

ORDER EFFECTS ON CONSUMER PRODUCT CHOICES IN ONLINE RETAILING

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Abstract

As a shopping interface, the Web possesses certain unique characteristics that necessitate a reevaluation and a new investigation of online consumer behaviors. One of the unique characteristics of online shopping is that consumers evaluate products and make judgments based on the product information presented on web pages, which enable the design of product list on a web page to have a great potential influence on consumer's product choice. However, relatively little has been written about the order effects of product list on consumer choice in online retailing settings. The purpose of this study is to investigate how and why product's presentation order in a list affects consumer's selection of products. Specifically, this study proposes that the serial position of a product in a list could affect the probability of this product being selected by consumers (position effect), and sorting the products by product configurations in a descending order, an ascending order, or a random order could affect the importance of product configuration as well as relative importance of product configuration/price in consumer's evaluation and choice (sorting effect). Implications of these two types of order effects for theory and practice are discussed.

Keywords: online retailing, order effect, position effect, sorting effect, decision making.

1 INTRODUCTION

A unique characteristic of online shopping is that consumers evaluate products and make judgments based on the product information presented on web pages (e.g. Hong & Thong & Tam 2004a, Tam & Ho 2005). Subsequently, the web interface design might play a critical role in affecting consumer online shopping behaviour because consumers often adapt their decision making strategies to specific situations and environments (Bettman & Luce & Payne 1998) and make choices based on the information content displayed on web pages. One common design which appears in nearly all the online retailing websites is the product list on online retailers' websites, where a number of products are displayed together to allow online consumers to search for and choose from products (Diehl & Zauberma 2005). This product list may be the results of alphabetic listing (Diehl 2005), or exists because the website arranges options in the form of a list with the first item representing the most desired option (Tam & Ho 2005).

In online environment, product listing pages are relevant to all commercial websites selling products. The design of product list as a specific type of information format could be a potential determinant of consumer choice (Hong & Thong & Tam 2004a), given that consumer's preference is often ill-defined, unstable and particularly susceptible to information format in which the products are presented (Bettman & Luce & Payne 1998). Studying this effect is of significant importance because the design of product listing pages explains more than half of the variance in monthly sales on commercial websites (Lohse & Spiller 1998). This study focuses on how to arrange a list of products on a web page and how the product information presentation order affects online consumer decision making.

Two types of order effects from deliberately ordering products in a list might be potentially relevant to consumer decision making in online environment. The first is the position effect, which suggests that the serial position of a product in a list has a potential effect on consumer choice (Lohse & Spiller 1998). The cognitive psychology literature suggests that human attention is a limited resource and people tend to feel fatigued when they explore a long list of items (Hogarth & Einhorn 1992). Therefore, the position matters because consumers scan product information sequentially and their scanning is not exhaustive (Lohse & Spiller 1998). Another type of order effect is sorting effect from sorting products based on certain criterion in different ways. Sorting effect suggests that sorting products in different ways could influence consumers' perceptions of the importance weights on certain dimensions of the products (Haubl & Murray 2003, Cha & Aggarwal 2003). Studying sorting effect is important because, although relatively unordered environments still dominate online, personalization and customization technologies are among the most promising and imminent developments explored by both online marketers and researchers (Diehl 2005, Tam & Ho 2005). Although position effect and sorting effect have been identified in different research fields in somewhat similar contexts to designing product list on websites, relatively little has been written about these order effects of product list on consumer choice in online retailing settings. Order effects might manifest themselves in different ways in online retailing settings given the dynamic nature of the environment which can change quickly and inexpensively (West et al. 1999). From an online retailer's perspective, the electronic environments differ from normal retail environments in at least two aspects: first, the electronic environments allow retailers to not only observe what is purchased, but also what information is examined on the way to purchase (West et al. 1999); second, a retailing website can be conceptualized as a stimuli-based decision-making environment and in a sense every page click represents a persuasion opportunity for retailers (Tam and Ho 2005).

