HOW DO WE USE ONLINE CUSTOMER REVIEW? A COGNITIVE PSYCHOLOGICAL PERSPECTIVE

by

QIANQIAN LIU

(Under the Direction of Elena Karahanna)

ABSTRACT

This dissertation investigates the psychological processes underlying consumers' use of online product reviews in their purchase decision-making and implications for online review web site design. Specifically, the dissertation examines (1) the information selectivity question, i.e., how do people select which reviews to read, (2) the preference construction question, i.e., how do the reviews they read influence their criteria for evaluating a product, and (3) the design question, i.e., how can we design an online review web site to help people make better "informed" decisions. The dissertation proposes that exploratory search and goal-directed search are two mechanisms underlying information selectivity. Exploratory search is driven by consumers' curiosity and cues for validity including review star rating, helpful vote, and review age. Goal-directed search is driven by information scent, defined as the perceived relevance of a review to a consumer's criteria for evaluating a product. Consumers' preference construction is affected by learning and forgetting, and biased information processing based on the intention to reduce cognitive costs and dissonance. Based on the conceptual model, a new review presentation design named Attribute Overview is proposed. The dissertation tests and refines the conceptual model and compares the Attribute Overview design with the traditional online review

web site using both variance and process approaches. Data are collected in an experiment using process tracing methods (i.e. monitoring information acquisition and verbal protocol analysis). The variance model confirms (1) the impact of cues for validity including review star rating (especially one star review) and helpful vote, consumers' curiosity, and information scent on information selectivity, and (2) the impact of memory processes and biased information processing on preference construction. The process approach shows how the psychological processes unfold over time. Although the variance model shows that the same set of factors affect people's information selectivity and preference construction when using the traditional web site and Attribute Overview web site, the process approach reveals processual differences. The experimental data show that the Attribute Overview web site is better in terms of mitigating inappropriate selectivity and in helping reduce evaluation bias.

INDEX WORDS: Online reviews, Psychological process, Information selectivity, Preference construction, Judgment and decision-making, Design, Variance model, Process model, Process tracing, Think-aloud, Bayesian modeling

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DEDICATION

This dissertation is dedicated to my parents for their unconditional love and support.

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Customer generated reviews have become a critical feature on many e-commerce web sites over the past few years, and they are changing online shoppers' behavior in important ways. In a CompUSA-iPerceptions study, 81% of surveyed shoppers consider customer ratings and reviews important when they are researching or planning a purchase and 63% of consumers indicated they are more likely to purchase from a site if it has product ratings and reviews (iPerceptions, 2006). Online review web sites also enable researchers to observe and measure the evolution of word-of-mouth (WOM) directly and accurately. Recently, Marketing and MIS scholars have raised various research questions related to online WOM. Among these questions, the impact of online WOM on consumers' behavior and market outcomes has been frequently investigated by researchers across different disciplines. For example, researchers have been able to show that the number of reviews and the average rating per product influence product sales (e.g. Chevalier & Mayzlin 2006; Duan et al. 2008; Liu 2006)

With very few exceptions, extant empirical studies usually use secondary data to infer the impact of online WOM on consumers' behavior and market outcomes. For example, much attention has been paid to the statistical correlation between the online WOM and aggregate market outcomes such as product sales (e.g. Godes & Mayzlin 2004; Liu 2006; and Duan et al. 2008) and price premium (e.g. Ba & Pavlou 2002). These studies are often premised on the notions that online WOM increases consumer awareness and communicates information about product quality (e.g. Etzion & Awad 2007) or online WOM reduces search costs to identify a

product that fits consumers' preference (e.g. Chen et al. 2004). This line of thinking provides interesting insights, but ignores important aspects of consumers' online behavior and cognitive processes: (1) limited information processing capability and the resulting information selectivity (i.e. people pay attention to and process only a subset of the available information) and (2) the constructive nature of the preference.[1]

Specifically, since many e-commerce web sites keep all historical reviews available online, information-overload can result especially for popular products. Anecdotal evidence suggests that consumers may not read all the reviews posted on a web site about a product. Due to the limited capacity of human information processing system, thinking about and making sense of all the information that has been collected incurs considerable cognitive costs. Because of the cognitive costs of processing information, information selectivity is necessary when people browse the online product reviews. To understand the impact of online WOM on consumer behavior and to design effective WOM web site, it is important to identify the subset of reviews selected by consumers and the strategies or heuristics used by them to select reviews.

Moreover, many extant studies often implicitly assume that consumers' criteria for evaluating product is pre-defined and fixed. When consumers choose between different products, product attributes are used as criteria to evaluate different alternatives. It is true that consumers may have some pre-defined criteria. However, as consumers learn more about products by reading the reviews, they may exclude some pre-defined attributes, or include new attributes as their criteria. Changes in evaluation criteria may lead to changes in preference either stated by the individual or revealed by his or her choice. It is unrealistic to assume consumers have fixed

[1] In addition to the comments on products, Consumers also post reviews about the sellers. For example, ebay.com allows online buyers to leave feedbacks on the sellers. This dissertation is framed around product reviews but applies equally to vendor reviews.

preferences because reading online reviews may influence their criteria for evaluating a product. Therefore, preferences may be constructed on the fly based on what reviews consumers select to read.

Herbert Simon (1979) argued that any human decision-making model must explicitly take into account the actual psychological processes that are involved. To address these gaps in the literature and advance our understanding of this phenomenon, the research question "what are the cognitive processes underlying people's use of online reviews" needs to be answered. Specifically this dissertation aims to answer the following research questions:

RQ1: How do online reviews influence consumers' criteria for evaluating a product?

RQ2: How do consumers select which reviews to read?

As contended by Ramaprasad (1987), psychological process research is able to provide useful guidelines for information systems design. The psychological processes underlying people's use of online reviews have important implications for online review organization and presentation design. In this dissertation, I will also discuss how understanding of the psychological processes can help improve the online review system design. Therefore, the third research question to be addressed is:

RQ3: How can we improve the online review system design to help people make better "informed" decisions?

Note that the phenomena of information selectivity and preference construction are not unique to the domain of online WOM. They are two prominent and ubiquitous issues in information-intensive environments. For example, suppose one is choosing between an android and an iPhone for their next cell phone. To make such a decision, many people would turn to the

Internet for help. If you Google the keyword "Android vs. iPhone", you will get more than 100 million results. It is believed that the Internet lowers the search costs of acquiring information: you can easily get the information you want with a search engine. However, due to the constraints of human mind, the cognitive costs of processing information are still high. Probably nobody would read all 100 million results before making the decision. The search results we choose to read may affect our choice between android and iPhone. Because of the information selectivity, the decision process and outcome are inevitably affected by what information we select and how we select the information. This dissertation examines the information selectivity and preference construction in the domain of online Word-of-Mouth, i.e. customer generated online reviews. The theory developed in this dissertation should also apply to judgment and decision-making in other information-intensive environments with minimal modification.

1.1 Positioning the Dissertation in the Literature

This dissertation aims to investigate the cognitive processes underlying the judgment and decision-making based on online WOM. It can be positioned in both the decision-making and Word-of-Mouth literature (see Figure 1.1).

In judgment and decision-making literature, a model can be developed as normative or descriptive. Normative models are concerned with the nature of rationality and the logic of decision-making. Examples of normative theory include expected utility theory and Bayes rule of belief updating. Normative models provide an ideal standard of judgment and decision-making but they often do not reflect what people actually do. Descriptive models attempt to characterize actual judgment and decision-making. Prospect theory is an example of a descriptive model. Agents who make decisions according to prospect theory violate the basic principles of rational choice. The objective of this dissertation is to develop a descriptive model

of online WOM, which seeks to characterize the actual psychological processes of judgment and decision-making based on online customer reviews.

This dissertation can also be positioned in the broad WOM literature. WOM has been studied in Economics and Marketing since 1980s (e.g. Hagerty & Aaker 1984; Roberts & Urban 1988). Both normative and descriptive models have been developed for offline WOM. However, because of a few major differences between offline and online WOM, findings of offline WOM cannot always be generalized to online WOM. Online WOM differs from offline WOM in at least three respects. First, the amount of available information is a striking difference between offline WOM and online WOM. As mentioned earlier, most web sites keep all the historic reviews available. The large volume of information accumulated over time inevitably results in people's information selectivity when using reviews in their decision-making. Information overload is typically not a concern in the offline WOM environment. Second, information credibility is a prominent issue in the electronic environment. Most web sites do not restrict who can post a product review. Sometimes people make unfair assessments of a product in the reviews because they do not have the necessary knowledge to evaluate the product. Reviews could also be deliberately manipulated by people who are directly involved with a product (e.g. the author of a book). In the electronic environment, people often judge the credibility of reviews based on certain cues such as author information, review length, star ratings, etc. The information credibility issue adds another dimension to information selectivity: people select information not only based on the intention to save cognitive costs but also based on their perception of information credibility. The cues that people use to judge credibility are thus different in the online versus the offline WOM environments. Third, the organization and display of information is very flexible in electronic environments. For example, Amazon.com allows

people to restructure the reviews in many different ways such as subset the reviews by star ratings or sort the reviews by the time when they were posted. Therefore, in the electronic environment, people have the ability to constantly manipulate the information environment in which their choice is made. Because of the marked differences between offline and online WOM, it is necessary to develop new models to examine people's information acquisition, judgment and decision-making in the online WOM setting.

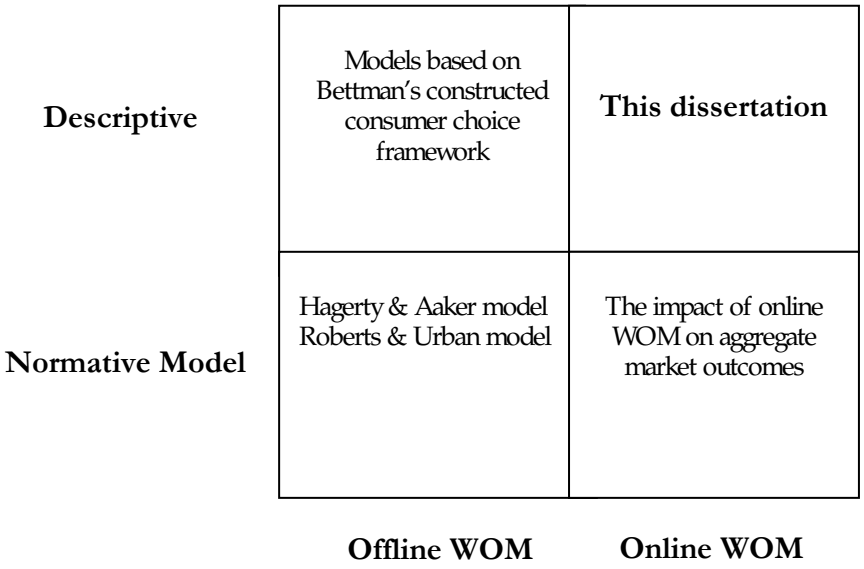


Figure 1.1: Positioning the dissertation in the decision-making and WOM literature

CHAPTER 2

LITERATURE REVIEW

2.1 A Survey of the Extant Online Word-of-Mouth (WOM) Studies

Online review web sites allow researchers to collect WOM data. Many published studies have used these data to examine various aspects of online WOM. The following questions have been examined in the existing studies:

1. How does online WOM influence consumer behavior and market outcomes?
2. How different factors affect posting behavior in online feedback Web sites?
3. Does online WOM represent the preference of the general consumer population?

2.1.1 The impact of online WOM on consumer behavior and market outcomes

Many recent studies have investigated the impact of the online WOM on product sales (or movie box office revenue) using various econometrics models (e.g. Chen et al. 2004; Dellarocas et al. 2005; Godes & Mayzlin 2004; Liu 2006; and Zhu & Zhang 2004). Volume and valence are the two most important aspects of online WOM that have been examined (e.g. Chen et al. 2004; Etzion & Awad 2007; and Liu 2006). Volume is the total amount of online WOM available on a review web site. It is usually measured by the number of reviews per product. Valence captures the nature of the review comments (whether they are positive or negative). It is measured by the average rating of a product.

The impact of volume and valence on the aggregate market outcomes (e.g. product sales) is often theorized through their effect on individual consumer behavior. For example, the effect of online WOM volume on product sales is referred to as the "informative effect" (Etzion & Awad

2007; Liu 2006). The rationale behind the informative effect is that the more reviews on a product have been posted, the more likely people would become aware of the product, thus leading to greater sales (Etzion & Awad 2007; Liu 2006). The effect of online WOM valence is referred to as the "persuasive effect" (Etzion & Awad 2007; Liu 2006). These researchers argued that positive comments in the reviews enhance perceptions of the quality of a product, increase people's intention to purchase that product, and thus increase the sales.

Unfortunately, the results for both the informative and persuasive effects are mixed. While some studies support that the volume of online WOM has a positive impact on product sales (e.g. Duan et al. 2008; Liu 2006), others did not find any significant relationship (e.g. Godes and Mayzlin 2004; Li and Hitt 2008). Similarly, some research did find significant relationship between valence and product sales (e.g. Dellarocas et al. 2005) but other empirical results challenged such a view (e.g. Chen 2004; Duan et al. 2005; Liu 2006). Zhu and Zhang (2010) argued that product and consumer specific characteristics affect consumers' reliance on online reviews and thus moderate the relationship between online WOM and product sales. Their study showed that the informative effect is more salient for less popular video games and for consumers who have relatively greater Internet experience.

