EVENT-RELATED POTENTIAL ANALYSIS ON THE INFLUENCE OF REGIONAL PRICE AND MARKETING STRATEGY OVER CONSUMERS’ PURCHASE DECISIONS

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Abstract

In online shopping, the most severe security risk stems from the information asymmetry between sellers and consumers. From the perspective of neurocognition, this paper explores the effects of regional price and marketing strategy on consumers’ purchase decisions. Specifically, the Stimulus-Organism-Response (SOR) model was employed to simulate the consumers’ purchase decision-making behavior. The event-related potential (ERP) analysis was conducted to reveal the impacts of regional price on consumers’ purchase intention, and analyze the decision-making mechanism of consumers. The results show that the regional price and marketing strategy can affect the consumers’ perceived value; this effect is mediated by the consumers’ cognition degree of the product; the making of purchase decisions can be divided into three phases, namely, cognition of risk, cognition of conflict and evaluation of decision; the three phases correspond to different electroencephalogram (EEG) components: N2, N400 and LPP, respectively.

Key words: ERP, Brand’s Price, Marketing Strategy, Purchase Decision-Making.

Received: 18-02-19 | Accepted: 15-07-19

INTRODUCTION

In recent years, with the popularization and development of the Internet industry (Guardini, D’Urso, & Fasano, 2002), e-commerce (Mcknight, Choudhury, & Kacmar, 2002; Gefen, 2000) has maintained rapid growth in both time and space, and it still has enormous development potential in the future. The online shopping (Bhatnagar, Misra, & Rao, 2000) has gradually replaced some of the traditional shopping methods for its convenience, fastness, rich varieties, lower price compared to physical stores, and breaking geographical restrictions (Yang & Jun, 2008), bringing consumers richer shopping experience. However, the biggest disadvantage of online shopping is the asymmetry of information between consumers and sellers (Aaker & Sengupt, 2000). Consumers can’t personally feel the quality of the products and more uncertainty will generate (Lee & Turban, 2001). Therefore, additional information, including information, clues, and comments of products are needed to further understand the products (Tan, 1999) for making decision-making behavior. In the era of online shopping, information (Chen, 2009) is a direct consumer product. Consumers select merchants and products through searching and browsing, and then share the use experience and consumption experience of products through comments and forwarding so that more information (Guo, Wang, & Leskovec, 2011) is provided as a reference for other people’s purchase decision-makings. Thus, the brand’s price and marketing strategy (Cetină, Munthiu, & Rădulescu, 2012) will largely influence consumer’s purchase decision-making behavior.

Online shopping (Li, Xu, & Li, 2013) has its own limitations. In addition, consumers doubt about products themselves and need enough information to judge the quality and reliability of products. Price (Wang, Zhang, & Zheng, 2011) is a relatively intuitive
reflection of product quality. Generally, the higher the price is, the better the quality is. However, at the same time, higher price means that consumers need to stand more financial losses. Therefore, the price of products has a decisive influence on the consumer’s purchase decision-making. Consumer’s purchase decision-making is closely related to perceived value (Lee & Lin, 2005) composed of quality assurance, shopping cost and privacy protection (Thang & Tan, 2003; Sweeney & Soutar, 2001), which is a comprehensive concept. At present, studies on consumer’s decision-making behavior are mostly based on psychology and obtain data through questionnaire survey. However, studies on the difference between traditional market consumption and network market consumption are still insufficient.

Based on the background of online shopping environment and the research method of brain cognitive neuroscience, this study explores the influence mechanism of regional price brand marketing strategy on consumer’s purchase decision-making behavior from different levels. This is important for online shopping merchants to choose suitable marketing strategies to improve the conversion rate and improve the user experience.