The purpose of this study is to enhance our understanding of order effects and its effectiveness in influencing consumer's choice behaviour. Although many studies have investigated online shopping behaviour from a consumer's perspective, which largely focused on how to attract consumers to online stores and how to gain their satisfaction and loyalty, we approach this issue from an online retailer's perspective and focus on how to design a product list in order to influence consumer's behaviour. Our

special interest is the “sorting effect”—the change in likelihood that relative high/low configuration products in a list are chosen when products are sorted by product configurations in a descending, ascending or random way. The product configuration refers to the technical specifications of a product’s non-price attributes. We also investigate the “position effect” given that few empirical studies have reported this effect in e-commerce settings, and more importantly, the possible compound between sorting effect and position effect. Such investigations are important because accounting for the order effects in models that predict online consumer’s preference and choice can enable marketers to construct strategically product list driven by business objectives.

2 THEORETICAL BACKGROUND AND RESEARCH MODEL

One important element of online environments is the organization of information (West et al. 1999). For years, we have known that the organization of information could influence decision and choice from empirical studies in Information Systems (IS) literature (e.g. Benbasat & Dexter 1986) and marketing literature (e.g. Bettman & Luce & Payne 1998). Studies of online consumer behaviour have shown that the processing cost of product attribute information affects consumers’ perceptions on attribute importance (Lynch & Ariely 2000, Haubl & Murray 2003). The standard rationale here is that the organization of information can change the cost of searching for various types of information, which in turn can influence decision strategies (Bettman & Johnson & Payne 1990). For example, Lynch and Ariely (2000) created online wine stores that manipulated the processing cost of information and found that when quality information was easily accessed, this attribute grew in importance. In online environment, the design of product list as a specific type of information format could be a potential determinant of consumer’s choice. When consumers perform the directed learning of the stimuli to make choice decisions, consumers’ information processing outcome could be affected by the order in which information is presented (West et al. 1999, Tam & Ho 2005). This effect is termed “order effect” in this study. When studying order effect, two types of effects must be differentiated. The first type of order effect is ‘position effect’, which refers to the impact from an item’s ‘position’ in a list. Particularly, the placement of an item at a certain position in a list may increase or decrease the likelihood that it will be chosen. Another type of order effect is ‘sorting effect’, which refers to the impact of ‘sorting’ methods of product information on individual’s judgment or choice when people are exposed to a list of options or items. More specifically, a list of options may be sorted in a descending way, or an ascending way based on certain criteria. Figure 1 illustrates how sorting effect together with position effect affect consumer’s choice.

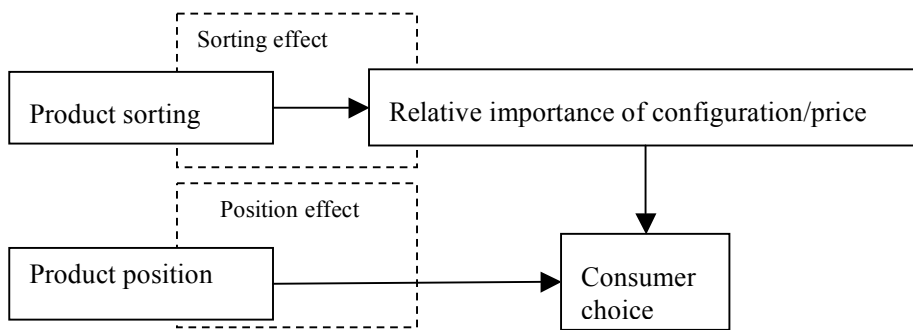


Figure 1: Mechanisms for order effects in online retailing

2.1 Position effect

The position effect, which was originally observed in cognitive psychology studies, suggests that when people are exposed to a list of items, those items listed in an early position might attract more attention because human attention is a limited resource and people tend to feel fatigued when they explore a long list of items (Hogarth & Einhorn 1992). Recently, this position effect has also been

reported in online shopping contexts. For example, Eastman (2002) found that Internet search engine users tend to browse through only the first few items on a long list of search results. Also, Tam and Ho (2005) found that items high up on a list attract more attention and are accessed more often than those further down the list in their study of web personalization.

