DESIGNING PRODUCT LIST ON E-COMMERCE WEB SITES: THE EFFECT OF SORTING ON CONSUMER DECISION

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Summary

One revolutionary power of the online environments is that the display of information is very malleable, and under the control of the seller, buyer, or both (West et al. 1999). Against the background of the rapid growth of business-to-consumer electronic commerce, it becomes increasingly important to develop an understanding of how consumers process product information and make purchase decisions in digital marketplaces.

One common information display design which appears in nearly all the electronic shopping sites is the product list on e-commerce websites, where a number of products are displayed together to allow online consumers to search for and choose from. This product list may be the results from simple keyword searches or alphabetic listing (Diehl2005), occur naturally because of heterogeneity in consumer attribute weights (Diehl et al. 2003), exist because Web site arranges options in the form of a list with the first item representing the most desired option (Tam et al. 2005), or appear as the searching results from online recommendation agents (Haubl and Murray 2003).

This product list can appear in several ways. Taking online vendors who sell digital cameras online as examples, some of them allow consumers to sort products by various product attributes in both a descending order or an ascending order, as freely as consumers want (e.g. www.ecost.com); some provide consumers with sorting tools but only allow them to sort the products in either a descending order (e.g. www.circuitcity.com) or in an ascending order

(e.g. www.dbuys.com); there are also some other vendors who do not provide any sorting tools but present the product list in a alphabetic order of brand or model, which results in a somewhat random list in terms of product quality (e.g. www.bestbuy.com). Given that consumer's preference is often ill-defined, unstable and particularly susceptible to information format in which the products are presented (Bettman et al. 1998), if the design of product list as a specific type of information format could be a potential determinant of consumer choice (Hong et al. 2004), what will consumers response to the listed alternatives and select a particular offer? Will the design of product list, in particular, a descending list, an ascending list or a random list (in terms of certain product attributes), influence consumer choice?

There are extensive evidences from Information Systems (IS) literature (e.g. Benbasat and Dexter 1986; Hong et al. 2004), marketing literature (e.g. Diehl et al. 2003; Lynch and Ariely 2000), and psychology literature (e.g. Bettman et al. 1986; Kleinmuntz et al. 1993) show that the same information presented in different formats can result in different purchase decisions. However, the extant literature has not been particularly insightful on how consumers respond to different order of product list. Despite the intuitive postulation that items appearing in an early position of a list may draw more attentions from consumers (serial position effect), it is not evident whether and how different order of products in a list affect consumer decisions.

Drawing upon a number of theories from information systems, decision science and economics, this thesis manifests an effort to understand the role of sorted

product list on consumer decision making. The purpose of this research is to investigate how product list design (ascending list, descending list, and random list) influence consumers' perceptions on product quality and price importance as well as their consideration set formation. Specifically, we investigated consumers' decision making when they were exposed to three types of product lists, which were created as results of product sorting by quality in three different orders. Results from a carefully designed experiment showed that three product sorting orders (ascending, descending, and random) directly influenced consumers perceptions on importance of product quality and price, given that product quality and price are typically correlated. Further, product sorting was found to significantly affect the possibility of products being included in consumers' consideration set in product choice. In general, consumers are more likely to include products with higher quality and price in their consideration sets when they are exposed to a descending sorted product list.

Such investigations are important because the design of product listing pages explains more than half of the variance in monthly sales on commercial Web sites (Lohse et al. 1998). 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 (Diehl2005; Tam et al. 2005). Accounting for the sorting effect in models that predict online consumer's preference and choice can enable marketers to construct strategically product list driven by business objectives.

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Chapter 1 Introduction

1.1 Introduction

Despite its newness, e-commerce is revolutionizing many aspects of the transactions between consumers and firms (Hoffman 2000). The Internet has dramatically democratized direct networked access to vendors, putting them only a few mouse-clicks away from consumers. This revolution has resulted in a need to understand consumer behaviour online and how consumers interact with e-commerce Web sites because of the enormous impact from the use of IT and its consequential impact on market success (Straub and Watson 2001).

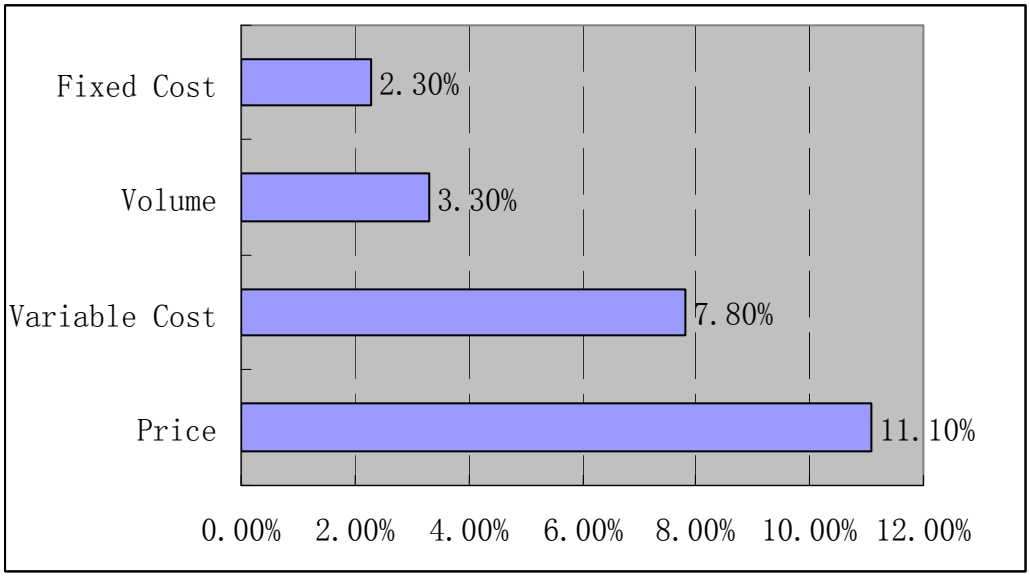
As a new marketing channel, the Internet differs from the traditional retail formats in many ways (Alba et al. 1997; Butler and Peppard 1998; Childers et al. 2001; Jiang and Benbasat 2004; Koufaris 2002). A unique characteristic of online shopping is that consumers evaluate products and make judgments based on the product information presented on web pages (e.g. Hong et al. 2004; Tam et al. 2005). Unlike traditional in-store shopping, where shopping information is conveyed to consumers through multiple channels, including the displays of products, store environment, and service (Schiffman et al. 1977), B2C e-commerce depends solely on Web interface to communicate such information. The rapid growth in e-commerce and the distinctiveness of this new marketing channel highlight the importance of understanding how consumers make decisions

in electronic shopping environments (Hong et al. 2004; Hong et al. 2005). From an online marketer's perspective, designing effective Web sites requires an understanding of how online consumers react to Web site designs (Song and Zahedi 2005). To a large extent, the promise of online shopping dependents on the design of Web interfaces and the way consumers interact with Web sites (Hoque and Lohse 1999).

With e-commerce growing steadily, online vendors are embracing the advantages of dynamic interface design to keep shoppers happy – and spending. According to Marn and Rosiello (1992), for a company with average economics, improving unit volume by 1% yields a 3.3% increase in operating profit, assuming no decrease in price. But, a 1% percent improvement in price, assuming no loss of volume, increases operating profit by 11.1%. Improvements in price typically have three to four times the effect on profitability as proportionate increase in volume (see Figure 1). Therefore, from an online vendor's perspective, how to make consumers spend more is critical to its profitability and bottom-line competition in the crowded electronic market. Despite many marketing strategies to encourage consumers to buy a larger quantity of products, encouraging consumers to shop for "premium" or high-end products also significantly contributes to the profitability. Ceteris paribus, high-end products often bring in more profits for both retailers and manufacturers. A story in Business Week reported how Samsung achieved significant profit increase in China market a few years ago. According to Ihlwan and Roberts (2002), China used to be the shortcut to hell for ambitious managers at Samsung since they pushed entire product lines to China market. However, soon after the new CEO took the position, Samsung's marketing

strategy was revised by concentrating on top-of-the-line electronic products. Those high-end products gained more profits for Samsung itself as well as its dealers and the profits soared 70% for the year of strategy changed. In e-commerce, how to encourage consumers to shop for products with higher quality could be a desirable technique for online vendors. Our study, therefore, attempt to demonstrate that, carefully designing a product list in certain ways can help online vendors to achieve this goal.

1% Improvement in … →…Creates Operating Profit Improvement of



* Based on average economics of 2,463 companies in Compustat aggregate

Figure 1. Comparison of Profit Levers

1.2 Product List Design on Electronic Shopping Sites

One common information display design which appears in nearly all the electronic

shopping sites is the product list on online vendors' Web sites, where a number of products are displayed together to allow online consumers to search for and choose from products (Diehl et al. 2005). This product list may be the results from simple keyword searches or alphabetic listing (Diehl2005), occur naturally because of heterogeneity in consumer attribute weights (Diehl et al. 2003), exist because Web site arranges options in the form of a list with the first item representing the most desired option (Tam et al. 2005), or appear as the results of search in online recommendation agents (Haubl and Murry 2003). Electronic shopping sites often organize product list in a tabular form, with each row corresponding to an alternative and each column to an attribute on which the alternative is described (Kleinmuntz et al. 1993). Publications like consumer reports use this organization for product comparisons.

One way to encourage consumers to select high-quality products is increasing consumers' perception on quality importance or reducing their price importance or sensitivity in judgment and choice. This could be achieved by making product quality information easier to search and process (Lynch and Ariely 2000). Providing a product list sorted based on quality is one method to make quality information more processable. However, many electronic shopping sites fail to provide adequate function on quality sorting. Some Web sites do not provide any sorting function (see Appendix C-1), while some only provide functions which allow consumers to sort products by price, not quality (see Appendix C-2). Among those Web sits which provide sorting functions related to product quality, they allow consumers to either sort by brand or manufacturer, by customer ratings on quality or by popularity (see Appendix C for examples). However, consumers

often do not fully trust the customer ratings on electronic shopping sites because they do not know whether those ratings truly come from real customer evaluations and consumers often have own evaluations significantly different from other consumers who rated the products. In addition, the popularity rating is not a good indicator of product quality because a “star buy” model does not mean it has high quality (configuration). Some electronic shopping sites could generate personalized product recommendations in the form of a list in which alternatives can be sorted by most of the key attributes of products (e.g. Yahoo! Shopping Site, Appendix C). However, although consumers are allowed to select the most important quality attribute for them by which products are sorted, a single quality attribute can not adequately represent the overall quality. In sum, sorting functions mentioned above might not sufficiently increase consumer’s perceived quality importance. In this study, we propose that products can be sorted by quality attributes in a hierarchical way, in which products are first sorted by the most important attribute perceived by consumers, and then the second most important attribute, etc. It is conjectured that the hierarchical sorted list by quality might be a close representation of product overall quality levels and can be easily recognized by consumers. We expect hierarchical sorted list by quality could increase the quality importance in consumer judgment and choice and thus encourage them to shop for products with higher quality level.

If this kind of sorted list does affect consumer decision making, the next question is: should we sort product list in an ascending way or descending way? Some electronic shopping sites allow consumers to sort products by various product attributes in both a descending order or an ascending order, as freely as consumers

want (e.g. www.ecost.com); some others provide consumers with sorting tools but only allow them to sort the products in either a descending order (e.g. www.circuitcity.com) or in an ascending order (e.g. www.dbuys.com, www.jr.com); there are also some other e-tailers who do not provide any sorting tools but present the product list in a alphabetic order of brand or model, which results in a somewhat random list in terms of product quality (e.g. www.bestbuy.com, www.buy.com). Given that consumer's preference is often ill-defined, unstable and particularly susceptible to information format in which the products are presented (Bettman et al. 1998), if the design of product list as a specific type of information format could be a potential determinant of consumer choice (Hong et al. 2004), what will consumers response to the listed alternatives and select a particular offer? Will the design of product list, in particular, a descending list, an ascending list or a random list (in terms of certain product attributes), influence consumer choice?

1.3 Limitations of Current Literature

Many traditional models of consumer choice assume that a consumer's tastes are well articulated, and much likes psychophysical functions. A more recent evolving view started from about three decades ago suggests that for some kinds of preference, consumers are often constructing their preference on the sport and adapt their decision making strategies to specific situations and environments (Hoeffler and Ariely 1999). In electronic shopping context, consumers' purchase decision is likely to be affected by online environments due to electronic shopping site's ability to manipulate the context in which the choice is made (Mandel et al.

2002). Consumer choice, whether in a physical or electronic environment, seems increasingly to be jointly determined by both a consumer's preference and the features of the shopping environment (West et al. 1999).

One revolutionary power of the online environment is that the display of information is very malleable, and under the control of the seller, buyer, or both (West et al. 1999). There are extensive evidences from Information Systems (IS) literature (e.g. Benbasat and Todd 1985; Benbasat and Dexter 1986; Hong et al. 2004), marketing literature (e.g. Diehl et al. 2003; Lynch et al. 2000), and psychology literature (e.g. Bettman et al. 1986; Kleinmuntz et al. 1993) show that the same information presented in different formats can result in different decisions.

According to Bettman et al. (1986), there are three potential benefits associated with providing product information in certain format: improved decision making, reduced prices and enhanced product quality. Overlooked in all work to date on the effects from information format on decision making is the fact that those studies have largely focused on the effects on consumers' decision quality (Diehl 2005; Haubl and Trifts 2000; Speier and Morris 2003) and price (Garbarino and Slonim 1995; Kosenko 1989; Lynch et al. 2000; Russo 1977). Despite the intuitive plausibility of the notion that making quality information more processable should increase the quality importance, there have been few studies demonstrating the effects of information format on decision criteria: especially the importance of product quality. Given that consumers typically perceive product quality and price as correlated (Cha and Aggarwal 2003), and that manipulations

of information format could simultaneously influence consumers' perceptions on both product quality and price, ignoring the role of quality might reduce the value of theories in explaining consumer choice behaviours.

The effects of different design of product list on consumer decision making and choice are particularly difficult to understand because the arrangement of product list could produce several different effects simultaneously and those effects may compound each other in influencing decision making. Those effects consist of ordering effect, information processing cost effect, and serial position effect (order effect). Although the focus of this study is more on the first two effects, the third effect, that is, serial position effect, is also briefly reviewed since sorting product list unavoidably change the positions of products in a list and thus bring in serial position effect. We also test the serial position effect in this study for the control purpose.

The first effect is ordering effect, which refers to the effects from arranging the positions of all the products in a list by certain product attributes (e.g. price, configuration) based on certain rules (e.g. descending, ascending). Unavoidably, ordering products not only change the positions of each individual items in a list (order/serial position effect), but also the overall trend of a list of products. For example, online vendors often arrange the products based on their prices. As we compare the two effects discussed above, we can see order effect/serial position effect could be a by-product of ordering effect. For the clarity of our discussion, the ordering effect discussed in this study only focus on the effects from arranging products based on certain rule (e.g. ascending, descending) but not include

order/serial position effect. Studies on ordering effect in E-commerce are almost scant. Among the few exceptions including the analysis of ordering effects (e.g. Diehl et al. 2003; Diehl2005), they did not differentiate order/serial position effects from ordering effect. Thus, their results could be confounded by serial position effect. For example, if subjects selected a higher quality option from a ordered (declining on quality) list, this result could be attributed to either changes in subjects' perceptions on quality importance, or changes in attentions of subjects being drawn to the upper list of the options. Further investigations are needed to systematically examine ordering effect while not ignoring the serial position effect.

The second effect is information processing cost effect. The design of product list could have a potential influence on how consumers compare product attribute information and make decision. For example, Lynch and Ariely (2000) systematically vary the design of online stores to alter information search costs. When the online retail store design made quality information easier to search and compare, respondents became less price sensitive. Haubl and Murray (2003) found that when a product attribute was included in a comparison matrix of recommendation agents, this attribute become more processable when respondents compare products and hence more prominent in consumers' purchase decision. However, although several studies have shown that changes of information search costs might affect how consumers compare product attributes and hence their final choice, whether solely sorting products by certain attributes could lead to this effect remains unknown.

The third effect related to product list is serial position effect, which generally refers to the effect from the position of one product in a list on the chance of this product being attended, memorized, recalled, short listed, or finally selected. This effect has a long tradition of being studied in psychology literature and termed "order effect" generally. In E-commerce literature, this effect has also been observed and recognized and termed "serial position effect". For example, in comparison shopping, previous studies showed that vendor's serial position in a comparison list was found to be a significant none-price factor affecting consumer choice such that vendors listed in the first screen or the first position of a list enjoyed a significant advantage (Smith and Brynjolfsson 2001). Meanwhile, paid inclusion and paid placement in search result of search engines is increasingly a common practice in internet marketing. Although this effect is relatively well understood, it could confound with the second effect, namely, ordering effect, and make it difficult to explain effects from product list design on decision making.

1.4 Research Purposes & Scope

The purpose of this study is to enhance our understanding of the effects of sorting product list by product quality on consumer decision making and its effectiveness in influencing consumer choice behaviour. Specifically, we attempt to answer the following research questions: 1) how does sorting products by product quality in different ways (ascending, descending, and random) affect consumer choice from a list of products? We suggest that sorting products by quality in certain ways will affect consumers' perceptions on importance of product quality and relative importance of quality over price, and the changes in the importance perceptions

will in turn influence consumer choice. 2) Why sorting products by product quality in different ways could lead to changes in importance perceptions and choice? We will explain this phenomenon based on theories and empirical evidences from IS, psychology, and economics literatures. We term the overall effects from sorting products by quality in three different ways as “sorting effect”. It is an overachieving concept subsumes order/serial position effect, ordering effect, and information processing cost effect.

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. Designers of commercial web sites face a myriad of decisions about how to organize the present product information, often without knowing how their design influences consumers’ decision making processes and subsequent choice. The goal of this research is to investigate how product list design (ascending list, descending list, and random) influence consumers’ purchase decisions. In this study, product quality attributes refers to the technical specifications of a product’s non-price attributes. Taking digital camera as an example, megapixl, optical zoom are important quality attributes of a digital camera. Product quality is the combination of all those attributes, i.e., the overall configuration of the product. Accordingly, the perceived product quality refers to consumers’ subjective evaluation of the overall excellence of the product quality. Further, in line with previous research, the quality importance (QI) (price importance (PI)) refers to the importance of product quality (product price) in

influencing purchase decisions (cf. Kalra and Goodstein 1998). Accordingly, the relative importance of quality over price (RIQP) refers to relative importance weights attached to product quality over price when consumers make the purchase decisions. RIQP might be the result of QI divided by PI.

This study includes a pre-test via survey and a main study via laboratory experiment. The pre-test survey serves two purposes: 1) to identify the important product attributes and the sequence in terms of importance level. This procedure enables us to design sorted product list which can best represent products' overall quality levels. 2) To provide subjective overall quality ratings of each products in the main study. The main study was carried out via a carefully designed laboratory experiment. An experimental electronic shopping Web site was developed with ASP.NET to manipulate the three product list order and simulate a typical online shopping task. A following questionnaire was distributed to all participants to measure their decision outcomes.

After reporting demographics information and carefully checking manipulation and controls, a series of ANOVAs were conducted to test participants' responses on quality importance, price importance, and relative importance of product quality over price. After that, a hierarchical linear model (HLM) method was employed to test the effects of product sorting on consumer's consideration set formation.