Other researchers examined the impact of online WOM on product sales from the search costs perspective (e.g. Chen, Wu, and Yoon 2004). They argued that the existence of search costs to identity a product that fits consumers' preference could hold consumers back from purchasing. Online WOM serves to reduce consumers' search costs, and therefore it may increase product sales. However, Chen et al.'s (2004) study showed that while the official recommendations from a web site do have a significant impact on product sales, there is no significant relationship between customer-generated review ratings and product sales. Similar to Zhu and Zhang's

(2010) study, Chen et al. (2004) also found that the official recommendations have a greater impact on sales for less popular products. They argued that this finding is consistent with the search costs argument: because search costs for less-popular products may be higher, people may rely on official recommendations to locate their products of internet.

A few extant studies examine the impact of the valence of the online WOM on consumers' trust and the price premiums (e.g. Ba & Pavlou 2002; Pavlou & Dimoka 2006). These studies show that online WOM can induce calculus-based credibility trust[2] without repeated interactions between two transacting parties, and therefore generate price premiums for reputable sellers. Notably in these studies, Pavlou and Dimoka (2006) analyzed the past seller behaviors contained in the sellers' feedback text comments. As they pointed out in their research, while the literature has focused on the quantitative aspects of online WOM (e.g. number of reviews and average ratings), the role of qualitative text comments that accompany these quantitative metrics has been ignored. The quantitative metrics provide an overall assessment of a product's quality, but online text comments contain fine-grained information about products that cannot be conveyed by crude quantitative metrics. When a consumer considers buying a product online, he is very likely to read the text comments to get more detailed information on the product.

2.1.2 Consumers' posting behavior in online review web sites

Probably because consumers' behavior data (e.g. motivation for posting a review) are not readily available, there are relatively fewer studies on consumers' posting behavior. Chen et al. (2003) studied the underlying patterns of online consumer posting behavior through online reviews for automobiles. They found that posting behavior does not follow a random selection process, and the characteristics of the product and the review web sites have a significant impact

[2] Calculus-based credibility trust is shaped by rational assessments of the costs and benefits of another party cheating or cooperating in a relationship.

on the propensity to post. Dellarocas et al. (2004) conducted a study on the drivers and dynamics of buyer participation in eBay's feedback system. They argued that participation on eBay's feedback system could be explained through the combined effects of altruism, self-interest, and reciprocation. Their empirical results showed that as reputation scores increase, consumers tend to increase their rate of feedback submission. However, they were unable to show whether this is due to the learning effects or to an increased sense of loyalty and belonging in the eBay community. Forman et al. (2008) examined consumers' identify self-disclosure when they post feedback in Amazon. They argued that identity self-disclosure is driven by the desire for identification with a community and the need for self-verifying feedback from other community members affirming that one is a member in good standing. On the basis of the argument, they found that identity self-disclosure in reviews of a product is positively related to the same behavior in previous reviews of that product and shared geographical location will enhance such a relationship. The study further found that the prevalence of identity self-disclosure is positively related to product sales and the reviews with identity self-disclosure are more likely to be voted as "helpful". The study essentially reveals that with certain designs online feedback web sites are able to establish norms and potential reviewers would comply with the norms when they post their comments.

2.1.3 Does online WOM reflect the preference of the general consumer population?

Recently researchers raised the question of whether online WOM reflects the preference of the general population. Li and Hitt (2008) investigated the self-selection effect and information role of online product reviews. They argued that the early reviews might be biased because the early reviewers' preferences may systematically differ from the broader consumer population. By analyzing the review data from Amazon, they found that average rating declines over time

and early consumer reviews demonstrate positive bias due to the self-selection effect. Using a combination of econometric, experimental, and analytical results, Hu et al. (2007) reached the same the conclusion that online WOM present a biased view of the actual product quality. They found that review data from Amazon exhibits a J-shaped distribution with more positive than negative reviews while in their experiment respondents' reviews have an approximately normal distribution with roughly equal number of positive and negative reviews. They argued that this is due to two types of biases: purchasing bias - only consumers with favorable attitude towards a product purchase the product and have the opportunity to write a product review, and under-reporting bias -consumers with extreme product experiences are more likely to post a reviews than consumers with moderate experiences.

Since the online reviews may be biased, it is essential for the online vendors to have an effective mechanism to help consumers gauge the validity of the reviews. To this end, many e-commerce web sites allow consumers to cast votes on the helpfulness of the posted reviews. The number of helpful votes a review receives can serve as an indicator of the validity of the reviews. Based on Amazon's helpful vote mechanism, Chen et al. (2007) investigated how the consumers' perceived validity of the online reviews influences product sales. They found that the voted helpful reviews have a bigger impact on sales than other reviews do. This is likely because helpful vote can be used as a sanctioning device to alleviate the moral hazard problem (e.g. reviewers post untruthful reviews) and a signaling device to alleviate the adverse selection problem (e.g. consumers do not know if the reviews are truthful until they purchase the product). They also found that helpful vote has a weaker impact on popular books. They argued that this is probably because for less popular books, consumers may have few quality cues to rely on, and therefore may place a higher weight on helpful vote in judging product quality. Their results

suggest that consumers may be able to correct for the self-selection bias if certain review validity mechanisms exist in an online feedback system.

2.1.4 A critique of the extant online WOM studies

As reviewed above, many extant online WOM studies focus on statistical correlations between online WOM and consumers' behavior. Although these studies offer interesting insights and useful managerial implications, they ignore important subtleties of consumers' behavior in the information-intensive environment.

First, the extant online WOM studies focus on the impact of quantitative aspects of online reviews such as total number of reviews and average rating. Only a handful of empirical studies have formally tested whether the textual information in online WOM can have an economic impact. There are at least two potential issues with solely using the quantitative aspects of reviews. First, products have multiple attributes and different attributes can have different levels of importance to consumers. It is common that people consider different aspects of a product when they make a purchase decision. Therefore, consumers need to read the actual reviews to examine whether the positive and the negative attributes of the product are of interest. The econometrics models solely based on numeric ratings cannot capture decision-making based on multiple product attributes. Second, by compressing textual information in the reviews to a few simple numbers, we lose the richness in the textual information. For example, a product review may include the reviewer's first-person experience of using the product, which is often used by readers to judge the validity of the review. In such situations, the average numerical rating assigned to a product conveys limited information to a prospective buyer. A study conducted by Nielsen Norman Group shows that people often read Web pages in an F-shaped pattern: two

horizontal stripes followed by a vertical stripe.[3] People read the first two paragraphs of a web page, move down the page a bit, and then ignore a large portion of the page. This finding suggests that consumers do read the online review text but probably do not read the reviews thoroughly in a word-by-word manner: They may read part of the reviews posted on a web site and discount some of the reviews they read. To examine the impact of online WOM on consumers' behavior, it is important to understand their information selectivity, i.e. to identify the subset of reviews that people actually read and the further subset of reviews they use in their decision-making (See Figure 2.1).

Second, the extant online WOM studies often implicitly assume that consumers' preference is exogenous and fixed. For example, the search costs perspective maintains that consumers use online WOM to identify a product that fits their preference. Psychological studies (e.g. Payne et al. 1992) show that people's preferences do not come readily from a list in memory, nor does some invariant algorithm generate them. Preferences are determined not only by various internal individual factors (e.g. knowledge, memory, and feelings) but also by many aspects of the external environment (e.g. what information is available? How is the available information presented?). People construct their preferences using different trade-off strategies depending on the specific task at hand, the task environment, and individual differences. For example, consumers have different cognitive styles and learning strategies. Their preferences may be affected by how the information is presented on the review web site, and by what functions are provided by the web sites to manipulate the review presentation. The variability in the ways consumers construct their preferences may yield preferences that are labile, inconsistent, and heterogeneous across different situations and time. Therefore, to understand the role of online

[3] http://www.useit.com/alertbox/reading_pattern.html

reviews, we should reject the notion of "fixed" preference and acknowledge the constructive nature of preferences.

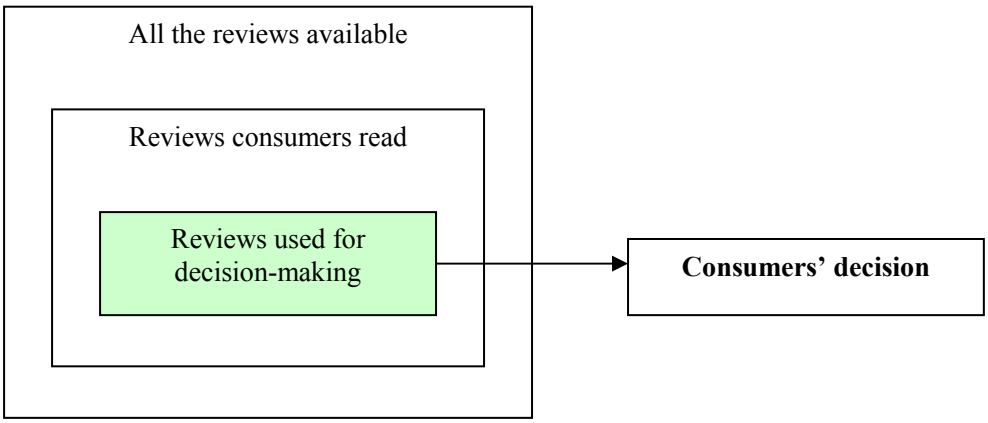


Figure 2.1: Consumers' information selectivity

2.2 The Constructive Preferences Perspective

2.2.1 A review on the constructive preferences perspective

The major tenets of the economic theory of rational choice include (1) people have stable and well-defined preferences that do not depend on particular descriptions of the options or on the methods used to elicit these preferences, and (2) people have the computational capacities that enable them to choose the courses of action that maximize their utilities. An example of the rational choice theory is the multi-attribute decision model: the utility of an option is equivalent to the sum of its preferences, that is, the sum of the weighted values of its attributes. When making a choice, people are able to calculate the utility of all options and choose the option with the highest utility.

The rational choice theory assumes procedure invariance of preferences: normatively equivalent procedures for eliciting preferences should give rise to the same preference order. However, empirically, different elicitation procedures can reveal very different preferences. The most well known examples are demonstrations that under different descriptions of essentially the

same options, people reveal different preference order (e.g. Tversky & Kahneman, 1981, 1986). Consequently, research has challenged the notion of preference invariance. Rather than being stable and well defined, preferences have been shown to be highly changeable and vary in complex ways across contexts and tasks (for a review, see Payne et al 1992).

Different from the economic theory of rational choice, an alternative stream of research, the constructive preferences perspective, takes the information-processing approach to study human choice. A fundamental distinction between the rational choice theory and the constructive preferences perspective is whether one assumes unbounded rationality or bounded rationality. As noted earlier, unbounded rationality suggests that people have the computational capacities that enable them to choose the option that maximizes the utility. In contrast, bounded rationality suggests that decision makers have limitations on their working memory and computational capabilities for processing information (e.g. Simon 1982). Thus, when making a decision, people are not always able to calculate the utility function and maximize their utility. Instead, they may develop decision strategies on the fly. Such strategies are often highly sensitive to local problem structure.

The major tenet of the constructive preferences view is that the preference construction process is shaped by the interaction between the properties of the human information-processing system and the properties of the choice task environment (Payne et al., 1992; Slovic 1995), leading to highly contingent choice behavior (Figure 2.2). More specifically, when making a choice, people will selectively use information that is part of the immediate task description, as well as information drawn selectively from memory, to construct a mental representation of the choice problem. In addition, people may also change their problem representations on the spot by structuring or restructuring the available information (Bettman et al. 1998). This implies that

information processing may change as people learn more about problem structure during the course of making a choice. The constructive view also maintains that rather than applying the utility maximization method, people often utilize a wide variety of strategies and simplifying methods (heuristics) to construct preferences (for a review, see Bettman et al. 1998). A key theme of the constructive preferences stream of studies is to identify different choice strategies/heuristics. Bettman et al. (1998) consider four aspects that characterize choice strategies/heuristics: (1) the total amount of information processed; (2) the selectivity in information processing, (3) whether the strategy is alternative-based or attribute-based; and (4) whether the strategy is compensatory or non-compensatory.[4] In order to study these characteristics, researchers often use process-tracing methods such as verbal protocol analysis and click stream data analysis (Payne et al. 1992).

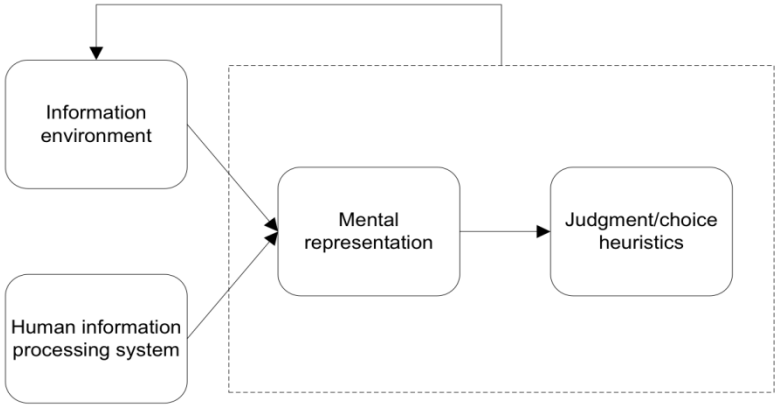


Figure 2.2: The constructive preferences view

Note that the constructive view does not claim that preferences are always unstable and constructed on the fly. People may have well-defined and stable preferences for the objects they are very familiar and experienced with. However, preferences will be more constructive when the decision problem is novel or complex (Bettman et al. 1998). In order to provide a unifying

[4] A strategy is compensatory if it makes tradeoffs among attributes. The key distinction is whether a good value on one attribute makes up for bad values on other attributes.

theory for the different preferences phenomena, Weber and Johnson (2006) proposed the Preferences-as-memory (PAM) framework. The framework views preference as the product of memory representations and memory processes. People make choices by retrieving past reactions and associations to similar situations rather than by constructing and maximizing a utility function (Weber & Johnson 2006). Because memory retrieval depends on prior encoding and problem representation, preferences are neither constructed afresh on each occasion nor completely stable.