Two theories support the position effect. First, according to the attention decrement paradigm, the position effect is viewed as resulting from a decrease in attention in performing sequential tasks (Jain & Pinson 1976). Items presented early in any list may help establish a cognitive framework or standard of comparison that influences interpretation of later items (Krosnick & Alwyn 1987). As they serve as anchoring points and are processed multiple times (Hogarth & Einhorn 1992), early items may be accorded deeper cognitive processing and special significance in subsequent judgment. Conversely, by the time respondents consider later items, their minds may be cluttered with thoughts about previous items, which may in turn prevent full consideration of these later items (Krosnick & Alwyn, 1987). One would imagine that subjects are more likely to “tune out” when there is cognitive overload. Second, the principle of satisficing is another related mechanism of position effect. The behavioural research suggests that consumers often exhibit the characteristic of cognitive miser by aiming to exert as little cognitive effort as possible while retrieving and processing information. In the extreme situation, consumers may selectively choose to ignore certain items to reduce the cognitive processing effort (Bettman & Luce & Payne 1998). Under satisficing strategy, alternatives are considered sequentially, in the order in which they are presented in the choice set. The values of the alternatives are compared to a predetermined cut-off level to see if this alternative qualifies. Since the alternatives are considered sequentially, which alternative is evaluated and considered can be a function of the order in which the alternatives are processed. Several studies on consumer behaviour in online environment have suggested a potential effect from serial position on consumer choice (e.g. Lohse & Spiller 1998, Tam & Ho 2005). In line with previous research, therefore, we hypothesize:

H1: When consumers are exposed to a list of products, the likelihood of a product being selected will be higher when it is placed in an earlier position than when it is placed in a later position.

2.2 Sorting effect

2.2.1 *Defining product configuration importance & relative importance of configuration/price*

People often perceive different attributes to have unequal impact on a decision and use statements about the “relative importance” or “weight” of attributes to characterize their own and other people’s decision (Goldstein, 1990). Some attributes are assigned a great deal of importance and have considerable impact on an evaluation, whereas others are weighted less heavily and have less impact on an overall evaluation. When consumers face market choices with a trade-off between price and several quality related attributes, they are likely to simplify such choices by construing the quality dimensions as one “meta-attribute” and by making their decision on the basis of price versus overall product quality (Kivetz, Netzer, & Srinivasan, 2004). In this study, we use “product configuration” to represent the technical specifications of a product’s non-price attributes. Previous research had defined product attribute importance as “a person’s general assessment of the significance of an attribute for products of a certain type (P.175) (Mackenzie, 1986)”. In line with previous research, the configuration importance refers to a consumer’s general assessment of the significance for product configuration in influencing purchase decisions. Accordingly, the relative importance of configuration over price refers to relative importance weights attached to product configuration and price when consumers make the purchase decisions.

2.2.2 *Sorted versus unsorted: the effect from Information processability*

According to the constructive preference approach, consumers tend to construct their preferences on the spot when product information are prompted and their importance weights attached to quality and price might be susceptible to the organization of information displays (Bettman & Luce & Payne 1998). A related theory is “the concreteness principle” (Slovic 1972). This theory proposed that

decision makers tend to use only that information which is explicitly displayed in a stimulus environment and process this information in the particular form in which it is presented because people often do not expend the cognitive effort necessary to transform information. The more concrete a dimension is the greater the ease with which information can be processed and the greater the likelihood it affects choice (Creyer & Ross 1997). Based on this principle, ordering products in a product list by their likely attractiveness to an individual in terms of certain attributes should render these attributes relatively more processable because the ordering makes certain product attributes more comparable and thus facilitate consumer's evaluations (Haubl & Murray 2003). Once an attribute's processability is enhanced, which may lead to an increase in the relative weight that consumers attach to the included attribute (Haubl & Murray 2003). In this study, we manipulate processing cost by sorting products based on product configurations. Sorting products by product configurations should make product configuration information more processable to consumers because this sorting method facilitates consumers' comparisons of product attributes (Diehl & Kornish & Lynch 2003). In turn, it makes processing configuration information easier and effortless. Based on the concreteness principle, this enhanced processability may lead to an increase in the relative weight that consumers attach to product configuration when making a decision. Therefore, we propose the following.