Such investigations are important because the design of product listing pages explains more than half of the variance in monthly sales on commercial Web sites

(Lohse et al. 1998). 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 (Diehl2005; Tam et al. 2005). Accounting for the sorting effect in models that predict online consumer's preference and choice can enable marketers to construct strategically product list driven by business objectives.

1.5 Research Contributions

This thesis seeks to contribute and benefit to both theoretical and practical arenas. From theoretical perspective, it can potentially contribute to the existing literature on consumer decision making in electronic shopping in Human-Computer Interaction and E-Commerce literature.

- It demonstrates that consumer decision making in electronic shopping environments might be influenced by the information format of presentation, and product list design as one specific type of information format could affect consumer choice.

- Building on the theories from decision science and economics literature, we explain how product sorting affects consumer choice of products from a list. In particular, we demonstrates that consumers' perceptions on quality importance, price importance, and relative importance of quality over price might be affected by product sorting, and these changes in importance perceptions will in turn lead to changes in consumer formation of

consideration set.

- Based on an extensive review of order effects, ordering effects, and information processing cost effects, we integrate theories from psychology, marketing, and economics, our study complements the current research by examining the differences between ascending order list and descending order list. Our finding suggests that a ‘loss aversion’ situation can be created on a webpage by properly arranging product orders in a list.

From a practical perspective, this study has implications for online vendors and marketers on how to construct strategically product list driven by business objectives. Our findings suggest that providing consumers with a descending list of products based on product quality could make consumers more quality (quality) sensitive. Applying the finding, electronic shopping sites can easily increase the attractiveness and purchase likelihood of designated options. For example, if used appropriately, they can “implicitly” promote high quality items when high-quality items are more profitable by designing a descending list of products, or vice versa. Because the presentation order has the advantage of being easily controllable by online vendors, this consequence has immediate practical implications.

1.6 Thesis Organization

This thesis comprises seven chapters.

Chapter 1 introduces the problems in product list design in terms of sorting and

illustrates the importance of our study. It underlines the strategic significance of product list design and introduces our research questions. Further, it provides an overview of the whole thesis.

Chapter 2 presents an extensive literature review on effects from product list design. Three important effects related to product list design including order effects, ordering effects, and information processing cost effects were reviewed. Limitations of current research were addressed.

Chapter 3 introduce a research model to address the issue of how sorting product list in three orders (descending, ascending, and random) affects consumer decision making. A set of hypotheses regarding sorting effects on consumer's perceptions on quality importance, price importance, and consideration set formation are proposed and theoretical reasoning are provided.

Chapter 4 describes the research methodology this study. It introduces the settings and procedures of a pre-test survey and a laboratory experiment as main study. It presents the details of how the pre-test and main study was conducted.

Chapter 5 reports the statistical analyses of experiment data. It explains why ANOVA and HLM methods are employed for data analysis. It presents the results of analysis assessing the effects of sorting method on quality importance, price importance, and relative importance of quality over price through a series of ANOVAs. Further, Turkey's Post Hoc analyses are conducted for pairwise comparisons. In addition, it reports the sorting effects on consideration set

formation from an HLM analysis.

Chapter 6 presents the discussion on data analysis results. Results from this study are compared to existing literature. Some possible reasons for unsupported hypotheses are discussed. It also discusses some implications for research and practice.

Finally, Chapter 7 concludes this thesis. It emphasizes the implications of our study and illustrates limitations of these researches. Further, it also projects possible directions for future research.

Chapter 2 Literature Review

2.1 Overview

In order to develop the research model, Chapter 2 reviews the related literature that could contribute to our understanding of product list design on consumer judgment and choice. First, information display and decision making literature are reviewed, which provides a theoretical base for subsequent discussion. Second, three types of effects related to product list designed are reviewed. The first effect is ordering effect, which suggests potential effects from the overall sequence of product list. For example, research in pricing literature provides some insights on how price list ordering (descending, ascending) affect consumer purchasing behaviour. The second effect is information processing cost effect, which is rooted in traditional psychology and decision literature and suggests the ease of information search and processing could influence judgment and choice. The third effect is order effect, which suggests that the position of items in a list matters in decision making. This effect is also observed in electronic shopping literature and generally termed “serial position effect”. Our study has largely focused on the first two types of effects and the third effect is also paid attention to for control purpose.

2.2 Information Display and Decision Making

Decision theory suggests that decision making is not only affected by the utility of

options, but also their presentation (Payne et al. 1993). The constructive preference perspective argues that people often construct their preference in a given situation based on information available at the time of preference elicitation (Hoeffler and Ariely 1999; Tversky et al. 1988). The acceptance of this constructive preference perspective has been laid with a variety of demonstrations of the liability of preferences in the face of task and context changes. These demonstrations include preference reversals (Fischer and Hawkins 1993), contingent valuations (Kahneman et al. 1993), the endowment effect (Medvec et al. 1995), and the asymmetric dominance effect (Simonson and Tversky 1992). The consumer behaviour literature also suggests that the organization of the products to be evaluated is a potentially important factor of the relative salience of various product attributes (Simonson et al. 1993; Simonson and Winer 1992). For example, Bettman, Luce and Payne (1998) maintained that choice among options is context dependent and is conditional on how the choice set is represented. Different representations, although equivalent from a normative perspective, may result in different decisions (Tversky and Kahneman 1981).

The number of imaginable visual representations of decision problems is virtually infinite. According to Kleinmuntz et al. (1993), generally there are three fundamental characteristics that apply to a broad range of displays (Kleinmuntz et al. 1993), including the form of individual information items, the organization of display item into meaningful groups or structures, and the sequence of individual items or groups of items.

Regarding information form, individual items of information can have at least

three distinct forms: numerical, verbal, or pictorial (Kleinmuntz et al. 1993). Since the effects from information forma have been relatively well-documented in the literature (e.g. Speier et al. 2003), our study more focuses on the two other characteristics.

Information organization refers to the structures of items on a display, such as groups, hierarchies, or patterns. One common organization is a table or matrix, with each row corresponding to an alternative and each column to an attribute on which the alternative is described. Each entry in the matrix could be of any suitable form (numeric, verbal, or pictorial). Another common organization is a series of lists or paragraphs of text, with each one describing an alternative, such as a travel guide listing hotels and resorts. A similar organization might have each list or paragraph describing all the alternatives on a particular attribute. A number of studies show that variations in matrix and list organizations lead to significant variations in decision process (Jarvenpaa 1989). The rational behind the effects from information organization is, different organizations of information vary the cost (e.g. time, effort) of absorbing and processing certain dimensions of information, and this change in processing cost in turn affects decision outcomes based on different dimensions of information. For example, in a study of online wine vendors, Lynch and Ariely (2000) manipulated the usability of quality and price information, such that when Quality Usability was high, the first-level list of wine names displayed descriptions of the wines using differentiating sensory attributes, when Quality Usability was low, the standardized descriptions on sensory dimensions did not appear on the first screen containing the list of wines. Instead, participants had to click on a wine’s name on the first screen to see them

and no tool was available to sort wines by varietals.

A given organization does not completely specify the order in which individual items or groups of items must appear. For instance, a series of lists can appear in many different sequences, with the elements of each list also appearing in any order. Although information often appears in an arbitrary order, a common practice is to sort the values. Similarly, information might be arranged in alphabetical or chronological order. Sequence can be important because it often determines the order in which information is read by the decision maker, which can, in turn, influence the way in which the information is processed (Hogarth and Einhorn 1992).

Among the three characteristics summarized by Kleinmuntz et al. (1993), the latter two characteristics are particularly relevant to our study focusing on the effects of sorting products based on product quality attributes in certain order, where products are presented in a list and product attribute information are presented in a matrix format. For a sequence of items, sorting products by their quality attributes unavoidably change the sequence of product list. For example, if products are sorted in a descending order, that is, products with higher quality will be placed in early positions of a list. 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 (Tam et al. 2005; West et al. 1999). The ordering of the products could be a potential factor influencing consumer choice (Kardes and Herr 1990; Kosenko1989). For organization of items, current online retailers commonly

adopt the table or matrix organization, with each row corresponding to an alternative and each column to an attribute on which the alternative is described. Sorting on those attributes could place a potential influence on decision making.

2.3 Ordering Effect

Ordering products not only change the positions of each individual items in a list (refer to the review on order/serial position effect), but also the overall trend of a list of products. For example, previous researches suggested that the order in which a price stimulus set is presented to experimental subjects may affect subject evaluation of specific prices (Kosenko1989).

2.3.1 Empirical Evidences of Ordering Effect

In marketing literature, several studies have focused on comparing consumer decision making from ascending, descending, random product lists. It has been suggested that, when multiple prices are presented in a list, the order in which they are presented (ascending or descending order) can affect both perceptions of what is a fair price and consumers' purchase decision (Monroe 1990; Smith et al. 1995). Kosenko (1989) investigated whether the order in which price stimuli is presented to subjects confounds price limit measurement. Kosenko suggested that subjects asked to evaluate a series of prices in descending order will specify a greater mean lower price limit/higher mean upper price limit than subjects asked to evaluate a series of prices in ascending order. However, no empirical evidences were found to support their propositions (Kosenko1989). Garbarino and Slonim (1995)

presented different groups of subjects with prices for pens in either ascending or descending order and measured different perceptual and behavioural response. Subjects who saw prices in descending order formed higher expected prices, higher perceived fair prices, and were willing to pay more for a pen than subjects who saw prices in ascending order. Subsequently, subjects exposed to descending prices purchased more pens (simulated purchase) than subjects exposed to ascending prices, and were more likely to consider their final purchase a good value (Garbarino et al. 1995). Bennett et al. (2003) presented a new study employing two types of products: fmcg and household appliances. Their study tested the effects of price order, price range and number of price points on the average price respondents are willing to pay for selected fmcg and durable products. For fmcgs, the highest price was obtained by presenting the prices in descending order, using a wide price range, and four price points. For the household appliances, the highest price was obtained using a wide price range and five price points; order was unimportant. A notable finding was that, for both sets of products, the models accounted for only about 10% of the variation (Bennett et al. 2003). While the above studies focused on descending/ascending price list, Diehl and Zauberman (2005) investigated effects from ordering products based on declining/improving quality on consumer decisions. They proposed a mechanism in which consumers' evaluations are determined by the overall sequence they are exposed to, not only by the individual options they select and suggested that searching ordered sets exposes consumers to a distinct sequence of items, characterized by different key psychological moments. Their results showed that declining orderings lead to more positive overall evaluation than improving orderings, and this difference was moderated by amount of search (Diehl et al.

2005). Related literatures are summarized in Table 1.

Table 1. Summary of Literatures on Ordering Effects			
Source	**Independent variable(s)**	**Dependent variable(s)**	**Context**
Kosenko 1989	Order (ascending, descending, random)	Price limit (n.s.)	Marketing
Garbarino & Slonim, 1995	Price order (ascending, descending)	expected prices, perceived fair prices, willing to pay, number of products subjects want to purchase	Marketing
Bennett et al. 2003	Price order (ascending, descending, random), price range, number of price points	Average price respondents are willing to pay for selected products	Marketing
Diehl & Zauberman, 2005	Ordering (declining vs. improving), extent of search	Evaluation of the selection, the chosen option, shopping experience	Marketing

2.3.2 Mechanisms of Ordering Effect

Considerable work in behavioural decision making supports the notion that decisions depend on the frame of reference from which choices are made (Kahneman and Tversky 1979; Tversky and Kahneman 1991). Notably, the descending and ascending product lists (based on quality) differ in the vantage point from which consumers begin their choice task.

One related theory which may account for this difference in starting point is the notion of ‘loss aversion’. The notion of Loss Aversion arises from the insights

given by Kahneman and Tversky (1979). Prospect Theory, developed as an alternative theory of choice under uncertainty. As Kahneman and Tversky (1991) stated, “a central conclusion of this study has been that such choices are best explained by assuming that the significant carriers of utility are not states of wealth or welfare, but changes relative to a neutral reference point. Another central result is that changes that make things worse (losses) loom larger than improvements or gains. The choice implies an abrupt change of slope of the value function at the origin (p.199)”. Loss aversion suggests that value function is steeper for losses than gains because the psychological impact of any given loss is bigger than that of an equivalent amount of gain. When an alternative is used as a reference state or anchor, losses from that state carry more impact than gains (Tversky & Kahneman 1991).

Loss aversion has been observed in both risky and riskless choice and can account for a wide range of decision phenomena. In the context of multiple attributes, loss aversion research 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 et al. 1993). They also 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 et al. 1997) and more directly supported in models of scanner data (Hardie et al. 1993). Bell and Lattin (2000) test the reference-dependent model using scanner panel data on refrigerated orange juice and

subsequently extend their analysis to 11 additional product categories. In a “sticker shock” model of brand choice, they found smaller and insignificant estimates of loss aversion. Accordingly, they further suggested that loss aversion may not in fact be a universal phenomenon and call for cautions in application of loss aversion in the context of frequently purchased grocery products.

The ordering of products based on product quality or price, either in ascending or descending order, change the order in which consumers evaluate each product. Pervious research has suggested that subjects exposed to descending price order form lower expected price and perceived fair price than subjects exposed to ascending price order do (Garbarino and Slonim 1995). The results indicate that consumers’ internal reference points are likely to be affected by product ordering. Therefore, even the products are identical except their ordering, some products are likely to be perceived as price or quality loss by some consumers while the same products are possibly to be regarded as price or quality gain by other consumers due to the different internal reference pointed influenced by product ordering.

2.4 Information Processing Cost Effect

There are numerous studies showing that the same information presented in different organization formats can result in different decisions. The rational behind this that consumer decision strategies used are contingent upon the particular characteristics of the situation (Bettman et al. 1986). A summary of literatures related to information processing cost effects is presented in Table 2.

Table 2. Summary of Literatures on Information Processing Cost Effects			
Source	**Independent variable(s)**	**Dependent variable(s)**	**Context**
Russo 1977	The organization of unit price information	Average amount spent on a product class	Marketing
Amer 1991	Task type (integrative task vs. selective task), object proximity	Performance, decision-making experience	Information Systems
Creyer and Ross, 1997	Availability of information about price, quality rating, value index	Consumer preference formation	Marketing
Areni et al. 1999	Product organization, baseline purchase likelihood, attribute salience	Attribute importance weights, purchase likelihood	Marketing
Areni 1999	Product organization	Purchase likelihood	Marketing
Lynch & Ariely, 2000	Price usability, quality usability, store comparability	Price sensitivity, market share of the common wines, search during shopping, liking of purchase wines, retention	E-commerce
Haubl & Murray, 2003	Inclusion (exclusion) of an attribute in a recommendation agent	Attribute importance, purchase decision	E-commerce
Diehl 2005	Search costs (ordered vs. unordered environment), accuracy motivation	Choice quality, consumer selectivity	E-commerce

2.4.1 Empirical Evidences of Information Processing Cost Effect

One of the earliest and influential studies is in the case of consumer choices among supermarket products. Russo (1977) showed that change in the

organization of unit price information at the point of purchase result in shifts in purchasing patterns such that that average amount spent on a product class was reduced by 11 percent of the maximum possible savings. The major comparison was to the situation where the same information was displayed differently through separate shelf tags. The improved format aided decision-making by making the same information easier to process. Creyer and Ross (1997) examined how the availability of information about the value of a product, expressed as a ratio of the quality received per dollar, influenced preference formation. The index is their study was similar to unit price. Their results indicated that consumers, presented with an index of quality per dollar, are more likely to choose a lower priced, higher value option rather than a higher priced, higher quality option compared to consumers presented with only price and quality information (Creyer and Ross 1997). Their findings confirmed that strategies and heuristics people use to make choices are contingent on the decision context. Specifically, their findings suggested respondents processed the information in the form in which it was provided. Consequently, the ease with which information can be processed was a significant determinant of the choice outcome. However, one critical limitation of their study is the use of hypothetical choice, in which the stimulus differs from real market settings. For example, they presented quality ratings of brands and asked respondents to make a choice. In the real purchasing situation, the quality of a brand may be inferred from several attributes and consumer perceptions on quality may vary depending on personal fit.

Two studies by Areni et al. (1999a) and Areni (1999b) examined the effects of product organization on purchase likelihoods. Their reasoning largely followed

two streams of theories. First, they argued that when products are displayed according to a specific attribute, the perceptual salience of that attribute increases. This could increase the importance that attribute received when consumers evaluate products and/or make purchase decisions (Areni et al. 1999). This seems follow MacKenzie (1986)'s influential study showing the importance of attributes were largely determined by the attention given to attributes (see MacKenzie 1986 for a systematic discussion). Second, they also argued that organizing product information according to a given attribute makes it easier for consumers to compare alternatives using the attribute (Areni 1999), following Russo (1997)'s argument. However, in their experiment design, the correlations among region, colour, and variety were constrained to be zero, which were not consistent with the realities of marketplace.

The item organization effect was also observed in IS (Information Systems) and EC (E-commerce) literature. Amer (1991) reported on an experiment that varied types of decision tasks and displays of multi-cue financial information to test their effects on decision making performance and user perceptions about display use. The author found that when one cue of information set must be selectively attended (selective task), displays with lower object proximity will improved performance and enhance users' decision-making experience. In addition, in E-commerce literature, Alba et al. (1997) relied on the literature on the economic effects of advertising and speculated that if online retailing reduces the information search costs for price information, consumers will become more price sensitive (Alba et al. 1997). Lynch and Ariely (2000) systematically vary the design of online stores to alter information search costs. When the online retail

store design made quality information easier to search and compare, respondents became less price sensitive. Haubl and Murray (2003) found that when a product attribute was included in a comparison matrix of recommendation agents, this attribute become more processable when respondents compare products and hence more prominent in consumers' purchase decision. Diehl (2005) proposed that, although a sorted product list lower the search cost for consumers, searching too much in ordered environments could degraded choice quality. These results are consistent with the findings in advertising literature, which shows hat advertising price information increases price sensitivity but advertising quality information reduces price sensitivity (Kaul and Wittink 1995).

2.4.2 Mechanism of Information Processing Cost Effects: Principle of Concreteness

One theory relates information format and decision making is "the concreteness principle" (Slovic 1972). It suggests 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 (Haubl and Murray 2003). Two constructs are highlighted in this theory: processability and concreteness. The more concrete a dimension is the greater the likelihood it affects choice (Creyer et al. 1997). Processability refers to the ease with information can be comprehended and used (Bettman et al. 1986). Processability of information is a function of the way the information is presented. That is, presenting information that is well-organized and in formats that facilitate processing can increase usage of that information. Since people often do not expend the cognitive effort

necessary to transform information, they tend to largely rely on that information which is explicitly displayed (Haubl et al. 2003).

Supporting evidences for the principle of concreteness have been found in e-commerce literature, such that processing cost of product attribute information could affect consumer decision making (Haubl et al. 2003; Lynch et al. 2000). 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 et al. 1990). There was a notion that providing consumers with more information is always helpful for consumers to improve decision quality is almost self-evidence since consumers armed with more complete information should be able to make better decisions than when their choice is based on limited knowledge about product attributes. However, consumers are not extensive information processors and thus merely making information available may not be sufficient (Bettman et al. 1986). Instead, the processability of information may increase or decrease consumers' usages of the information. Accordingly, information format could influence the ease with which consumers can compare alternatives on various attributes and therefore, the likelihood that a given attribute will be the basis for selecting alternative (Areni1999; Kleinmuntz et al. 1993; Russo1977).