The PAM focuses on three aspects of the preference construction. The first aspect is memory interrogation, in which people consult their memory with a series of component queries about the value of the attributes of an alternative. The order of the queries posed to memory is important because it influences the answers provided by memory and resulting preferences. The framing of the choice problem and the goals of the individual may influence the order of the queries. For example, when asked to accept an option or not, people often trigger queries about the positive attributes first. In contrast, if asked to reject an option or not, people may pose queries about the negative attributes first.

The second aspect of the PAM is about the accessibility of information in memory. The accessibility of information can be increased by priming or be decreased by interference and inhibition. Psychology research has shown that previous activation of a piece of information in memory increases the accessibility of the same information and related information, resulting in both shorter retrieval times and greater likelihood of retrieval (e.g. Higgins & King 1981; Higgins et al. 1977). At the same time, when one component of a memory structure is activated, the accessibility of other memory components that will result in a competing response is temporarily reduced (Anderson & Neely 1996). When an individual is making a choice, the

choice context and goals determine his focus of attention, which further translates into the series of queries posed to memory. These queries, in turn, result in increased activation of response-consistent information and decreased activation of response-inconsistent information, and further influence the answers provided by memory and resulting preferences. For example, a positive response towards an alternative leads to increased activation of positive aspects of this alternative in memory.

The third aspect of the PAM framework is memory representation. Human memory can be modeled as an enormous collection of connected nodes. To store a large amount of information, people can organize these information nodes in hierarchical structures. The insight of this memory representation aspect is a better understanding that the way in which people organize and cluster their knowledge can help model preference construction.

2.2.2 How does the constructive preferences perspective inform IS research?

The constructive preferences view is a potentially useful theoretical perspective for studying behavioral issues in information-intensive environments. As discussed earlier, the constructive preferences view posits that the preferences construction process is shaped by the interaction between the properties of the task environment and the properties of the human information-processing system. The electronic environment not only presents a different task environment, it also directly influences the human information-processing system. Thus the constructive preferences view seems particularly appropriate in the electronic environment.

First, the Internet provides a wealth of information that is available at all times and is accessible from almost any place. Especially with the assistance of the search engine, an individual is able to gather all the publicly available information online when making a choice. However, because of limitations of working memory and computational capability, information

selectivity is often necessary. For example, Johnson et al. (2004) found that instead of examining all possible information a household visited no more than two web sites, on average. Thus, the question of "how individuals select which information" is critical to understanding their choices. In fact, information selectivity is not only critical in understanding individual choice, it is also important in understanding the entire online market. Since the Internet allows individuals to access all publicly available information with minimal costs, the traditional economic theory would predict the Bertrand competition in the online market, in which the lowest priced vendors get all market share (Bakos 1997). However, studies showed that wide price dispersion exists for many products in the online market (e.g. Brynjolfsson & Smith 2000). Individual's information selectivity provides a possible explanation to the price dispersion phenomenon.

Second, in addition to the large volume of information, the Internet has an unprecedented capability for dynamically generating, organizing, and presenting information. Thus in the electronic environment, individuals can easily restructure their information environment. As a result, an interesting question to ask is how interactivity influences individuals' preferences and choice. Benbasat and Jiang (2007) showed that increased interactivity positively influences consumers' perceptions of the diagnosticity of websites, their perceptions of the compatibility between online shopping and physical shopping, and their intentions to purchase the products displayed on the website. However, Ariely (2000) argued that interactivity offers both the benefit of allowing consumers to explore information more freely and the cost of increased cognitive effort needed to manage the information flow. In his study, participants who searched for product information in a highly interactive environment had higher levels of recall and selected products that better suited their needs than subjects in a less interactive environment. However, when the choice task required a high level of cognitive effort, the performance of participants in the highly

interactive condition first decreased and later increased compared with the participants in the less interactive environment. This study provides some interesting insights into this phenomenon. However, in the study use of the interactive system was mandatory. In the real world, individuals may choose not to use the interactive system at all if the system requires too much cognitive effort to learn. Further study may examine the relationship between interactivity and preferences construction in a more realistic setting.

In addition to greater interactivity, the electronic environment may influence the preference construction in other subtle ways. Mandel and Johnson (2002) showed that subtle changes in a web site background could influence individuals' product choices. They found, a green web site background, in which U.S. dollars were shown, primed thoughts about money, increasing the importance of price when participants made their choices -- subjects were more likely to choose the cheapest option. In contrast, a flame-like web site background primed the safety attribute and increased the importance of that attribute in choice making.

Finally, the Internet also influences the human information processing system by enabling sophisticated tools to assist individuals in their choice making. For example, some e-commerce web sites allow users to sort products on an attribute so that users can select a product with the best value on that attribute. Without the sorting function, such a procedure requires a lot of cognitive effort. Hauble and Trift (2000) showed that consumers tend to use a two-stage procedure to make their choices. At the first stage, they typically screen a large set of options and identify a subset of the most promising alternatives. At the second stage, they compare the alternatives across the most important attributes, and then make a choice. Consequently they recommended that decision aid tools should support the initial screening first and the later comparison of selected products before making the actual purchase decision. For the online

decision aids, two questions can be asked: (1) how they influence the preference construction process, and (2) whether they lead to better choice. As discussed previously, people may develop a variety of choice strategies/heuristics on the spot when making choices. The decision aids put a constraint on what strategies/heuristics can be used and take over part of consumers' processing. Thus the decision aids may change the preference construction process. The quality of choice depends on the situational context and individual differences. Both questions are worth further effort to investigate.

In summary, because the Internet provides large amount of information, a highly interactive environment, and the capabilities for enhancing the human information-processing system, the constructive preferences view is a particularly useful framework for understating both individuals' choice and aggregate market outcomes (e.g. price distribution). In the following section, the constructive preferences view will be used as an overarching framework to study the role of online product reviews in individuals' information acquisition.

CHAPTER 3

THEORY DEVELOPMENT

3.1 The Role of Online Reviews in Consumers' Choice

The process of consumers' choice between alternative products often includes two stages: information acquisition and choice making. In the information acquisition stage, individuals may collect two types of information: (1) alternative-level information; and (2) information on some product attributes. Alternative-level information is the holistic assessment of a product. For example, the comment "This is a great product" is alternative-level information. The numeric or star rating on many e-commerce web sites is also alternative-level information. In addition to the holistic assessment, people also gather information on some specific attributes. Attribute-level information plays an important role in consumers' choice making. The holistic alternative-level assessment is often made based on the attribute-level assessment. Tversky and Koehler (1994) showed that a statement is judged more likely when it is broken into more specific causes. Thus, attribute-level information may increase individuals' confidence in their judgment (e.g. Lichtenstein & Slovic 1971). In the second stage, consumers often use some strategies or heuristics to make a choice between alternatives. Choice heuristics have been discussed intensively in the psychology and marketing literature (See Bettman et al. 1998 for a review).

According to the constructive preferences perspective, information acquisition and choice making are shaped by the interaction between the information environment (online review system in this study) and individual differences (see Figure 3.1). For example, most existing review systems present a holistic product assessment upfront (e.g. average star ratings,

distribution of star ratings). Based on the holistic information, it is very easy to use some non-compensatory strategies (e.g. take-the-best based on holistic information) because people do not need to make tradeoffs between different attributes.. In contrast, collecting attribute level information for all attributes of interest is not a trivial task in the many existing review systems. Thus it is more effortful to use the weighted additive rule to choose between alternatives. Consequently, individuals who are less motivated to process information or have very limited cognitive resources (e.g. working memory capacity) may be inclined to collect alternative level information and use some non-compensatory choice strategies. Furthermore, use of different strategies of information acquisition and choice making further leads to different choice outcomes. For example, as discussed previously, use of attribute level information increases confidence in choice. Other examples of choice outcomes include the level of cognitive effort expended to make the choice and the resulting negative emotion.

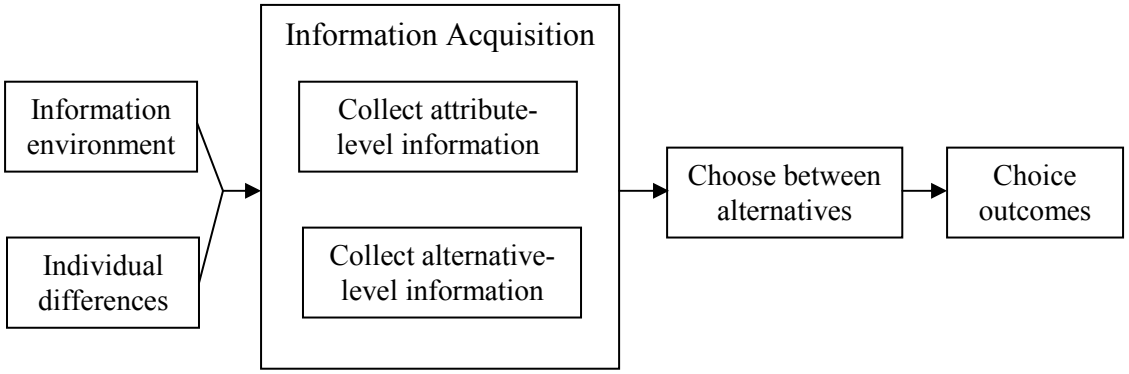


Figure 3.1: The process of consumers' choice between alternatives

3.2 Characterizing Information Acquisition

The analysis of consumers' information acquisition from online review systems involves the structure of the information environment, individual differences (e.g. prior knowledge with the product, cognitive style, and other dispositional traits), and the actions taken by consumers. The general framework proposed by Hui et al. (2009) to describe consumers' movements in a

spatial configuration is able to accommodate various aspects of information acquisition and will therefore be used here as an organizing framework.

Similar to the framework developed by Hui et al. (2009), consumers' information acquisition from online reviews can be denoted by a three-tuple $X = \{I, C, A_t(C)\}$. The first component, I, denotes an observable information environment. The second component, C, denotes a consumer who is making movements in the information environment. Once information environment and consumer are specified, $A_t(C)$ denotes the action of the consumer at time t within the information environment.

In the following section, I will outline the three key components of the framework: the structure of information environment, the characteristics of the consumer, and different types of actions taken by consumer.

3.2.1 The information environment (I): the online review web site

The online review web site is an information environment that can help consumers get more knowledge before they make a choice. The upper section of Figure 3.2 shows an example of a customer-generated review for a GPS. It can be seen that the review, in this example, is represented by 1) the number of helpful votes the review received, (2) a numeric star rating, (3) the reviewer's identity information and review age (the time when the review is posted), (4) an overall comment on the product ("Good Product"), and a few keywords evaluating a few attributes of the product ("Pros" and "Cons"). In this example, the review full text is not directly visible unless consumers click on the link pointing to the full text.[5] On the basis of these mediating snippets (i.e. helpful vote, overall comment, pros and cons, etc.), consumers can make

[5] Some web sites may display the first few sentences of the review or even display the entire full text (e.g. Amazon.com). The differences of this detail do not affect the theory development.

judgments about what information is available and the potential value of reading the entire review text. In this dissertation, the set of mediating snippets is called ***proximal cues***, a concept used in the information foraging theory developed by Pirolli (2007).

As noted earlier, many e-commerce web sites keep all historical reviews available online and the reviews often distribute across many web pages. To help consumers navigate through the large quantity of review texts, many review systems allow users to sort the reviews in certain ways, i.e., they allow them to restructure the information environment. For example, the bottom section of Figure 3.2 shows that people can subset the product reviews by star rating, and sort the reviews by helpful vote ("Most Helpful First") or the time when the review was posted ("Newest First").

Figure 3.2: An example of online review web site

3.2.2 The consumers (C): information goals and information scent

Having defined the information environment, researchers need to characterize the second component of the three-tuple framework -- the consumers. There are two important aspects that should be considered for consumers who are gathering information in the review web site: (1)

their ***information goals***, defined as product attributes of interest, and (2) ***information scent*** of reviews, defined as the perceived relevance of the reviews attended by consumers[6].

Information scent is a concept developed by Pirolli and Card (1999) to predict what links people will visit among the results returned by a search engine. It is defined as a judgment made based on the proximal cues on how likely it is that the source of information is relevant to the information seeker's goal. The concept of information scent is squarely based on the information processing approach in cognitive psychology. The following section presents a detailed discussion on the derivation of this concept.

3.2.2.1 The origin of the concept of information scent

Information scent is derived from the information-processing approach, which analyzes cognition into a set of steps in which information is processed (Anderson 2009). An important assumption of this approach is that information is stored in several memories having different capacities and accessing characteristics. Information coming from the environment is held in transient sensory stores (e.g. iconic and auditory memories) from which it is lost unless attended. Attended information goes into the short-term memory (STM) that has very limited capacity and intermediate duration. The amount of information that can reside in STM at one time is limited to a small number of familiar patterns, called chunks. As new information is attended, information previously stored may be lost. Information in the STM can be transferred to the long-term memory (LTM) through the rehearsal process. The LTM can be modeled as an enormous collection of connected nodes. Each node represents a piece of information. Information held in LTM is not directly available unless it is accessed and brought into attention (brought back to STM).

[6] Information scent is not a characteristic of the consumer alone. It is the interplay between the information environment (i.e., the proximal cues) and a consumer's information goals.

