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探討跨境網購購買意圖之決定因素：自陳測量與腦波特徵之比較分析

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本研究具有政策應用參考價值：■否 □是，建議提供機關
（勾選「是」者，請列舉建議可提供施政參考之業務主管機關）
本研究具影響公共利益之重大發現：□否 □是

中 華 民 國 108 年 12 月 27 日

中 文 摘 要 ： 顧客面臨多重線索時如何評估商品的實際品質？本計畫探討了線上海外網站不同產品資訊線索的影響方式，以及認知處理的前置因子（包含專注度、風險，正面/負面情緒）如何影響顧客認知處理和購買意圖之間的關係。透過實驗室實驗法，我們藉以探討腦波特徵與問卷回覆之關係。首先，本研究於實驗情境設計加入三個產品線索變數：語言、評價和銷售量，並且使用腦電圖(EEG, electroencephalogram)來測量神經生理狀態。主要是利用不同語言國(英語版本/簡體中文版本)的線上海外商城，並分別在商城中呈現出特定產品的外在線索：2（高評價/低評價）x2（高銷量/低銷量）的架構。本研究進而建立了線索診斷模式來分析顧客在外部產品資訊線索如何影響顧客的決策制定。接著，從線索利用理論觀點，了解消費者如何藉由多重線索來評估產品品質。在此研究模型下，我們也會探討專注度、風險，正面/負面情緒對顧客認知處理之影響以及認知處理對購買意圖之中介效果。本研究蒐集160份有效樣本，並提供了研究模型有力的支持。本研究透過海外網路產品線索設計與認知神經機制之了解，提供廣告設計商與行銷者針對不同的客群與產品來擬定更完善的行銷策略。

中 文 關 鍵 詞 ： 認知處理、EEG、專注度、風險、正面／負面情緒、前額葉不對稱、跨境電商

英 文 摘 要 ： How do consumers assess product quality when confronted with multiple cues? This study examines the dissimilar use of product information cues in product evaluations of cross-border websites and how to affect on the relationships among the antecedents of consumer cognition (concentration, risk, and positive/negative emotions), cognitive processing, and purchase intention. Through laboratory experiments, we use electroencephalogram (EEG) to supplement the survey questionnaire. First, the study conducted different experiments with three product cues: country of origin, sales, and ranking. We used an electrophysiological monitoring method to measure neurophysiological states while customers assess the diagnosticity of cue usage in decision making. Next, the study further examined the dissimilar use of product information cues in product evaluations of Web sites. The cue diagnosticity framework is then used to assess the effects of engagement, risk, and positive/negative emotions on both consumer cognitive processing and purchase intention, as well as the mediation effect of cognitive processing on purchase intention. Data collected from 160 customers provide strong support for the research model. By understanding online product cue design and neurocognitive mechanisms, the insights from the findings can benefit designers and marketers in implementing more effective cross-border marketing strategies.

英文關鍵詞：Cognitive Processing, EEG, Concentration, Risk, Positive and Negative Emotions, Frontal Asymmetry, Cross-border Electronic Commerce.

探討跨境網購購買意圖之決定因素：自陳測量與腦波特徵之比較分析

Exploring the Determinants of Purchase Intention of Cross-Border Online Shopping: Evidence from Self-Reported and EEG Data

Introduction

Research Background

With the prevalence of E-commerce, online shopping has become an indispensable part of most people's daily lives. According to Forrester Research, online sales will account for 17% of all US retail sales by 2022, up from a projected 12.7% in 2017 (Keyes, 2017). Moreover, global B2C e-commerce is expected to increase to $1.84 trillion in 2017, and global online retail is increasing rapidly with a forecasted growth rate of 17% in 2017 (NVC, 2017). Obviously, online shopping has become a prevalent part of the average consumer's shopping experience.

Cross-border ecommerce, also called international e-commerce, refers to buying online from merchants located in other countries and jurisdictions (CBEC, 2015). According to Accenture (2016), over 2 billion e-shoppers (60% of target global population) would be engaging in global B2C e-commerce trading by 2020, accounting for 13.5% of the total online retail consumption, equivalent to a market value of US$3.4 trillion. As a key engine of the B2C trading market, cross-border e-commerce is estimated to undergo a compound annual growth rate (CAGR) of 29.3% during 2014 to 2020. Boston Consulting Group also predicts that by 2025, 40% of global cross-border e-commerce sales will take place in the Asia-Pacific region (van Heel et al., 2014), by then the world's largest cross-border e-commerce market. It presents highly promising prospects to provide borderless and globally operated e-commerce and after-sales services through ICT platforms. Moreover, cross-border ecommerce is a phenomenon that has quietly gained huge momentum as customers purchase products from outside their borders. However, few researches have been done to understand the determinants that lead consumers to shop on foreign websites.

One of the disadvantages of online shopping is that consumers cannot directly touch or observe the products to learn about their function and content. Therefore, it is critical that online sites present products in a way that embodies all kinds of cues in order to facilitate consumers' decision-making (Cox, 1967). For example, consumers are able to locate their desired products within a short period of time if the shopping platform has the function to quickly filter information, compare both products and prices, and display the products in detail (Chen & Dubinsky, 2003). Easterbrook (1959) proposed cue utilization theory to further illustrate that the attention will be focused primarily on the arousing details (cues) of the stimulus, so that information central to the source of the emotional arousal will be encoded while peripheral details will not. Hence, this study adopts cue utilization theory to examine the effects of product-related cues on cross-border consumers' purchase decisions.

