The influence of Product Photo display on Purchase intention in Cross-border E-commerce

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Abstract: Nowadays, cross-border e-commerce (CBEC) has become an important channel for promoting international trade. There are many factors that influence consumer participation in CBEC, including the display of product images in the product search list. Excellent and appropriate product photo display can not only attract more consumers, but also stimulate consumers' willingness to buy. However, few studies have focused on the specific elements that should be included in a product photo in a CBEC setting. Based on cue utilization theory and ELM model, this study constructs a research model of consumer purchase intention under the background of CBEC from the perspective of task-relevant cues and affection-relevant cues. In addition, we explore the choice pattern of customers during online shopping by using the decision tree model, and then investigate the influence of specific elements in product photo on sales volume by using hierarchical regression. The data will be obtained from a well-known CBEC platform in China, using clothing products as key words to gather the three factors that consumers will normally first encounter in the search results: the price of goods, number of orders, and a photo of the merchandise. Results will have important theoretical and practical implications for CBEC researchers and practitioners.

Keywords: cross-border e-commerce , product photo display, purchase intention, elm model, cue utilization theory

1. INTRODUCTION

Cross-border e-commerce (CBEC) has become an important channel for promoting international trade. It provides opportunities to both developing and developed countries to achieve benefits from global transactions[1]. In 2018, the total amount of CBEC transactions worldwide reached 13 trillion yuan. Van Heel[2] predict that by 2025, annual global cross-border e-commerce revenues will be between 250 and 350 billion US dollars, with China and other Asia countries accounting for 40% of this total amount. In China, there were over 5,000 CBEC platforms, and more than 200,000 enterprises involved in CBEC through various platforms, by 2020, the growth rate of cross-border e-commerce is expected to be twice that of domestic e-commerce[3]. The CBEC platform has been booming all over the world. Therefore, many e-commerce companies attach importance to cross-border e-commerce (CBMC).

How to attract consumers' attention and stimulate consumers to buy is a constant topic for sellers[4]. Usually, when customers search for products on the e-commerce platform, the first thing that enters the consumer's field of vision is the pictures of various products in the product search list. Online images are commonly used as a visual clue to draw consumer's visual attention to enhance their perception of product understanding, which plays an important role in consumers' purchasing decisions[5]. Therefore, how to effectively design product display pictures and make clear the impact of the specific attributes in the product photo on the sales should become the focus of CBEC platform sellers. An effective product picture display will produce the following two results. First of all, reflect the online store differentiated marketing strategy, with its unique characteristics to attract potential customers. Secondly, it will be easier for customers to find their favorite products faster and better according to their cultural background and behavior habits. Therefore, pictures of goods with appropriate content can break down barriers and shorten distance between buyers and sellers, which will be more likely to lead to positive outcomes[6].

So far, academic research on CBEC mainly focuses on the field of goods transportation[7], commodity after-sales service[8] and cross-border payment[9]. Few studies have involved the display of product photos on CBEC. On CBEC platform, the appropriate product picture display involves three fields: marketing, consumer psychology and information system. This is because product information has a potential impact on consumers' purchasing decisions. Our study attempts to address this research gap by investigating the following two key research questions.

1. In cross-border e-commerce, do the specific attributes in the product photos affect the purchase intention of consumers from different regions?

2. In cross-border e-commerce, in order to increase the purchase intention of consumers in different countries and regions, which attributes should be highlighted in the product photos?

Based on this, this study takes the product photos in the commodity search list as the research object, combines the cue utilization theory and the ELM model, divides the decision-making cues provided by commodity pictures to consumers into Task-relevant Cues and Affection-relevant cues, and uses the central route and peripheral route of the ELM model to analyze the impact of the information displayed by these two types of cues on consumers' purchase intention. The anticipated contribution of this study is that based on this research model, we can analyze whether the specific elements contained in product photos will affect consumers' willingness to buy in CBEC. At the same time, in order to improve the sales performance of sellers from different regions on CBEC platform, two different theories are combined to help sellers optimize the specific attributes that should be included in the product photo so as to attract more buyers, and help CBEC researchers understand the importance of appropriate product picture display.