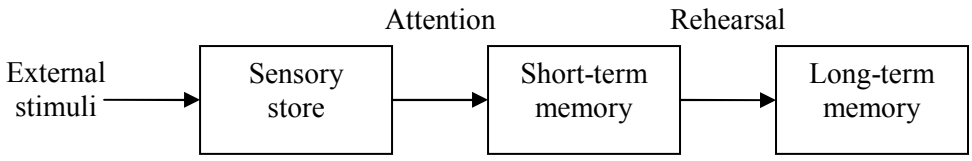


Figure 3.3: The model of human memory

Not all researchers agree that STM and LTM are separate systems. Anderson (2009) proposed that STM is simply a portion of LTM that is currently and temporarily activated. Activation means a piece of information is available in memory and can be quickly accessed. The activation level is determined by how frequently and how recently we have used the memory. Memory traces can be activated through direct recognition or association. During the recognition process, information received by sensory organs is directly recognized and associated with existing nodes in the memory. In the association process, activation spreads from the currently activated nodes (cuing nodes) to associated nodes (outcome nodes) in memory. In other words, memory traces become active when associated concepts are present. In the adaptive character of thought-rational (ACT-R) theory of human cognition, Anderson and Lebiere (1998) specified how activation spreads from the cuing nodes to outcome nodes. The model hypothesizes that the total activation of an outcome node is a function of (1) that node's base-level of activation and (2) incoming activation of the outcome node from cuing nodes weighted by the amount of attention given to the cuing nodes:

$$A_i = B_i + \sum_{j=1}^{N} W_j S_{ji} \qquad \text{(Equation 3.1)}$$

where A_i is the total activation of the outcome node i, B_i is the outcome node's base-level of activation, S_{ji} is incoming activation of the outcome node i from cuing node j, and W_j is the amount of attention given to the cuing node j.

The base-level activation B_i reflects the availability and accessibility of the outcome node before activation spreads from the cuing node. It is a function of how frequently and recently the piece of information has been retrieved from the memory in the past. Suppose the information has been accessed n times in the past at lags t_1, t_2, …, t_n from the present, the base level activation is formally specified as the following:

$$B_i = \ln(\sum_{k=1}^{n} t_k^{-0.5}) , \qquad \text{(Equation 3.2)}$$

The associative strength S_{ji} reflects how frequently the cuing node and the outcome node have been accessed at the same time in the past. It can be expressed as a function of the conditional probability of outcome node i's presence given cuing node j's presence divided by the base rate of i, or

$$S_{ji} = \log[\frac{P(i \mid j)}{P(i)}] \qquad \text{(Equation 3.3)}$$

The equation above can be interpreted as whether the outcome i is more likely to be retrieved when the cue j is retrieved than when that cue j is not retrieved.

The attentional weight W_j represents the amount of attention given to the external stimulus that results in the current activation. W_j is related to the perceptual salience of the external stimulus. If an individual is presented with a number of equally salient stimuli, it is assumed that the amount of attention paid to each stimulus is the same and it decays exponentially as the total number of cues increases (Anderson and Lebiere 1998):

$$W_j = We^{-dn} , \qquad \text{(Equation 3.4)}$$

where n is the number of cuing nodes and W and d are scaling parameters. The exponential decay function reflects the limit of working memory. It ensures that attention will not increase without bounds.

Drawing on the activation spreading equation (Equation 3.1), Pirolli and Card (1999) developed the concept of information scent to predict what links people will visit among the results returned by a search engine. Since online review exploration is similar to information seeking using search engine, it is possible to use information scent to predict what reviews consumers choose to read. In the remaining part of this section, information scent will be explained in the context of online review web site.

3.2.2.2 Information scent in the online review web site

Figure 3.4 presents a schematic example of information scent assessment. In this example a consumer is deciding whether to buy a wireless router. To make this decision, the consumer will evaluate the wireless router on what he views as the most important attributes: price and compatibility with Mac. These attributes become the consumer's information goals as he or she browses the reviews. Suppose the consumer sees a review represented by a few proximal cues that include the keywords "great signal strength", "light weight" and "not compatible with Mac". The information scent assessment task is to predict the likelihood that the review contains information about price and compatibility based on the proximal cues (i.e., whether the review is relevant to the consumer's information goals and thus whether or not to read the review).

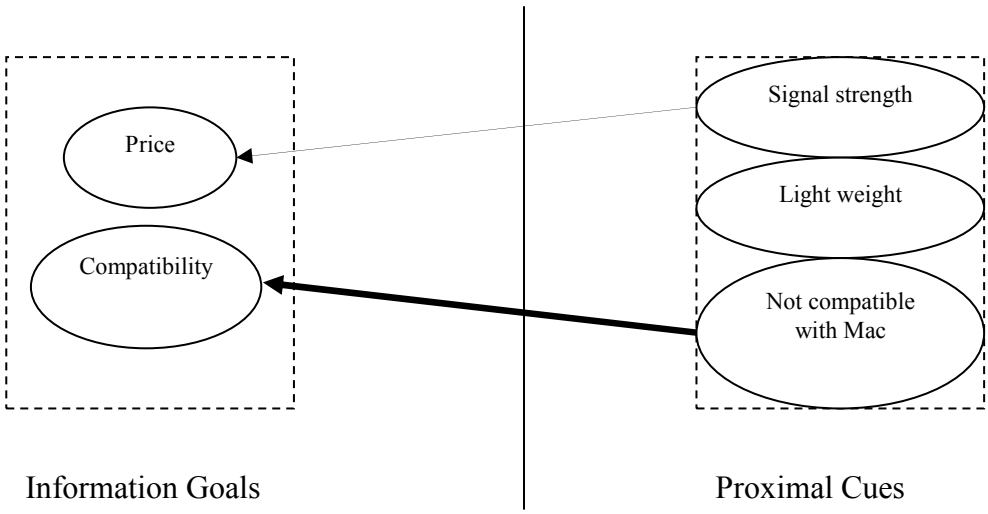


Figure 3.4: An example of information scent assessment

To put in the activation-spreading framework, the proximal cues of a review activate a consumer's information goals through an association process. The lines represent the associative strengths between proximal cues and information goals. As noted earlier, associative strength reflects the likelihood of the outcome node being accessed in the presence of the cuing node. Greater strength of association produces greater amounts of activation flow from a cuing node to an outcome node. The information scent of a review is simply the sum of activations through the association process for all the information goals:

$$IS(G,R) = \sum_{i \in G} \sum_{j \in R} W_j S_{ji} \qquad \text{(Equation 3.5)}$$

In the equation above, i indexes the information goals, j indexes the proximal cues, IS(G, R) represents the review R's information scent with respect to the information goal set G. W_j is the amount of attention allocated to the proximal cue j, and S_{ji} is the associative strength between the proximal cue j and the information goal i. Because there are multiple proximal cues and information goals, information scent sums over all the proximal cues and information goals. Thus it reflects the consumer's judgment of how likely the review is relevant to the entire

information goal set. The basic idea behind equation 5 is that external stimuli (e.g. review summaries, keywords) activate the consumer's information goals via the association process. The total amount of activation via the association process accumulating on the consumer's information goal set is an indicator of the possibility that the review has the desirable information. Table 3.1 summarizes various concepts of the activation spreading equation and their corresponding concepts in the context of online review.

Table 3.1: Activation spreading equation and its components

Concept in activation spreading equation	Concept in online review	Description	Notation/equation
Cuing node	Proximal cue	A keyword in the summary that represents a review	j
Outcome node	Information goal	An attribute the consumer uses to evaluate the product	i
Base-level activation B_i	Salience of an information goal	The salience of a product's attribute in the consumer's memory	$B_i = \ln(\sum_{k=1}^{n} t_k^{-0.5})$
The associative strength S_{ji}	Information scent	A judgment of how likely it is that the review is relevant to the consumer's information goal set	$S_{ji} = \log[\frac{P(i \mid j)}{P(i)}]$
Attentional weight W_j			$W_j = We^{-dn}$
			$IS(G,R) = \sum_{i \in G} \sum_{j \in R} W_j S_{ji}$

It can be easily seen from equation 3.5 that information scent is an individual-specific construct since the two components W_j, and S_{ji} are determined by the individual's past experience and their current attentional state. Information scent could be extremely hard to measure simply because it is not feasible to ask people how frequently they retrieve the concepts in proximal cues and information goals at the same time. Empirically, information scent is approximated by the semantic similarity based on word co-occurrence in a large and structured set of texts, called text corpus (Pirolli 2007). Recently, several techniques that estimate word similarity have emerged. Among these techniques, Pointwise Mutual Information (PMI) has

been shown to provide good fit to human word similarity judgments (Turney 2001). However, one drawback of this approach is that the word co-occurrence-based measure no longer reflects individual differences. It is quite apparent that when different people explore the same information environment, the PMI measure will result in the same amount of information scent for these people as long as they have identical information goals.

Information scent has a great potential to explain what reviews consumers choose to read. However, the theory doesn't discuss how the information environment shapes information seekers' goals. In fact the current version of information scent assumes people have a well-defined information goal set before they perform an information-seeking task (Fu & Pirolli 2007). This assumption may be true when people perform a search using a search engine. However, as noted earlier, consumers do not always know what information to look for when they read online reviews. Moreover, when consumers gather sufficient information for an information goal, they may shift their focus to other information goals when they explore the remaining reviews. Thus when an information goal is fulfilled, consumers will adjust the way they assess the information scent for the remaining reviews. Unfortunately, the current information scent formula does not take into account such an adjustment in information scent assessment. Furthermore, consumers always terminate their information acquisition at some point of time. The information scent formula does not tell us when consumers stop their information search. Based on the theories and concepts discussed in this section, the next few sections will present a detailed discussion on the third component of the three-tuple framework, consumer's actions in the information environment. Specifically, the questions of how online reviews influence consumers' information goal and how consumers select which reviews to read

will be answered. Information scent will also be extended to account for how consumers adjust information scent assessment and when they terminate the information acquisition.

3.2.3 Consumer's actions ($A_t(C)$): exploratory search and goal-directed search

Consumer's information acquisition can be categorized into two broad types of behavior: exploratory search and goal-directed search (Janiszewski 1998). Exploratory search occurs when consumers do not have well-defined criteria for evaluating a product or do not have the motivations to search information for their criteria. Exploratory search is a bottom-up activity because it is often driven by visual stimuli rather than planned in advance. In contrast, goal-directed search occurs when consumers gather information based on a set of pre-defined criteria.

Figure 3.5 presents a diagram of the cycle of consumer's information selectivity. There are two classes of information acquisition activities in this cycle: (1) exploratory search and evaluation criteria refinement. For example, a computer illiterate consumer may not know what information to look for when he considers buying a laptop. If he browses a review web site and encounters a few reviews that discuss CPU and video card considerations, he may consider these to be important criteria in selecting a laptop. In this case, the consumer refines his criteria for evaluating laptop through exploratory search. (2) Goal-directed search. In the above example, since the consumer views CPU and video card as important criteria, he is more likely to select the reviews that discuss CPU and video card and read these reviews.

One important characteristic of the cycle is that a consumer may only have a rough idea of what is important in selecting a product, and may not be able to predict whether a particular review will lead to some useful information in the beginning. As he gains knowledge about the product, his criteria for evaluating the product are refined and enriched, allowing better judgment of the relevance of the reviews. Note that people may not figure out all relevant criteria for

evaluating the product in a single iteration. An information acquisition process may have multiple iterations of the cycle. The following two sections present a detailed discussion on exploratory search and goal-directed search.

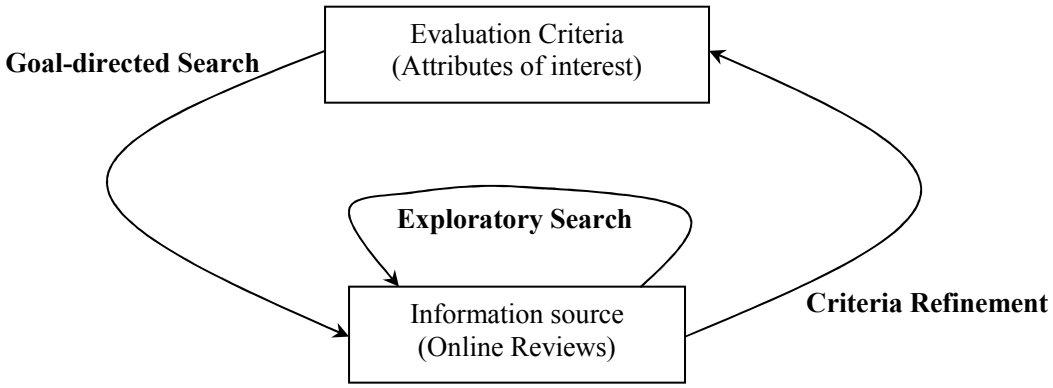


Figure 3.5: Information selectivity in the use of online reviews

3.2.3.1 Exploratory search in information selectivity

Exploratory search can operate as a screening process that identifies potentially "valid" information. In exploratory search, people often judge the "validity" of a review based on some cues provided by a web site. As shown in Figure 3.2, star rating, helpful vote, and review age are probably the major cues that drive exploratory search.

People may use star rating to judge the validity of a review differently. Some people believe that negative reviews (e.g. 1-star or 2-star reviews) help them better identify the potential problems with the product. For such consumers, positive reviews are not as valid as negative reviews. As such, these consumers may focus on negative reviews in their exploratory search. Other people believe that extremely positive or negative reviews (e.g. 5-star review or 1-star review) include many exaggerated comments. For them, these extreme reviews are not as valid as well-balanced reviews (e.g. 4-star review or 3-star review). As such, these consumers may focus on more balanced reviews in their exploratory search.

It is easy to understand the use of helpful vote and review age as cues for validity in exploratory search. Helpful vote is a direct indicator of the perceived helpfulness of a review.[7] If a review does not make it easier to accept or reject a product, it is less likely to be voted helpful. Old reviews may not reflect the current status of a product. Especially for those time-sensitive products, only the recent reviews are relevant for consumer's decision making. Therefore recent reviews are perceived more valid than old reviews.