According to the cognitive development theory by Piaget (1980), interactions with the environment will affect an individual's information-processing strategies and representations. Dagher (2007) applied this theory to state the impacts of different shopping atmospheres and product information presentation on consumers' decision-making and behavior. Thus, how to make a deep impression on consumers, leading them to purchase and repurchase become an

important topic in customer behavior research. However, few studies have conducted an analysis of the time customers spend on cognitive processing, due to the lack of measuring instruments that can accurately record consumers' attention when making purchase decisions, including view blocks and processing time. Nevertheless, cognitive processing serves as important bases for understanding consumers' attention under visual stimulation when browsing for online information. This study uses eye-tracking technology to analyze the impact of the attractiveness of various product-related cues on customer processing time.

Behavior intention refers to an individual's response to stimulation from their external environment. From the perspective of the consumer market, it can be mainly interpreted as the behavioral tendency of the customer before purchasing a product (Dimoka et al., 2012; Blackwell, Miniard, & Engel, 2001). However, past online consumer behavior research (Peter, Olson & Grunert, 1999; Foxall, 2003) has focused on the impacts of explicit factors, which are perceptual, mainly measured by self-reported data, generally overlooking implicit factors (Baxter Magolda, 2004), which are spontaneous, unconscious, and difficult for others to observe or individuals to express.

Pasts studies have indicated that electroencephalogram (EEG) signals can be used to determine implicit antecedents in behavior intention (Cook & Campbell, 1979; Berka et al., 2007). Electroencephalography measures the response of brain waves by placing devices with electrodes on subjects' scalps and scanning the signals generated by these electrodes (Vokorokos et al., 2014). Zald and Pardo (2000) pointed out the possibility of understanding an individual's invisible sense of smell and taste through the measurement of brain reactions. Wang et al. (2016) further demonstrated, through electroencephalography, that online information can make subjects aware of risk, which is one kind of implicit antecedent. Therefore, the purpose of this study is to use EEG to understand the impact of implicit antecedents on the cognitive processing of consumers when browsing online product information.

In sum, this study takes into account both explicit (perceptual) and implicit (neurophysiological or neural) antecedents to gain a comprehensive understanding of consumers' intention to shop on foreign websites. The insights from the findings can benefit designers and marketers in implementing more effective marketing strategies.

Research Purpose

In order to build effective online marketing strategies, the objective of this study is to develop strategic elements for product cue design in providing innovative services. We also discussed, from the perspective of cross-border marketers, the improvement of the effectiveness of advertising products, hoping to serve as reference for designers. Key questions asked in the study are:

1. What are explicit (perceptual) and implicit (neurophysiological or neural) antecedents of consumer decision making?
2. How can multiple product cues be designed and leveraged to increase consumer purchase intention?

Theoretical Background

Cross-border Electronic Commerce

Cross-border e-commerce is defined as import and export business activities conducted through electronic means by trading entities belonging to different customs frontiers or jurisdictions (Ali Research, 2016). In other words, cross-border e-commerce enables trading entities located in different countries or regions to conduct business transactions through e-commerce platforms, cross-border payment settlement, and cross-border logistics (Ali Research, 2016). Cross-border shopping has undergone an unprecedented growth amidst the surging demands for overseas products. As such commercial activities involve multiple countries, various issues may arise with respect to language barriers, logistics, regulatory control, tariff costs, and after-sales services. Consequently, even with the convenience of rapid information exchange enabled by the Internet, cross-border online shopping can go far more complex than conventional domestic online shopping.

Cue Utilization Theory

Media richness refers to the communication capability of the media within a given period of time (Daft et al., 1987). Communication media conducts communication with multiple cues, such as language variety, to improve customer satisfaction. Language variety refers the availability of data in multiple languages depending on the location and environment. The more information the linguistic symbol can convey, the better the effectiveness of communication will be.

Multiple cues mean that the data will provide a variety of information cues (including text, numbers and graphic symbols). According to the cue utilization theory by Easterbrook (1959), people tend to take into account the cues related to surroundings in addition to the direct cues of the product itself. Olson & Jacoby (1972) further explores the application of cues in the consumer field and puts forward that the cue of the product itself can be divided into intrinsic cue and extrinsic cue where intrinsic cue is used to describe the properties of the product (such as color, composition) and extrinsic cue is the additional attributes by people (such as price, evaluation). As it is impossible for the consumers to directly observe the intrinsic cues of packaged products, they tend to take advantage of the evaluation of explicit values (Wells, Parboteeah & Valacich, 2011). Therefore, for the enhancement of the media communication ability, this study designed a shopping webpage available in different languages and containing different explicit product cues to explore the influencing factors of consumer purchase decision.

Cognitive Processing and Purchase Intention

Based on the cognitive development theory by Bruner (1960), the process of transforming things or events in the surroundings into inherent psychological events is called cognitive representation or knowledge representation. In short, cognition is the acquisition and use of knowledge which involves two levels: 1) the mental structure that is about how knowledge is stored in our memory and what memory content is stored; 2) the mental process that is about the use and processing of knowledge. Schwonke, Renkl, Krieg, Wittwer, Aleven, and Salden (2009) stated that information processing is critical to affect consumer decision making. Based on the above, this study focuses on the mental process to explore the impact of processing time spent on the browsing of product information cues on the advertising effectiveness.