H2: When products are sorted by product configurations in a descending order, consumers will attach higher importance to product configuration than when products are ordered randomly.

2.2.3 Descending versus ascending: the effect from loss aversion

If sorting products by configurations could introduce higher weights to configuration relative to random list, then, should the products be sorted in an ascending way or a descending way, or either way will produce similar results?

One related theory which may account for the different impacts produced by descending sorting and ascending sorting is the notion of 'loss aversion'. Loss aversion suggests that value function is steeper for losses than gains. It means that the psychological impact of any given loss is bigger than that of an equivalent amount of gain (Tversky & Kahneman 1991). In the context of decision making when options have multiple attributes, loss aversion research in marketing has dealt mainly with price and quality trade-off. For example, Hardie et al. (1993) showed a clear evidence of loss aversion following the reference dependence model. They assumed on reference point for each attribute and report loss aversion in the multi-attribute space in the orange juice market (Hardie & Johnson & Fader 1993). Thus, if we arrange products in a descending order by product configurations, since consumers usually conduct pair-wise comparisons among the alternatives in a first to last fashion (Hogarth & Einhorn, 1992), they may compare products which appear later to those products which appear first, thus, the declining of product configurations may produce a feeling of "configuration loss" to consumers (Cha & Aggarwal 2003). Alternatively, if products are presented in an ascending order by configuration, applying the same logic, consumers may face a situation of "configuration gain". Based on the concept of loss aversion, the psychological impact of "configuration loss" is bigger than "configuration gain", which will result in a higher weight which consumers attach to configuration in a "loss" situation than in a "gain" situation. Hence, we propose the following.

H3: when products are sorted by product configurations, consumers will attach higher importance to configuration in a descending than in an ascending list.

2.2.4 The price-configuration correlation

Typically, a positive relationship between product quality and price exists in the real marketplace (Cha & Aggarwal 2003). That is, higher quality products tend to be higher priced. This assumption exerts a potential influence on the degree in which the sorting methods proposed in our study affect consumer choices because if product configuration is also positively correlated with price, sorting products based on product configurations in a descending way may also produce a somewhat descending list of price. In other words, consumers' perceptions on price importance are likely to be influenced by our

manipulation on product configurations as well. Then, will consumers' choices be systematically influenced by our manipulation if configuration and price are positively correlated?

In line with previous literatures on price/quality relationship, we use Spearman Rank Correlation Coefficient (R) to capture the strength of price/configuration correlation. In market place, the score of R might be between 0 and 1. When $0 < R < 1$, a descending list of products based on configuration is also a partial descending list of products based on price. We argue that the processibility of product configuration or price is higher in a 'complete' descending list than in a 'partial' descending list. Therefore, according to the principle of concreteness, although the importance of price might increase in a descending list based on product configuration (compared to random list) as well, this increase of the price importance may not be as significant as the increase of configuration importance. As a result, the relative importance of product configuration/price will be higher in a descending or an ascending list based on product configuration than in a random list. Let us represent increase in configuration importance as ΔC and increase in price importance as ΔP . We will add subscripts D, A, and R to represent descending list, ascending list, and random list, all based on product configuration. The increase of relative importance of product configuration/price (comparing descending list and random list) can be denoted as $\Delta C - \Delta P$. Based on the principle of concreteness, we have $\Delta C_D > 0$ and $\Delta P_D > 0$. In addition, as we assume that the rank correlation coefficient is smaller than 1, sorting the products based on configuration rather than price makes $\Delta C_D > \Delta P_D$. Therefore, we have $(\Delta C_D - \Delta P_D) > 0$, which supports our proposition that the relative importance of product configuration/price is greater in a descending list than in a random list.