2.5 Order Effect

Item sequence could produce three kinds of effects. The first and most commonly observed effect is the order effect (Hogarth et al. 1992; Lohse et al. 1998), where

items listed early or later in the list will receive more attention and have more chance to be selected. The second effect is serial position effect which is often observed in online shopping context. Serial position effect is actually a special case of order effect in E-commerce literature and often manifests itself as primacy effect. The third effect is the direction-of-comparison effect, where the sequence of items influences the direction of comparisons, which in turn, affects consumer's evaluation on focal and referent options (Mantel and Kardes 1999). The direction-of-comparison effect is actually an extension of order effects and more focuses on how consumers evaluate specific item attributes in the light of order effect. In summary, this section we focus on discussion of order effects and two special cases of order effects, namely, serial position effect and direction-of-comparison effect.

2.5.1 General Order Effects

The initial research on order began in 1925 with F.H. Lund. Lund first studied the law of primacy, albeit without any statistical research. His before-after design was the first to prove that when two opposed messages on a controversial topic were presented, the initial message was more influential. This effect was termed as "order effect". There are two possible outcomes of order effect: primacy effect and recency effect. When there is primacy (recency) effect, an item is evaluated higher when it is earlier (later) in a list than when it is later (earlier). As a result, an item is favoured when it is listed earlier (later) in a list (Krosnick 1991; Krosnick and Alwyn 1987; Miller and Krosnick 1998; Whipple and McManamon 1992). These definitions, although misleadingly simple, seem to open the door to

numerous studies in the field. The empirical results produced are rather divergent, with many opposing results due to other, more specific factors.

There has been widespread in interest in this topic in various disciplines. As a result, order effect has also been observed in advertising (Bruine de Bruin and Keren 2003; Zhao 1997), consumer research (Asare 1992; Ashton and Ashton 1988; Bennett et al. 2003; Duffy 2003; Kardes et al. 1990; Messier 1992; Messier and Tubbs 1994), auditing (Anderson and Maletta 1999; Monroe and Ng 2000), psychology (Crano 1977; Hogarth et al. 1992; Petty et al. 2001), and survey research (Krosnick et al. 1987). Recently, this effect was also observed and gained interests in online shopping studies and researchers often termed it as "serial position effect" (Lohse et al. 1998; Murphy et al. 2006). Related literatures are summarized in Table 3.

Table 3. Summary of Literatures on Order Effects

Source	**Independent variable(s)**	**Dependent variable(s)**	**Context**
Petty et al., 2001	Message order, chunking, motivation to think	Message persuasion	Psychology
Haugtvedt & Wegender, 1994	Message order, message elaboration (high vs. low)	The effect of messages on final judgment	Marketing
Unnava et al. 1994	Order of information presentation, modality (auditory vs. visual presentation)	Order of recall of arguments, attitude	Marketing
Buda & Zhang, 2000	Presentation order, source credibility, message framing	Product evaluation	Marketing

Brunel & Nelson, 2003	Presentation order, gender, value relevance	Advertising message persuasion	Marketing
Duffy 2003	Order, item popularity	Importance of items	Marketing
Scarpi 2004	Presentation order	product price, quality, and price-quality relationship, consumer preference	Marketing
Hoque & Lohse, 1999	Serial position, travel distance, display advertisements	Patronized options	E-commerce
Murphy et al. 2006	Position of a link	Clicking behavior	E-commerce

When studying order effect, two types of goals must be differentiated. The first type is to integrate multiple information items to make a judgement or impression of a single object. For instance, reading a list financial reports to evaluate the financial risk of a company in auditing (Anderson et al. 1999; Monroe et al. 2000) and jury decision making fall into this category. In this task, there is one target object to be evaluated; all information items pertain to this object. The second type is to rank alternatives in terms of preference (Duffy2003; Krosnick et al. 1987). Vendor selection, product selection, acceptance of job applicants, student recruitment, and vacation destination selection are examples of this category. In this study, we focus on how consumers make choice from a list of products, therefore, the second type of goals regarding order effects are more relevant to our study.

2.5.2 Mechanisms of Order Effects

The forming mechanisms of order effect include satisficing effect from decision

making perspective (Payne et al., 1993) and the cognitive accessibility explanations from psychology perspective.

From the decision making perspective, order effect (e.g., primacy effect) can be explained by satisficing effect. Satisficing effect assumes people have only bounded rationality. They are not always looking for optimization in decision making, but rather looking for satisfactory solutions and trying to save cognitive cost whenever possible (Simon 1957). Decision research has repeatedly found decision makers adjusting their decision strategy to balance cognitive cost and decision quality (Kleinmuntz et al. 1993; Payne et al. 1993).

When consumers face a choice problem from a list of products on e-commerce Web sites, the satisfactory offers encountered earlier in a list can produce two effects. First, a consumer's motivation to consider other vendors is reduced for the sake of cognitive effort. As a consequence, cognitive elaboration of later items is decreased (Bettman et al. 1998). To certain point, when the consumer sees no benefit of further exploration, the comparison process stops and the remaining products would be totally ignored regardless of their actual merit. Second, the satisfactory product alternatives encountered previously set judgment anchors for the later products (Hogarth et al. 1992). Only when later products are significantly better than the satisfactory ones would the consumer update the consideration set. This implies increasingly stringent criteria for later products.

While satisficing effect explains why the currently accepted products "suppress" the later comers, it does not explain why the incumbents were considered in the

first place. We argue that the incumbents are also subject to the order effect.

From cognitive psychology perspective, prior research suggests that cognitive accessibility of an option is a major cause of order effect (Hogarth et al. 1992). The availability heuristic states that people tend to estimate the frequency of an event as a function of the ease with which it comes to mind (Tversky and Kahneman 1973). If an incident comes to mind easily, people believe there must be many such incidents in the population from which it is drawn. Conversely, the more difficult it is to remember an incident, the smaller one should perceive the overall population (Menon and Raghubir 2003). The accessibility construct was proposed to describe how ease information come to mind (Schwarz et al. 1991). Kahneman (2003) defined accessibility as “ease (or effort) with which particular mental contents come to min (p.699)” (Kahneman 2003). He posited that the different aspects and elements of a situation, the different objects in a scene, and the different attributes of an object—all can be more or less accessible. Moreover, the determinants of accessibility subsume the notions of stimulus salience, selective attention, specific training, associative activation, and priming. Therefore, the accessibility of a thought is determined jointly by the characteristics of the cognitive mechanisms that product it and by the characteristics of the stimuli and events that evoke it. Accessibility has been shown to be a direct function of the frequency and recency of activation of the information (Higgins 1996). Its consequences are manifold: when information comes to mind easily, subsequent judgments of the probability of an event occurring are higher (Tversky et al. 1973), self-perceptions of personality traits based on behaviours recalled are more extreme (Schwarz et al. 1991), and target

evaluations reflect the content of information retrieved (Jacoby et al. 1989).

When earlier items serve as anchoring points and are processed multiple times (Kardes et al. 1990), they become more cognitively accessible. For example, when people are asked to choose a product based on product attributes, the repeated comparison with previous items favours primacy effect (Duffy2003). However, if they are asked to memorize the attributes of a list of products, a task that does not require information integration, recency effect occurs (Kardes et al. 1990). In an eye-tracking study of reading Yellow Pages, experimental subjects tended to view and choose ads that were at the top of the alphabetical list (Lohse 1997). This result helps explain why restaurant managers place high margin items at the top of a menu, as customers tend to order items near the top of a menu more often than when those same items are at the bottom (Ditmer and Griffin 1994) and direct-mail catalog displays similar products in the order of most to least expensive (Smith and Nagle 1995).

Background knowledge and expertise affects elaboration through processing efficiency. More experienced or cognitively sophisticated people process a list of items with higher efficiency, hence less order effect (Krosnick et al. 1987; Monroe et al. 2000). Otherwise, fatigue sets in and the later items are less elaborated, leading to primacy effect. For example, in advertising literature, Zhao (1997) found a primacy effect on the liking of advertisements. Buda and Zhang (2000) found a primacy effect for information presentation and the attractiveness, willingness to purchase, and the perceived performance of a product (Buda and Zhang 2000). In addition, Scarpi (2004) conducted empirical study by

interviewing real consumers, the first product alternative was found to be in favour by consumers (Scarpi 2004).

Finally, information presentation also affects elaboration. For example, the length of the list affects the fatigue level when a consumer reaches to the later part of the list (Crano1977; Zhao1997), resulting in primacy effect. In addition, if the list is ordered by certain attribute (e.g., all products are sorted by quality or price), it will ease the cognitive processing and reduce order effect (Duffy2003).

In short, lower motivation, lack of experience and cognitive skill, high requirement to integrate information, complicated task, and the resultant fatigue will decrease cognitive elaboration of the later items in a list and favour the primacy effect. Such effect has been observed in both information integration task and preference ranking task (Hogarth and Eihorn, 1992; Jacob et al., 2002; Zhao 1997) when the task is relatively complicated with many options and attributes (Hogarth and Eihorn, 1992).

2.5.3 Serial position Effect

Online shopping can be regarded as a complicated decision task when consumers often face a long list of products to make selection. In this case, the earlier items enjoy higher consumer motivation and ampler cognitive resource while the later items suffer fatigue effect. The net effect is that the earlier items are more cognitively accessible. Accordingly, primacy effect is very often observed in online shopping contexts. The position of products in a list matters because

consumers scan product information sequentially and their scanning is not exhaustive (Lohse et al. 1998).

One specific type of order effect observed in online shopping literature is “serial position effect”. The serial position effect is observed in rank task, which is the second type of order effects as introduced above. Most studies observe primacy effect outcome in online shopping contexts. Hoque and Lohse (1999) manipulated an online interface to match the traditional offline Yellow Pages and found evidence of a primacy effect only (Hoque et al. 1999). While Hoque and Lohse (1999) used laboratory environments, with high internal validity, generalizing their results to web page navigation is unclear. Both studies seemed to induce high task involvement, but appeared to be more text based than are many popular web pages. Hoque and Lhose (1999) argued that the impact of placement is magnified in electronic media because it is more difficult to read online and because of the effort involved in scrolling. Eastman (2002) found that consumers using Internet search engine tend to browse through only the first few items on a long list of search results. Similar results were reported by Tam and Ho (2005). 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. Ansari and Mela (2003) provided the analysis of serial position related clicking behaviour in emails or web pages in their efforts to “…develop a statistical optimization approach for customization of information on the Internet” (Ansari and Mela 2003, p.131). The authors modelled their optimization using click stream data from 1,048 users who received opt-in emails from a leading Web site and found that the effect of link order is negative, indicating that the effectiveness

of links decreases as the link appears later in the e-mail. Moreover, they noted only a primacy effect, as in Hoque and Lohse (1999) Yellow Pages study reviewed earlier. Based in part on their finding of primacy, Ansari and Mela (2003) then created optimal sequences of email links. A recent study by Murphy et al. (2006) investigated consumer's clicking behaviour on web pages and their results showed the efficacy of the first link, a primacy effect (Murphy et al. 2006).

2.5.4 Direction of Comparison Effect

Tversky's (1977) feature-matching model suggests that comparison involves the mapping of the features of one object to the features of the other. According to his model, when two objects are compared, one object is typically the more focal subject of comparison, the other object is the less focal referent of comparison, and the focal object tends to elicit more thoughts than the less focal objects when a judgment is made between the two objects (Dhar and Simonson 1992). The focal object serves as the starting point or subject of comparison, and the referent object serves as the target of referent (Tversky 1977). Asymmetries in judgments of similarities will occur, depending on the direction-of-comparison. That is differences in judgments of similarity may result depending on which object serves as the subject of comparison. One important factor that determines which object serves as the subject of comparison and which object serves as the referent is the order of presentation. Several studies have shown that the most recently observed object serves as the subject of comparison and the earlier observed object serves as the referent (Houston and Sherman 1995; Kardes and Sanbonmatsu 1993).

The effects of direction-of-comparison have been observed in several experiments. Sanbonmatsu et al. (1991) note that during the comparison process, the object which serves as the subject of comparison, rather than as the referent of comparison, is critically important because people are attuned to the subjects' features. This phenomenon is known as the direction-of-comparison effect. Consequently, preference for a given object is not determined solely by the bundle of attributes that define that object; preference is relative to the object to which it is compared (Sanbonmatsu et al. 1991). Kardes and Sanbonmatsu (1993) found that the amount of information available for judgment, the manner in which features of two objects are compared (direction of comparison), and the manner in which consumers respond to missing information jointly influence judgemental extremity. Mantel and Kardes (1999) investigated the role of direction-of-comparison, and attitude-based processing in consumer preference and found that when consumers engage in an attribute-based comparison process, the unique attributes of the focal subject brand are weighed heavily, whereas the unique attributes of the less focal referent brand are neglected. The direction-of-comparison effect is reduced when consumers engage in attitude-based processing or when high involvement increases motivation to process accessible attributes more thoroughly and systematically. Bruin de Bruine and Keren (2003) also reported direction-of-comparison effect. Their study showed that the direction-of-comparison effect is not limited to judgment tasks with sequential presentation. Even simultaneously presented options may show order effects, if they are judged one at a time in sequence.

2.6 Summary of Literature Review

The constructive preference perspective of decision theories suggest that very often people construct their preference in a given situation based on information available at the time of preference elicitation (Hoeffler and Ariely 1999; Tversky et al. 1988). Accordingly, decision making is not only affected by the utility of options, but also the presentation of information. This perspective provides the theoretical background for this study that product list, as a specific type of information format, could affect consumer decision making. Focusing on effects of information format on decision making, Kleinmuntz et al. (1993) categorize information format factors into three categories: item form, item sequence, and item organization. For product list design in our study, the latter two are relevant to our research. Sorting products by quality attributes in a hierarchical way might influence 1) the sequence of products in the list, and 2) the organization of products. Regarding the sequence of the products in the list, two effects have been observed in the literature. The first one is ordering effect, the second is order effect. Regarding the organization of products, the organization of products might affect the ease of information search and processing, thus, information processing cost effect, which has been highlighted in the literature, could contribute to the development of research model. Accordingly, these three types of effects, including ordering effect, information processing cost effect, and order effect are reviewed subsequently. The extant literature generally suggests that 1) for ordering effect, an ascending price list, compared to a descending product list, will result in higher price sensitivity. In contrast, a descending product list in terms of quality, compared to ascending list, will lead to higher quality importance. The

loss aversion notion proposed in the Prospect theory and the Reference-Dependent model provide explanations for these ordering effects. However, the loss aversion phenomenon is not without boundary. 2) For information processing cost effect, the extant literature suggests that the information search and processing cost is closely related to consumer judgment and choice. Lower information processing cost of certain dimension of information will render this dimension of information has more weights in consumer judgment. The principle of concreteness provides theoretical backdrop for this effect. 3) Order effect, which has been studied in psychology and various literatures for more than half a century, has generally been observed in online shopping contexts as serial position effect. This effect suggests that the early products in a list are more likely to be in favour by consumers.

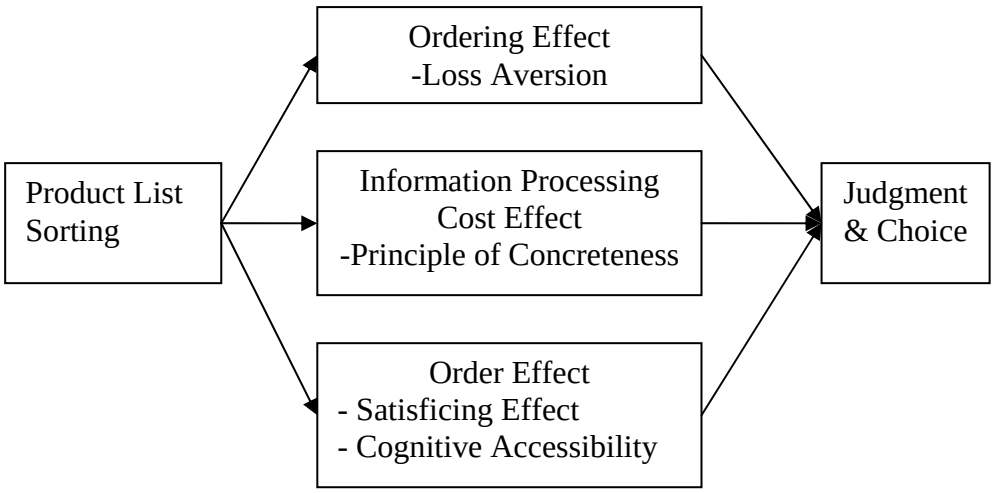


Figure 2. Summary of Literature Review

Chapter 3 Research Model and Hypotheses

3.1 Overview

In order to investigate the effects from different product sorting methods on consumer decision making, we develop a research model on how product sorting affect decision in two stages. First, we adopt the consideration set as the dependent variable. If sorting does influence consumer decision making, this effect might be reflected on consumer's purchase behaviour, i.e. how consumers select products and form their consideration set. We further indentify two intermediate variables, consumer's perceptions on product quality importance and price importance as direct outcomes of product sorting and antecedents of consideration set formation. Decision theories generally advocate that people choose by weighting attributes according to their relative importance and then selecting the alternative with the largest weighted composite (Heath et al. 2000). The importance of product quality and price, i.e., the decision weights consumers attach to quality and price, become critical determinant of whether a product would be included in the consideration set. Second, we investigate the impacts of product sorting methods on quality importance and price importance. The product sorting is manipulated in three different ways, including descending order, ascending order, and random order based on product quality. In particular, the product sorting in this study refers to a hierarchical sorting method on product quality attributes, such that products with several quality attributes are first sorted

by the generally accepted most important attribute, then the second important attribute, and so on and so forth. Therefore, the sorted product list could generally represent a product list with improving or declining overall quality level, although the orderings are imperfect because each consumer has his or her personal fits (Research framework is presented in Figure 3).