Purchase intention refers to consumers' actual willingness to purchase a certain product (Grewal et al., 1998). Therefore, it is a reliable indicator for predicting purchase behavior (Turney & Littman, 2003). Vakratsas & Ambler (1999) indicated that advertising has a psychological impact on consumers and purchase intention can be viewed as behavioral result after the psychological impact. From the perspective of *Consumer Socialization Theory*, Wang et al. (2012)

confirmed that social media peers discover, research, and share information about products and services, and they do have the potential for facilitating the focal consumer towards a certain consumption behavior. Hence, this study regards to design different advertisement contexts on shopping websites in order to explore the product information cues of advertising on consumers' purchase intentions.

According to the theory of planned behavior (TPB) by Ajzen (1991), to carry out an in-depth analysis of the human behavior intention, the influencing factors of intention in an information system are divided into two types: explicit and implicit. First, *explicit* or perceptual determinants refer to phenomena that occur within individuals' awareness and then people can report on them (Agarwal & Karahanna, 2000; Barki, Paré, & Sicotte, 2008; Karahanna & Straub, 1999). Thus, explicit factors can be observed to understand individual behavior and response (Amodio et al., 2004), and all these antecedents have been identified by the IS literature. However, past researches in TPB have also identified *implicit* or automatic determinants of behavioral beliefs (Ajzen, 1991), since this approaches to the investigation of behavioral beliefs can complement current (explicit) approaches. Implicit factors refer to the unconscious expression of the feelings by an individual when interacting with the environment (Wilson & Stone, 1985). Parasuraman and Rizzo (2007) further understudied the process of inducing implicit factors when the human brain is subject to external stimulus by observing the response of the brain waves.

Researches stated that explicit and implicit antecedents may not relate because individuals cannot report accurately on things about which they might be unaware (Ouellette & Wood, 1998). In the specific case of IS research, few studies have examined implicit antecedents of behavioral beliefs (de Guinea et al., 2014). Dimoka (2010) combined the implicit factors with explicit factors in order to obtain a more comprehensive understanding of the individuals' behavior intention and explain their behavioral responses after interacting with the external environment. Thus, this study strives to investigate both implicit (neurophysiological or neural) and explicit (perceptual) antecedents to influence the cognitive processing responses of customers when browsing online product information.

Implicit emotional frontal asymmetry

EEG (electroencephalography) is a method of studying the response of the brain by scanning the signal of the electrode point carried on the scalp (Liberio, 2014). The discovery of electroencephalography (EEG) by Berger (1929) was a historical breakthrough providing a new neurologic and psychiatric diagnostic tool at the time. Berger further stated that epileptic seizures had an abnormal EEG signature, and that between the seizures (interictal) there were also transient epileptiform abnormalities not seen in controls (Gloor, 1969). Moreover, the brain's cerebral cortex is the outermost layer that gives the brain its characteristic wrinkly appearance. The cerebral cortex is divided lengthways into two cerebral hemispheres connected by the corpus callosum. Traditionally, each of the hemispheres has been divided into four lobes (Gazzaniga, 2008): frontal, parietal, temporal, and occipital, in which frontal lobe is responsible for the implementation of the brain, language formation, and the control of autonomy.

Davidson and Fox (1989) proposed an emotional prefrontal asymmetry hypothesis, which suggests that the brain stimulates positive and negative emotional responses at specific sites. They measured using the brain wave instrument β wave (13-30Hz), if the left frontal lobe produced less β wave, said the left frontal lobe more activated, the mood approaching the front. On the contrary,

if the right frontal lobe β wave less, said the right frontal lobe more active, the mood approaching negative. Davidson et al. (1990) and then design experiments show that the subjects watching the positive content of the film, the left prefrontal fissure β wave less than the right frontal lobe, which means positive emotions; the other hand, the right frontal lobe of the β wave less than Left front frontal lobe, which means the generation of negative emotions. Based on the above, this study will analyze the customer's left and right prefrontal β-wave data to explore the customer to watch a variety of online product information clues on the impact of emotions.

Explicit Emotions

Emotion is defined as the different emotional experience under external stimulus by any individual (Kleinginna & Kleinginna, 1981). Emotion has a substantial influence on the cognitive processes in humans (Tyng et al., 2017), including perception, attention, learning, memory, reasoning, and problem solving. Eroglu et al. (2001) stated that the types of human emotions can be classified into positive emotion (e.g., joy, excitement, and pride) and negative emotions (e.g., anger, sadness, and pain).

Positive emotion helps people release their tension and produces beneficial effects (Katz & Miledi, 1973). Folkman and Moskowiz (2000) further proves that customers are more relaxed when they feel positive about a product, which in turn drives the customer to pay more attention to the product information and relatively improves the accuracy of their purchase decision. Seligman (2002) also stresses that positive emotions can widen the view of things and make people aware of more environmental details. Hence, this study also discusses the impact of positive emotion on consumer cognitive processing which may enhance their purchase intention.