In addition to the cues for validity, curiosity is another factor that drives exploratory search. Lowenstein (1994) interpreted curiosity as a form of cognitively induced deprivation that arises from the perception of an information gap. An information gap refers to a discrepancy between what one knows and what one wishes to know. Curiosity arises when attention becomes focused on the gap in one's knowledge. Such an information gap motivates the individual to obtain the missing information through exploratory search to reduce or eliminate the feeling of deprivation.

As shown in the upper half of Figure 3.2, a review is represented by some textual cues such as an overall comment on the product and a few keywords evaluating the pros and cons of the product. Sometimes the textual cues are holistic assessments on the product without necessary details (e.g. "awful product", "completely satisfied"). People may perceive an information gap when they pay attention to these non-specific textual cues. They may choose to read these reviews out of curiosity to find out, for example, what makes this an "awful product."

[7] Some studies have showed that the helpful vote on Amazon.com may not be an effective mechanism for ranking reviews (e.g. Ghose & Ipeirotis, 2007). The perceived rather than the objective value of the helpful vote are discussed here. The objective effectiveness of the helpful vote is out of the scope of this dissertation.

3.2.3.2 Goal-directed search in information selectivity

Goal-directed search can be driven by the information scent of the reviews. Based on the information scent, people may have different strategies for selecting reviews. Reader and S. Payne (2007) investigated two types of strategies people use for information acquisition. The sampling strategy is that individuals start by quickly evaluating the available texts, perhaps inspecting the first few paragraphs. They then select the best text and once this text has been read they will move to the next best text or begin a new round of sampling. It can be seen that in the sampling strategy, exploratory search and goal-directed search are separated in time, and there is an intention to choose the best text.

A very different strategy is to adopt the rule of satisficing. Before reading, individuals set an aspiration level as to how much they expect to learn from a text and that as long as a text meets that aspiration level they continue to read. The goal of the satisficing strategy is to obtain information from the texts rather than to find the best text available. Hence a text will be read as long as the quality of the text is above the aspiration level.

The sampling and satisficing strategy can be formalized using McFadden's (1978) Random Utility Model (RUM). Suppose the utility of reading the jth review can be decomposed as $U(j) = IS(j) + \varepsilon_j$, where ε_j captures the factors that affect utility but are not included in the information scent of the jth review, $IS(j)$. The joint density function of the random vector $\varepsilon = (\varepsilon_1, \ldots, \varepsilon_n)$ is denoted $f(\varepsilon)$. With this density function, we can make probabilistic statements about the people's goal directed search.

Behavioral model for sampling strategy: suppose the ith review is the best among the n reviews a consumer has sampled. The probability of choosing the ith review is

$$P(i) = P(U_i > U_j, \forall j \neq i)$$

$$= P(IS(i) + \varepsilon_i > IS(j) + \varepsilon_j, \forall j \neq i)$$

$$= P(\varepsilon_j - \varepsilon_i < IS(i) - IS(j), \forall j \neq i) \quad \text{(Equation 3.6)}$$

The probability above is a cumulative distribution, namely, the probability that each random term $\varepsilon_j - \varepsilon_i$ is below the quantity $IS(i) - IS(j)$. Using the density function $f(\varepsilon)$, this cumulative probability can be rewritten as

$$P(i) = P(\varepsilon_j - \varepsilon_i < IS(i) - IS(j), \forall j \neq i)$$

$$= \int_{\varepsilon_j - \varepsilon_i < IS(i) - IS(j)} f(\varepsilon) d\varepsilon \quad \text{(Equation 3.7)}$$

Behavioral model for satisficing strategy: suppose a consumer has a threshold value τ. He or she will read a review if the utility of this review is above the threshold value. Thus the probability of choosing the ith review is

$$P(i) = P(U_i > \tau)$$

$$= P(IS(i) + \varepsilon_i > \tau)$$

$$= P(\varepsilon_i > \tau - IS(i)) \quad \text{(Equation 3.8)}$$

Similarly, using the density function $f(\varepsilon)$, this probability can be rewritten as

$$P(i) = P(\varepsilon_i > \tau - IS(i))$$

$$= \int_{\tau - IS(i)}^{\infty} f(\varepsilon) d\varepsilon \quad \text{(Equation 3.9)}$$

If we assume that ε is distributed logistically, such that its density function is $f(\varepsilon) = e^{-\varepsilon} / (1 + e^{-\varepsilon})^2$ with cumulative density function $F(\varepsilon) = 1/(1 + e^{-\varepsilon})$, then the probability of reading the ith review based on satisficing strategy is

$$P(i) = F(\infty) - F(\tau - IS(i))$$

$$= 1 - 1/(1 + e^{IS(i)-\tau})$$

$$= e^{IS(i)-\tau}/(1 + e^{IS(i)-\tau}) \qquad \text{(Equation 3.10)}$$

Reader and S. Payne (2007) showed that satisficing is the dominant strategy subjects used to allocate time in online texts reading. However, their experiments also showed that providing an outline for each text significantly increased the number of participants using a sampling strategy. As shown earlier, many online review systems provide a simple summary for each review (see Figure 3.2). This seems to suggest that both the sampling and satisficing strategies are used in online reviews reading. However, I argue that the satisficing strategy may still be the dominant strategy in online review reading. As Reader and S. Payne (2007) concluded, the relative merits of sampling and satisficing strategies depend on the task, the text characteristics, and the reader. The primary goal of reading online reviews is to learn about the product rather than to find the best reviews. When the sampling strategy is employed, a significant portion of time is devoted to locating the best reviews. The iterative process of sampling also requires a lot of mental effort, especially when there is a large volume of reviews to sample. Reader and S. Payne (2007) asserted that there is no guarantee that the sampling strategy will result in better learning. J. Payne et al. (1992) view strategy selection to be the result of a compromise between the desire to make the most correct decision and the desire to minimize effort. If we accept the effort-accuracy framework, satisficing may still be the primary strategy used by consumers to select reviews.

3.3 Preference Construction: The Criteria Refinement Process

Preference construction is the process whereby people refine their criteria for evaluating a product while they gather information from the online reviews. As shown in Figure 3.6, before people see online product reviews (t=0), they have an initial criteria set. The size of the initial

criteria set depends on the context of the decision and the individual's knowledge about the product. The individual has a final criteria set when he or she makes the decision (t=T). The final criteria set may differ from the initial criteria set depending on two processes occurring in the review browsing: (1) Learning and forgetting, and (2) biased pre-decision processing.

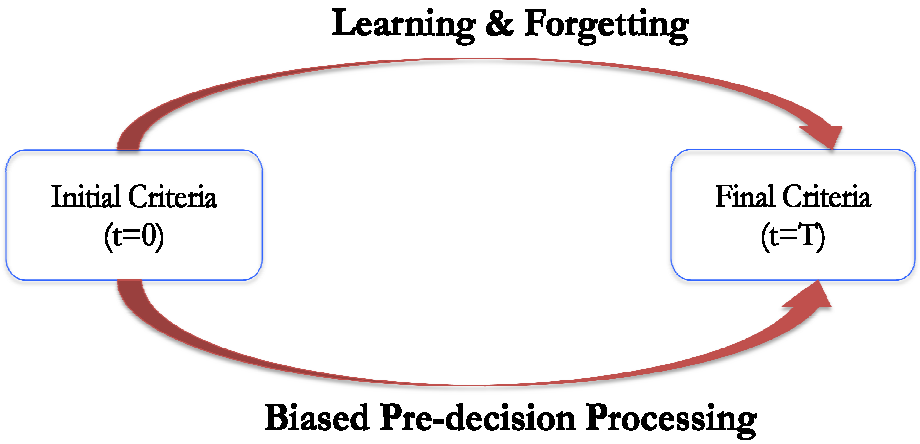


Figure 3.6: The process of preference construction

3.3.1 Learning and forgetting

Reading online product reviews is a learning process that enriches people's criteria for evaluating the product. However, human memory has its limitation: we can only retain a limited number of items in memory over a limited period of time. Therefore, as we discover criteria that are important to us from the reviews, we may also forget some criteria in the review browsing process. Learning and forgetting explains criteria refinement through the principles of human memory.

Exposure to a stimulus results in a transient increase in accessibility of the representation of that stimulus and related concepts, with effects on subsequent memory access (e.g., shorter reaction times and greater likelihood of retrieval). Suppose the representation of that stimulus retained in memory is a function of time since exposure. Some researchers (e.g., Wickelgren 1974) have suggested that the function satisfies a power function:

$$A = \alpha T^{-\beta}$$ (Equation 3.11)

Where A is a measure of accessibility, T is the delay time, and α and β are parameters of the model. Suppose an individual is exposed to the same stimulus repeatedly (t_1, $t_2 \ldots t_n$ are the delay times since exposure). The accessibility of the representation of that stimulus is:

$$\sum A = \sum_{i=1}^{n} \alpha t_i^{-\beta}$$ (Equation 3.12)

Therefore accessibility is a direct function of the frequency and recency of exposure to a stimulus. The higher the information accessibility, the more easily information should come to mind. When information comes to mind easily, it is more likely to be utilized in judgment and decision-making.

Feldman and Lynch (1988) formalized the consequences of accessibility in their accessibility diagnosticity framework, which proposes that the use of one source of information versus another in making judgments or decisions is a positive function of its relative accessibility and diagnosticity. Accessibility and diagnosticity are formulated as distinct aspects of information: While accessibility refers to the ease of retrieving an input from memory, diagnosticity refers to the extent to which a given piece of information discriminates between alternative hypotheses, interpretations, or categorizations. For example, a piece of information about a product attribute is perceived as diagnostic if it helps the consumer either accept or reject a product. Diagnosticity reflects whether a piece of information is relevant to the issue at hand. Although the insights of the framework are useful in anticipating the inputs to judgment and decision, the theory is silent about what factors determine diagnosticity. Menon and Raghubir (2003) argued that accessibility plays a dual role in judgment and decision: it allows a source of information to come to mind and is used as a proxy for the diagnosticity of the input.

The accessibility-diagnosticity framework has great implications for learning and forgetting and the resulting criteria refinement process. People are likely to include a highly accessible product attribute in their final criteria set. The accessibility of a product attribute is affected by the frequency and recency of exposures to product attribute as people browse the reviews.

3.3.2 Biased pre-decision processing

Biased pre-decision processing occurs when decision makers restructure their mental representation of the decision problem, especially the criteria for evaluating a product, to favor one alternative before making a choice. Biased pre-decision processing is often based on people's intention to reduce cognitive costs or cognitive dissonance. Cognitive costs result from making tradeoffs between attributes or resolving conflicting information in the reviews. Cognitive dissonance arises when information in the reviews does not support an emerging choice or when information in the reviews conflicts each other.

Cognitive costs and dissonance can be reduced by dropping certain attributes from the criteria set or adjusting the importance of the attributes in the criteria set. Montgomery's search for a dominance structure (SDS) theory and Svenson's differentiation and consolidation (diff-con) theory are two theories that view such "biased" processing as an integral part of decision-making.

Montgomery (1983, 1989, 1993, 1994) described the process of making a decision as a search for a dominance structure. A dominance structure is the perception that one alternative dominates the others because it is superior to all other alternatives on at least one attribute and is not inferior to any other alternative on any attribute. SDS theory specifies four phases of decision-making. In the pre-editing phase, decision makers identify the alternatives and attributes

that they will consider in the decision making process, including only alternatives that have some chance of becoming dominant and screening out attributes that are not important.

In the second phase, decision makers survey their alternatives, looking for one that may be dominant: a promising alternative. This promising alternative might have been noticed because it is more attractive than other alternatives on an important attribute, and it is considered a "hypothesis about the choice" (Montgomery, 1989, p.28).

In the dominance-testing phase (the third phase), decision makers test their hypotheses about the promising alternative, examining it to make sure that it is superior to all other alternatives on at least one attribute and not inferior to any other alternative on any attribute. If they find that the promising alternative is truly dominant they choose it, but in most cases the promising alternative falls short of full dominance, so they proceed to the dominance-structuring phase.

In the dominance-structuring phase (the fourth phase), decision makers try to restructure the situation to achieve a dominance structure. Dominance structuring can involve bolstering the positive aspects of the promising alternative and the negative aspects of the other alternatives and deemphasizing the negative aspects of the promising alternative and the positive aspects of the other alternatives. If decision makers successfully create a dominance structure they choose the newly dominant alternative; if they are unable to achieve dominance they return to an earlier phase and begin the process again with another alternative.

Svenson's (1992, 1996, 1999) differentiation and consolidation, or diff-con, theory is another model of decision making that views biased processing as an inherent part of decision making. Svenson suggested that decision makers attempt to differentiate among alternatives before as well as after making a decision: In the pre-decision phase they differentiate a promising

alternative until it emerges as a sufficiently superior alternative, and in the post-decision phase they continue to consolidate the chosen alternative's advantages over the rejected alternatives. Svenson has discussed some of the ways in which a promising alternative may be differentiated from the other alternatives before a decision. Svenson suggested that differentiation may involve changes in the perceived structure of the decision situation (structural differentiation) so that the perceived attractiveness or importance of attributes may change, or the representations of facts may change, even to the point of generating new attributes or alternatives. Such structural changes assist in the strategic application of decision rules to differentiate a promising alternative from the other alternatives (process differentiation). Some decision rules involve eliminating alternatives on the basis of whether they meet certain criteria (e.g. satisficing); thus, differentiation by means of those decision rules may involve adjusting decision criteria. According to diff-con theory, biased processing would occur both before and after a decision. Before a decision, biased processing serves to find a "good enough" alternative by adjusting the decision criteria to differentiate this alternative from the other alternatives. After a decision, biased processing serves to maintain confidence in the choice by adjusting the decision criteria to make the chosen alternative look better.