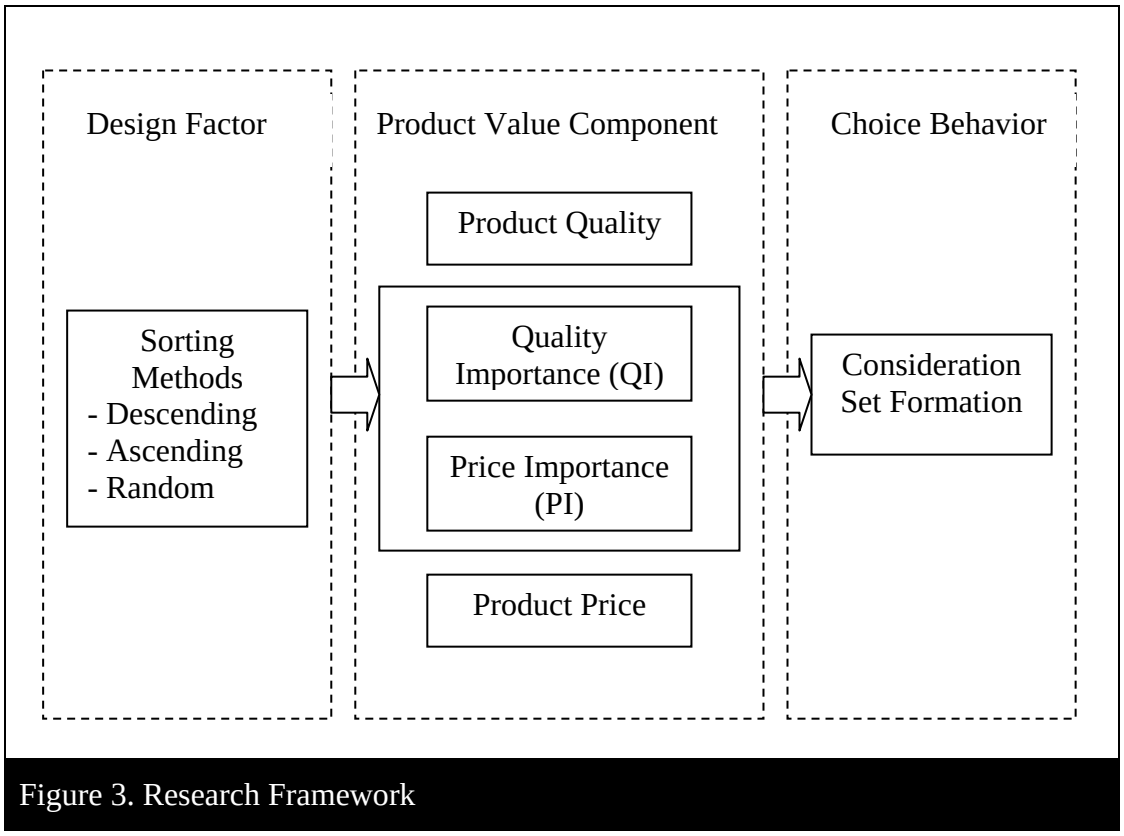


Figure 3. Research Framework

In the research model, we first hypothesize the effects from product sorting on consumer's perceptions on importance of product quality (QI), product price (PI), and then we hypothesize the effects from sorting method on the possibility of one product being included in the consideration set. Product quality and price are assumed to be positively correlated and no dominating products exist for choice. When product quality and price are not correlated, the effects of product sorting effect are rather clear and straight-forward and have been addressed in the

literature. In real situation, the quality and price for most of the products in the marketplace are closely correlated; otherwise there is no quality-price trade-off problem. Hence, the hypotheses in this thesis are based on the above assumptions (Research Model is presented in Figure 4).

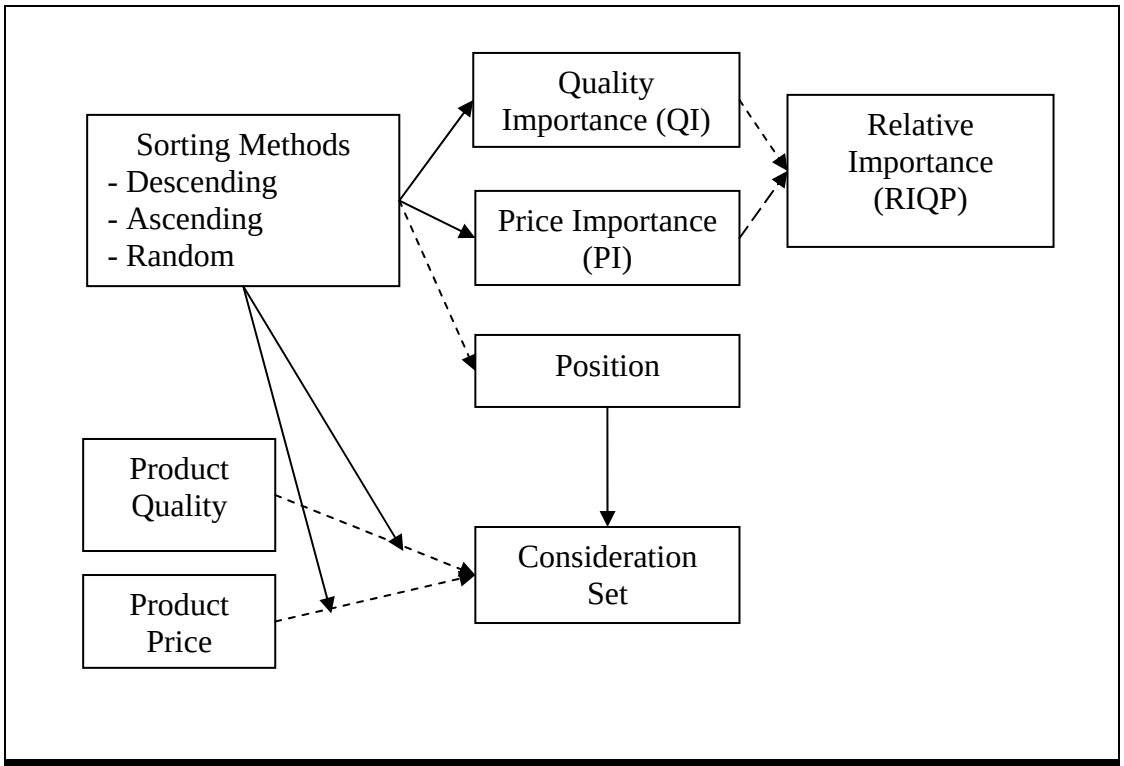


Figure 4. Research Model – Sorting Effects

3.2 Consideration Set Formation

The concept of consideration set is attracting increasing academic and managerial attention in the past two decades (Roberts and Lattin 1991; Shocker et al. 1991). In the study of consumer decision processes, most research assumes a hierarchical choice process in which being part of the consideration set is a precondition for choice, and the set of alternatives that enter the consideration set has a pivotal

effect on final selections (Alba et al. 1997; Nedungadi 1990; Shoker et al. 1991) because consumers tend to form a small set of alternatives and then evaluate the alternatives within the subset in more details (Alba et al. 1997). Analysis of consideration sets is important if the consideration stage is of managerial interest in its own right or if consumers' consideration set sizes is small in relation to the number of products of which they are aware (Roberts and Lattin 1991).

The study of consideration set was purposed initially under the rubric of evoked set analysis, first used by Howard (1963). However, "evoked set" has been used with several different meanings, from "brands the consumer would consider" to "brands acceptable to the customer" (Roberts and Lattin 1991). In this study, we adopt the latter term and define "consideration set" as the products that a consumer would consider buying in the near future. Thus, the consideration set could be a more accurate predictor of actual product selection.

Consideration set formation is critical to predict consumer selection. Understanding how consideration sets are determined is both theoretically important (Nedungadi 1990) and critical to improving the predictive ability of consumer choice models (Hauser and Wernerfelt 1990). Theories in consumer behaviour and economics suggest that for complex decisions consumers are likely to employ a decision process that can be represented by a phased decision rule (Bettman 1979). For example, Wright and Barbour (1977) suggested that consumers often undertake a two-stage process, first filtering available alternatives and then undertake detailed analysis of the reduced set. Gensch (1987) provides empirical support for the notion that screening rules may be

invoked for as few as four alternatives. Simonson et al. (1993) suggested that consideration sets play an important role in quantitative models used for predicting consumer choice. The importance of consideration set is also in line with findings from the literature on information search in economics, which are based on the premise that a consumer will continue to search for information as long as the expected returns from search exceed the marginal cost of further searching (Stigler 1961). For example, Shugan (1980) showed that the cost of search is proportional to the number of brands the consumer evaluates and the difficulty of making comparisons.

3.3 Quality Importance and Price Importance in Decision Making

3.3.1 Quality/Price Importance and Product Choice

Consumers are believed to seek information, evaluate products, and make purchases guided in part by their perceptions of the importance of various product attributes (Mackenzie 1986). According to consumer behavior literature, cconsumers vary in their attitudes towards product characteristics (Swait and Sweeney 2000). Consumers 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.

Consumers' preferences and their final choices result from the comparison between the products to a set of criteria. Decisions to purchase a particular product from a set of alternatives are generally based on multiple criteria - weights and values. The subjective value for each alternative is derived by integrating each attribute's weights and values; where weights are independent of the scale unit used for attribute values. The weights given to each attribute vary for each decision maker. The values of all the criteria are processed for each alternative and a preference structure is built. The hierarchy of this structure determines which products will be purchased or rejected (Matsatsinis and Samaras, 2000).

The attribute importance is closed related to product choice. Specifically, the attribute importance could significantly influence consumer's selection/evaluation process, regardless of whether compensatory or non-compensatory (i.e. lexicographic or elimination-by-aspects) strategies are used. When consumers use compensatory strategies to make choices, that is, consumer choose by weighting attributes according to their relative importance and then selecting the alternative with the largest weighted composite (Heath and Ryu 2000), attribute importance often influences the outcome because judgment is an integration of the weights and valuations of the presented attributes (Sanbonmatsu et al. 2003). When consumers use lexicographic or elimination-by-aspects rules, attribute importance can sometimes dramatically affect the outcome because it determines the order in which the attributes are considered (Bettman et al. 1998).

This notion is consistent with the Multiattribute Utility Theory (MAUT). The MAUT techniques have become standard tools in decision analysis. In a

multiattribute framework, alternative A is preferred to alternative B if the utility of A is larger than the utility B (von Nitzsch and Weber, 1993). The additive form of the utility function is the simplest yet most widely used form. It states that the utility of an alternative is the weighted sum of the conditional utilities of the alternative's attributes (Beattie and Baron 1991; Keeney and Raiffa 1976). Therefore, in product choice situations, the weights consumers give to product quality and price might be strong determinants of the possibility of one product being included in the consideration set. In other words, the importance of product quality and price, together with a product's quality and price, jointly influence consumers' consideration set formation.

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 et al. 2004). Accordingly, product quality importance, the subjective weights consumers assign to overall product quality in decision making, together with price importance, might play a pivotal role in shaping consumer's product choice. In addition, previous research on multiattribute choice suggests that the influence of a product attribute is determined by its relative importance (e.g. Bettman 1979, Keller and McGill 1994). For example, in choosing among a set of products, consumers who place greater importance on quality than price would be influenced to a greater extent by the quality of the alternatives than by the price.

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) (Mackenzie1986)". In line with previous research, the quality/price importance refers to a consumer's general assessment of the significance for product quality/price in influencing purchase decisions (cf. Kalra et al. 1998). Also, this definition shares similar conceptual bases with other interpretations of attribute importance, such as price sensitivity. In addition, the relative importance of quality over price (RIQP) refers to relative importance weights attached to product quality and price when consumers make the purchase decisions.

3.3.2 Antecedents of Attribute Importance

Because of its central role in predicting consumer choice, the antecedents of attribute importance have drawn research attention from various literatures. Considerable research in marketing, decision science, and e-commerce literature has addressed factors that may affect an individual's assessment of attribute importance (e.g. An and Wen 2004; Han et al. 2001; Kaul and Wittink 1995; Keller and McGill 1994; Mackenzie 1986). A summary of selected literature on antecedents of attribute importance (quality importance, price importance/sensitivity) is presented in Table 4.

Table 4. Antecedents of Quality and Price Importance (Sensitivity)

Source	**Independent variable(s)**	**Dependent variable(s)**
Mackenzie 1986	Advertising (characteristics of the advertisement, response opportunity factors, and characteristics of the message recipient)	Attribute importance

Beattie and Baron 1991	Stimulus (attribute) range	Attribute weight
Kaul and Wittink 1995	Price advertising, non-price advertising	Price sensitivity
Mitra and Lynch 1995	Advertising	Price sensitivity
Shankar and Krishnamurthi 1996	Promotional variables (price cut, feature advertising, display), pricing policy (everyday low pricing, high low pricing)	Price sensitivity
Lynch and Ariely 2000	Price usability, quality usability, store compatibility	Price sensitivity, Market Share of the Common Wines, etc
Han et al. 2001	Price promotion, reference price	Price sensitivity, price threshold
Diehl et al. 2003	Product ordering (varying search costs for Quality Information)	Price sensitivity, product choice, etc.
Haubl and Murray 2003	Inclusion of attributes in recommendation agent	Attribute importance
An and Wen 2004	Consumer participation	Price sensitivity
Van Ittersum et al. 2005	Reference point, primed and framed reference points	Attribute importance

Prior studies indicate that characteristics of both the context and the person shape the weights of attributes that are used in judgment (e.g. Kahneman and Miller 1986; Sanbonmatsu et al. 2003; Tversky et al. 1988). Among the external factors other than personal preference and product property, three important determinants of attribute importance (quality importance and price importance/sensitivity) are frequently reported in the literature. They are advertising, information search cost, and reference point.

The first important factor is advertising. Mackenzie (1986) found that the amount of attention given to a product attribute in an advertisement has an impact on the importance of the attribute, and this attention also mediates the impact of advertising on attribute importance. The advertising-price sensitivity relationship has also been explored by many researchers in different settings (e.g. Kaul and Wittink 1995; Shankar and Krishnamurthi 1996; Mitra and Lynch 1995). There are two divergent theoretical viewpoints about the effects of advertising. First, the market power theory of advertising postulates that advertising reduce price sensitivity of demand (Comanor and Wilson 1979). The second theory, the information theory of advertising, contends that advertising increases price sensitivity by exposing consumers to information about alternative brands (Nelson 1974, 1975). Accordingly, price sensitivity was postulated to be a function of consumer awareness and of qualitative knowledge about close brand substitutes (Stigler 1961).

Previous research has not produced conclusive evidence on this controversial issue. Popkowski and Rao (1990) found that local advertising increases price sensitivity whereas national advertising decreases it. Local advertising is typically price oriented advertising whereas national or manufacturer advertising is typically non-price advertising. Mitra and Lynch (1995) suggested that the effect of advertising on price sensitivity is mediated by consideration set size and relative strength of preference. If advertising increases (decreases) the size of consideration set it may lead to higher (lower) price sensitivity. At the same time, advertising could increase the relative strength of preference for the brand, resulting in lower price sensitivity. The observed result of the impact of

advertising on price sensitivity would thus be a net result of the effects of these two mediating constructs. Kaul and Wittink (1995) presented an extensive review of literature and generated three empirical generalizations. These were (1) an increase in price advertising leads to higher price sensitivity among consumers, (2) the use of price advertising leads to lower prices, and (3) an increase in non-price advertising leads to lower price sensitivity among consumers.

The second important factor is information processing cost, or information search cost. Regarding price competition, academic scholars have noted circumstances under which electronic shopping might either increase or decrease price sensitivity (Alba et al. 1997, Bakos 1997, Degeratu et al. 2000). If online shopping could reduce the cost of search in ways that enlarge consumers' consideration sets and that make price comparisons easier, the lower search cost for price information might increase consumer's price sensitivity (Lynch and Ariely 2000). On the other hand, if online shopping Web site can convey non-price information related to quality that is superior to the comparable information that can be gleaned from shopping in conventional malls, catalogs, etc (Hoffman et al. 1995), the lower search cost for non-price or quality information could contribute to better quality differentiation, and thus increase quality importance or reduce price sensitivity. This is very similar to the effects advertising discussed above. Several studies in e-commerce literature have demonstrated this effect. Lynch and Ariely (2000) reported that, for differentiated products like wines, lowering the cost of search for quality information reduced price sensitivity. Habul and Murray (2003) found that including a product attribute in the recommendation agent might increase the importance of this attribute in consumer judgment and choice. The authors further

proposed three possible explanations, including information processing cost due to format of information presentation, feature-based priming, and potential information value of attribute inclusion.

The third important factor is reference point. Several studies have pointed out that a consumer's perception on attribute importance is a function of this consumer's reference point/state. Tversky and Kahneman (1991) proposed that evaluation of a given attribute in multi-attribute settings conform to the value function proposed for single-attribute evaluation in prospect theory: one with diminishing marginal sensitivity in gains and losses from a reference state where losses carry more value than gains (see Kahneman and Tversky 1979). That is, the importance of an attribute in judgment and choice is larger if the attribute levels in the product space represent a loss, relative to the consumer's reference point (van Ittersum et al. 2005). This reference state/point could be formed based on previous purchase experience (Heath et al. 2000), consumer knowledge on products, etc. In applications of the theory of reference-dependent choice (Tversky and Kahneman 1991) in pricing studies, reference price is regarded a price that consumers are assumed to form in their minds as a result of experience (Kalyanaram and Little 1994). There have been many empirical results supporting for the existence of such a reference price (e.g. Kalwani et al. 1990; Putler 1992). A large number of empirical studies suggest that prices above the reference prices represent perceived losses for the consumers and prices below the references represent perceived gains. Research has found that consumers react more negatively to losses than they do positively to gains (Bell and Lattin 2000; Han et al. 2001; Hardie et al. 1993; Kalwani et al. 1990; Putler 1992). Therefore, the relative

position of the product under evaluation and consumer's reference point is another critical determinant of attribute importance, quality importance, and price importance (sensitivity).

3.4 Sorted List versus Unsorted List

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 et al. 1998). A list of sorted products based on product quality, compared to a random list, should make the product quality attributes easier to compare because products with similar attribute levels are spatially closer to each other. This notion is supported by the proximity compatibility principle (Wickens and Andre 1990b; Wickens and Carswell 1995), which states that if there is close processing proximity between two elements, then close perceptual proximity is advised. A comparison tasks requires two pieces of information to be used together (integrated), that is, these two pieces of information have close processing proximity. Thus, close perceptual proximity (two pieces of information is spatially close) will make the comparison task easier and less effortful. Accordingly, when we arrange the products in a sorted list based on product quality, the product quality information should be relatively more processable, compared to a random list.

Based on the principle of concreteness, the enhanced processability of product quality information will, in turn, increase the importance weight it receives when

consumers evaluate products and make purchase decisions. According to the principle of concreteness, product organization influences the ease with which consumers can compare alternatives on various attributes, and in turn, the likelihood that a given attribute will be the basis for selecting alternatives (Areni1999). Therefore, we propose that when products are sorted by product quality (no matter ascending order or descending order), consumers will attach higher importance to product quality than when products are not sorted (random).

Next, we consider the influence of sorting on price importance (PI). When the correlation between product quality and price is low, the price importance should not be significantly affected by sorting based on quality attributes. If the above condition were met, given that the product quality importance is improved by sorting on quality attributes but the price importance largely remains unchanged, the relative importance of quality/price may increase in a descending list compared to a random list. However, in the real marketplace, product price often positively correlates with product quality. Accordingly, a sorted list based on product quality is also a somehow sorted list by product price. Therefore, based on the principle of concreteness, the importance of product price (PI) should increase in a sorted list compared to a random list, given quality and prices are positively correlated. However, the increase of PI depends on the degree to which quality and price are correlated. If the rank correlation between quality and price is less than 1, the increase of PI in a quality sorted list should be less than the increase of QI, because it is a partially price sorted list.

However, neither the quality importance nor price importance solely determines

consumers' product choices. Very often, consumers treat product quality as benefits and product price as sacrifice (Zeithmal 1988) and tend to trade-off product quality and price to make a choice. Assuming consumers have full information about product quality and price, to predict and explain consumer's choice, it is necessary to investigate the relative importance of quality over price (RIQP) because RIQP is a more direct predictor of consumer purchase decisions. We conjecture that sorting products by product quality could affect consumers' perceptions on relative importance of quality/price (RIQP) as well. When the correlation between product quality and price is high, as far as quality and price are not perfectly correlated (i.e. the Spearman Rank Correlation Coefficient for product quality and price is above .5 but smaller than 1), a descending list of products based on quality is also a partial descending list of products based on price. We argue that the processability of product price is higher when a list of products is 'completely' sorted by prices than those products are only 'partially' sorted. Consequently, although the importance of price might increases in a descending list based on product quality as well, this increase of the price importance compared to its counterpart in a random list may not be as significant as the increase of quality importance. In other words, in case that product quality and price are correlated but the correlation is not perfect, sorting products by their quality attributes may increase the importance of quality and importance of price simultaneous. However, the increased amount of quality importance will be more than the increased amount of price importance. As a result, the relative importance of product quality/price will be higher in a descending or an ascending list based on product quality than in a random list.

