry are encouraged to study related topics. Second, since the sample of the present research targeted Korean consumers, the effects might be different when analyzing consumers from other countries. Future research can explore cultural differences to examine if there are different impacts according to different cultural backgrounds. Third, the present paper focuses on young

consumers. Since the mobile phone is popular with almost every generation, the future study can consider exploring elder generations' perception of mobile visual search service.

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