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Understanding Purchasing Behaviors for Online Grey Privacy Products

-The Moderating Effect of Grey Product Knowledge

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Abstract: Some products are subconsciously thought to be seldom purchased online, but in fact search online this paper have found a large number of online purchases, such as bra. So what are the characteristics of this kind of product? From the perspective of outlier knowledge, this study analyses why consumers buy such products, who is buying, what's the relationship between grey product and purchasing behavior. The research process of this paper is as follows: Firstly, the consumers who buy bra online are interviewed by field interviews, and the different effects of the attributes of such products on consumers are summarized from the perspective of outlier knowledge. Secondly, the influencing factors privacy concerns and purchasing behavior in the model are measured by the previous maturity scale, while the grey products knowledge is revised by using Bruck's scale for reference. Finally, sample data are obtained by questionnaire. This study finds that privacy concerns have a negative impact on consumers' online purchasing behavior of grey privacy products and consumers' grey products knowledge has a significant positive impact on consumers' purchasing behavior from the perspective of outlier knowledge. Discussing the factors of consumers' online purchasing behavior from the perspective of outlier knowledge management can provide a new perspective for follow-up study.

Keywords: grey privacy products, online purchasing behavior, grey product knowledge, outlier knowledge management, privacy concerns

1. INTRODUCTION

1.1 Research background

With the rapid development of e-commerce, the consumer consumption scenario and shopping habits have undergone major changed in fast-paced society. White S C et al. (2018) found that consumers' purchasing decision-making is caused by different purchasing motivations, namely hedonistic motivations and utilitarian motivations. These two kinds of motivation will affect the uniqueness of consumers' perceived preferences and consumers' choice of products^[1]. Behavioral Decision Theory tells us that the factors influence consumers' decision-making are divided into two types: consumer individual factors and related environmental factors^[2]. Some empirical studies have been made on clothing consumers' purchasing behavior, but there are few studies in the field of grey privacy products and there are still great differences in the influencing factors of online grey privacy product purchasing behavior in academic circles.

Through offline research and development, this study finds that due to the particularity of grey products (such as bra), consumers are mostly concerned about the privacy information of consumers. When consumers choose grey products online, they are more worried about privacy issues such as disclosure of privacy information and illegal use of privacy information, which will have a significant impact on their choice of products. Online products have a significant impact on their choice of products. As far as the choice of privacy products is concerned, privacy is an important concern of consumers. Consumers pay more attention to the privacy of online purchasing behaviors of such products than other products. Therefore, the relationship need to explore between privacy concerns and online purchasing behavior of consumers in online privacy products based on the perspective of outlier knowledge management and introduce consumers' grey product knowledge.

This variable provides a reference for the overall development of e-commerce.

1.2 Research question

Through off-line survey and on-line comparison, this study finds some interesting phenomena. Some special products, such as bra, Consumers are more likely to buy offline than online. But when searching for the keywords "Bra" on Taobao, Tianmao, Jingdong and other e-commerce websites, this study finds that there are a lot of sales online. This is quite different from the offline survey, so which consumers are willing to buy such products online? What kind of needs do online bra products satisfy consumers? Can grey product knowledge help consumers promote purchasing behavior?

In order to explore the answers to these questions, then interview consumers who have purchased such products online and summarize influencing factors of such consumers' online purchasing decision-making process. After defining the research questions and hypotheses to be tested, this paper intends to construct a more suitable consumers' privacy concerns scale, grey product knowledge scale and purchasing behavior questionnaire on the basis of previous mature questionnaires and the characteristics of China's e-commerce environment. According to the results of the survey, adjust and modify the questionnaire. Finally, the sample data is obtained through the combination of questionnaire and paper questionnaire.

1.3 Research meanings

The sharp rise of the grey product e-commerce market not only drives enterprises but also drives consumers to pay attention to more questions, such as whether there is certain regularity between the market sales and the factors. Therefore, this study revises the consumers' grey product knowledge scale suitable for e-commerce platform according to the mature scale of consumer knowledge and introduces the regulatory variable of consumer privacy product knowledge to analyze the relationship between privacy concerns and purchasing behavior of grey privacy products from the perspective of outlier knowledge analysis and on the basis of previous scholars' research, .

From the perspective of outlier knowledge management and on the basis of previous scholars' research, this study constructs a scale suitable for e-commerce platform, introduces the regulatory variable of consumers' grey product knowledge to analyze the relationship between privacy concerns and grey privacy product purchasing behavior, and enriches the research content between privacy concerns and online purchasing behavior. The results can help e-commerce platform to improve their own strategic form in order to meet consumer purchasing behavior and provide guidance for consumers to reduce privacy concerns and improve online transactions. Open up a new scheme for follow-up scholars to study from the perspective of outlier knowledge management.