Previous literature suggests that the increases in a consumer' 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 on consumer perceptions on relative importance of product quality/price will be reflected in consideration set formation. Since both the quality importance (QI) and price importance (PI) are higher in a sorted list based on product quality than in a random list, we conjecture that consumers will prefer higher quality, higher priced products when they are exposing to a sorted product list than to an unsorted product list.

3.5 Descending List vs. Ascending List

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

When options appear in sequence, the consumers' judgments may be vulnerable to potential order effects (Bruine de Bruin et al. 2003). When evaluating a list of options, consumers usually conduct pair-wise comparisons among the alternatives in a first to last fashion (Hogarth et al. 1992). Several studies have shown that the most recently observed options serves as the subject of comparison and the earlier observed option serves as the referent (Houston et al. 1995; Mantel et al. 1999). Since consumers may compare products which appear later to those products appear first, when the products list is sorted in a descending order by product quality, the declining of product quality may produce a feeling of "quality loss"

and “economic gain” (decreasing price) (when price and quality are positively correlated) to consumers (Cha et al. 2003). Alternatively, if products are presented in an ascending order by quality, applying the same logic, consumers may face a situation of “quality gain” and “economic loss” (increasing price).

Based on the concept of loss aversion, the psychological impact of “quality loss” is bigger than “quality gain”, and the impact of “economic loss” is grater than “economic gain”, which will result in a higher weight which consumers attach to quality in a “loss” situation than in a “gain” situation. Hence, we propose that when products are sorted by product quality, consumers will attach higher importance to quality, lower importance to price in a descending list than in an ascending list.

We then compare the increases of relative importance of product quality/price in descending order and ascending order to the relative importance of quality/price in random order.

When consumers’ perceptions on quality importance were affected by different order of sorting, and the importance of price largely remains unaffected, the proposition in previous hypothesis could be extended to the effect in relative importance of product quality/price. This postulation only holds when product quality and price are not correlated or just weakly correlated. In this case, the sorting of products by quality may not result in a similar ordering of product price. However, a positive relationship between product quality and price typically exists in the real marketplace (Cha et al. 2003). That is, higher quality products tend to

be highly priced. If product quality is positively correlated with price, sorting products based on product quality 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 sorting products based on product quality as well. Then, will consumers' perceptions on relative importance of product quality/price be systematically influenced by quality sorting when quality and price are positively correlated?

A descending list based on product quality leads to 'loss' for quality (utility) and 'gain' for price (economic loss), whereas an ascending list lead to 'gain' for quality (utility) and 'loss' for price (economic loss). Consumers exposed to a descending list (based on product quality) are more sensitive to the losses in utility incurred by declining quality levels than consumers exposed to an ascending list are to the gains in utility incurred by improving quality levels (quality loss (D) > quality gain (A)). In contrast, consumers exposed to an ascending list are likely to be more sensitive to the economic losses than consumers exposed to a descending list (economic gain (D) < economic loss (A)). Let us represent increase in quality importance as C and increase in price importance as P, compared to a random list. We will add subscripts D and A to represent descending list and ascending list, all based on product quality.

Loss aversion for product quality: $QI_D > QI_A > 0$ (1)

Loss aversion for product price: $PI_A > PI_D > 0$ (2)

Relative importance of quality/price in descending list (RIQP-D): QI_D / PI_D (3)

Relative importance of quality/price in descending list (RIQP-A): (4) QI_A / PI_A

Comparing RIQP-D with RIQP-A: (3)/(4) = $(QI_D / PI_D)/(QI_A / PI_A)$= (5) $(QI_D /QI_A) * (PI_A / PI_D)>1$

Based on (1) and (2), we have (5) > 1, which means that the increase of relative importance of product quality/price in a descending list is greater than in an ascending list. Therefore, we propose that when products are sorted by product quality in a descending order, consumers' perceptions on the relative importance of product quality/price will be higher than when products are sorted in an ascending order. Accordingly, we expect the influence from sorting products in different ways on consumer perceptions on relative importance of product quality/price will be reflected in consumers' choices. That is, when consumers make trade-offs between product quality and price, if they put more weights in certain dimension, those products superior in that dimension should be preferred. Therefore, we expect that products with high quality are more likely to be included in the consideration set in descending list than in ascending list.

3.6 Serial position Effect

In addition, the serial position effect suggests that a product in a list has a large effect on consumer choice because people scan product information sequentially and their scanning is not exhaustive (Lohse et al. 1998). Prior literature has suggested two important mechanisms of order effects: satisficing and cognitive accessibility.

First, 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 E-commerce have suggested a potential effect from serial position on consumer choice (e.g. Lohse & Spiller 1998, Tam & Ho 2005).

Second, from cognitive accessibility perspective, the order effect is viewed as resulting from a decrease in attention in performing sequential tasks (Jain and 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 et al. 1987). As they serve as anchoring points and are processed multiple times (Hogarth et al. 1992), early items may be accorded deeper cognitive processing and special significance in subsequent judgment. Conversely, later items are less likely to be subjected to deeper cognitive processing. 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 overloaded. The consequence of decremental

attention and cognitive processing could be decreasing levels of accessibility, which describes how ease information come to mind (Schwarz et al., 1991).

Online shopping can be regarded as a complicated decision task whereby the earlier products in a list enjoy higher consumer motivation and ampler cognitive resource while the later products suffer fatigue effect. Therefore, we hypothesize that the position of a product in a list is positively related to the possibility of this product being included in the consideration set.

3.7 Summary of Hypotheses

In summary, seven hypotheses are proposed in our research model. We do not include comparisons between descending list and random list directly because those comparison results could be inferred from hypotheses regarding comparisons between ascending list and descending list, and ascending list and random list. Similarly, relative importance of quality over price (RIQP) is included in our discussion and theoretical reasoning but not in our hypotheses because the change in RIQP could be inferred from hypotheses regarding quality importance (QI) and price importance (PI). A summary of hypotheses are presented in Table 5.

Table 5. Summary of Hypotheses	
H1	When products are sorted by product quality in an ascending order, consumers will attach higher importance to product quality than when products are ordered randomly.

	(Ascending Order QI > Random Order QI)
H2	When products are sorted by product quality in an ascending order and product quality and price are positively correlated, consumers will attach higher importance to product price than when products are ordered randomly. (Ascending Order PI > Random Order PI)
H3	When products are sorted by quality in an ascending order, consumers are more likely to include those products with high quality and high price in the consideration set than when products are ordered randomly.
H4	When products are sorted by product quality in a list, consumers will attach higher importance to quality in a descending list than in an ascending list. (Descending Order QI> Ascending Order QI)
H5	When products are sorted by product quality in a list, consumers will attach lower importance to price in a descending list than in an ascending list. (Descending Order PI< Ascending Order PI)
H6	When products are sorted by quality in a descending order, consumers are more likely to include those products with high quality and high price in the consideration set than when products are sorted by quality in an ascending order.
H7	When all other things being equal, products placed in early positions of the product list will have a higher probability of being included in the consideration set.

Chapter 4 Research Methodology

4.1 Overview

The design of this study comprises two phases: a pre-test and a main experiment.

The pre-test serves two purposes. The first purpose is to identify the most important quality attributes subjects concern. Although electronic shopping sites attempt to include product information as much as possible, the product quality attributes they included on the product display page are actually a bit different. In the main study, we will vary product quality sorting methods by manipulate product list by sorting the product quality attributes in different ways. To make sure different orderings of product quality could be successfully achieved by sorting product quality attributes, we need to first decide which set of product quality attributes can best represent the quality of products. For this purpose, we carried out a pre-test before we conduct our main experiment. By identifying important quality attributes, we are then able to make the product list as the results of hierarchical sorting the most appropriate representation of product list with declining or improving quality level. The second purpose of the pre-test was to obtain the overall quality rating for each product from independent judges.

A laboratory experiment was employed to empirically test the effects of product sorting on consumer perceptions on quality importance, price importance, and consideration set formation. The experiment allowed close control over

independent, dependent, and possibly confounding variables to achieve a high degree of internal validity (Singleton and Straits 1999). To enhance mundane realism, the similarity of experimental events to real experiences and the generalizability of the findings, we used digital camera models which were on sale from real online stores in the experiment.

We selected digital cameras as consumer products in the experiment for three reasons: 1) digital cameras are very popular in online shopping, 2) student subjects were relatively familiar with digital cameras, 3) digital cameras were suitable in multi-attribute decision making tasks and had been used extensively in pervious experiments of decision making tasks (e.g. Chernev 2004; Kardes et al. 2004) and B2C ecommerce (Mauldin and Arunachalam 2002; Wang and Benbasat 2005).

4.2 Pre-Test

4.2.1 Pre-Test Design

A pre-test was carried out to 1) identify the most important quality attributes of digital cameras in general and 2) the quality ratings for the digital camera models. The respondents participated in the pre-test and main studies are undergraduate students from the same university. Subjects in pre-test and main study are selected from the same sampling pool and they are more likely to share similar levels of product knowledge, involvement for digital cameras. The questionnaire for pre-test was presented in Appendix A.

Thirty undergraduate students participated in this pre-test by filling a two-part questionnaire (see Appendix 1 for the questionnaire). In the first part of the questionnaire, nine digital camera attributes which can be measured in number were listed. The detailed description and explanations for those attributes were provided. Those detailed definition and introduction of quality attributes were obtained from manufacturer's website as well as www.bizrate.com. Thirty participants as independent judges were asked to rate the importance of each attribute in a 1-11 Likert scale. Their ratings were then averaged for each attribute.

In the second part of the questionnaire, they were asked to rate nine digital camera models in terms of their quality in a 1-100 scale. The order of digital cameras was counterbalanced. Participants' ratings were averaged, and average ratings were used as the criterion measure for the quality of the digital cameras in the subsequent HLM data analysis in main study.

4.2.2 Pre-Test Results

Rating on importance of quality attributes from thirty independent judges were averaged and ranked. Results showed that Mega pixels, optical zoom, LCD screen resolution, and digital zoom were the four most important attributes student subjects concerned. We then sorted the product list in a hierarchical way based on the importance rating results, such that products were first sorted by Mega pixels, and then by optical zoom, and etc. The rank correlation coefficient between product order in hierarchical sorting by product quality and product order in price sorting was 0.87, indicating a good but not perfect correlation.

Thirty independent judges also rated all available digital camera models on quality. Judges used a 1-100 scale where higher value indicated a higher quality to their personal evaluations. Cronbach's alpha of their ratings was 0.9269, implying a high level of agreement across judges. Judges' ratings on overall quality of each digital camera models were averaged, and averaged ratings were used as the input of overall quality of each product in the later HLM analysis (Results are reported in Table 6).

Table 6. Ratings on Overall Product Quality

Model	**Number of Judges**	**Min.**	**Max.**	**Mean**	**Std. Deviation**
PowerShot SD400	30	45	90	66.53	11.793
PowerShot S60	30	40	95	68.63	13.528
PowerShot SD500	30	55	97	78.57	9.497
PowerShot A95	30	40	92	69.23	12.367
PowerShot SD550	30	62	95	79.57	8.577
PowerShot A620	30	68	100	78.80	8.339
PowerShot G6	30	60	100	81.40	10.966
PowerShot S80	30	55	100	83.23	9.402
PowerShot Pro 1	30	75	100	88.10	6.970
Reliability: Cronbach's alpha = 0.9269					

4.3 Main Study

4.3.1 Participants and Incentives

All subjects were recruited through campus advertisements at a large public university. Participants in the study were voluntary. A total of 62 students were recruited for the one-factorial experiment, which product sorting method was manipulated. Fifty-eight valid questionnaires were returned. The participants were paid S$8 (US$1=S$1.6) for their participation. In addition, to encourage participants to answer an open question at the end of the survey, which asked "why do you consider (this product) as a good choice", 7% (9) of the participants with detailed answers was given a small gift worth S$15 based on their answers to the open question. The participants were randomly assigned to each of the three experimental conditions (Table 7).

Table 7. Subject Assignment in Product Sorting Experiment

Sorting Method	**Ascending**	**Descending**	**Random**
Number of Subjects	19	20	19

4.3.2 The Experimental System

The system used in the experiment was designed specifically for this research to simulate the online shopping process.

Nine digital cameras are displayed on this Web site. They were organized in a list

form, with each row corresponding to an alternative and each column to an attribute on which the alternative is described (Kleinmuntz et al. 1993). Product images, major product quality, along with price information were presented to participants when they log in the Web site (see Figure 5). A detailed product information page, containing all attribute information was displayed when the participants clicked on a product name (see Figure 6). Digital camera information is real market data gathered from www.ecost.com, and product specifications were double-checked with the manufacturer. Minor revisions were made such as change the product price from US dollars to local currency based on current exchange rate. The brand of digital cameras was controlled by only selecting products with the same brand. We carefully examined the product information including all quality attributes and price to ensure that there is no objectively dominating product in the product list.

Please select the product that you would purchase.
Indicate your selection using the checkbox then click on the submit button below.

Select	Model	Megapixel	Resolution	Optical Zoom	Digital Zoom	LCD Screen	RAM Standard	RAM Type	Price(SGD)	
☐	PowerShot S60	5	2560 x 1920	3.6	4.1	1.5	32 MB	Compact Flash, Compact Flash Type II	¥ 469.00	Details
☐	PowerShot A95	5	2568 x 1928	3	4.1	1.8	-	Compact Flash	¥ 579.00	Details
☐	PowerShot SD400	5	2568 x 1928	3	4	2	-	SD/MMC Card	¥ 519.00	Details
☐	PowerShot SD550	7.1	2048 x 1536	3.6	4	2.5	-	SD/MMC Card	¥ 750.00	Details
☐	PowerShot A620	7.1	2832 x 2128	4	4	2	-	SD/MMC Card	¥ 799.00	Details
☐	PowerShot SD500	7.1	2832 x 2128	3	4	2	32 MB	Compact Flash, SD/MMC Card	¥ 719.00	Details
☐	PowerShot G6	7.1	3200 x 2400	4	4.1	2	32 MB	Compact Flash, Compact Flash Type II	¥ 949.00	Details
☐	PowerShot Pro 1	8	3200 x 2400	7	3.2	2	-	Compact Flash, Compact Flash Type II	¥ 1,099.00	Details
☐	PowerShot S80	8	3200 x 2400	3.6	4	2.5	-	SD/MMC Card	¥ 869.00	Details

Submit

Best viewed with Internet Explorer, 1024x768 resolution.

Figure 5. Screen Capture of the Product List Page

Figure 6. Screen Capture of the Detailed Product Information Page

4.3.3 Independent Variable

The independent variable studied is sorting method of product list. Product sorting method, as a between-subject factor, was manipulated by presenting respondents with a list of nine digital cameras in descending order, ascending order, random order based on product quality. For product list in descending/ascending groups, digital cameras were organized in a list form, with each row corresponding to an alternative and each column to an attribute. The products were first sorted by megapixal, then by optical zoom, LCD Screen Resolution, and digital zoom, which were four major qualities attributes selected based on our pre-test ratings.

The rank correlation coefficient between product quality and price was 0.87, indicating a high but not perfect correlation. It is not possible to design a product list with which all consumers to agree that this list is sorted perfectly by product quality because the importance weights consumers assigned to product attributes might be different. Instead, we expect to provide a product list which most consumers believe that the position of each product in the list generally represents its quality rank order, although not perfectly.

4.3.4 Dependent Variables

Our study focuses on investigating the changes in importance weights of product quality and price introduced by different sorting methods of product list. We used direct subjective rating to measure the quality importance and price importance. The direct subjective measure was selected primarily for two reasons. First, it has been used extensively through out the literature as a measure of attribute importance (e.g. Goldstein1990; Goldstein and Mitzel 1992; Mackenzie1986). Second, we attempted to capture respondents' perceptions on the subjective importance of product dimensions. Hence, some objective measures such as conjoint weight were not included. Specifically, we measured the sorting effects by asking respondents to directly rate the importance of product quality and price on a 100-point scale, which is similar to Mackenzie (1986)'s measure of 7-point subjective rating. Thus, consumers' perceptions on relative importance of product quality over price could be calculated from these two measures. However, we also concern about the limitation of deriving relative importance measure from the above method. Based on consumer behaviour literature, consumer often trade-off

product quality and price when they form product preference (Creyer and Ross, 1997; Chernev, 2004), thus, measuring quality and price importance in a separate and independent manner could impair our conclusions from the data analysis. Accordingly, following the Goldstein (1990)'s and Goldstein and Mitzel (1992)'s relative importance measure, we also measured the relative importance of product quality/price in this experiment by asking quality and price, which is more important to our participants in an 11-point scale (1=price is significantly more important, 11=quality is significantly more important). Measurement for dependent variables is presented in Table 8.

Table 8. Measurement for Dependent Variables

Construct	Item/Measure	Source
Quality importance (QI)	Please indicate the degree to which the product quality/product price is important to you by rating them in a 1-100 scale, where 1 indicates "not at all important" and 100 indicates "very important. Quality Importance Rating:_____ Price Importance Rating:_____	Adapted from Goldstein and Mitzel 1992, Mackenzie1986.
Price Importance (PI)		
Relative Importance of quality over price (RIQP)	Please indicate the relative importance of product quality to price if you were to buy a digital camera?	Adapted from Goldstein 1990, Goldstein and Mitzel 1992.
Consideration Set	If one product is included in subject's consideration set, it is coded as 1, otherwise 0.	

4.3.5 Procedure

The laboratory experiment approach was chosen for its ability to utilize real consumers as subjects so as to provide detailed insights into specific problems and issues that consumers face while interacting with Web site. The experiment allowed close control over independent variable and possibly confounding variables to achieve a high degree of internal validity (Singleton and Straits 1999).

The experiment was designed as a one-factorial experiment manipulating sorting method of product list on electronic shopping Web site with three groups. The task was to simulate a shopping process for buying a digital camera. The Web site for each group had the same content and design style but different product ordering. To increase the realism of the task, subjects assumed the role of consumers who needed to purchase a new digital camera. There were asked to browse through the Web site for that purpose, and to evaluate and select products.

Each participant was first asked to complete a questionnaire measuring their knowledge with digital camera, internet shopping experience, etc. Then, they were asked to login specific Web sites with URL printed on the questionnaire and perform the experimental task. No communications with other respondents were allowed. Next, participants were asked to answer a set of questions including manipulation check as well as measures of product quality importance, price importance, and relative importance of quality/price (see Appendix B for main study questionnaire). The respondents were also asked to indicate the product they were most likely to buy and their reasons. Manipulation checks were done before

the dependent measures were taken to prevent bias formed from the responding to the dependent measures (Perdue and Summers, 1986). No support was given so as to avoid introducing demand characteristics that could confound the treatment effects.