Negative emotion also affects the cognitive process of the product information by the customer, resulting in the less effectiveness and accuracy of purchase decisions (Rosenblatt & Ruvio, 1996). Kuhert and Palmer (1991) points out that the consumers are more likely to have a sense of irritation and insecurity if the online website is disorganized, hard to use or has the possibility of information leakage. In addition, negative emotion might emerge during the absorption of product information, which leads to negative perception of the product itself and results in a buying behavior contrary to the seller's expectations. This is because one negative thought will give rise to more negative thoughts and affect the subsequent actions, resulting in more unpleasant emotions and stress and a negative cognitive processing. Therefore, this study probes into the impact of negative emotion on consumer decision-making process.

Explicit Concentration

Dunn et al. (1999) define concentration as the ability to control concerns about things and further explain that concentration is representative of individual behavior. Concentration emerges at a subconscious level when people focus their attention on the cognitive process (Cook & Campbell, 1979). As long as there is a certain degree of speed and accuracy in the task, it indicates that there is a certain degree of concentration (Schmidt et al., 2004). Gulas and Bloch (1995) pointed out customers are attentive and dedicated to a particular product during the purchasing process, which in turn improves the accuracy of their purchase decisions. In the light of this, the study regards concentration as one of the determinants to explore whether it affects customer's cognitive processing.

Explicit Risk

The concept of risk was first proposed by Haynes (1895) to signify the possibility of loss or failure. According to Williams and Heins (1985), the greater the gap between the predictions and actual outcomes, the greater the risk is. Thus, when consumers believe that their buying behavior may fail to meet their expected goal, they will have a perception of risk (Cox, 1967). According to Wang et al. (2016), social-based cues of the online buying context, such as product rating, affect consumers' risk assessment of the products before making a purchase decision. Thus, this study considers risk as one of the determinants to explore the influence of this factor on online customers' decision-making.

Research Methodology

Research Model

The purpose of this study is to explore the impact of product information on the antecedents to customer information processing in different online shopping situations. This study further strives to understand the impact of cognitive processing on customers' purchase intention by utilizing the following research model.

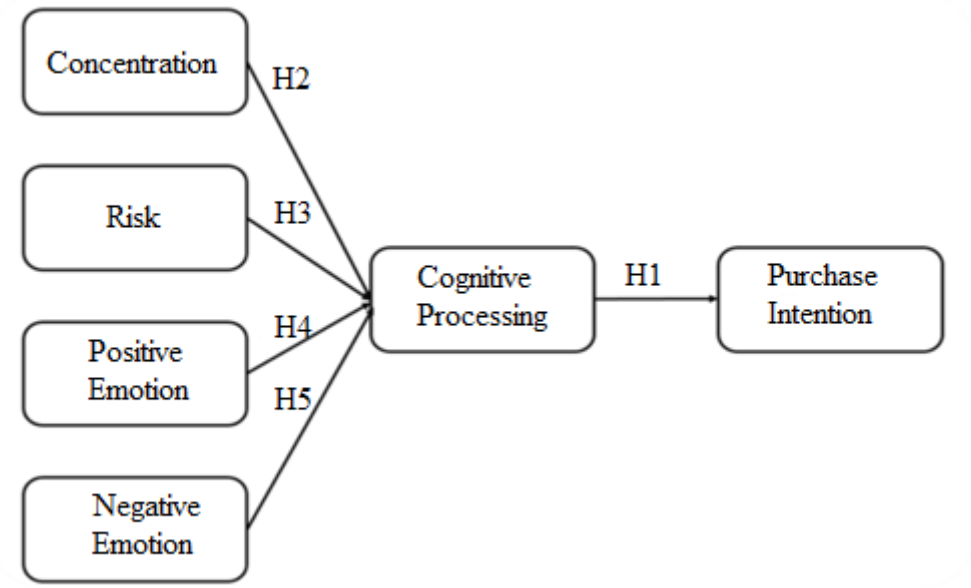

Figure1. Research model

Framework of Online Extrinsic Cue Design

Generally, consumers tend to make their decision based on three to five product attributes rather than all information (Olson and Jacoby, 1972; Brady et al., 2005). Therefore, this study chose three extrinsic product cues to explore the cognitive decision-making of customer. Firstly, we regarded ranking and sales as the first two dimensions of the extrinsic product cues based on Wang et al., (2016) and divided them into High Ranking (HR) / Low Ranking (LR) and High Sales (HS) / Low Sales (LS). Next, according to the concept of Country of Origin Effects (COO) by Ahmed and

Machold (2004), we took language as the third dimension of the extrinsic product cue to explore the difference between countries of origin images with different languages. After making the product information on the webpage available in simplified Chinese and English, we further divided the two shopping websites respectively into four situations of external cues: HR / HS, HR / LS, LR / HS, and LR / LS. The four situations with three dimensions were thereby designed in order to explore the impact of factors on the consumer cognitive processing under stimulation of different information cues of certain product as well as their impact on the enhancement of purchase desire. Table 1 lists the demographic information of the respondents.

Table 1. Demographic profile of respondents.