2. LITERATURE REVIEW

This study based on Behavioral Decision Theory, and applies it in to online grey privacy products purchasing behavior. Behavioral Decision Theory (Becker, 1967) holds that consumers make purchasing decisions through rational and irrational thinking that consumers make decisions through checking under the interference of their own beliefs and external conditions^[2]. In the field of Information System (IS), privacy concerns have also been widely introduced into the research of consumers' behavior intentions. However, the research of privacy concerns on consumers' behavior in the Internet field lacks the research on the application field of grey privacy products. The applicability of research findings in other online product areas to grey privacy product environments needs further validation. Therefore, from the perspective of outlier knowledge analysis it is necessary to take online grey privacy products as the research object and to construct theoretical model to explore the impact of consumers' privacy concerns on their purchasing behavior and to deepen the

development of behavioral decision theory in the process of online purchasing behavior.

2.1 Grey privacy product

Products refer to goods supplied in the market which can attract consumers' attention, access, use and satisfy consumers' happy mood. Personal privacy is mainly concerned about personal information. Information Privacy (IP) (Westin, 1968) means that the time, manner and extent of private information dissemination are determined by individuals or organizations independently from a sociological perspective^[1]. At present, there is no clear definition of grey products in academic circles. When consumers buy grey products online in e-commerce environment (e.g. bra), they usually do not want to disclose what kind of products they have purchased, because they may expose personal privacy information such as their own size and others. Therefore, the grey products set in this paper can be considered as part of the privacy products, mainly referring to bra and other clothing products. That is to say, if the definition of privacy product data set contains n data $\{x_1, x_2, \dots, x_n\}$, the grey product data set is a subset of n data.

2.2 Privacy concerns

From a sociological perspective, Westin (1968) pointed out that information privacy means that the time, manner and extent of private information dissemination are determined by individuals or organizations^[3]. Later, when exploring users' attitudes towards privacy, Western scholars introduced the new concept of privacy concern in order to measure users' attention to information privacy better. From the perspective of information system, Goodwin (1991) referred to the concern that "some privacy information stored in the database is likely to be used by others and endanger themselves"^[4].

2.3 Grey product knowledge

Since 1980, consumer knowledge has become a unique field in the study of consumer behavior. There are three dimensions of transforming consumer knowledge: direct product knowledge, indirect product knowledge and consumer emotion. Direct product knowledge is similar to consumer's professional level, which is mainly summarized as the understanding of product performance, product type and product quality attributes; indirect product knowledge is equivalent to familiarity, mainly from personal consumer experience and other people's consumption experience; consumer sentiment mainly refers to the description of consumer's personal thoughts, preferences and product evaluation.

Shukun T (2010) first pointed out "Grey Knowledge", they think maybe a special type of "tacit knowledge" can be termed as "grey knowledge"^[5]. In the recent researches, Min Li (2018) think grey knowledge is a type of wide-view dynamic knowledge. If the amount of tacit knowledge is scaled as "1" (or the amount of explicit knowledge is scaled as "0"), then the value of grey knowledge can be any value between "0" and "1"^[6].

Therefore, from the perspective of outlier knowledge management, this study combines the characteristics of consumer knowledge and grey knowledge, and then point out a concept of grey product knowledge to analysis consumers' behavior better.

2.3 Purchasing behavior

Behavioral Decision Theory (Becker, 1967) tells us that the factors influencing consumers' decision-making are consumer individual factors and related environmental factors^[2]. For clothing purchasing behavior, some Chinese scholars have proved that the factors affecting consumers' online clothing purchasing are composed of three parts: social environment factors, consumer factors and enterprise environment factors. The main examples of grey privacy products in this study refer to bra on e-commerce platform. When consumers purchase

such products online, they will expose their own characteristic data and behavior data, which makes privacy information security, become the focus of consumers' purchasing behavior of grey privacy products. Therefore, from the perspective of consumers' online information privacy concerns, this study intends to introduce the variable of consumers' grey privacy knowledge to explore its impact on consumers' online grey privacy product purchasing behavior.

3. RESEARCH MODEL

The research on the impact of privacy concerns on consumers' behavior in e-commerce environment mainly focuses on two aspects: one is the impact of privacy concerns on consumers' willingness to disclose personal information online; the other is the impact of consumer privacy concerns on product purchase willingness. Scholars such as Ching-Hsuan Yeh(2018) have proved that in the privacy calculate system, information privacy concerns do not significantly affect consumers' willingness to disclose information, while external incentives significantly affect consumers' intention to disclose information, and there is no moderating effect between external incentives and information privacy concerns and willingness to disclose information^[7]. Gal-Or E(2018) had proven that privacy concerns have a significant impact on online platform competition^[8]. Lee and other scholars have shown that there is a negative correlation between consumers' behavior and privacy concerns^[15]. Chinese scholars (Li He, 2018) divided disclosure intention into short-term disclosure intention and long-term disclosure intention. The results show that privacy concerns have no significant impact on short-term disclosure intention, but significant impact on long-term disclosure intention. Both short-term disclosure intention and long-term disclosure intention will affect users' behavior^[9].