**COGNITIVE NEUROSCIENCE**

**Cognitive neuroscience**

Cognitive neuroscience (Tucker, 2001) is an interdisciplinary and cross-disciplinary new branch of science. With the study of brain science and the development of brain imaging technology, cognitive neuroscience develops rapidly. It mainly studies the neural mechanism of people’s cognitive activities, and studies how the brain mobilizes organizations and structures at all levels for cognition. At present, the application of cognitive neuroscience is also very wide. It provides new ideas and research methods for the studies of other disciplines, such as the study of consumer online shopping decision-making process. The advantage of using cognitive neuroscience to study consumer shopping decision-making process lies in the acquisition of data of the physiological indicators of consumers during the shopping process so as to more objectively and accurately study the influence factors that influence consumer’s decision-making. There are two commonly used methods: one is an eye tracker that indirectly reflects cognitive activities, and the other is ERP that directly collects brain activities and functional magnetic resonance imaging (FMRI).

**ERP analysis**

(1) ERP analysis is a technology developed based on electroencephalography (EEG). When people perform various activities, there will be continuous electrical activities in the brain. ERP technology uses electrodes to collect and record the changes in human brain potential to explore the internal cognition of an activity in the brain. The method is shown in Figure 1.

**Figure 1. Event-related potential analysis**

Compared with FMRI, ERP has the advantages of extremely high resolution, very high time accuracy, and higher accuracy and objectivity in processing human BEP activities, which can eliminate error caused by subjective factors as much as possible. In addition, compared with ordinary evoked potentials, ERP has the following characteristics as shown in Figure 2.

**Figure 2. Features of event-related potential analysis**

(2) ERP components related to decision-making. The measured data of ERP will be different according to the change of reference electrodes and electrode position. Therefore, the measured data of ERP is mainly described from the three dimensions: scalp
distribution, polarity and latency. In essence, the process of consumer shopping is a process in which the brain makes decisions. At present, ERP is one of the primary means of researching decision-making neurology. In the experimental process of ERP, several brain wave components in a certain cognitive activity of the brain are obtained, and brain wave components related to decision-making mainly include N2, N400, and LPP.

**Consumer decision-making behavior**

Consumer decision-making is a complex decision-making process of consumer’s rational evaluation and selection of products and services by referring to many factors. According to different dimensions, consumer decision-making theory can be divided into several viewpoints as shown in Figure 3. Although there are big differences among these viewpoints, these viewpoints are complementary and comprehensively considered when consumers make decisions.

**Figure 3. Consumer decision-making behavior theory**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Scalp</th>
<th>Polarity</th>
<th>Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>N2</td>
<td>Forehead, Forehead Central Union Area, Central District</td>
<td>Negative</td>
<td>200-350ms</td>
</tr>
<tr>
<td>N400</td>
<td>Frontal area, Central Brain Area</td>
<td>Negative</td>
<td>400ms</td>
</tr>
<tr>
<td>LPP</td>
<td>Central Brain Area</td>
<td>Positive</td>
<td>300-700ms</td>
</tr>
</tbody>
</table>

**DECISION-MAKING INFLUENCING MECHANISM MODEL AND HYPOTHESIS**

**Basic model**

In the process of shopping, consumers are first stimulated by information about products and sellers, and then their cognitive activities are motivated, and finally they make decisions about purchase behavior based on the processing of information by the brain. Therefore, we use S-O-R Model as a basic model for consumer’s purchase decision-making behavior. The model is divided into three variables: antecedent, agency, and outcome. When the model is applied to analyze the influence of regional price brand marketing strategy on consumer’s purchase decision-making, the stimulus (S) is the regional brand’s price and brand’s reputation, the organism (O) is the perceived value, and the end-user behavioral response (R) is the consumer’s purchase action. The model is shown in Figure 4.

**Figure 4. Consumer decision-making model**

**Hypotheses of model**

On the one hand, brand’s price is the reflection of product’s quality. That is, the higher the price is, the better the quality of the product is. On the other hand, it is a burden of wealth for consumers, that is, the higher the price is, the lower the attraction to consumers is. Consumer’s perceived value of products is related to the perceived quality, perceived risk, and shopping costs. Therefore, before starting the study, we make relevant hypotheses about the basic model as shown in Figure 5.