Variable	HR-HS (N=39)	HR-LS(N =39)	LR-HS(N=38)	LR-LS(N=44)	Total(N=160)
Male	27	31	30	31	119
Female	12	8	8	13	41

EEG experiment and measurement method

This study adopted event-related potentials with a measurement framework of 2 (High Ranking/Low Ranking) × 2 (High Sales/Low Sales). The experimental flow was divided into five steps and carried out in a sound insulation space. Step 1: researchers orientate the subjects to the whole experimental flow in order to maintain sample consistency. Step 2: the subjects wore the EEG instrument and calIPrated the eye tracker to ensure they could receive and transmit the signals accurately. Step 3: the experiment began by asking the subjects to stare at the "+" sign for about 10 seconds in order to improve their engagement in the experiment and ensure the integrity of the signals collected. Step 4: the subjects were randomly assigned to browse the product information pages of shopping websites with different extrinsic product cues: High Ranking/High Sales, High Ranking/Low Sales, Low Ranking/High Sales, and Low Ranking/Low Sales. Step 5: we collected the subjects' questionnaires. In order to encourage the subjects to carefully fill in the questionnaires, this study offered the subjects a bonus of about 4 US dollars after confirming that the EEG and eye movement data was complete and the questionnaires were valid.

Electroencephalogram (EEG) measures brain activity by placing devices with electrodes on subjects' scalps and scanning the signals generated by these electrodes. EEG can obtain a complete record of brainwaves without any invasion into the human body (Fell et al., 1999; Mizoguchi et al., 2002). Therefore, this study utilized EEG for brainwaves collection to ensure high resolution and accuracy for the data collected.

In terms of experimental flow design, this study designed the tasks using E-prime software, which supports stimuli such as graphics, text, and video. In addition, as E-prime software allows connections with external instruments, it can be connected to EmotivTestbench of the Emotiv EPOC using an RS232 cable to obtain the brain activity data of the subjects and the experiment marker data by E-Prime. Accordingly, EEGLAB in MATLAB was used to analyze subjects' engagement with and risk response to the different cue situations of shopping websites by observing the frequency spectrogram in EEG.

In terms of Emotional frontal asymmetry analysis in EEG, this study mainly referred to the research by Ma et al., (2014), Yang et al., (2007), and Ferree et al., (2001). As theβ waves (13-

30Hz) at "conscious level" is quite active during thinking and emotional frontal asymmetry often occurs in the frontal cortex, this study chose the corresponding brain points as AF3, AF4, F3, F4, F7,F8.

Finally, eye movement (gaze) data were collected using a commercial remote MirametrixS2 eye tracker in order to analyze the effect of cognitive processes. We separate the two cues and analyzed the gaze data and processing time. The collected data were analyzed using established algorithms. Various quantitative metrics were extracted to characterize the recorded gaze patterns (Voisin, Sophie et al., 2013).

Questionnaire design

All of the measures was applied a seven-point Likert scale, with ranged from strongly disagree (score of '1') to strongly agree (score of '7'). Among them, the measures in this study were all adopted from existing measures. To preserve the richness of each construct, all of the constructs were measured with a multipleitem scale. Moreover, measurement items were adapted from the literature. The first part is mainly to understand the basic information of customers. The second part is the scale of Risk, which is mainly referred to Pappas (2016). The third part is the scale of Concentration, which is based on the contents of Krawietz (2007). The forth part is the scales of Positive and Negative emotions, which is modified from . Verhagen & van Dolen (2011).

Pretest

Before the experiment, five experts from information management and technological management related fields (three PhDs and two experts in the industry) were requested to first perform the pretest. Thirty participants were invited to undergo the pilot test. The experimental process is in line with the formal experiment. Results of reliability shows that the Cronbach's α of constructs all exceed 0.7 (Nunnally, 1978). In questionnaire validity, the indicator loading all exceeded 0.5 (Fornell & Larcker, 1981).

Data Analysis of EEG

In this study, EEGLAB was used to compare the brain waves, and the position was determined and matched. This study found that subjects watched the page, β wave (13-30Hz) are concentrated in the brain prefrontal position. Figure 1 is the average power graph of the beta-wave distribution of the brain while the subjects received different language websites with different product cues. We can realize the cue effects of four different scenarios on the average power.

In Figure 2, gray lines are as right-brain waves, and black lines are as left-brain waves. If the gray line is higher than the black line, the subjects' emotions are inclined to be negative. On the contrary, they have more positive emotion. The results show that in the high ranking/high sales, high ranking/low sales and low ranking/ high sales, the subjects on the simplified website are inclined to have more negative emotions. Besides, only in the low ranking/low sales, the subjects on the English site are inclined to have more negative emotions.