Previous studies (Hu Changping, 2018) have classified privacy concerns into three aspects: firstly, information factors, mainly including information quality and information sensitivity; secondly, subjective perception factors, mainly including perceived risk and perceived trust; thirdly, platform factors, which mainly including reputation and privacy policy. As for the relationship between privacy concerns and online purchasing behavior, previous studies have mostly explored the relationship between privacy concerns and information disclosure. Therefore, this study intends to combine privacy concerns and grey privacy products to explore the impact of these products on purchasing behavior in the application field of grey privacy products.

Therefore, this paper proposes hypotheses:

H1: Privacy concern has a negative effect on grey privacy product purchasing behaviors.

Knowledge provides information and resource feedback for decision-making and analysis processes. At the beginning, scholars mainly summarized the knowledge of consumers and consumers' familiarity with their consumer experience. Later, some scholars gradually summed up consumer knowledge as the level of knowledge and experience that consumers can base on when choosing and purchasing products. Experience is due to the frequent use of products by consumers, and product knowledge includes consumers' knowledge of product structure, product materials, and existing technology of similar products in the market. The enrichment of consumer product knowledge can make them understand products better. Karimi (2018) and other scholars found that product knowledge has an impact on consumers' purchasing decision-making process and consumers with high product knowledge are more satisfied with the purchasing decision-making process^[10]. A large number of studies have proved that consumer knowledge is a very important moderating variable in the process of consumer purchasing decision-making^[10]. In view of the purpose of this paper, the study mainly explores the product knowledge of consumers, combining with the characteristics of grey products, focusing on the measurement of consumers' product knowledge, that is, the degree of consumers' knowledge of grey products. In China, Some researchers have found that consumers' product knowledge has a positive impact on brand loyalty of products with low perceived risk, and the relationship between them is U-shaped for products with high

perceived risk. Previous studies have shown that consumer brand loyalty can affect consumers' purchasing, and brand loyalty plays a mediating role between privacy concerns and purchasing intention.

Therefore, this paper proposes hypotheses:

H2: Consumers' grey product knowledge has a moderating effect on the relationship between consumer's privacy concern and consumer's purchasing behavior.

H3: The higher the consumer's grey privacy product knowledge, the more likely it is to promote purchasing behavior.

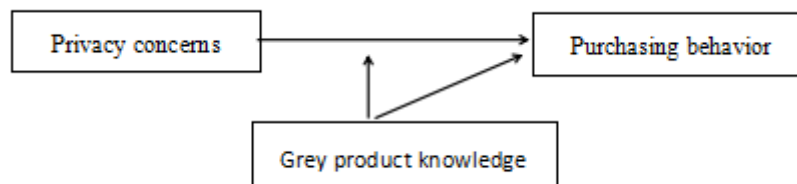


Figure 1. Research Model

4. DATA ANALYSIS

In order to measure the variable "Grey product knowledge", this paper revised the scale based on Brucks^[14] measurement of consumer knowledge. Then the sample data are obtained in the form of questionnaires.

Firstly, SPSS 19.0 was used to analyze the reliability of the questionnaire. Cronbach alpha reliability coefficient was 0.843, and the results of the questionnaire had high internal consistency reliability. KMO value are all higher than 0.7, and the significance probability was 0.000, less than 0.05. The questionnaire was suitable for factor analysis.

Secondly, Using SPSS 19.0 software, exploratory factor analysis of measurement variables "grey product knowledge" is carried out, and the items with factor load less than 0.5 were deleted. For the measurement of grey product knowledge, this study designed five items. Based on the first step KMO value is higher than 0.7, three factors are proposed by principal component analysis: privacy concerns, purchasing behavior, and grey product knowledge.

Table 1. Factor analysis

		KMO and Bartlett's Test	
Privacy concerns		KMO	.810
		x^2	1255.583
		df	36
		sig	.000
Grey product knowledge	Bartlett's Test	KMO	.893
		x^2	928.691
		df	10
		sig	.000
Purchasing behavior		KMO	.774
		x^2	407.870
		df	10
		sig	.000

Thirdly, based on the hierarchical regression model, this paper examines the impact of privacy concerns on

purchasing behavior and the moderating effect of grey product knowledge on major relationships. Firstly, independent variable privacy concerns, consumers' grey product knowledge and dependent variable purchasing behavior are added in the first layer model 1. The results show that privacy concerns have a negative impact on purchasing behavior ($\beta=-0.324$, $P<0.05$). With the improvement of grey product knowledge, consumers' purchasing behavior will be promoted($\beta=-0.175$, $P<0.05$).