Now, we consider the comparison between descending list and ascending list. A related mechanism is differential loss aversion for quality and price (Tversky & Kahneman, 1991; Hardie, Johnson, & Fader, 1993). Hardie et al. (1993) proposed that asymmetric price competition might arise from greater loss aversion to quality than to price. This differential loss aversion has been implicated in experimental tests of asymmetries in price and quality competition (Heath, Ryu, Chatterjee, & McCarthy, 1997) and more directly supported in models of scanner data (Hardie et al., 1993). In our study, we compare the increase of relative importance of product configuration/price in these two situations through the following equation: $(\Delta C_D - \Delta P_D) - (\Delta C_A - \Delta P_A)$. Recall that ΔC_D relates to a loss in product configuration, and ΔC_A relates to a gain in product configuration. Based on the loss aversion concept, $\Delta C_D > \Delta C_A$, that is, $(\Delta C_D - \Delta C_A) > 0$. In a similar way, $(\Delta P_A - \Delta P_D) > 0$. Thus, we have $(\Delta C_D - \Delta P_D) - (\Delta C_A - \Delta P_A) = (\Delta C_D - \Delta C_A) + (\Delta P_A - \Delta P_D) > 0$, which means that the increase of relative importance of product configuration/price in a descending list is greater than in an ascending list. Therefore, we propose the following.

H4: When products are sorted by product configurations in a descending order, consumers' perceptions on the relative importance of product configuration/price will be higher than when products are ordered randomly.

H5: When products are sorted by product configurations, consumers' perceptions on the relative importance of product configuration/price will be higher in a descending than in an ascending list.

2.2.5 *Sorting effect on consumer choice*

In ordered environments, there are possible confounding effect between the position effect and sorting effect. When the products are sorted based on product configurations, the positions of those products in a list are changed as well. In this case, the position effect and sorting effect may be interrelated. For example, if we sort the products in a descending list based on product configuration, and consumers do select products with higher quality, is it because consumers place higher weights on configuration and select products superior in configuration (sorting effect)? Or is it just because high configuration products are placed at the start of the list under this sorting method (position effect)?

To capture the sorting effect and remove the confounding effect from position effect, we shall control the confounding effect from product position by comparing consumer's preference for the product which is placed in the same position in the product list across different sorting methods. Accordingly, we will compare consumer preference for the 'middle' product in a list with odd number of products. For example, when we sort a list of 9 products by configurations in an ascending way or a descending way, the position for the 5th product remains unchanged. The consumer behaviour literature suggests that the increases in a consumer's reliance on one important attribute naturally leads to an increase in the likelihood of choosing the option superior on this dimension (Chernev 1997). Accordingly, we expect the influence from sorting products in different ways to be reflected in consumers' choices. That is, when consumers make trade-offs between product configuration and price, if they put more weights in certain dimension, those products superior in that dimension should be preferred. In case the relative importance of product configuration and price increases, consumers will be more likely to prefer those products with high configurations. Accordingly, we propose the following.

H6: When products are sorted by configuration in a descending order, consumers' preference for high (low) configuration products will be stronger (weaker) than when products are ordered randomly.

H7: When products are sorted by configuration in a descending order, consumers' preference for high (low) configuration products will be stronger (weaker) than when products are sorted by configurations in an ascending order.

3 RESEARCH METHODOLOGY

An experiment Web site was built to simulate the online shopping process. Nine digital cameras are displayed on this website, and participants will be asked to choose an alternative model that he/she is most likely to purchase. Digital camera information is real market data gathered from www.ecost.com, and product specifications were double-checked with the manufacturer. Minor revisions, such as change the product price from US dollars to local currency based on current exchange rate, were made. The brand of the digital cameras is controlled by only selecting products with the same brand. Among the nine products, there is no objectively dominating product in the product list.