The remainder of this paper is organized as follows. First, we review the literature related to purchase intention in CBEC. Second, we propose a research model and hypotheses based on the theoretical foundations found in the literature. Third, we describe the research methodology. Finally, we present the implications and further research directions.

2.   PRIOR LITERATURE AND THEORETICAL FOUNDATION

2.1 Purchase intention in CBEC

Since 2000, research on consumers' purchasing intention has been started in the field of electronic commerce, such as Wu K[10] pointed out that in the online market environment, how to be selected by consumers in the list of search results is extremely important for sellers. Gu[11] found that the sales volume and low price of products positively affect the customer's purchase intention when exploring the influencing factors of the customer's purchase intention in online shopping. And when the web design is not exquisite, the customer's purchase intention will be significantly reduced. Gefen[12] proved that trust has a significant positive effect on purchase intention. Zhou et al.[13] proved that perceived risk reduces consumers' willingness to buy.

With the increasing popularity and rapid development of CBEC, scholars have begun to consider new factors that affect consumers' purchase intention in CBEC. For example, Hsiao et al.[14] uses partial least squares and designs a text mining tool to analyze the key factors that affect consumers' satisfaction with cross-border logistics services. Han[15] uses a research model to analyze the factors that affect consumers' purchase intention in CBEC, and finds that consumer information has a positive impact on consumers' purchase intention. Wenlong[16] constructed a three-stage model to assess consumers' purchase intention in CBEC. The results show that product description and product awareness have a positive impact on trust belief, while platform lasting participation and platform situational participation have a positive impact on trust. The purchase intention is subject to the positive impact of platform situational involvement.

By reviewing the literature related to purchase intention of CBEC, we find that there are more researches in

the field of domestic e-commerce than CBEC, and more importantly, there is less research on the impact of specific attributes in product photos on purchase intention. Therefore, we decided to study the impact of product photos on consumers' purchasing behavior in the CBEC context. The study contributes to the extant literature in the following two aspects. First of all, based on the cue utilization theory, in the aspect of product photos display on the CBEC platform, we explore consumers' perception of goods from two perspectives: task-relevant cues and affection-relevant cues. Secondly, based on ELM model, we propose the influence of specific elements in product photos on consumers' purchase intention according to the difference in information processing degree between people's central route and peripheral route. As prior research has shown that sales are impacted by product prices and orders[17][18], this study also takes these two confounding factors into consideration.

2.2 Cue utilization theory

Eroglu[19] proposed Clue utilization theory applicable to e-commerce environment, which defined stimulus as "all the clues that online consumers can see or hear", and divided online product display cues into two types: task-relevant cues and affection-relevant cues. Task-relevant cues refer to "all descriptions to promote consumers to complete shopping goals". They are functional clues that are oriented to effectively complete consumers' shopping tasks and can provide consumers with information supporting task decision-making. And affection-relevant cues are very important to create an environment for consumers' shopping experience, enhance user experience and create a pleasant shopping atmosphere, improve consumers' mood and awaken consumers' attention, so as to form a good shopping experience, which is relatively secondary to promote consumers to achieve their shopping goals.

This study believes that the product photos on the CBEC platform also contain the above two clues. The task-relevant clues of product photos refer to the information contained in the picture that can promote consumers' understanding of the goods, such as the brand of the goods and the specific attributes of the goods, such as the fabric and size of clothing. Emotion-related clues of commodity pictures refer to the aesthetic feeling and visual attraction of commodity pictures. By attracting the attention of consumers, they can generate pleasant experience of browsing pictures, arouse the positive emotions of consumers, and thus stimulate the desire for shopping. On the CBEC platform, models can be divided into two situations: fully showing their faces and not fully showing their faces. Therefore, we take the product photos containing models as emotional clues, believing that they can increase consumers' purchasing intention.