Table 2. Regression Results

Model1	B	Beta	t	Sig.	R Squared	Adjusted R Squared	Std.Error
(Constant)	3.801		101.968	0.000			
Privacy concerns	-0.324	-0.324	-5.889	0.000	0.171	0.166	0.652
Grey product knowledge	0.115	0.175	3.185	0.002			
Model2	B	Beta	t	Sig.	R Squared	Adjusted R Squared	Std.Error
(Constant)	3.727		100.361	0.000			
Privacy concerns	-0.208	-0.209	-3.784	0.000	0.266	0.258	0.615
Grey product knowledge	0.113	0.173	3.332	0.001			
Privacy concerns*Grey product knowledge	-0.306	-0.328	-6.224	0.000			
Dependent Variable:Purchasing behavior							

In order to get more accurate results, this study uses the interaction terms between independent variables and moderator variables to test the moderating effect. Independent variable privacy concerns, consumers' grey product knowledge the interaction terms between independent variables and moderator variables and dependent variable purchasing behavior are added in the second layer model 2. From the results of the model analysis, the model interpretation rate increases from 16.6% to 25.8% after adding the interaction items of consumers' grey product knowledge and privacy concerns, so the model interpretation degree increases after adding the interaction items of consumers' grey product knowledge and privacy concern, and consumers' grey product knowledge plays a regulatory role between privacy concerns and purchasing behavior. The effect was ($\beta=-0.328$, $P < 0.01$). When the knowledge level of privacy products is higher, the negative impact of privacy concerns on consumers' purchasing behavior is more significant; while when the knowledge level of privacy products is lower, the negative impact of privacy concerns on consumers' purchasing behavior is relatively weakened. The impact of privacy concerns on consumers' purchasing behavior will be reduced after the interaction terms is added. So hypothesis H1, H2, H3 are verified.

5. CONCLUSIONS AND DISCUSSIONS

5.1 Conclusions

Firstly, this study summarizes according to the investigation and interview of offline physical stores. One of the findings is that when consumers want to buy these products the common knowledge is that the quality and price are the main factors influencing consumers' decision. There is a sensitive interval in the price of grey products; corresponding services of product can also help promoting grey products volumes. The discount activities of "Double Eleven" and "Double Twelve" have great attraction to consumers.

Secondly, based on Brucks^[14], this study revises the scale of consumer knowledge and then we have developed a scale on grey products knowledge. Through SPSS 19.0 analysis, this paper has found that the items met the requirements of exploratory factor analysis. At last, after induction and analysis, we find the eligible scales to measure grey product knowledge; it can be used as a reference for subsequent scholars to measure grey product knowledge.

Thirdly, from the above analysis, it is found that there is a significant relationship between privacy concerns, the grey product knowledge and purchasing behavior. This study finds that privacy concerns have a negative impact on purchasing behavior and grey product knowledge has a positive effect on purchasing behavior. With the improvement of consumers' grey products knowledge, the influence of privacy concerns on consumers' purchasing behavior is weakened.

Different from previous studies, this study is based on the perspective of outlier knowledge management, breakthrough from the perspective of consumers' grey product knowledge. It proves that grey product knowledge plays an important role between privacy concerns and purchasing behavior. It expands the research perspective of online grey privacy product purchasing behavior.

5.2 Discussions

The purpose of this study is to build up the relationship between privacy concerns, grey product knowledge and purchasing behavior in order to explore the mechanism of consumers' online purchasing behavior of grey privacy products. However, due to the limitations of time, expertise and business practice, this study still has the following shortcomings: the questionnaire is designed by Level 7 questionnaire. The respondents mainly fill out the questionnaire based on subjective judgment, and the questionnaire has inherent deviation. Therefore, future research should start from more accurate measurement data, or introduce interviews on the basis of questionnaire survey or supplement case studies on the basis of panel data analysis.

All in all, from the perspective of outlier knowledge, this paper wants to explore the mechanism of consumers' purchasing behavior online. The quality and price are the main factors influencing consumers' decision. The overall conservative state has become the mainstream, but some relatively open buds have also been found, which is related to the results of the differences between Chinese culture and Western culture. And it is also a factor to be considered of further research in the future. Grey product knowledge can help consumers making purchasing decision. More research is needed in the future to study the mechanism of consumers' online purchasing behavior of grey privacy products from the perspective of outlier knowledge.

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