**Hypotheses of ERP**

When consumers make purchase decision-making, they will be affected by the product’s price and seller’s reputation. This will affect the consumer’s cognitive process, which in turn will stimulate the ERP component related to the decision-
making process, including N2 component in the early decision-making, N400 component in the medium term and LPP component in the late stage. Therefore, based on the above analysis, the hypotheses of ERP components in the decision-making process are shown in Figure 6.

**EXPERIMENTAL STUDY BASED ON ERP ANALYSIS**

**Experimental method**

(1) Experimental objective and method. The experimental objective is to use relevant experimental instruments to measure the real BEP data of consumers in the purchase decision-making process to explore the influence of brand’s price on consumer’s purchase intention, and to study mechanism of consumer’s decision-making process from the spatial and temporal aspects of brain activities. In this experiment, ERP analysis is used to analyze the BEP activities of 20 volunteers, including 10 men and 10 women aging between 25 and 30. All subjects don’t have mental illness.

(2) Selection of experimental materials. In order to make subject integrate into the experimental situation, this experiment selects real sellers on an e-commerce platform in China. The products selected in this experiment are computers and sunglasses, as shown in Figure 7. A total of 400 decisions are made. Each product’s price and the brand’s reputation are combined for 50 times. The high and low price and the high and low brand reputation can be combined into eight experimental situations.

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**Figure 5. Hypotheses of the consumer decision-making model**

- **Hypothesis 1**: Consumer perceived price of the product negatively affects the perceived value of the product.
- **Hypothesis 2**: The perceived reputation of the seller for the seller positively affects the perceived value of the product.
- **Hypothesis 3**: There are interactions between perceived price and perceived reputation in terms of the perceived value impact on the product.
- **Hypothesis 4**: Consumer’s perceived value of products positively affects consumers’ purchase intention.
- **Hypothesis 5**: The level of product involvement will adjust the perceived price, perceived seller’s reputation and perceived value.

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**Figure 6. Hypotheses of ERP**

- **Hypothesis 1**: In the process of perception of decision-making risk, which appears as an N2 component in ERP: the higher the price and the lower the reputation, the greater the amplitude of N2.
- **Hypothesis 2**: In the process of decision-making conflicts, which appears as an N400 component in ERP: the greater the conflict, the greater the amplitude of the N400.
- **Hypothesis 3**: In the classification process of decision valence, which appears as an LPP component in ERP: the higher the tier, the greater the LPP amplitude.
- **Hypothesis 4**: Product involvement will have a moderating effect on information processing and cognitive processes in consumer decision making.
(3) Procedure of ERP Experiment. Before carrying out the ERP experiment, we must first introduce the experimental procedure to the subjects and start the experiment after they fully understand the experimental procedure and requirements. Moreover, the continuous process of the experiment is long, and the whole experiment is divided into five subsections, and they can have a rest in the middle stage so as to ensure that the experimental result is objective and effective. The experimental procedure is shown in Figure 8, including situation settings, decision process, and making a decision.

(4) Data recording of experiment. In this experiment, 64-lead BEP recorder is used to record the BEP data of 64 points through the electrode cap. The reference electrode position is left ear protrusion. There are two electrodes around the eye to record the horizontal and vertical eye electric waves. To ensure the validity and accuracy of the data, it is necessary to ensure that the scalp maintains good contact with the electrodes in the whole process of the experiment.

Data processing of ERP
In order to obtain valid waveform data, we perform offline analysis on the recorded experimental data. The specific process is shown in Figure 9:

Component analysis of ERP
The BEP data selected in this experiment is 200ms-
800ms. The BEP related to N2, N400, and LPP components at electrodes of the frontal, top, and occipital areas is selected for data processing. The processing method is as described above.

(1) The N2 component is mainly distributed in the forehead and related areas. Therefore, the FZ, F3, and F4 of the forehead are selected as reference points. After the data is processed, the N2 peak is detected again, and the time window is 300ms-350ms. It can be seen from the comparison that the amplitude maps of the three poles are consistent in the time window. Thus, Figure 10 takes F3 as the representative pole, showing the amplitude map of price and reputation of the two products at the pole.