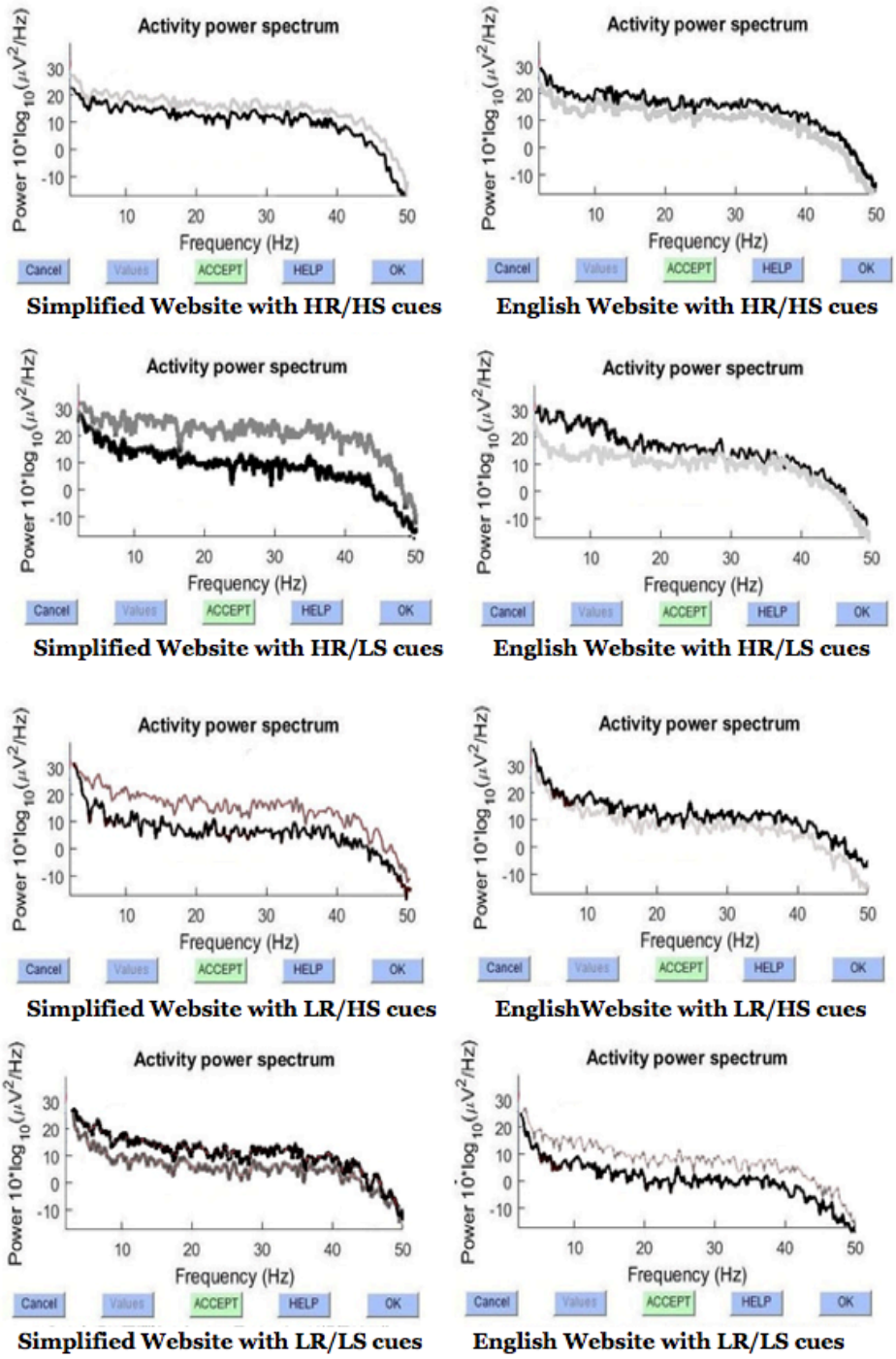

Figure 2. Spectral analysis results for different language sites.

Data Analysis of SEM

A two-step approach, recommended by Anderson and Gerbing (1988), was adopted for the data analysis. The first step involves the analysis of the measurement model and the second step

tests the structural relationships among the latent constructs. The aim of the two-step approach is to establish the reliability and validity of the measures before assessing the structural relationship of the model. SmartPLS 3.0 was used because it allows latent constructs to be modeled as formative or reflective indicators. PLS places minimal restrictions on the measurement scales, sample size, and residual distribution (Chin & Newsted, 1999).

Measurement Model

The second order construct (i.e., loyalty) was approximated using the approach of repeated indicators suggested by Chin et al. because it is the easiest approach to implement (Chin, Marcolin, and Newsted, 1996). In this approach, a second order construct is directly measured via observed variables for all of the first order constructs. "While this approach repeats the number of manifest variables used, the model can be estimated using the standard PLS algorithm. This procedure works best with equal numbers of indicators for each construct" (Chin et al., 1996, Appendix).

The adequacy of the measurement model was evaluated based on the criteria of reliability, convergent validity, and discriminant validity. Reliability was assessed based on the composite reliability values. Our measurements show that: (1) all indicator loadings should be significant and exceed 0.7 and (2) the AVE for each construct should exceed the variance according to the measurement error for that construct (i.e., the AVE should exceed 0.50). Table 3 shows that all of the items exhibit a loading higher than 0.7 on their respective constructs.

Discriminant validity was examined by using the following three tests. First, the cross factor loadings indicate that there exists good discriminant validity because the loading of each measurement item on its assigned latent variable is larger than its loading on any other construct (Chin, 1998). Second, the correlations among the constructs are all well below the 0.85 threshold (Kline, 1998), suggesting the existence of discriminant validity. Third, the square root of the AVE from the construct is much larger than the correlation between the construct and other constructs in the model. This also demonstrates the existence of discriminant validity (Fornell & Larcker, 1981).

Structural Model

This study further tested the structural paths of the models among four cue conditions of 2×2: High Ranking/High Sales, High Ranking/Low Sales, Low Ranking/High Sales, and Low Ranking/Low Sales.

In the High Ranking/High Salescategory, there are two independent variables that can positively affect cognitive processing: Risk (β=0.463, $p<0.01$) and Positive Emotion (β=0.339, $p<0.01$); cognitive processing has a positive effect on impulse purchase (β=0.586, $p<0.01$).

In the High Ranking/Low Salescategory, there are three independent variables thatcan positively affect cognitive processing: Engagement (β=0.273, $p<0.05$), Risk (β=0.354, $p<0.01$) and Negative Emotion (β=0.422, $p<0.001$);cognitive processing has a positive effect on impulse purchase (β=0.66, $p<0.001$).