Chapter 5 Data Analysis

5.1 Overview

Chapter 5 analyzes the data from our main experiment and presents the results of the data analysis. First, it presents descriptive analysis of participants' demographics. Second, manipulation and control checks results are presented. Third, hypotheses testing results are reported based on a series of ANOVA tests and Hierarchical Linear Model (HLM).

5.2 Demographics

Sixty-two undergraduate students participated in this experiment. Four returned questionnaires were judged to be invalid for inconsistent answers to our double-check questions (at the end of the questionnaire, participants were asked to rate the attractiveness of a "upgraded" model with better quality, same price compared to one of the nine cameras they rated, if their ratings for the "upgraded" model were worse than the original model, we considered this questionnaire with inconsistent answers). Among the remaining 58 participants, 60.3% were males and 39.7% were females. The average age of the participants was 21.224. On average, they have 6.552 years of experience using Internet. 60.3% of participants already have a digital camera and 39.3% of them do not have (see Table 9).

Table 9. Descriptive Analysis - Demographics			
Gender	M: 35 (60.3%) F: 23 (39.70%)		
Age	Mean: 21.224 Std: 1.85		
Internet usage experience	Mean: 6.552 Std: 2.42		
Online purchase within the past 12 months	None: 21 (36.2%)	1-3 times: 28 (48.3%)	4-6 times: 4 (6.9%)
	7-10 times: 2 (3.4%)	More than 10 times: 3 (5.2%)	
Frequency of searching/browsing product information online (per month)	Less than once: 10 (17.27%)	1-3 times: 15 (25.9%)	4-6 times: 12 (20.7%)
	7-10 times: 15 (25.9%)	Almost everyday: 6 (10.3%)	
Digital camera possession	Y: 35 (60.3%) N: 23 (39.70%)		

5.3 Manipulation and Control Checks

The manipulation of product sorting method was verified by a five-point rating scale to assess the degree to which the participants noticed the product list order they were exposed to in the experiment. The participants were asked: “based on the product quality, the general pattern of the product list you’ve seen is sorted in which order?” (1-ascending, 2-partial ascending, 3-random, 4-partial descending and 5-descending). If the manipulation procedure was successful, one would expect that the ascending-condition evaluation of product sorting order would have a distribution with a mean in the neighbourhood of 1; in the descending-condition the distribution should have a mean close to 5, whereas in the random-condition the distribution would have a mean close to 3. The means of participants’ evaluation in the three conditions were consistent with the

expectations: Mean=1.58 (SD=0.51) for ascending group, Mean=3.90 (SD=0.91) for descending group and Mean=3.00 (SD=0.47) for random group (see Table 10).

Table 10. Manipulation Check – Consumer Recognition of Product Order

Group	**Mean**	**Std. Deviation**	**N**
Ascending	1.58	.507	19
Descending	3.90	.912	20
Random	3.00	.471	19
Total	2.84	1.167	58

A statistical analysis of the results using ANOVA indicated that the three groups were significantly different ($F(2, 55) = 59.850$, $P<0.000$, $MSE=26.586$). A Tukey's post-hoc comparison further confirmed significant differences between each pair of the three groups. The results of this follow-up investigation are presented in Table 11. These tests showed sufficient evidence of effective manipulation between the three manipulations.

Table 11. Post-hoc Analysis Presented by Mean Difference between Groups

Group	**Descending**	**Random**	**Ascending**
Descending	--	0.90*	2.32*
Random		--	1.42*
Ascending			--
** Denotes significance at the p<0.001 level.			

We performed statistical tests on gender, respondents' experience with Internet usage, online product information search, digital camera usage, as well as

subjective product knowledge on digital cameras, possession of a digital camera, and future purchase plan of digital camera to check the results of random assignment. Product knowledge was measured in terms of the amount of knowledge consumers believe they have about the digital camera with items adapted from Smith and Park's (1992) seven-point Likert scale. Responses were recorded on three 7-point strongly agree/strongly disagree scales, “I feel very knowledgeable about digital camera”, “If I had to purchase digital camera today, I would need to gather very little information in order to make a wise decision”, “I feel very confident about my ability to tell the difference in quality among different brands of digital camera” (Smith and Park 1992). The average scores on these items were used for further analysis. Several ANOVA tests with product sorting method as independent variables and gender, respondents’ experience with Internet usage, online product information search, digital camera usage, as well as subjective product knowledge on digital cameras, and possession of a digital camera as dependent variables were conducted. The results indicated that there was no significant difference across three experimental conditions and suggested that the random assignment of the respondents to the three experimental conditions was successful (see Table 12).

Table 12. Random Assignment Check

Factors controlled by random assignment	**F value**	**P value**
Gender	0.462	0.630
Internet experience	0.115	0.890
Online purchase experience	0.664	0.517
Online product information search/browse experience	0.175	0.838

Knowledge of digital camera	0.363	0.697
Usage experience of digital camera	0.466	0.629
Gender	0.539	0.585

5.4 Hypotheses Testing

A two-stage process was employed to test our hypotheses. For hypotheses regarding product sorting on subjects' perceptions on quality importance (QI) and price importance (PI), two importance measures, quality importance and price importance, were obtained from subjects' self-reported questions. A series of ANOVAs were carried out to test these effects. Further, the effects from sorting on relative importance of quality over price were further explored. For the hypotheses regarding product sorting on consideration set formation, a Hierarchical Linear Model (HLM) was employed to include factors from the product-level (product price, quality) and consumer-level (product sorting).

5.4.1 Sorting Effects on QI, PI, and RIQP

Analyses of variances (ANOVAs) were used in hypotheses testing and Tukey's Post Hoc Tests were used to further explore the results. The means and standard deviations of the dependent variables are presented in Table 13. The scores of quality importance (QI), price importance (PI) were measured in a self-reported manner. In addition, the relative importance of product quality over price (RIQP) was also measured. This RIQP was measured in two ways. The first RIQP was based on calculation from QI divided by PI; the second RIQP was measured

directly by asking participants to rate the relative importance in a 11 point scale.

Table 13. Mean and Standard Deviation of QI, PI & RIQP				
Dependent Variables		**Ascending** Mean (STD)	**Descending** Mean (STD)	**Random** Mean (STD)
QI		72.632 (15.309)	82.000 (11.050)	64.474 (14.990)
PI		79.211 (13.669)	66.000 (10.954)	68.684 (13.524)
RIQP	**Calculated**	0.971 (0.370)	1.279 (0.279)	0.966 (0.266)
	Direct Measured	5.632 (0.348)	7.200 (0.3391)	5.474 (0.348)

Illustrations of mean levels of QI, PI, and RIQP across three groups (ascending, descending, and random) were presented in Figure 7 and Figure 8.

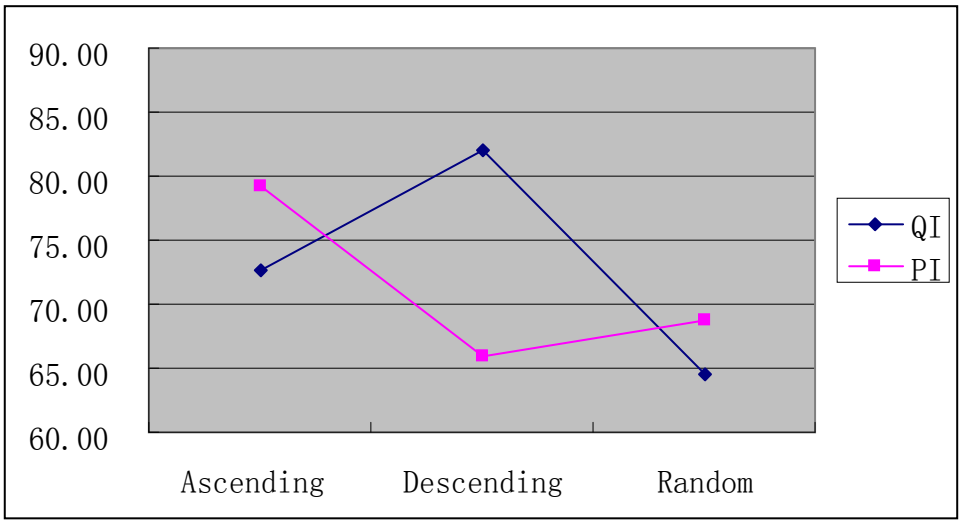


Figure 7. Illustration of Means of QI & PI in Three Groups

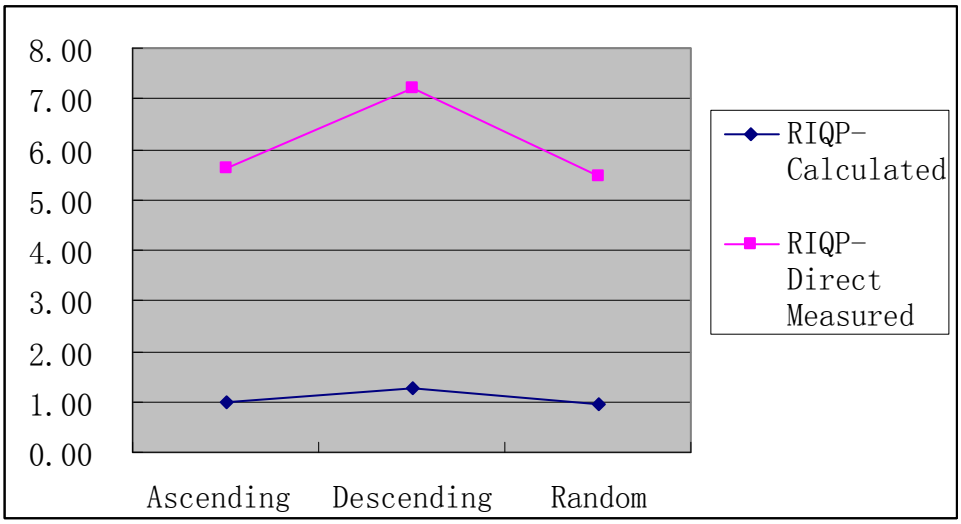


Figure 8. Illustration of Means of RIQP in Three Groups

A series of ANOVAs were conducted with sorting method as independent variables and importance of product quality (QI) as well as importance of price (PI) as dependent variables. A summary of hypotheses testing results is presented in Table 14. The results generally supported that product sorting has a significant effects on all dependent variables. Again, we employed ANOVAs to make multiple comparisons of treatment means for hypotheses testing. Finally, a series of Tukey's Post Hoc Tests were conducted as follow-up analysis. This test should be performed only as a follow-up analysis to the ANOVA, i.e., only after we had conducted the appropriate analysis of variance F tests and determined that sufficient evidence exists of differences among the treatment means (Mendenhall and Sincich 1994). Tukey's Post Hoc Tests are reported in Table 14.

Table 14. Turkey's Post Hoc Test Results

Dependent Variable		**Mean Difference**	**Std. Error**	**Sig.**
QI	D - R	17.526	4.444	0.001

		A - R	8.158	4.501	0.175
		D - A	9.368	4.444	0.097
PI		D - R	-2.684	4.083	0.789
		A - R	10.526	4.135	0.036
		D - A	-13.211	4.083	0.006
RIQP	**Calculated**	D - R	0.313	0.099	0.007
		A - R	0.005	0.100	0.998
		D - A	0.307	0.099	0.008
	Direct Measure	D - R	1.726	0.486	0.002
		A - R	0.158	0.492	0.945
		D - A	1.568	0.486	0.006

First, for the importance of product quality, ANOVA results showed that sorting method significantly affect consumers' perceptions (F (2, 55) = 7.800, P= .001). We then conducted ANOVAs to compare the ascending group with random group and ascending group with descending group in terms of quality importance, respectively. Results showed that quality importance was not significantly higher (F (1, 36) = 2.754, P=0.106) in ascending group (Mean=72.632, Std. =15.309) than in random group (Mean=64.474, Std. =14.990), although the P value was close to the 0.1 level. Thus, hypothesis 1 was rejected. Further, comparing quality importance in descending group with ascending group, results showed that quality importance was significantly lower in ascending group (Mean=72.632, Std. =15.309) than in descending group (Mean=82.000, Std. =11.050) in 0.05 significant level (F (1,37)= 4.839, P=0.034), hypothesis 4 was supported.

Turkey's Post Hoc Test also demonstrated similar results that the difference

between ascending group and random group was not significant (Mean Difference = 8.158, Std. Error=4.501, P = 0.175). In addition, quality importance in descending group was significantly higher than quality importance in ascending group (Mean Difference = 9.368, Std. Error=4.444, P = 0.097) at 0.1 significant level and random group (Mean Difference = 17.526, Std. Error=4.444, P = 0.001) at 0.01 significant level.

Second, for the importance of product price, ANOVA results showed that sorting method significantly affect price importance (F (2, 55) = 5.787, P= .005). We then conducted ANOVAs to compare the ascending group with random group and ascending group with descending group in terms of price importance, respectively. Results indicated that price importance was significantly higher in ascending group (Mean=79.211, Std. =13.669) than in random group (Mean=68.684, Std. =13.524) at 0.05 significant level (F (1, 36) = 5.694, P=0.022). Thus, hypothesis 2 was supported. Further, comparing price importance in descending group with ascending group, results showed that price importance was also significantly higher in ascending group (Mean=79.211, Std. =13.669) than in descending group (Mean=66.000, Std. =10.954) at 0.05 significant level (F (1,37)= 11.149, P=0.002), indicating an opposite direction compared to quality importance. Thus, hypothesis 5 was supported.

Turkey's Post Hoc Test also demonstrated similar results. Price importance in ascending group was higher than price importance in descending group (Mean Difference = 13.211, Std. Error=4.083, P = 0.006) and in random group (Mean Difference = 10.526, Std. Error=4.135, P = 0.036). In addition, the difference in

terms of price importance was not significant between descending group and random group (Mean Difference = 2.684, Std. Error=4.083, P = 0.789).

Table 15. Summary Hypotheses Testing on QI & RIQP

	Hypotheses		Mean Square	F Value	Sig.	Result
H1	**Quality Importance (QI)**	A vs. R	632.237	2.754	0.106	Rejected
H4		D vs. A	855.169	4.839	0.034	Supported
H2	**Price Importance (PI)**	A vs. R	1052.632	5.694	0.022	Supported
H5		D vs. A	1700.432	11.149	0.002	Supported
RIQP-Calculated		A vs. R	2.632E-04	0.003	0.960	Rejected
		D vs. A	0.921	8.621	0.006	Supported
RIQP-Direct Measured		A vs. R	0.237	0.123	0.729	Rejected
		D vs. A	23.969	7.945	0.008	Supported

We also investigated the impacts of product sorting on relative importance of quality over price (RIQP) because the quality importance and price importance jointly determine consumer's choice behaviour. The means and standard deviations of RIQP were presented in Table 13and Figure 8.

The relative importance of quality over price (RIQP) was measured in two ways. First, it was calculated based on quality importance (QI) and price importance (PI). Accordingly, the score of RIQP was derived from QI/PI. An ANOVA analysis indicated that sorting method had a significant effect on calculated RIQP ((F (2, 55) = 6.635, P= .003). We then proceed to pair wise comparisons. Results from two ANOVAs showed that calculated RIQP was significantly lower (F=8.621, P=0.006) in ascending group (Mean=0.971, Std. =0.370) than in descending group

(Mean=1.279, Std. =0.279). However, there was no significant difference in terms of calculated RIQP (F=0.003, P=0.960) between ascending group (Mean=0.971, Std. =0.370) and random group (Mean=0.966, Std. =0.266). Similar patterns were found from Turkey's Post Hoc analysis. Calculated RIQP in descending group was significantly higher than in ascending group (Mean Difference=0.307, Std. Error=0.099, P=0.008) and random group (Mean Difference=0.313, Std. Error=0.099, P=0.007). However, the difference in terms of RIQP was not significant between ascending group and random group (Mean Difference=0.005, Std. Error=0.100, P=0.998).

Second, RIQP was measured directly in a self-report manner. ANOVA results showed that sorting method significantly affects directly measured RIQP (F (2, 55) = 7.791, P= .001). We then used a series of ANOVAs to compare the measured RIQP in the ascending group with random group and ascending group with descending group in terms of RIQP, respectively. Results showed that there was no significant difference between ascending group (Mean=5.632, Std. =0.348) and random group (Mean=5.474, Std. =0.348) in terms of RIQP (F (1, 36) = 0.123, P=0.729). Similar pattern was also revealed by Turkey's Post Hoc Test (Mean Difference = 0.158, Std. Error=0.492, P = 0.945). Further, ANOVA results indicated that RIQP was significantly lower (F (1, 37) =7.945, P=0.008) in ascending group (Mean=5.632, Std. =0.348) than in descending group (Mean = 7.200, Std. = 0.3391). Turkey's Post Hoc Test also showed consistent results (Mean Difference=1.568, Std. Error=0.486, P=0.006).

5.4.2 Sorting Effects on Consideration Set Formation

When theoretical questions involve variables at different levels of analysis, one is confronted with a cross-level model (Hofmann and Gavin 1998). Cross-level models were defined by Rousseau (1985) as those that specify “the effects phenomena at one level have on those of another (p.14)”.

The hypotheses on consumer choice of the present study require testing the effects of consumer-level properties (i.e. consumer perceptions on importance of product quality & price) on product selection outcomes (i.e. consideration set formation). As Hierarchical linear model (HLM) overcomes the statistical weaknesses of traditional methods for analyzing nested data (Hofmann 1997), it is a statistical technique available to researchers that is ideally suited for the study of cross-level issues (Wech and Heck 2004).

The HLM (Bryk and Raudenbush 1987, 1992) is known also as the multilevel model (Bock 1989; Goldstein 1987) and the random coefficient model (Longford 1993), it examines both lower-level and higher-level variance in dependent variable, while maintaining the proper level of analysis for independent variables (Lee 2003; Wech and Heck 2004).

HLM are becoming increasing used and gaining acceptance in econometric research (Bock 1989; Bryk and Raudenbush 1992; Goldstein 1987; Kreft et al. 1995) and management literature (Hoffmann et al. 2000; Whitener 2001) to address our cross-level relationships. We conducted the analyses in HLM 6, which

is a user-friendly software package designed to test hierarchical linear models. In general, HLM simultaneously assesses relationships both within and across (or between) levels. HLM achieves this process by performing regressions of regressions (Hofmann, 1997). Following are the equations for our product-, consumer-, and cross-level models (see Table 16).