Two experiments will be conducted to test the position effect and sorting effect respectively (the hypotheses and measures are presented in table 1). In Experiment 1(position effects), we focus on testing the existence of position effect in unordered environment. Specifically, we will test hypotheses 1 and 3 in this experiment. About 50 undergraduate students will be recruited for this experiment. In experiment 2 (sorting effect), we focus on the sorting effect in ordered environments. About 130 undergraduate students will be recruited to serve as subjects on a voluntary basis. The basic design is a 3 X 2 factorial design, with product sorting method (descending, ascending, and random) manipulated between subjects and product configuration category (high, low) manipulated within subjects. Product sorting method will be manipulated by presenting subjects with a list of nine digital cameras in descending order, ascending order, or 'random' order. One exception is that the 'random' order in this experiment does not refer to a complete random list. In fact, eight out of nine products are randomly ordered, except the 5th product option in descending/ascending list is also fixed in the 5th position of random list for comparing purpose. The product configuration will be measured by asking respondents to perform a categorization task that will indicate the extent to which the 5th product could be categorized as a member of a high versus a low configuration category of digital cameras. After the experiment, participants will be asked to fill in a post-experiment questionnaire.

We used direct subjective rating to measure the configuration importance and relative importance of configuration/price. Specifically, we measured the sorting effects by asking respondents to directly rate the importance of product configuration on a 100-point scale, which is similar to Mackenzie (1986)'s measure of 7-point subjective rating. Further, following the Goldstein (1990)'s relative importance measure, the relative importance of product configuration/price in this experiment was measured by an 11-point scale (1=price is significantly more important, 11=configuration is significantly more important), similar to Goldstein (1990). In addition, we measured respondents'

preferences for the 5th product across the six groups with a self-developed three-item scale: “what is your chance of buying a ___ (the 5th product) if you need to purchase a digital camera?”, “how much do you consider ___ as a desirable product”, and “how many other products appear in the product list are more desirable than ___”.

4 CONCLUSIONS

There is an increasing interest among human-computer interaction (HCI) researchers in identifying important website design features. This study focuses on one specific aspect of website design—how to deliberately arrange product list in a certain order to influence online consumer’s preference construction and choice. Grounded on the theories of cognitive psychology and context-dependent decision, this paper builds a research model to examine two types of order effects, namely, position effect and sorting effect in the context of online retailing.

The theoretical contribution of this study is manifold. First, building on the works of information format effects in decision making literature, we propose that sorting products by quality configurations will consequently change the importance of configuration as well as relative importance of configuration/price in consumer choice. Second, our study complements the current research by examining the differences between ascending order list and descending order list. Our study suggests that a ‘loss aversion’ situation can be created on a webpage by sorting products by configuration in a descending order. As a consequence, consumer’s perception of configuration importance or price importance will be changed. Third, regarding the position effect, it reveals that when consumers shop around for a good deal, even though the position says nothing informative about the business, it does affect consumer choice significantly. Consumer choice is subjected to position effect because of consumers’ limited cognitive capacity and their pursuing of satisfactory products. Also, our study contributes to the order effect literature by examining the underlying mechanism of position effects, namely, decrement attention effect and satisficing effect. Finally, our experiment will provide empirical evidences on the existences of position effect and sorting effect by controlling sorting effect in unordered environments and position effect in ordered environment respectively.

From a practical perspective, this study also has potential implications by providing online retailers with possible strategies in presenting product information and ‘implicitly’ influences consumers’ choices. Particularly, we provide online retailers with suggestions on attracting consumers’ attention to some specific products they wish to promote by placing them in an early position in the product lists and influencing consumer’s evaluation criteria in product judgment by sorting products in certain ways. As a result, online retailers can easily increase the attractiveness and the purchase likelihood of designated options.

The study has several potential limitations that should be noted. First, subjects in the experiments are students who might somehow react differently than “typical” consumers. However, the processes associated with decision making are likely to be similar between student subjects and “typical” consumers (Creyer & Ross 1997). Second, when consumers face a list of product options, contexts effects might also take place. How the order effects work with context effects may be an interesting future research direction.

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