(2) The N400 component is mainly distributed in the forehead and the central area of the brain. Therefore, CZ, C3, and C4 in the occipital area are selected as reference points. After the data is processed, the time window for selecting the LPP component is 700ms-750ms. Through comparison, the amplitude maps of the three poles are consistent in the time window. Thus, Figure 12 takes P3 as the representative pole, showing the amplitude map of price and reputation of the two products at the pole.

(3) The LPP component is an important research object in the late stage of ERP. Therefore, the PZ, P3, and P4 at the top area are selected as reference points. After the data is processed, the time window for selecting the LPP component is 450ms-500ms. Through comparison, the amplitude maps of the three poles are consistent in the time window. Therefore, Figure 11 takes C3 as the representative pole, showing the amplitude map of consistency and inconsistency of the two products at the pole.

Figure 10. Electrode Point of Computer (Price (a) and Reputation (b)) and Headset (Price(c) and Reputation (d)) N2 Waveform Diagram
RESULTS AND ANALYSIS

The experimental results of consumer’s purchase decision-making through ERP show that the nature of online shopping is a matter of decision-making. In the cognitive process of the brain, the components related to decision-making are stimulated. Experiment by ERP
can collect millisecond of BEP data, which provides a basis for us to understand the information processing of the brain during the decision-making process and to study cognitive neural mechanism. The experimental results show that the decision-making process is roughly divided into three stages:

The first is the stage of cognition and recognition of decision-making risk. Studies have shown that changes in N2 amplitude reflect the size of decision-making risk. The greater the consumer’s decision-making risk is, the greater the N2 amplitude is. Therefore, in the early stage of decision-making, attention is mainly paid to the change of N2. The experimental results show that when the product is high-involvement laptop, the brand’s reputation is negatively correlated with the N2 amplitude; when the product is low-involvement sunglass, the brand’s price is positively correlated with the amplitude of N2. The brand’s price and reputation can induce changes in the N2 amplitude. The difference lies in the difference in involvement of product.

The second is the cognitive stage of decision-making conflict. Studies have shown that changes in N400 amplitude can reflect non-semantic conflicts. In the experiment process, brand’s price and reputation are two factors presented to consumers in a way of combination. The situation in which the N400 amplitude changes greatly appears in the consistency group and conflict group of combination of low-involvement products. High-involvement products have no such phenomenon. This is may be that when consumers have a deep understanding of a certain product, they will pay more attention to the brand’s reputation. Therefore, in the face of information conflict, they will select brand’s reputation as a reference; others, for low-involvement products, consumer’s assessment of conflict information will induce bigger N400 amplitude.

The third is the assessment stage of the decision-making process. Studies show that LPP is closely related to the assessment process of information. The experimental results show that for high-involvement products, LPP amplitude is positively correlated with the brand’s reputation while it is not sensitive to price. However, for low-involvement products, both the brand’s price and reputation can significantly affect LPP component.

CONCLUSIONS

Taking the online shopping environment as the background and combined with the research methods of brain cognitive neuroscience, this study explores the mechanism of regional price brand marketing strategy on consumer’s purchase decision-making behavior based on ERP, and draws the following conclusions:

(1) The brand’s regional price and marketing strategy will influence consumer’s perceived value, and consumer’s perceived degree of product, namely involvement degree, will have a direct moderating effect on the influence. According to the results, the brand’s reputation of high-involvement products has a great influence on consumer’s purchase decision-making while both the brand’s reputation and brand’s price of low-involvement products will affect consumer’s purchase decision-making.

(2) The purchase decision-making process of consumers is a process in which the brain processes information, which can be divided into three stages and correspond to different BEP components: the cognition of decision-making risk corresponds to component N2, the decision-making conflict corresponds to component N400, and the evaluation of decision-making corresponds to component LPP.

REFERENCES


of Electronic Commerce, 6(1), 75-91.