Table 16. HLM Analysis Equations

Product-Level Model

$$\text{Prob}(\text{SELECTIO}_{ij}=1|\beta_j) = \varphi_{ij}$$

$$\text{Log}[\varphi_{ij}/(1 - \varphi_{ij})] = \eta_{ij}$$

$$\eta_{ij} = \beta_{0j} + \beta_{1j}(\text{POSITION}_{ij}) + \beta_{2j}(\text{QUALITY}_{ij} - \overline{\text{QUALITY}}_{..}) + \beta_{3j}(\text{PRICE}_{ij} - \overline{\text{PRICE}}_{..}) + r_{ij}$$

Consumer-Level Model

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(D_j) + \gamma_{22}(R_j) + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}(D_j) + \gamma_{32}(R_j) + u_{3j}$$

Cross-Level Model

$$\eta_{ij} = \gamma_{00} + \gamma_{10}*\text{POSITION}_{ij} + \gamma_{20}*(\text{QUALITY}_{ij} - \overline{\text{QUALITY}}_{..}) + \gamma_{21}*D_j*(\text{QUALITY}_{ij} - \overline{\text{QUALITY}}_{..}) + \gamma_{22}*R_j*(\text{QUALITY}_{ij} - \overline{\text{QUALITY}}_{..}) + \gamma_{30}*(\text{PRICE}_{ij} - \overline{\text{PRICE}}_{..}) + \gamma_{31}*D_j*(\text{PRICE}_{ij} - \overline{\text{PRICE}}_{..}) + \gamma_{32}*R_j*(\text{PRICE}_{ij} - \overline{\text{PRICE}}_{..}) + u_{0j} + u_{1j}*\text{POSITION}_{ij} + u_{2j}*(\text{QUALITY}_{ij} - \overline{\text{QUALITY}}_{..}) + u_{3j}*(\text{PRICE}_{ij} - \overline{\text{PRICE}}_{..}) + r_{ij}$$

In our equations, SELECTION represents whether a product was included in the consideration set (Included 1, not included 0). POSITON refers to a product's position in the list, ranging from 1 to 9. QUALITY is the averaged quality ratings for each product deriving from our pre-test. PRICE is the product price showed in our experiment. Two dummy variables (D & R) were created to represent three

sorting conditions, depicted in Table 17. Before estimating the models, we centred two product-level variables: PRICE and QUALITY to reduce potential multicollinearity problem (Ang et al. 2002).

Table 17. Two Dummy Variables Representing Three Sorting Conditions

Variables / **Product list**	**D**	**R**
Descending	2	1
Ascending	1	1
Random	1	2

In the Product-Level Model (Level 1), the formula depicts that the possibility of a product being included in the consideration set (SELECTION) is a function of product position in the list (POSITION), product quality (QUALITY), and product price (PRICE). If POSITION is significantly correlated to SELECTION, the support for hypothesis 7 will be found.

In the Consumer-Level Model (Level 2), the formula represents our hypotheses that the possibility of a product being included in the consideration set (SELECTION) is a function of product quality sorting. More specifically, the well established links between SELECTION and QUALITY, as well as SELECTION and PRICE, are moderated by product sorting. If the moderating effects from dummy variable D were found to be significantly, it means that consumers in the descending group are more likely to select a high quality (high price) product than consumers in the ascending group (please refer back to our coding of two dummy variables: D & R). Similarly, if the moderating effects from dummy variable R

were found to be significantly, it means that consumers in the ascending group are more likely to select a high quality (high price) product than consumers in the random group.

Table 18 reports the HLM coefficients of all product-level and consumer-level predictors of consideration set formation.

Table 18. HLM Results on Hypotheses Testing

Product-level Predictors	**Consumer-level Predictors**	**Coefficient**	**P-Value**
POSITION		0.017	0.765
QUALITY		0.452	0.072*
	D	0.277	0.013**
	R	0.077	0.492
PRICE		0.010	0.088*
	D	-0.008	0.034**
	R	-0.002	0.520
* significant at 0.1 level; ** significant at 0.05 level			

First, the hypothesis regarding serial position effect was rejected (B=0.017, P=0.765), indicating insignificant effect of position on the probability of one product being included in the consideration set. Hence, hypothesis 7 was rejected. Second, consistent with most of the research on product quality and price, product quality and price affects consumer selection, which is the basis for our subsequent analysis on product sorting effects on consumer consideration set formation. Finally and most importantly, results showed that the first dummy variable

indicator D significantly moderates the relationship between QUALITY-SELECTION and PRICE-SELECTION. However, the effects of the second sorting indicator R were not significant.

Referring back to our coding on these two dummy variables, the significant moderating effect from D indicates that sorting products in descending order lead to significant differences in consumer consideration set formation, comparing to sorting products in ascending order. The second dummy variable R represents the difference between ascending group and random group. The insignificant effects from variable R indicated that there was no evidence that subjects assigned to ascending group and random group differs in their selections of products in consideration set. Hence, hypothesis 3 was rejected and hypothesis 6 was supported (an overview of HLM hypotheses testing results are presented in Figure 9).

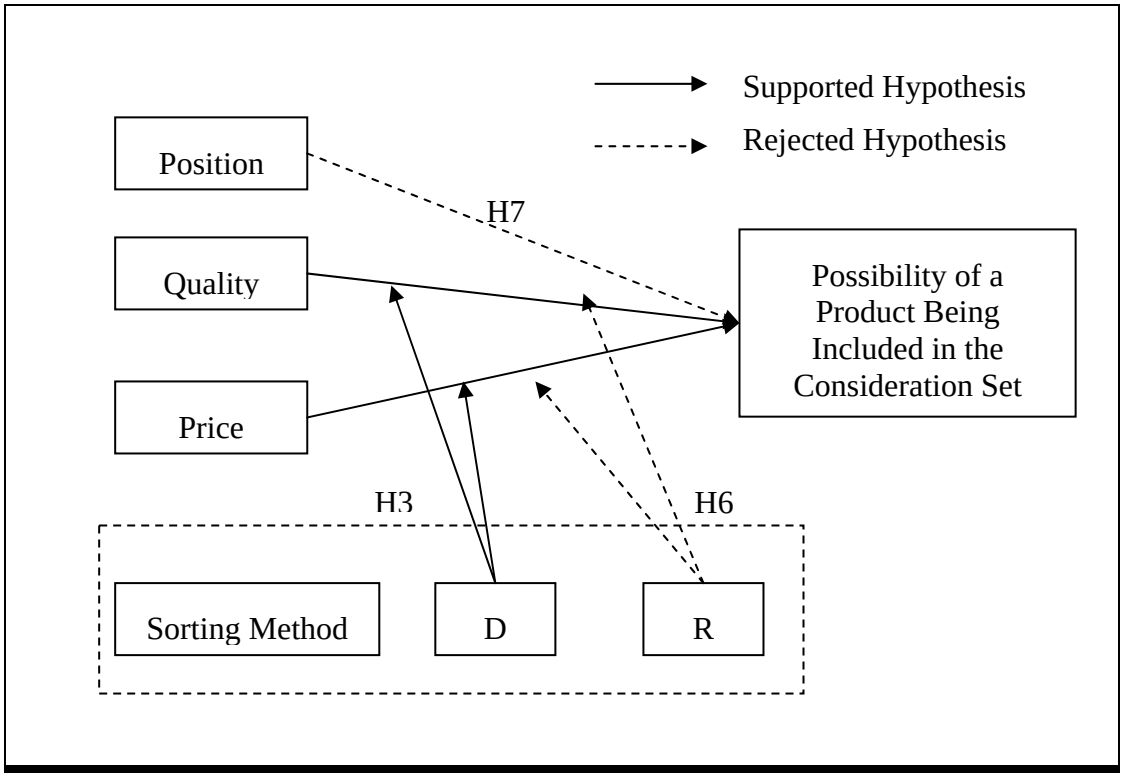


Figure 9. Illustration of HLM Hypotheses Testing Results

Chapter 6 Discussions

6.1 Overview

Chapter 6 discusses the research findings, compares our findings to literature, and draw implications from these findings. It first discusses findings regarding the differences between ascending list and random list. Then, discussions on the differences between descending list and ascending list are presented.

While most of the studies investigating product presentation order on consumer decision making focus on the serial position effect (Bruine de Bruin et al. 2003; Scarpi 2004) and the comparisons between ranked and random product lists (Cronley et al. 2005; Diehl et al. 2003), we built on theories and prior investigations into how consumers respond to different order of product list and attempt to advance current understanding of designing product list by systematically comparing consumers' perceptions on product quality, relative importance of product quality/price, consumer judgments and choices across three orders of product list in this study. Based on a carefully designed experiment, this study generates several main findings.

6.2 Discussion of Sorting Effects: Comparing Ascending List with Random List

We first compared the sorted (ascending) product lists with unsorted (random)

product list based on product quality in terms of importance of product quality, price importance, relative importance of quality/price, and consideration set formation.

Regarding importance of product quality, the difference between ascending list and random list was rejected (H1). Quality importance was not significantly higher in ascending group than in random group, although the P value was very close to 0.1 significant level (P=0.106). In the literature, most of studies advocate that low search cost for quality information should lead to higher quality importance (e.g. Creyer and Ross 1997; Haubl and Murry 2003; Lynch and Ariely 2000), based on the principle of concreteness explanations. However, Diehl et al. (2003) found that quality importance was lower in random list, which is different from most of evidences reported in the literature. They further argued that ordered product list would introduce higher substitutability of quality and thus make quality importance lower. We suspect that both effects (low search cost effect and higher substitutability effect) would exist and the net effect of sorted list on quality importance, whether increase or decrease, depends on the relative strength of two accounts: information processing cost account and substitutability account. Then, why most studies reported the information processing cost effect and only one study in the literature capture the substitutability effect? We carefully review the design of experiment in Diehl et al. (2003). There are two possible reasons which lead to very significant substitutability effect. First, the product included in their experiment was e-cards. The product quality of e-card is difficult to evaluate and might vary significantly across subjects due to different personal fits. Further, seven independent judges in their study rated all available cards on quality (i.e.,

their fit) and their averaged ratings were then treated as the overall quality of each e-card. Given that electronic card's quality may vary a lot across consumers, we suspect that ratings from seven judges may not sufficiently be the good indicator of e-card's quality. Second, a very long product list was introduced in their experiment, and no other sorting or filtering functions were provided. Since subjects in their experiment may not be able to review all the e-cards exhaustively, substitutability effect would loom larger in this setting. Although results from our experiment was not significantly support this proposition, the P value was also close to the cut-off level. Therefore, we still suggest that in most of real online shopping cases, the information processing cost effect should be dominant.

As for the price importance, hypothesis 2 was supported. This result is consistent with the e-commerce literature and pricing literature that a sorted price list will lead to higher price importance (sensitivity) than a random price list.

Further, regarding the relative importance of quality over price (RIQP), the calculated RIQP and directly measured RIQP showed consistent results that there was no significant difference between ascending list and random list. This finding was contrary to our hypothesis. We then turn back to the theoretical reasoning of this hypothesis. Recall that we derived this hypothesis based on the assumption that the increase of processability in quality (completed sorted) would be larger than the increase of processability in price (partially sorted). And for the products selected in our experiment, the rank correlation coefficient of quality-price was relatively high (0.87), we suspect that this high coefficient could result in weak difference between the processability of quality (completed sorted) and price

(partially sorted). This is consistent with the literature that price-quality correlation is a potential moderator of sorting effect (Diehl et al. 2003). Accordingly, sorted or unsorted may only result in a small and not significant difference in terms of relative importance of quality/price. In other words, although the quality of importance is likely to be improved in ascending list, the price importance also increases due to high correlation between quality and price, then the effects from changes information processing cost are offset, which lead to the insignificant difference between ascending list and random list in terms of RIQP.

Finally, looking at the results related to consideration set. Results regarding sorting effects on consideration set formation showed consistent pattern with RIQP. This result further confirms that, when product quality and price are highly correlated, consumer choice should not be influenced by product sorting.

6.2 Discussion of Sorting Effects: Comparing Descending List with Ascending List

We then compare the differences between descending list and ascending list.

Our study investigates the effects from sorting product list in different order on consumer decision making. In particular, our results indicated that the importance of product quality was significantly higher in descending list than ascending list, and the price importance was significantly lower in descending list than in

ascending list. Accordingly, the relative importance of product quality/price was improved in a descending list, compared to an ascending list. The effect on consideration set formation was also consistent with our hypotheses.

The significant differences between descending and ascending list are consistent with several empirical results of related literature (Creyer et al. 1997; Haubl et al. 2003; Lynch et al. 2000). However, our study differs from theirs in the means of manipulating processing cost of product quality information. Although researchers generally agree that how a consumer chooses to “get the best for his or her money” depends on the ease with which information about the choices can be processed (Creyer et al. 1997), there are different ways to vary the ease with which certain attribute information is processed. For example, Lynch & Ariely (2000) vary the quality usability by three means: displaying descriptions of wines using differentiating sensory attributes, permitting consumers to sort by wine varietals, and allowing consumers to “drill down” to see further differentiating comments. In addition, Hauble and Murray (2003) manipulated the information processing cost by including or excluding certain attributes in a recommendation agent.

Futher, we hypothesize that the changes in importance of product quality and relative importance will be reflected on consideration set formation. Specifically, we hypothesized a moderating effect from product sorting on quality/price-choice relationship. The probability of one product being included in the consideration set was significantly different between descending list and ascending/random list. These results are consistent with Diehl and Zauberman (2005)’s results which

showed that consumers selected options with better quality from declining than improving orderings. We speculated that the difference between descending list and ascending list was due to the loss aversion. Although the phenomenon of loss aversion have been observed in many studies and its robustness has been verified as well, several researchers added a word of caution before making the empirical generalization about loss aversion in different contexts and suggested that loss aversion had its boundaries (e.g. Kalyanaram and Russell 1995). Our results demonstrated that, in the context of multiple attributes trade-offs, loss aversion could occur in a sorted product list, which is consistent with Cha and Aggarwal (2003)'s suggestions.

6.3 Control: Serial position Effect

Finally, the position effect was not significant in our experiment. A possible explanation is that the number of products included in this experiment was too small (9 products in a list). When respondents are exposed to a short list of products, they would have sufficient efforts and time to evaluate every product. Thus, position effect may not be significant in our settings.

Chapter 7 Conclusions and Implications

7.1 Overview

Chapter 7 concludes the whole study by first summarizing the research contributions and implications, then pointing out several limitations of this study, and finally proposing several future research directions.

7.2 Theoretical Implications

This study focuses on one specific aspect of Web site design—how to deliberately arrange products list in a certain order to influence online consumers' decision making. The theoretical contribution of this study is manifold.

First, it reveals that even when consumers shop around for a better deal in electronic shopping Web sites, the decision making process is still not entirely rational. They are subject to sorting effect because the importance weights they attached to product quality and price could be affected by product sorting.

Second, building on the works of information format effects in decision making literature, we explain how product sorting affects consumer choice of products from a list. In particular, we provide the Importance Change explanation on how sorting affects consumer choice. More specifically, we demonstrated those consumers' perceptions on quality importance and relative importance of quality

over price might be affected by product sorting, and these changes in importance perceptions will in turn lead to changes in consumer formation of consideration set.

Finally and more importantly, we provide evidences in explaining why product sorting could influence consumer choice. Based on an extensive review of order effects, ordering effects, and information processing cost effects, we integrate theories from psychology, marketing, and economics to answer the research questions. Prior research reported the effects of presentation order on the relative attribute weights in two sequentially options condition (e.g. Bruine de Bruin et al. 2003). Our study extends the prior research by applying the current theories in designing a list of products. Specifically, our study complements the current research by examining the differences between ascending order list and descending order list. Our finding suggests that a 'loss aversion' situation can be created on a webpage by properly arranging product orders in a list.

7.3 Practical Implications

From a practical perspective, this study has potential implications by providing online retailers with possible strategies in presenting product information and 'implicitly' influences consumers' choices. With e-commerce growing steadily, electronic shopping sites are embracing the advantages of dynamic interface design to keep shoppers happy – and spending. Our findings suggest that providing consumers with a descending list of products based on product qualitys could make consumers more quality (quality) sensitive. Applying the finding,

online vendors can easily increase the attractiveness and purchase likelihood of designated options. For example, if used appropriately, they can “implicitly” promote high quality items when high-quality items are more profitable by designing a descending list of products, or vice versa. Because the presentation order has the advantage of being easily controllable by electronic shopping sites, this consequence has immediate practical implications. However, this strategy should be applied with cautions. Sorting products in a descending order makes high quality and high price items appear first, will it raise consumers’ perceptions on the price image of that online? If that is the case, what methods could be applied to compensate it? This could be an interesting future research.

7.3 Limitations & Future Research

We should note that this study has certain limitations, as is the case with any exploration of new research venues.

First, subjects in the experiments are college students who might somehow react differently than “typical” consumers. Although college students are representative of younger online consumers, the typical student subjects could have characteristics that differentiate them from other segments of the general population. Further, the sample we used are actually convenience one instead of deriving from a systematic sampling process. This could impair the internal reliability of our studies. In addition, the relative homogeneous nature of the participants in this study (college students) restricts the generalizability of the experimental results. Obviously, generalization could have been broader if

participants had more heterogeneous backgrounds. Therefore, future research should use a more representative sample based on sampling theories will certainly make the results more generalizable.

Second, we only select the digital camera for the experiment. Quality may be particularly important for this type of product. Including several different types of products in the experiment will make the results more generalizable.

Third, it should be noted that experimentation as a method has its own drawbacks, although it provides the obvious advantage of tight control and strong ability to infer causal effects. In the case of studying consumer online shopping behaviours, the experimental setting presented a possible problem in terms of internal validity. The environment for the experiments was a computer lab in which subjects were run in batches to save time and allow more students to participate. This setup was not an ideal replication of many real shopping situations, since the common practice of online shopping is at home alone by oneself. We have used several methods to make the experiment settings as close as real online shopping. Nevertheless, despite all these efforts, the experimental setting was still different from real life shopping.

Finally, we believe that sorting effects on consumer perceptions on quality importance and relative importance of quality over price may be reflected in consumer choice behaviours. However, the effects of sorting on consumer choice could be compounded by other effects. For example, Cronley et al. (2005) suggested that the product presentation order (ranked vs. random) could affect

consumer’s price-quality inference and inference-based choice. Providing a full picture describing how product sorting (design factor) influence consumer choice (behaviour) may be an interesting future research.

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Appendixes

Appendix A: Pre-test Questionnaire

A-1 Ranking Digital Camera Quality Attributes

The following table lists down some quality attributes of digital cameras as well as explanations.

Attributes	Explanations
Mega pixels	Mega pixels, describes the quality of an image. The higher the camera's megapixels, the more detail an image will retain when enlarged.
LCD Screen Resolution	The Liquid Crystal Display (LCD) Screen Resolution refers to the number of pixels that comprise the image displayed onscreen.
LCD Screen Size	LCD Screen size is the measure from bottom corner to opposite top corner of the viewable screen of a device.
Digital Zoom	Digital Zoom is an editing device that crops the outside edges of an image and enlarges the middle portion in order to create a zoom effect.
Optical Zoom	Optical Zoom is a feature that allows users to alter the view angle of an image by altering the focal length of the lens.
Weight	The weight of the camera.
ISO Rating	The International Standardization Organization (ISO) Rating describes how sensitive to light a digital camera is. The higher the rating, the more sensitive the camera is to light and the darker the environment in which the camera can take a photo.
Still Image	Still Image Capture Speed, controlled by aperture, refers to the

Capture Speed	number of frames per second a camera can capture.
Photo Quality Print	Photo Quality Print refers to the maximum size photo that a camera can reproduce, while still maintaining the integrity of the image.

Please rate the above attributes based on the importance you perceive when you are going to shop for a digital camera.