Compared with learning and forgetting, biased pre-decision processing is a different mechanism of criteria refinement. To a large extent, biased pre-decision processing theories emphasize cognitive costs and cognitive dissonance reduction as important aspects of decision-making. Figure 3.7 shows an example of biased pre-decision processing. Suppose a person is choosing between two products A and B. As he or she browses the reviews, the person finds out that product A is favored by attribute 1 but disfavored by attribute 2 and product B is favored by attribute 2 but disfavored by attribute 1. In this situation, it is difficult to differentiate the two

options. According to the biased pre-decision processing perspective, this person could adjust the decision criteria. As shown in figure 3.7, he or she could easily differentiate the two options by dropping or deemphasizing attribute 1 (or by bolstering attribute 2).

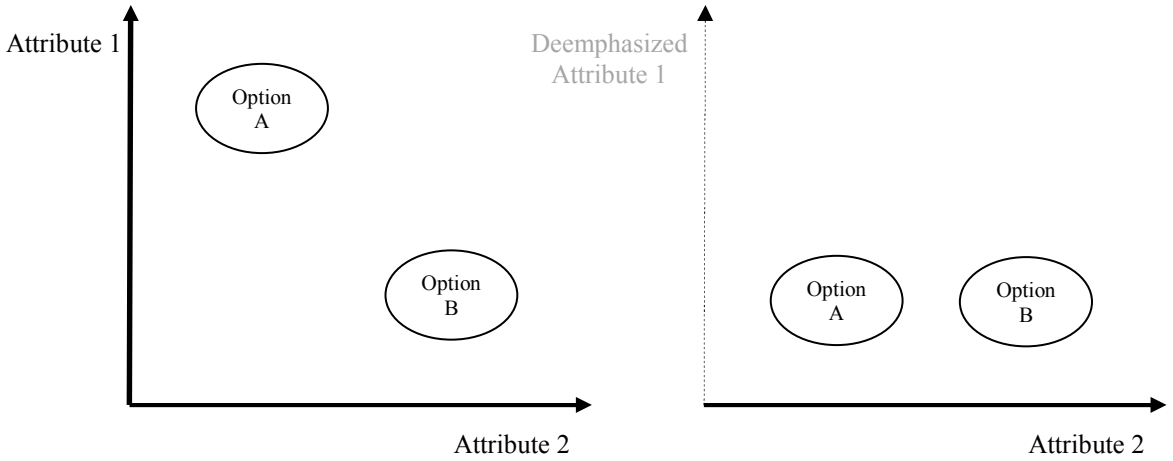


Figure 3.7: An example of biased pre-decision processing

Neither SDS nor diff-con theories tell us what criteria people choose to drop, deemphasize, or bolster. The choice in criteria adjustment can be explained by the diagnosticity principle discussed in the preceding section. A piece of information is perceived as diagnostic if it helps the consumer assign a product to one (and only one) cognitive category (e.g. good or bad). In contrast, information that is ambiguous (i.e. information that has multiple interpretations) is non-diagnostic. Therefore, if people find conflicting information about a product attribute, they may deemphasize or drop the attribute due to its non-diagnosticity. Diagnosticity also reflects whether a piece of information is relevant to the issue at hand. People may also deemphasize or drop attributes that are perceived irrelevant to the decision context. For example, when choosing a digital camera, a person may deemphasize or drop the attribute "battery life" if there is conflicting information about the battery life of this camera. Similarly, a person may deemphasize or drop the attribute "compatibility with Mac" if he or she does not

have a Mac. In the first example, the person can save cognitive costs that would be incurred in trying to resolve the conflicting information. In the second example, the person can save cognitive costs by focusing on a smaller set of attributes that are more diagnostic to his or her decision.

3.4 An Integrative Model of Consumer Use of Online Product Reviews

As a summary for the preceding sections, Figure 3.8 shows a schematic presentation of people's use of online reviews. People's use of online reviews includes information selectivity and preference construction. Exploratory search and goal-directed search are two classes of activities in information selectivity. Exploratory search is driven the cues for validity and curiosity. People may use review star rating, helpful vote, and review age as cues for validity. Curiosity may arise when people read non-specific text cues. Goal-directed search is driven by information scent of the reviews, defined as the perceived relevance of the reviews to people's current set of criteria for evaluating a product.

Learning and forgetting, and biased decision processing are two mechanisms underlying preference construction. Online review web sites present an opportunity to learn about different attributes of a product. As people browse the reviews, they may discover important attributes that they had not considered before seeing the reviews (learning). It is also well known that human memory has limited capacity. People may also forget about certain attributes as they browse the reviews. According to the accessibility-diagnosticity framework, the exclusion/inclusion of attributes in people's final criteria set is affected by the frequency, recency, and sequence of exposures to product attribute as they browse the reviews. Biased predecision processing, another mechanism of preference construction, reflects cognitive effort and cognitive dissonance reduction as important aspects of decision-making. By adjusting decision criteria (i.e.

deemphazise, drop or bolster certain attributes), people can reduce cognitive effort and cognitive dissonance and enable differentiation between alternatives.

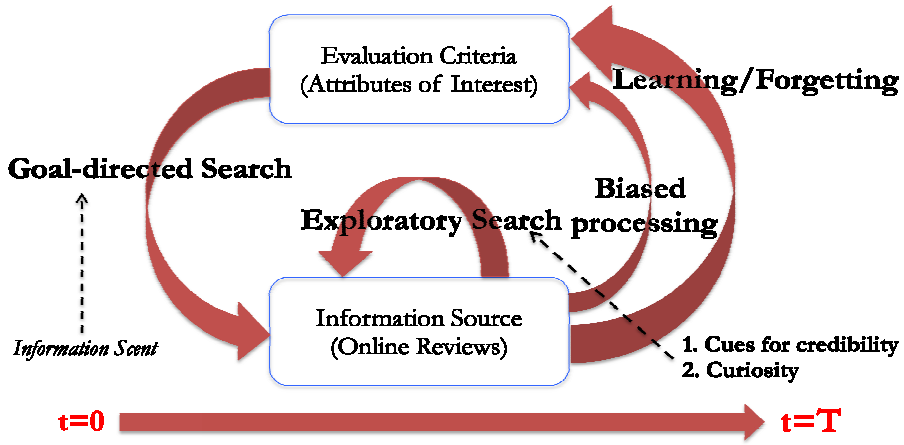


Figure 3.8: An integrative model of consumer use of online review

3.5 The Choice Making Stage

People often apply some strategies or heuristics to make a choice when they gather sufficient information. Bettman et al. (1998) studied a wide range of strategies used in consumer choice (see Table 3.2). As shown in Figure 3.9, these choice strategies can be characterized by their accuracy and the effort they require in any given situation. People select strategies in a situation based on some tradeoff between the desire to make an accurate decision and the desire to minimize cognitive effort. For example, weighted additive rule places great demands on consumers' working memory and computational capabilities, but it is often considered to be normatively accurate. In contrast, lexicographic rule considers only the most important attribute so it is less effortful. However, it is also less accurate since it ignores information on other less important attributes.

A robust finding about online behavior is that people often exhibit cognitive inertia or laziness, or a tendency to conserve cognitive effort. People's choice of strategy and preferences are affected by the default or status quo functions of a web site. For example, Bellman et al.

(2001) showed that default settings have strong effects in electronic environments. They presented subjects a web site asking them to opt-out or opt-in to the site's privacy policy. The opt-out or opt-in options were described based on whether the default option is the automatic collection of personally identifying information or whether the individual must first give explicit permission for such information to be collected. Although the two options were qualitatively equivalent, Bellman et al. (2001) found that the framing of the default option strongly influenced choice.

Table 3.2: Common strategies in consumer choice

Strategy	Description
The weighted additive rule (WADD)	It considers the values of each alternative on all the attributes of interest and considers all the relative importance or weights of the attributes to the choice maker.
The equal weight rule (EQW)	It considers all the alternatives and all the attribute values for each alternative. However, it assumes that all attributes are equally important.
The satisficing rule (SAT)	It considers one alternative at a time, in the order it occurs in the set. It compares the value of each attribute of an alternative to a predefined threshold value. The first alternative that has values that meet the thresholds for all attribute is chosen.
The lexicographic rule (LEX)	It considers the most important attribute. The alternative with the best value on the most important attribute is selected.
The elimination-by-aspects rule (EBA)	It eliminates alternatives that do not have a value on the selected attribute that is greater than or equal to a predefined threshold.
The majority of confirming dimensions rule (MCD)	It considers alternatives in pairs, with the values of the two alternatives compared on each attribute, and the alternative with a majority of better attribute values is retained. This process of pair wise comparison continues until all the alternatives have been evaluated and one alternative is chosen.
The frequency of good and bad features rule (FRQ)	It considers alternatives based on counts of good or bad features the alternatives have.

In the context of online review, many existing review systems present holistic alternative-level information (e.g. star ratings) and enable people to sort reviews by the alternative-level information by default. However, gathering attribute-level information is not a trivial task especially when many attributes are considered. This may lead to consumers' reluctance to comprehensively collect attribute-level information and increasing use of the less effortful strategies such as lexicographic rule, or elimination-by-aspects.

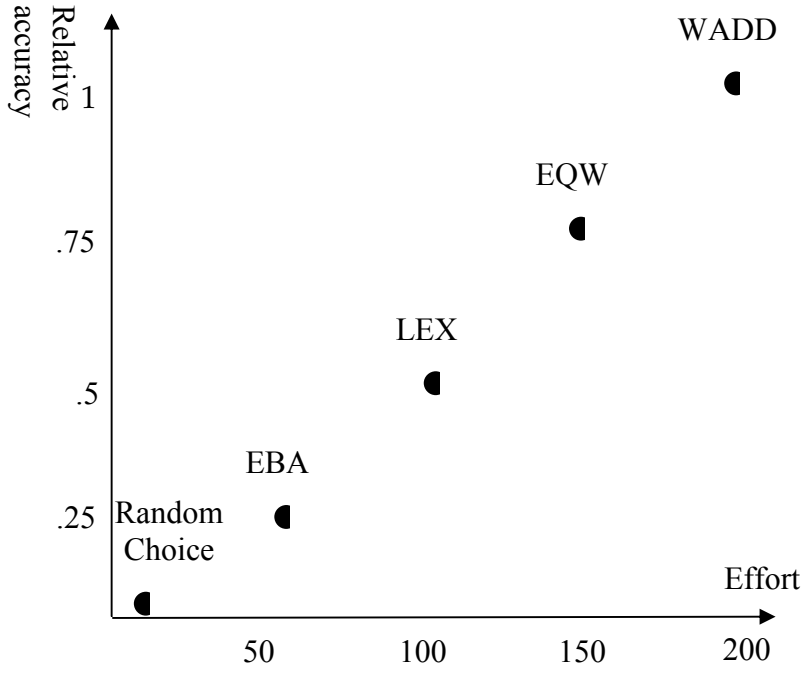


Figure 3.9: Accuracy and effort of choice strategies (Adapted from Bettman et al., 1998)[8]

When making a judgment or choice, consumers may not seek the optimal result. Instead they often use a "satisficing" rule (Simon, 1982), that is, they accept choices or judgments that are "good enough" for their purposes and not so effortful to make. We plot the common strategies on their accuracy-effort coordinates and assume these strategies form a strategy

[8] Since any strategy can be decomposed into more elementary information processes (EIPs), such as reading an item of information, comparing two items of information, multiplying or adding items of information, and so on, cognitive effort is measured by the number of EIPs required to use a strategy (Bettman et al., 1998).

frontier (see Figure 3.10). We can further assume that consumers have a "satisficing area" – consumers will only consider the strategies in the area because using these strategies will generate "good enough" choices or judgments and these strategies are not too effortful to execute.

If we can shift the strategy frontier to the left as shown in Figure 3.10, strategies that result in more accurate choice or judgment will be pushed into the "satisficing" area. One possible way to shift the strategy frontier to the left is to make the attribute-level information acquisition less effortful.

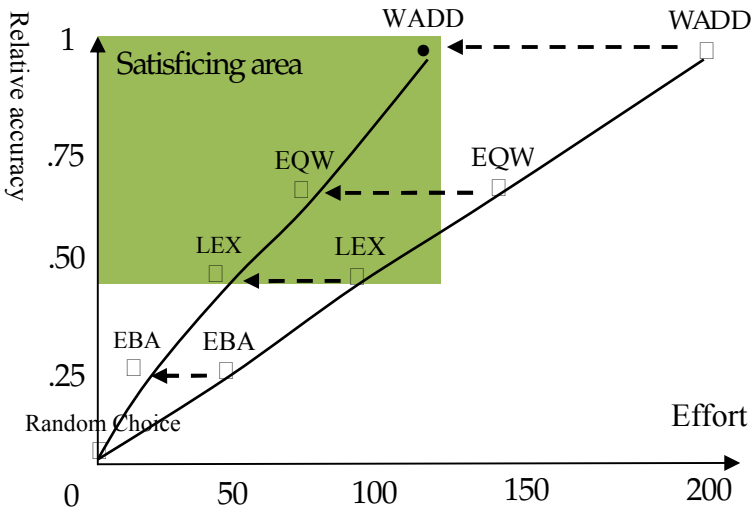


Figure 3.10: Shifting choice strategy frontier

As mentioned earlier, the Internet is capable of organizing and presenting information in various different ways. It is possible to organize the online reviews by attributes and make the attribute organization the default presentation scheme. By visualizing the relevant attributes and summary information, such a presentation reduces the cognitive effort required to apply multiple-attribute based strategies (e.g. the weighted additive rule), and thus shifts the strategy frontier to the left. The new design will be discussed in the next section in greater detail.