In the Low Ranking/High Salescategory, there are three independent variables thatcan positively affect cognitive processing: Engagement (β=0.504, $p<0.05$), Risk (β=0.626,

p<0.05), and Negative Emotion (β=0.667, p<0.001);cognitive processing has a positive effect on impulse purchase (β=0.663, p<0.001).

In the Low Ranking/High Salescategory, there is onlyone independent variable that can positively affect cognitive processing: Negative Emotion (β=0.706, p<0.001);cognitive processing has a positive effect on impulse purchase (β=0.641, p<0.001).

In sum, the research model accounted for 61.5% to 79.2% of the explained variance in impulse purchase. Therefore, the fits of the four conditions models are acceptable. The results indicate that different cues in online shopping can have differenteffects on consumers' buying decisions.

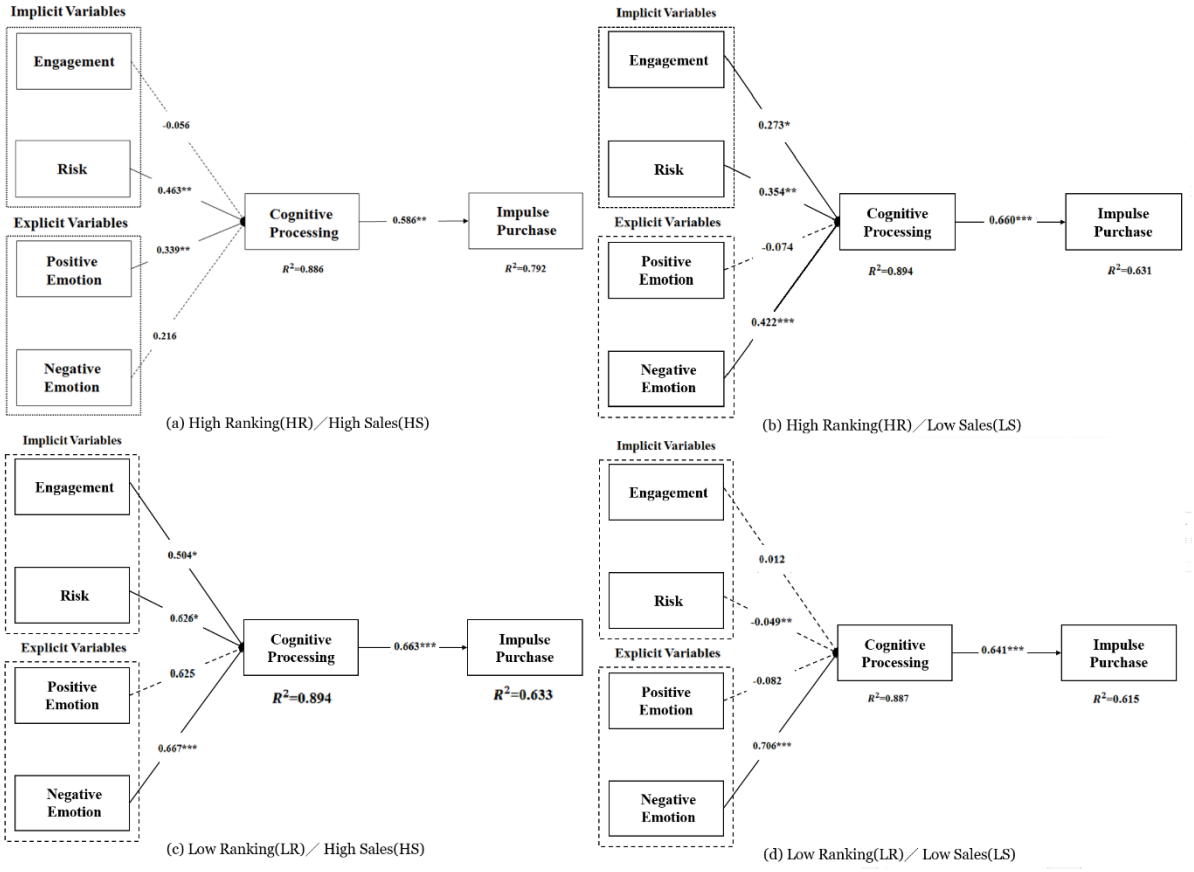

Figure 3. SEM analysis of the research model.

Conclusion

This study reports the preliminary findings of the experiment design using different language websites with two extrinsic product cues—ranking and sales—to explore the effects of product-related cues on consumers' purchase decisions. The valid data collected from 160 customers provide strong support that different extrinsic cues, including country of origin, ranking, and sales, stimulate different emotional responses at specific sites. A fair comparison of average power graphs (shown in Figure 2 and Figure 3) was presented, and the key conclusions were:

First, consumers are simultaneously exposed to multiple extrinsic cues, and they usually process each product cue in relation the others. We designed the measurement of three different cues (country of origin, ranking, and sales) with high- or low-scope in order to test the positive or negative inferences evoked by different cues. Second, past research has typically only used explicit factors to design measurement. This study uses implicit factors, analyzing EEG data to explore the implicit effects on online purchase intention. The insights from the findings can benefit designers and marketers in implementing more effective marketing strategies.