2.3 ELM model

ELM model is an effective tool to analyze online user information processing and decision-making process. The model holds that individuals will process information through the central route and peripheral route respectively because of the different motivation and ability of information processing. The central path means that when an individual has the motivation and ability to focus on information, he or she carefully thinks about persuasive information and forms an attitude of approval or disapproval. Peripheral route means that individuals are unwilling or do not have the ability to think carefully, but are influenced by peripheral clues to form corresponding attitudes. In the center path and peripheral path, the most common components are the quality and source of information[20]. Based on the central path and peripheral path of the ELM model, this study specifically analyzed the influence mechanism of the specific element information in the product pictures of online stores on customers' purchase intention according to the difference of the transmission mode of information quality.

3. HYPOTHESIS AND RESEARCH MODEL

3.1 Influence of task-relevant clues on consumers' purchase intention

In the process of completing the shopping, consumers can use the information of Task-relevant clues to judge the quality of the product. On CBEC platforms, logo is one of the most important brand elements of a product. It can convey the brand image and attract consumers' attention, affect consumer's attitude and "brand attachment", and help consumers understand product information[21]. The source of information is a common clue of the peripheral route of ELM model. When the customer thinks that the source of the information is more reliable, the more likely the customer is to be persuaded to accept the information. In the CBEC context, commodity brands come from all over the world, customers are relatively unfamiliar with brand information, and they will have some doubts about the source of product information. Therefore, customers will deal with product information more through the peripheral route. Therefore, we hypothesize as follows:

H1a: In the CBEC context, by controlling the price and the quantity of orders, a product photo containing a brand logo has a certain positive impact on the consumers' purchase intention.

The attribute information of goods, such as product size and material, are the main variables for consumers to evaluate products and make purchase decisions. In the context of e-commerce, the display of commodity information helps customers understand and believe the quality and performance of products sold online. From the perspective of signal theory, Braddy[22] found that when consumers are not directly exposed to a product, they usually derive inferences from the available signals to form cognitive perceptions. In other words, knowing the attribute information of goods can eliminate consumers' uncertainty about online goods. According to the central path of the ELM model, information quality is an important factor affecting individual information processing and attitude formation. The higher the quality of the product description, the higher the consumers' psychological acceptance of the product. In this case, consumers will have more psychological activities related to the product, including purchase intention. Therefore, we propose the following hypothesis:

H1b: In the CBEC context, by controlling the price and the quantity of orders, a product photo contains commodity attribute has a significant positive impact on consumers' purchasing intention.

3.2 Influence of affection-relevant cues on consumers' purchase intention

Affection-relevant cues indirectly promote the realization of shopping goals by improving consumers' shopping experience. In the CBEC context, despite consumers' different cultural backgrounds, visual attractiveness has a similar impact on consumers' psychological perception and behavior intention[23]. Existing literature shows that product displays with higher visual appeal can attract consumers' attention and provide more information clues.

In the online shopping environment, because customers are unable to try on clothes, models wearing goods in product photos become an important signal affecting consumers' perception. When the cognitive experience is weakened, knowing "someone is shopping for me (represented by the model)" can produce a sense of social presence, generating trust and pleasure, leading to the ultimate purchase behavior. On CBEC platforms, models displaying goods can be divided into two categories, one is those who fully show their faces, and the other is those who do not fully show their faces. According to the ELM model, the more vivid and attractive the product description, the better the consumer's understanding of the product. Therefore, we assume that:

H2a:In the CBEC context, by controlling the price and the quantity of orders, the product photos contain models with full faces, which has a significant positive impact on consumers' purchase intention.

H2b: In the CBEC context, by controlling the price and the quantity of orders, the product photos contain models with incomplete faces, which has a certain positive impact on consumers' purchase intention.