3.6 Customer Review Web Site Design Principles

A consumer's judgment or choice making depends on the construction of mental representations of the target product against the evaluative criteria. Therefore, the quality of the mental representations is critical to overcoming undesirable judgment or choice. A well-constructed mental representation is based on a thorough consideration of the range of information most critical to the individual. Inappropriate information selectivity occurs when individuals are too particular and do not acquire and consider enough relevant information. Thus, inappropriate information selectivity is a major fault that impedes attaining well-constructed mental representations (Payne et al. 1999).

When many reviews are available, consumers may examine only a subset of the available reviews, and as a result, may leave out some product attribute information that is critical to a high quality decision. Inappropriate information selectivity can be exacerbated when some reviews that are in the arena of attention are irrelevant to the attributes of interest. For example, many web sites allow users to sort reviews by star ratings, helpful vote, or the time when the reviews were posted. After sorting the reviews, consumers may only read the reviews displayed on the first few pages. Inappropriate information selectivity occurs when the reviews displayed on the first few pages are mainly irrelevant to the consumer.

Another major fault that impedes attaining well-constructed mental representations is that individuals simply may not comprehend the information available or interpret it in ways not intended by the provider (Payne et al. 1999). While attribute-level information is important for consumers to inform their choice making, they may comprehend and interpret attribute-level information incorrectly due to a lack of product knowledge or the poor writing of some reviews.

One way to mitigate inappropriate information selectivity and lack of information comprehension is to categorize reviews by meaningful attributes and to provide an overview of these attributes. Arranging reviews around meaningful attributes shows relationships between attribute level information and individual reviews, and thus helps consumers comprehend and interpret the reviews to some extent. With an overview, consumers can identify all the attributes mentioned in the reviews at a glance, making the mental representation construction more efficient. The prior discussion leads us to identify two critical web site design principles:

The categorization principle: A review system should categorize the reviews by meaningful product attributes.

The overview principle: A review system should present an overview of a product's attributes.

When designing an online review system, an important question to take into account is the heterogeneity in consumers' information needs. The first type of heterogeneity is the heterogeneity among consumers. Specifically, reviews that are relevant to one person may have little value to another. The second type of heterogeneity is the dynamically changing information needs during the information acquisition process.

A solution to the heterogeneity problem is to give consumers the necessary information control that allows for acquiring information based on that person's mental representations. For example, when the reviews are organized around product attributes, the designer can further link the product attributes to the actual reviews that mention these attributes. As such, consumers can focus on the portions of the attribute space that are of most interest. This would enable, for example, a consumer to confirm whether a comment on an attribute is pertinent. For many existing sites, since reviews are not organized by attributes, consumers have to browse until they

find a review that mentions the attribute of interest. In contrast, when reviews are organized and linked to product attributes, consumers can quickly locate reviews to confirm whether a comment on the attribute is pertinent.

Many existing online review systems allow consumers to slice and dice the reviews based on a variety of filters (e.g., see all 5-star reviews). As a further step, the designer could implement these filters at the product attribute level. For example, the designer may provide a profile of the reviews that mention a specific attribute. The profile could be a visual, such as a bar chart, showing the number of reviews that mention the attribute positively, neutrally, and negatively, with links to the particular reviews. A benefit of these links is that they enhance the depth of field, the extent to which a tool provides contextual overview versus detailed information or enables consumers to keep both levels in focus at the same time (Lurie & Mason 2007). Because people differ in their willingness to process detailed information, depth of field increases the fit between heterogeneous needs for detailed information and information presentation. Specifically, for those who are reluctant to process detailed information, they can browse only the reviews' profile for the attributes of particular interest. Those who are interested in greater detail may drill down to the full reviews.

To sum up, the following design principles can be considered to improve review presentation:

The linkage principle: A review system should link individual reviews to the product attributes mentioned in the reviews.

The filtering principle: A review system should enable consumers to filter reviews by attribute and review characteristics.

3.7 The Attribute Overview Design

Figure 3.11 shows an example of the attribute-oriented design. Similar to most existing online review presentations, the attribute oriented design first shows the profile of the reviews (that is alternative-based information presenting an overall evaluation of the product - see the upper half of Figure 3.11). Under the review profile section, each tag represents an attribute mentioned in the reviews. The size of each tag indicates the total number of reviews that mention that specific attribute. The exact number of the reviews that are mentioned in an attribute is shown in parentheses. The bar under each tag also indicates the consensus among the reviews. The more positive reviews about the attribute, the longer the left end (darker side) of the bar.

If consumers click on a tag, the review system displays both the profile for the attribute and the reviews that mention the attribute (see bottom part of Figure 3.11). From the attribute-level profile area, consumers can choose to browse the positive, neutral, or negative reviews. Under each attribute, product reviews can be sorted by the number of helpful votes they received ('Most helpful first'), and the time when the review was posted ('Newest first'). Table 3.3 shows how each design principle is implemented in the example review system.

Table 3.3: Implementation of the design strategies

Design Principle	Implementation
The Categorization Principle	The 60 customer reviews are categorized by 24 attributes.
The Overview Principle	The first page shows a tag cloud in which each tag represents an attribute, the number in the parentheses shows the total number of reviews that mention an attribute, and the bar under a tag indicates the proportion of the positive and negative reviews.
The Linkage Principle	When clicking on an attribute tag, consumers will see all the reviews that mention the attribute.
The Filtering Principle	The first page allows consumers to filter the reviews by star ratings and sort the reviews by helpful vote and the time when a review was posted. Similarly, under each attribute category, consumers can filter the reviews by positive, neutral, and negative categories and sort the reviews by helpful vote and the time when a review was posted.

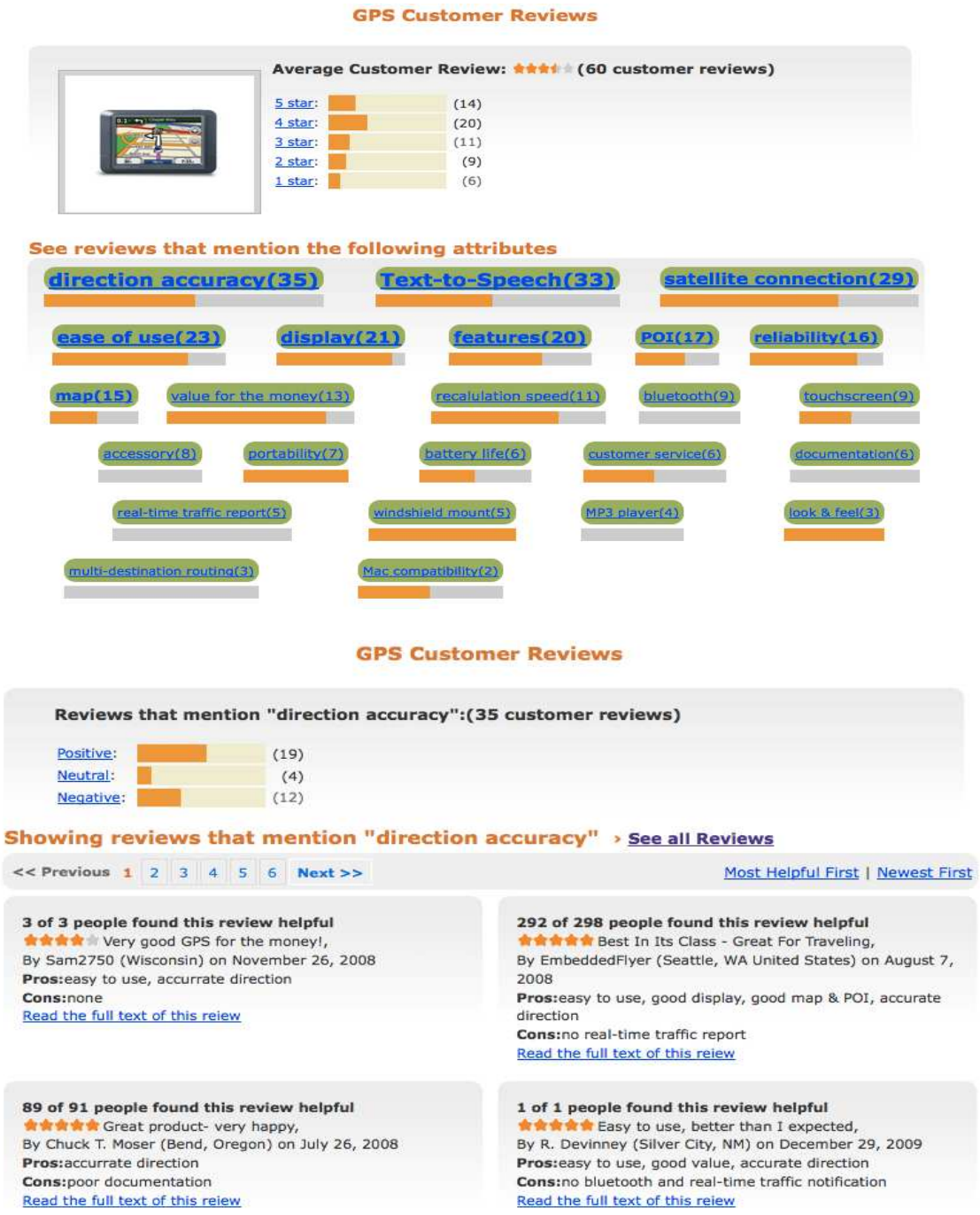


Figure 3.11: An illustration of the attribute overview system

3.7.1 Why is attribute overview design better?

In addition to increasing the accuracy of a judgment or choice and decreasing the cognitive costs (that we have already discussed as proposed advantages of the attribute overview system),

consumers also seek to increase the ease with which a choice can be justified, and reduce the experienced negative emotion (Bettman et al., 1998).

3.7.1.1 Greater justifiability

The judgment or choice made by a consumer is often evaluated by others or by the consumer, and sometimes consumers must justify their decision to others and themselves. Thus, an important goal is to increase the ease with which a judgment or choice can be justified. Without a well-constructed mental representation of the target product and evaluative criteria, it is impossible to justify why a judgment or choice is good to oneself or to others. Inappropriate information selectivity and comprehension are two major problems that impede the attainment of clear mental representations. Since the categorization principle, overview principle, and linkage principle are able to mitigate the inappropriate selectivity and comprehension, they should also help consumers better justify their choice. At the same time, the information control and depth of field enabled by the linkage and filtering principles allow consumers to easily gather information from the reviews they trust reviews and aggregate across these trusted reviews. Hence, it is easier for consumers to identify reasons to justify their choice.

3.7.1.2 Greater confidence in choice or judgment

Since it is difficult to objectively assess decision accuracy, choice or judgment is often driven by consumers' level of confidence. With the categorization, overview, and linkage principles, consumers are less likely to overlook important information and interpret the attribute-level information incorrectly. Thus, appropriate selectivity and comprehension enabled by these principles should enhance consumers' confidence in their choice. Similarly, greater control of information flow and depth of field enabled by the linkage and filtering principles

allows consumers to process new information and learn about the options more efficiently. This should also lead to greater confidence in identifying a preferred option.

3.7.1.3 Lower cognitive costs

Categorized information is easier to remember and recall. Thus, the categorization principle helps consumers process the reviews with lower cognitive costs. With the overview principle, consumers might be able to form the initial mental representations of the product and the evaluative criteria at a glance. Moreover, the profiling feature under each attribute tag increases the ease with which attribute level information can be assessed and compared, and thus enhances consumers' ability to evaluate information on multiple attributes (Lurie & Mason 2007). The linkage principle allows consumers to distinguish relevant from irrelevant information and locate the critical information with which available alternatives can be discriminated. The filtering principle allows consumers to slice and dice the information environment. It may also reduce their cognitive effort by displaying first potentially more diagnostic reviews. Therefore the proposed design reduces the cognitive costs required for judgment or choice making.

3.7.1.4 Less experienced negative emotions

Another benefit of the proposed design is less experienced negative emotion in choice or judgment making. Experienced negative emotion is the outcome of the degree to which the other three goals (i.e., justifiability, confidence, and cognitive costs) are attained. A more justifiable judgment or choice should generate a higher positive overall emotional reaction (Luce et al. 2001). Hence, negative emotion depends on whether people can justify their judgment choices. When consumers are not confident in their judgment or choice, they are inclined to postpone the consumption decision. Consequently, lower confidence results in a delay in consumption, which

further increases negative emotion. Complex judgment or choice requires greater cognitive costs, which give rise to stress and frustration. As a result, high cognitive costs will increase the experienced negative emotion.

3.8 Approaches to Empirical Testing

The conceptual model developed in the dissertation and presented in Figure 3.8 will be tested via both variance and process approaches. The variance approach focuses on explaining the variation in outcomes through a set of independent variables derived from our conceptual model. In contrast to the variance approach, the process approach views the focal phenomenon as a sequence of events that occur over time. This approach focuses on how the underlying process unfolds over time. Sabherwal and Robey (1995) showed that the joint application of variance and process strategies can magnify our understanding of the phenomenon of interest. As shown in Table 3.4, the goal of the variance approach is to identify predictors of subjects' review selection and their final criteria set for decision-making. Therefore, both the determinants of information selectivity (RQ1) and of constructive preferences (RQ2) will be tested through the variance approach. In addition, these will be compared across two online review systems: a traditional system and the attribute overview system that has been designed based on the principles derived in the dissertation. The goal of the process approach is to examine the sequences of action occurring during online review processing particularly focusing on information selectivity and on preference construction.