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行政院國家科學委員會補助國內專家學者出席國際學術會議報告

2018 年 08 月 30 日

報告人姓名	吳雅鈴	服務機關及職稱	淡江大學資訊管理系 副教授
會議時間地點	2018/8/14-2018/8/29 **New Orleans, USA**	本會核定補助文號	MOST 106-2410-H-032-025
會議名稱	(中文) 第 24 屆美洲資訊系統國際研討會議 (英文) 24th Americas Conference on Information Systems (AMCIS 2018)		
發表論文題目	(中文) 行動遊戲化設計之成效評估 (英文) Implementation and Evaluation of Mobile Gamification Design for Effective Performance		

報告內容應包括下列各項：

一、參加會議經過

The conference was held in **New Orleans, USA**. During the five-day seminar, many tracks of IS study were held. In this year, I was not only a reporter but also a chair. I had more chance to interact and conduct deep discussion on several important topics on Social Influence.

二、與會心得

In today's society, online shopping has become a prevalent part of the average consumer's shopping experience. One of the disadvantages of online shopping is that consumers cannot directly touch or observe the products to learn about their function and content. Therefore, it is critical that online sites present products in a way that embodies all kinds of cues in order to facilitate consumers' decision-making Countries around the world are developing both infrastructures to facilitate the development of service quality and strategies to enhance the utilization of the developed technologies.

三、建議

There is an important committee related to the research of IS communications technology. This group involves academics from Europe, Australia, Canada, America, Asia, etc. We will keep interactive relationship with this group.

附件六

科技部補助專題研究計畫出席國際學術會議心得報告

日期：108 年 08 月 28 日

計畫編號	MOST 107-2410-H-032-039		
計畫名稱	探討跨境網購購買意圖之決定因素：自陳測量與腦波特徵之比較分析		
出國人員 姓名	吳雅鈴	服務機構 及職稱	淡江大學資訊管理系 副教授
會議時間	108 年 08 月 15 日 至 108 年 08 月 17 日	會議地點	Cancún, México
會議名稱	(中文)第 25 屆資訊系統之美洲研討會 (英文) Twenty-fifth Americas Conference on Information Systems(AMCIS 2019)		
發表題目	(中文)飢餓行銷策略與顧客情緒於購買行為之成效 (英文) The Effects of Hunger Marketing Strategy and Customer Emotion on Purchase Behavior		

一、 參加會議經過

The conference was held in Cancún, México. During the three-day seminar, many tracks of IS study were held. In this year, my two papers were accepted by the AMCIS. I had more chance to interact and conduct deep discussion on several important topics on e-business.

二、 與會心得

Hunger marketing is one of marketing techniques i.e. commodity suppliers intentionally lower yield to control supply-demand relation, create a false front of short supply, and reach the purpose to arouse consumers' internal desire. This study aims to explore the fitted relation between mental process and information presentation under scarcity of the information stimulation in different products. Countries around the world are developing both infrastructures to facilitate the development of service quality and strategies to enhance the utilization of the developed technologies.

三、 發表論文全文或摘要

Full paper

四、 建議

There is an important committee related to the research of e-business technology. This group involves academics from Europe, Australia, Canada, America, Asia, etc. We will keep interactive relationship with this group.

五、 攜回資料名稱及內容

1.出席證明

六、其他

107年度專題研究計畫成果彙整表

計畫主持人：吳雅鈴			**計畫編號：**107-2410-H-032-039-		
計畫名稱：探討跨境網購購買意圖之決定因素：自陳測量與腦波特徵之比較分析					
成果項目			量化	單位	質化 （說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等）
國內	學術性論文	期刊論文	0	篇	
		研討會論文	0		
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	
		其他	0	篇	
國外	學術性論文	期刊論文	1	篇	[1]Wu, Ya-Ling* (2018) “Gamification Design: A Comparison of Four M-Learning Courses,” Innovations in Education and Teaching International, 2018, Vol. 55, No. 4, pp. 470-478. (SSCI, Impact Factor: 0.667)
		研討會論文	3		[1]Wu, Ya-Ling, and Lai, S.-T., “The Effects of Hunger Marketing Strategy and Customer Emotion on Purchase Behavior,” Proceedings of the 25th Americas Conference on Information Systems 2019 (AMCIS 2019), Cancún, México, August 15-17, 2019. [2]Wu, Ya-Ling, and Sun, Y.-H., “Re-conceptualizing Scarcity Effects on Desirability for Hunger Marketing,” Proceedings of the 25th Americas Conference on Information Systems 2019 (AMCIS 2019), Cancún, México, August 15-17, 2019. [3]Wu, Ya-Ling, and Hsiung, C.-Y., “Understanding Online Produce Cue Effects on Consumer Behavior: Evidence from EEG Data,” Proceedings of the 24th Americas Conference on Information Systems 2018 (AMCIS 2018), New Orleans, USA, August 16-18, 2018.
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	

		其他	0	篇	
參與計畫人力	本國籍	大專生	0	人次	
		碩士生	3		本計畫需要大量蒐集實驗資料，故需要三名碩士級研究助理，他們最高學歷皆為資訊管理相關領域之大學畢業生，以協助本計畫之資料檢索、實驗活動執行、文獻探討、以及一般事務性工作(如：報帳等)
		博士生	0		
		博士級研究人員	0		
		專任人員	0		
	非本國籍	大專生	0		
		碩士生	0		
		博士生	0		
		博士級研究人員	0		
		專任人員	0		
其他成果 （無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。）					