3.3 Moderating effect of knowledge heterogeneity on consumers' purchase intention

In the study of consumer behavior, knowledge heterogeneity plays an important role in explaining consumer decisions and responses to products. Knowledge heterogeneity is an important dimension of cognitive structure, which reflects that individuals have different characteristics in knowledge structure, knowledge type, knowledge content and knowledge level[24]. Due to the difference of individual cognitive level, some studies show that the information conveyed by the picture belongs to weak information relative to the text content, it can not be denied that the picture can still convey different degrees of stimulating shopping information to the individual, which will eventually affect the purchase intention of consumers[25]. Therefore, this paper proposes:

H3a: Knowledge heterogeneity plays a positive moderating role in the influence of logo information contained in product photos on consumers' purchase intention.

H3b: Knowledge heterogeneity plays a positive moderating role in the influence of product photos including product attribute information on consumers' purchase intention.

H3c: Knowledge heterogeneity plays a positive moderating role in the influence of product photos contain models with full face on consumers' purchase intention.

H3d: Knowledge heterogeneity plays a positive moderating role in the influence of product photos contain models with incomplete faces on consumers' purchase intention.

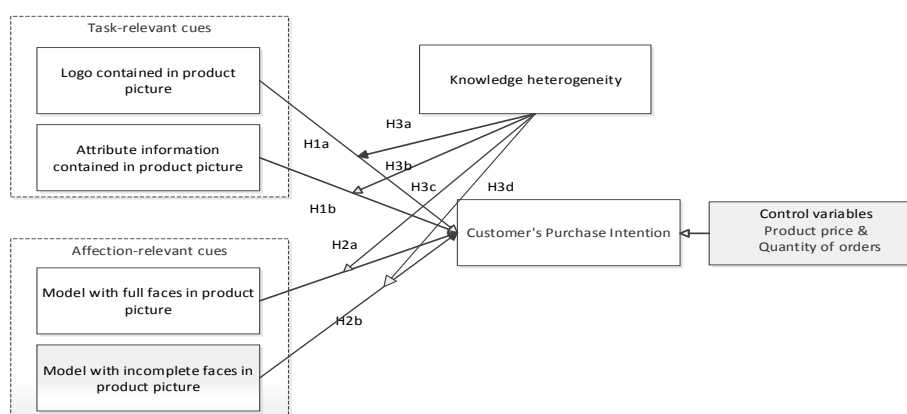The model of this paper is shown in Figure 1.

Figure 1.   The research model

4.   METHODOLOGY

The data will be obtained from a well-known CBEC platform in China. DHGate.com, is the first online platform to provide B2B cross-border transactions for China's small and medium-sized enterprises. According to PayPal data, in 2013, DHGate.com was the number one online foreign trade platform in Asia Pacific and the sixth in the world. DHGate.com has 19 million registered buyers from 222 countries and regions around the world, and the platform is authoritative and representative.

This study will take clothing (jacket) as an example to analyze the impact of specific attributes in product photos on consumers' purchase intention. Firstly, enter keywords on the CBEC platform to search, and then obtain the product photos of the search results page through the web crawler as the data sample of this study. Then identify the specific elements in the picture through deep learning, that is, whether the picture contains product logo; whether it contains attributes such as product size and material, and whether it includes models who fully show their faces and models who do not fully show their faces. After the data collection is completed, the characteristic matrix is formed and input into the decision tree machine learning model to verify the research hypothesis from the perspectives of information gain and regression coefficient.