Mega pixels

1 2 3 4 5 6 7 8 9 10 11

Very Unimportant Neutral Very Important

LCD Screen Resolution

1 2 3 4 5 6 7 8 9 10 11

Very Unimportant Neutral Very Important

LCD Screen Size

1 2 3 4 5 6 7 8 9 10 11

Very Unimportant Neutral Very Important

Digital Zoom

1 2 3 4 5 6 7 8 9 10 11

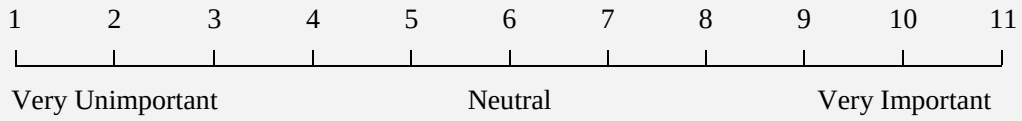
Very Unimportant Neutral Very Important

Optical Zoom

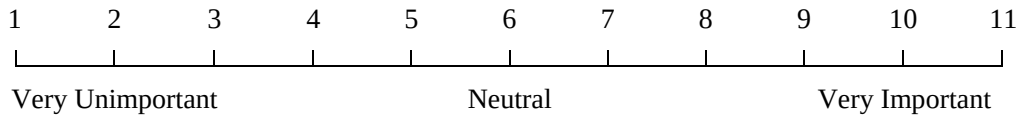
1 2 3 4 5 6 7 8 9 10 11

Very Unimportant Neutral Very Important

Weight



ISO Rating



Still Image Capture Speed

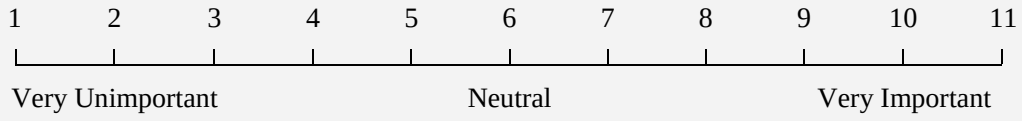
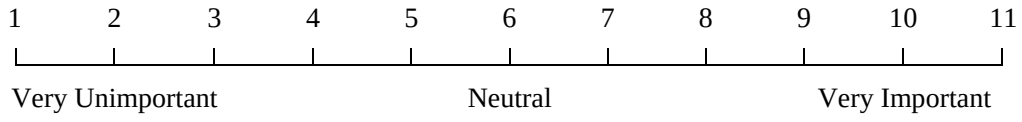


Photo Quality Print



A-2 Digital Cameras Overall Quality Rating

In this section, the quality-related information of nine DC model is presented. Please rate their overall quality in a 1 to 100 scale (100 – extremely excellent; 1 – extremely poor) based on the information given, regardless their market price. The **Product Quality** in this research refers to the technical specifications of a product's non-price attributes.

(Nine digital camera models were listed after the above instruction. The information on each model is identical in pre-test and main study. To save the space, the long list of digital camera information was not listed in this appendix).

Appendix B: Main Study Questionnaire

B-1 Personal Information

1) Your e-mail address:_____

2) Your gender: a) Male b) Female

3) Your age: _____

4) Your current education level:

a) Undergraduate b) Postgraduate c) Others

5) For how many years have you been using the Internet?

_____year(s)

6) How many times have you made purchases online within the last 12 months?

- ○ None
- ○ 1-3 times
- ○ 4-6 times
- ○ 7-10 times
- ○ More than 10 times

7) How often do you search/browse for product information online?

- ○ Less than once per month
- ○ 1-3 times per month
- ○ 4-6 times per month
- ○ 7-10 times per month
- ○ Almost everyday

Please indicate the degree to which you would agree with the following statements by choosing a number from 1-7, where 1 indicates “strongly disagree” and 7 indicates “strongly agree”

8) I feel very knowledgeable about digital camera.

○	○	○	○	○	○	○
1	2	3	4	5	6	7

Strongly disagree Strongly agree

9) If I had to purchase digital camera today, I would need to gather very little information in order to make a wise decision.

○	○	○	○	○	○	○
1	2	3	4	5	6	7

Strongly disagree Strongly agree

10) I feel very confident about my ability to tell the difference in quality among different brands of digital camera.

○	○	○	○	○	○	○
1	2	3	4	5	6	7

Strongly disagree Strongly agree

11) How frequently do you use a digital camera?

- ○ Almost every week
- ○ About 2-3 times per month
- ○ About once per month
- ○ About once every two months
- ○ About once every six months
- ○ Even less frequent

12) Do you have a digital camera which you can conveniently use?

○ Yes ○ No

B-2 Experimental Website

Please input the following URL to enter the experimental website.

Http://cal.ddns.comp.nus.edu.sg/cs/DH_login.aspx

(The actual URL varies across three treatment groups)

After filling your email address and clicking “Next”, you will see a group ID appears on the experimental website. Please check this ID with the one printed on your questionnaire. If this group ID is not “DH”, please report to the experiment coordinator before proceed with the experiment.

Now you are exposed to a list of digital cameras. Suppose that you are shopping online for a digital camera and the website is an online store which you will purchase from. You need to evaluate those products and then make a choice that best fits your personal situation.

B-3 Product Selection

13) Please write down the model of the product (from the list) that you are most likely to purchase (e.g. PowerShot xxx) _____

14) Please explain in details why do you consider this product as a good choice?

_____

_____

15) Were there any other products in this list you consider? Please indicate them. You can indicate as many or as few as you want.

1._____

2._____

3._____

B-4 Post-Experiment Questions – Section I

In the following statements, **product quality** in this research refers to the technical specifications of a product's non-price attributes.

16) Based on the product quality, the general pattern of the product list you've seen is sorted in which order?

○	○	○	○	○
1	2	3	4	5
Ascending	Partial ascending	Random	Partial descending	Descending

17) What is your chance of buying the **PowerShot SD550** if you need to purchase a digital camera?

○	○	○	○	○	○	○
1	2	3	4	5	6	7
Unlikely						Likely

18) How much do you consider **PowerShot SD550** as a desirable product?

○	○	○	○	○	○	○
1	2	3	4	5	6	7
Undesirable						Desirable

19) How many other products appear in the product list are more desirable than **PowerShot SD550**?

○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8

20) Please indicate the relative importance of product quality to price if you were to buy a digital camera?

○	○	○	○	○	○	○	○	○	○	○
1	2	3	4	5	6	7	8	9	10	11

Price is more important than quality — Equally important — Quality is more important than price

21) Please indicate the degree to which the product quality/product price is important to you by rating them in a 1-100 scale, where 1 indicates "not at all important" and 100 indicates "very important".

Product quality _____

Product price _____

B-5 Post-Experiment Questions – Section II

The online retailer is currently evaluating two promotion strategies. If you are a customer who wants to buy a digital camera from this online retailer, what would you react to the following promotions?

First, the retailer introduces an enhanced model of **PowerShot SD550,** named **PowerShot SD550 Plus**, to substitute the original model. The new model is the same with the original one (including the price), EXCEPT for upgraded Mega pixels, Optical zoom and Digital zoom. The information of the original model and new model is listed as following:

Model	Mega pixels (M)	Resolution	Optical zoom	Digital zoom	LCD screen	Price (S$)
PowerShot SD550	7.1	2048 x 1536	3.6X	4X	2.5 inch	750
PowerShot	8	Same	4X	4.5X	Same	Same

SD550 Plus						

Assume that you are exposed to a 9 digital camera list on the web site, with all other products remain the same except that PowerShot SD550 is substituted by PowerShot SD550 Plus. Please indicate your attitude towards the new model.

22) What is your chance of buying a **PowerShot SD550 Plus** if you need to purchase a digital camera?

○	○	○	○	○	○	○
1	2	3	4	5	6	7

Unlikely Likely

23) How much do you consider **PowerShot SD550 Plus** as a desirable product?

○	○	○	○	○	○	○
1	2	3	4	5	6	7

Undesirable Desirable

24) How many other products appear in the product list are more desirable than **PowerShot SD550 Plus**?

○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8

Appendix C: Screen Captures of Product List Display on Current Electronic Shopping Sites

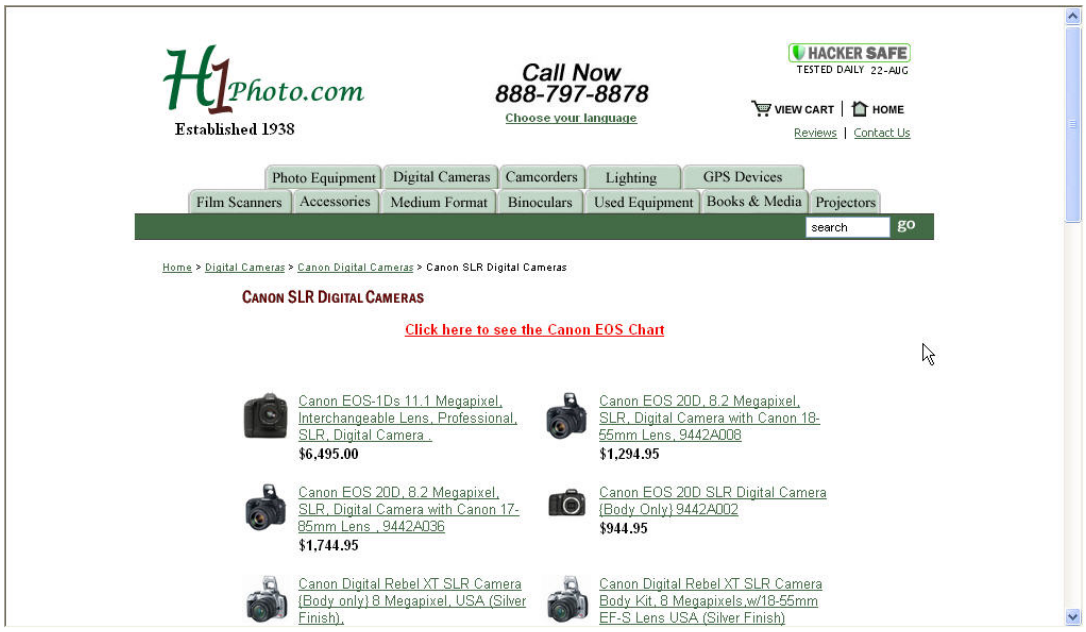


Figure 10. Web Site - No Sorting Function

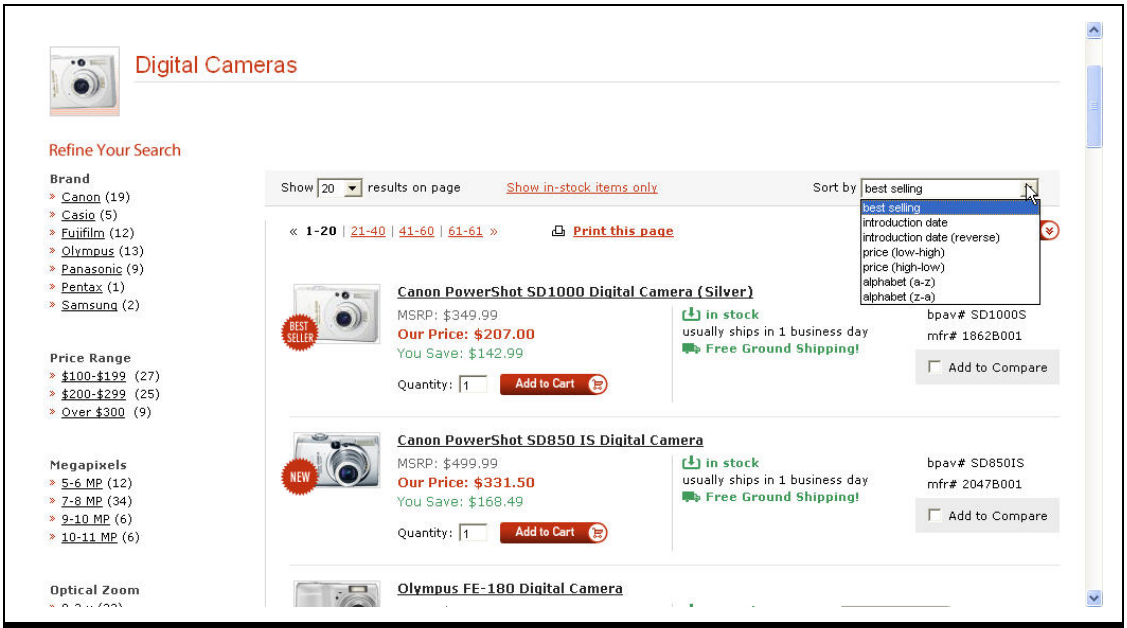


Figure 11. Web Site - Price Sorting

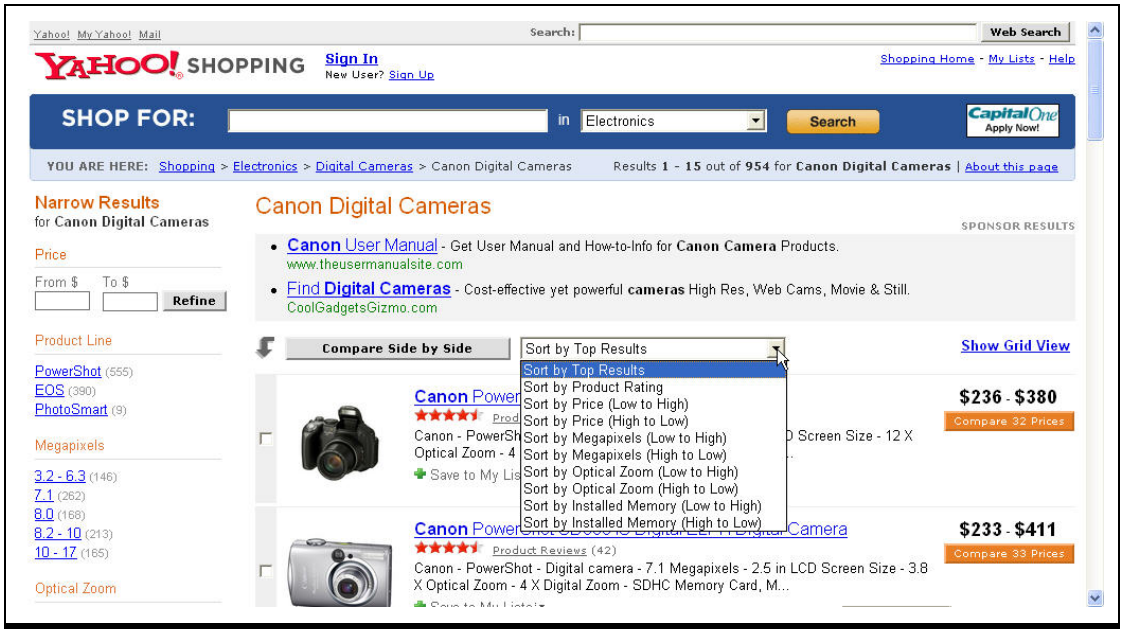


Figure 12. Web Site – Sorting on Quality Attributes

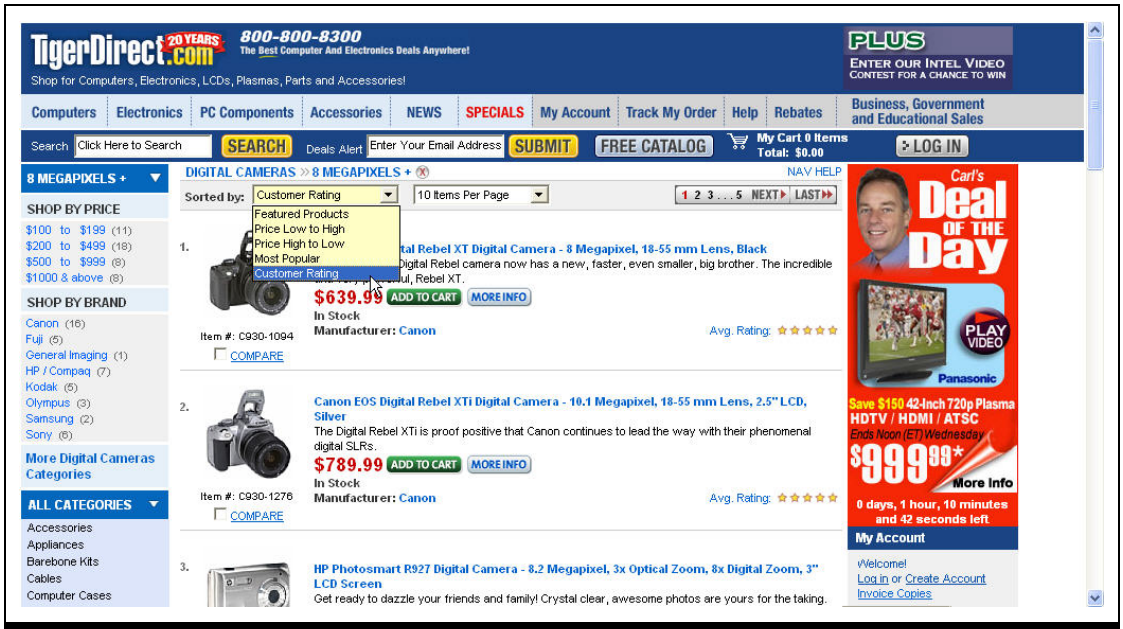


Figure 13. Web Site – Sorting on Customer Rating & Popularity

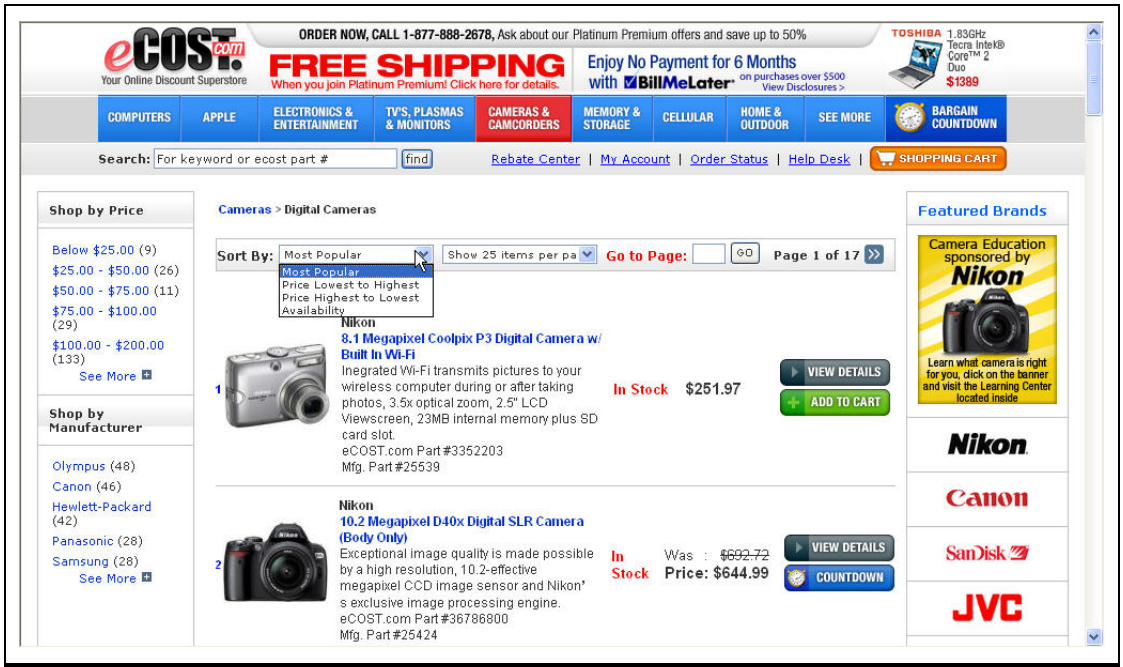


Figure 14. Web Site – Sorting on Popularity