In this study, the C5.0 algorithm in SPSS Modeler14 is used to model the discretized trading volume through six variables: the discretized price, the quantity of the order and whether the marked picture contains logo, whether it contains the basic attributes of the commodity, whether it includes the model that fully shows the face and the model that does not fully show the face. The results are shown in figure 2. And the main rules of the decision tree model for commodity sales are shown in Table 1.
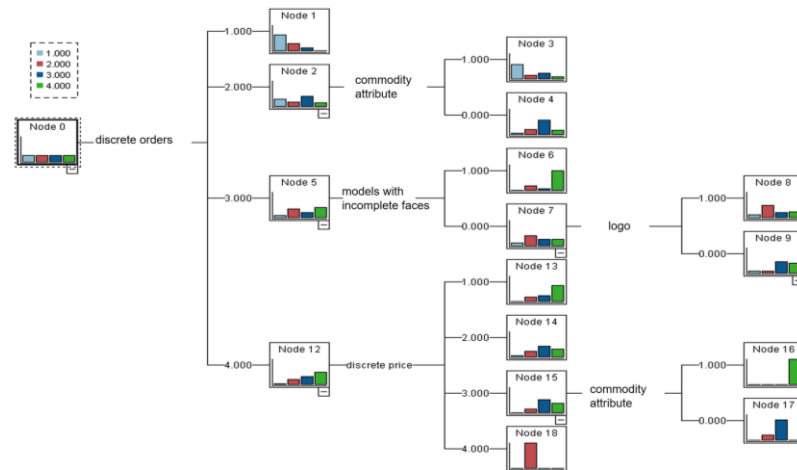

Figure 2.   Decision tree model of commodity sales

Table 1.   Main rules for the decision tree model of commodity sales

Rules
1     $count(d\_vol \geq 3 \mid d\_orders = 4 \cap d\_price \leq 2) > count(d\_vol \geq 3 \mid d\_orders = 4 \cap d\_price \geq 3)$
2     $count(d\_vol \geq 3 \mid d\_orders = 3 \cap Vif = 1) < count(d\_vol \geq 3 \mid d\_orders = 3 \cap Vif = 0)$
3     $count(d\_vol \geq 3 \mid d\_orders = 4 \cap d\_price = 3 \cap Va = 1) < count(d\_vol \geq 3 \mid d\_orders = 4 \cap d\_price = 3 \cap Va = 0)$
4     $count(d\_vol \geq 3 \mid d\_orders = 3 \cap Vif = 0 \cap Vl = 1) > count(d\_vol \geq 3 \mid d\_orders = 3 \cap Vif = 0 \cap Vl = 0)$

Note: count is a count function, d_vol, d_orders, and d_prc are the discrete monthly sales, the quantity of the order, and prices, respectively. Vif refers that the product photo contains the model that does not fully show the face. Va refers that the product photo contains the basic attributes of the Commodity.

From the above results, in the context of cross-border e-commerce, consumers from different regions pay more attention to the number of commodity orders in the product search results list. When the number of orders is basically the same, those with lower prices are more likely to get high sales (as shown in Rule 1 of Table 1); when there are models in the product photos, customers prefer to include incomplete models in the pictures (as shown in Rule 2 of Table 1). When the commodity price is basically the same, the commodity picture does not contain the basic attribute information of the commodity can get better sales than the basic attribute information in the commodity picture (as shown in Rule 3 of Table 1). When the commodity picture contains logo information, it can get higher sales than not including logo information (as shown in Rule 4 of Table 1).

5.   CONCLUSIONS

In this study, we propose a research model based on the ELM model and Cue utilization theory to study the impact of product photos display on consumers' purchase intention in the CBEC context. Our study can make both theoretical and practical contributions. Theoretically, this study enriches the theoretical research of picture information in online marketing and deepens the influence mechanism of picture information on customers'

online consumption behavior. Firstly, based on the Clue utilization theory, we divide the information conveyed by commodity pictures into task-relevant cues and affection-relevant cues. Secondly, this study uses the central route and peripheral route of the ELM model to explain the information processing process when customers face online merchandise photos, and to explore the impact of specific elements of product photos on customers' purchase intention in the CBEC context. Practically, this study provides practical suggestions for the development of marketing strategies, which can help online sellers optimize product photos design to attract more buyers and create more profits on the CBEC platform, and help CBEC researchers to further understand the importance of product photos in sales.

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