Table 3.4: Variance and process approach in theory testing

	RQ1: Information Selectivity	RQ2: Preference Construction	RQ3: Design
Variance Approach	Predict subjects' review selection	Predict the final criteria set	Compare decision outcomes
Process Approach	Analyze sequence of actions in information selectivity	Analyze sequence of actions in criteria refinement	Compare the sequence of events

CHAPTER 4

RESEARCH DESIGN AND METHOD

4.1 Method Overview

The study employs the process tracing method in an experimental setting. Process tracing techniques are often used to study the cognitive processes underlying judgment and decision-making (e.g. Svenson 1979; Payne et al. 1978). Two process tracing methods, verbal protocol analysis and information acquisition monitoring are commonly employed in decision research. When using these process tracing techniques, researchers ask decision makers to report their stream of thought by "thinking aloud" while performing the task of interest (verbal protocol analysis, Ericsson & Simon 1993) or to make a series of information acquisition acts on an information display board or its computerized equivalent (information acquisition monitoring, Payne et al. 1993).

The experiment for this study uses multiple methods of data collection that include verbal protocols, clickstream data, questionnaires and interviews. Verbal protocols are the stream of thoughts reported by the subjects while performing the experimental task. Clickstream data is the record of subject activity while browsing the reviews, including every review page that the subject visits, how long the subject was on a review page, in what order the review pages were visited. In addition to verbal protocols and clickstream data, the experiment also collects survey and interview data that capture subject individual difference, their perceptions of their decision outcomes (e.g., confidence in their decision) and their initial and final criteria used for decision-making.

4.2 Verbal Protocol Analysis Overview

Verbal protocol analysis (VPA) is a major method for analyzing cognitive processes, and has been used successfully in psychology, management, marketing, and MIS (e.g. Barber & Roehling 1993; Benbunan-Fich 2001; Isenberg 1986; Nunes & Park 2003). This method requires participants to either verbalize their thought processes during the performance of a task (concurrent VPA) or after completion of the task (retrospective VPA). The method is premised on the assumption that it is possible to instruct subjects to verbalize their thoughts in a way that does not change the sequence of thoughts mediating the completion of a task, and can therefore be accepted as valid data on thinking (Ericsson & Simon 1993). It is a nondirective technique, such that the only interaction between experimenter and subject after initial instructions is when subjects stop thinking aloud for some time, at which point they are simply reminded to think aloud. The recorded transcripts of the verbalizations are then segmented and encoded to provide a trace of the thought processes involved in making the decision or solving the problem. VPA is usually very labor-intensive, requiring considerable effort for transcription, coding, and analysis. As a result, many VPA studies are conducted with small samples of less than 20 participants (see Eveland & Dunwoody, 2000).

4.3 Experimental Design

One goal of the experiment is to compare the traditional review web site with the attribute overview design. To make the comparison, the experiment can use either a within-subject design or a between-subject design.

In the pre-test and pilot test, a within-subject design was used in the experiment, that is, every subject performed two experimental tasks, one with the traditional review web site and the other with the attribute overview web site. Within-subject designs usually allow for more

powerful tests of effects than between-subjects designs. The potential for greater power occurs because when treatment effects are considered within subjects, it is possible to use error terms that are unaffected by the main effects of individual differences among subjects and are, therefore, smaller. There is also a fundamental disadvantage of the within-subjects' design, which is referred to as "carryover effects". If each subject is tested more than once, the order in which the review systems are presented becomes a major concern. If the same order is used with every subject, then the treatment and order are confounded. Because of the potential carryover effect in a within-subject design, procedures for counterbalancing stimulus presentation are frequently used (Pollatsek & Well 1995). For the current experiment, in addition to two online review websites (traditional and attribute overview) we also had to use two different products (a camera and a GPS) since we could not give the subjects the same product for both review systems. As a result, two groups are needed to counterbalance the stimulus combinations (i.e., the mixing of product and review web site) and another two groups are needed to counterbalance the review web site order. Table 4.1 shows how each group is treated. In this design, groups are represented by the two between-group factors, review web site order and the product-web site combination. In addition to the main effect for review web site, the design will also allow for tests of several interactions. The order by web site interaction will reveal whether or not there are any overall order effects. The combination by web site interaction will indicate whether or not there are any overall differences between the two products.

Table 4.1: Counterbalancing in the pilot and pre-test

Group #	Order	Product-Web site combination	Traditional Web site		Attribute Overview Web site	
1	1	1	Product 1	Trial 1	Product 2	Trial 2
2	2	1	Product 1	Trial 2	Product 2	Trial 1
3	1	2	Product 2	Trial 1	Product 1	Trial 2
4	2	2	Product 2	Trial 2	Product 1	Trial 1

The products used for the pretest and the pilot were selected through a two-stage procedure. First, thirty undergraduate students enrolled in a required MIS class were asked to write down at least five products that they typically purchase from the Internet. A list of the top ten products students purchase was generated based on the students' responses. Second, twenty-seven undergraduate students from a different class were invited to rate their involvement with the 10 products on a product involvement scale (Zaichkowsky 1985). There were some additional requirements that guided our selection of products to use for the experiment. First, two different products are needed for the within-subject design of the pretest and pilot. In addition, subject involvement with the two products should be comparable: if one product has much stronger involvement than the other, a fair comparison of the review web sites cannot be drawn. Finally, to capture preference construction processes, the product used for the experiment must have a reasonable number of attributes. A multiple comparison showed that there were no significant differences in students' involvement with the top 10 products. Among these products, the digital camera and the GPS have a richer set of attributes. As such, the digital camera and GPS were chosen for the dissertation as experimental products.

A pre-test was conducted with two doctoral students to test the experimental setup and to refine the experimental procedure. A pilot test was also conducted with 24 undergraduate students to further refine the experimental procedure. The pre-test and pilot showed that the within-subject version of the experiment ran for too long as the average time for a subject to complete two tasks was 105 minutes. As such, subjects became fatigued and lost interest. To avoid the threat to internal validity resulting from subject fatigue, a between-subject design was used in the full scale experiment, that is, every subject was randomly assigned to one of the two experimental conditions, in which he or she performed only one task using either the traditional

review web site or the attribute overview web site. The digital camera was used for the full scale experiment because it has been used in many other judgment and decision-making studies (e.g. Moreau et al. 2001; Novemsky et al. 2007).

4.4 Individual Differences

In the psychology and marketing literatures, many individual difference variables are shown to have some impact on information processing and decision-making. *Need for cognition* and *need for cognitive closure* are two such dispositional variables. Need for cognition is defined as the tendency for an individual to engage in and enjoy thinking (Cacioppo et al. 1996). Verplanken et al. (1992) showed high need for cognition people desired more information and expended more cognitive effort on the search task than did low need for cognition people. Need for cognitive closure is defined as an individual's desire for a firm answer to a question and an aversion toward ambiguity (Webster & Kruglanski 1994). Kardes et al. (2004) showed that low need for cognitive closure individuals processed information in a more open-minded way, and were less likely to use defensive strategies than high need for cognitive closure people.

In addition to need for cognition and need for cognitive closure, other individual differences, often termed cognitive styles, are also related to information processing and decision-making. Cognitive styles have been conceptualized as a subset of personality types, decision-making style, and learning style (see Kozhevnikov 2007 for a review). These different perspectives lead to many different dimensions and operationalizations, and the overlap between the different dimensions of cognitive style is unclear. In this study, the scale of *maximizing vs. satisficing* (Schwartz et al. 2002) and the *cognitive reflection test* (Frederick 2005) were used to assess subjects' decision-making style. The scale of maximizing vs. satisficing was designed to assess how individuals approach decision situations. Specifically, it distinguishes between two

approaches: Maximizing is the tendency to optimize when making decisions. It is characterized by increased information-seeking and social comparison. Satisficing is the tendency to use shortcuts when making decisions and to settle for a "good-enough" option that passes a "threshold of acceptability." The cognitive reflection test was designed to assess individuals' ability to suppress an intuitive and spontaneous wrong answer in favor of a reflective and deliberative right answer.

Prior knowledge about the product is another important individual difference that has some impact on information processing (e.g. Bettman & Park 1980; Moorthy et al. 1997; Rao & Monroe 1988; Schmidt & Spreng 1996). Since experts have a large volume of product knowledge, they tend to make a choice based on memory. In contrast, novices are more likely to use external information to make a choice (Mandel & Johnson 2002). This study focuses on the individuals who have low to medium amount of knowledge about the experimental products.

4.5 Experimental Procedure

The experimental procedure is illustrated in Figure 4.1. One-hundred and seven undergraduate students enrolled in two MIS courses were invited to participate in the study. Participation was voluntary and students could withdraw from the study at any point of time. The incentive for participation was extra course credit, Students who chose not to participate could also get extra course credit by completing an alternate assignment. Sixty-eight students participated in the experiment (response rate=63.5%).

Participating students were instructed to complete an online survey (*pre-experimental survey* in Figure 4.1) before they came to the lab. The *pre-experimental survey* captured subjects' need for cognition, need for cognitive closure, and tendency of maximizing or satisficing in decision-making (see Appendix A). After a student completed the pre-experimental survey, an individual

experimental session was scheduled for him or her. On arrival at the lab for their scheduled sessions, subjects were asked to complete the *pre-task survey*. The *pre-task survey* included questions about their prior knowledge of the experimental product (a digital camera), their level of interest in the experimental product, and included the cognitive reflection test (see Appendix B).

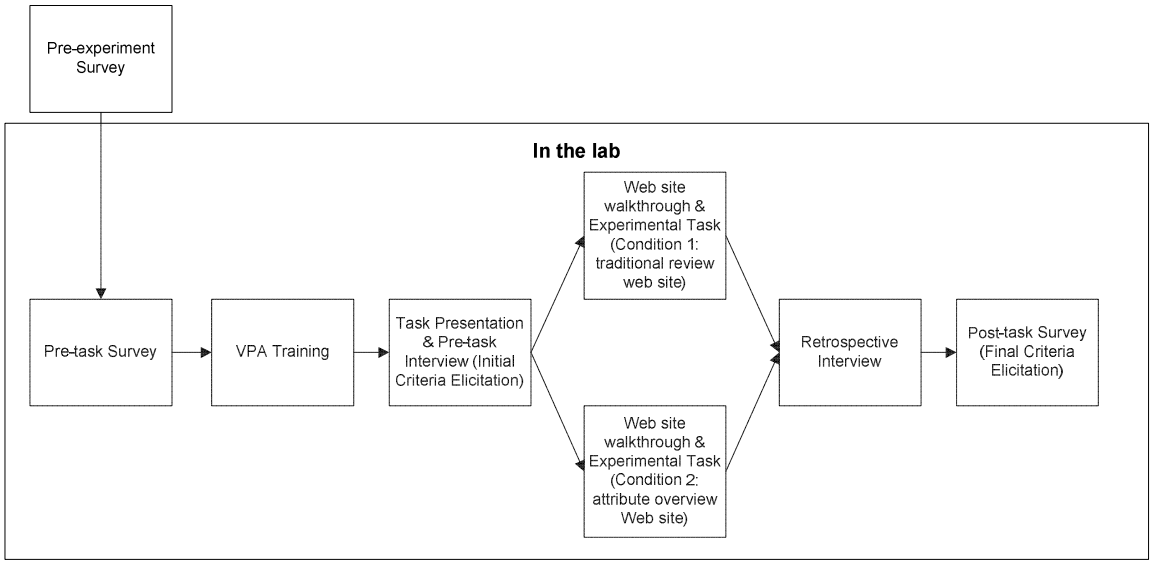


Figure 4.1: Experiment procedure

Following the pre-task survey, a *think-aloud training session* was held for the subjects to practice thinking aloud while performing a task (see VPA Training Session Script in Appendix C). In the training session, the experimenter first showed subjects a think-aloud demonstration video. In the video, a person browsed a job posting web site and made a decision on which position to apply for. The person was verbalizing her thoughts aloud constantly while performing the task. After the demonstration, subjects performed their first think-aloud exercise, in which they were required to think aloud while browsing a single job posting. The exercise was repeated until subjects were able to verbalize their ongoing thoughts constantly and clearly. After completing the first exercise satisfactorily, subjects performed a second think-aloud exercise. In

the second exercise, subjects were required to think aloud while browsing IBM's job posting web site. The second exercise allowed subjects to further practice thinking aloud while navigating through an informational web site and engaging in a decision making process similar to that of evaluating a product on an online product review web site.

After the VPA training session subjects were presented with the following scenario[9] (see Task Presentation and Initial Criteria Elicitation in Appendix D): "Suppose you are considering buying a digital camera for your best friend as a birthday gift. Your friend occasionally takes long trips, and he is starting to show some interest in photography. I will show you a web site with a camera and real customer reviews on this camera. Your task is to decide whether this camera is a viable option you would consider." Following the decision scenario presentation, subjects were asked to list the attributes of the digital camera they would consider as important criteria in making their decision.

After this initial decision criteria elicitation, subjects were randomly assigned to either the traditional review web site condition or the attribute overview web site condition. Both traditional review web site and attribute overview web site are designed specifically for the experiment (see Figure 4.2 and Figure 4.3 respectively). The two review web sites have the same set of product reviews. These are 60 customer reviews for Canon A590 IS randomly selected from Amazon.com (see the reviews in Appendix E). The brand and model name were removed from reviews so that subjects' judgment and decision-making will not be biased by the brand name. The 60 product reviews distribute over 10 pages. Both web sites allow people to sort the reviews by the helpful vote a review received or by the date when a review was posted, and to

[9] Since the pre-test and pilot used two products, two different scenarios were developed – one for the digital camera and one for the GPS. However, the main study used only a single product (a digital camera) and as such used a single scenario.

subset the reviews by star rating. The difference between the two web sites is that the attribute overview web site organizes the reviews by product attributes and presents the attributes in the form of a tag cloud (see Figure 4.3).

Before subjects performed their task, the experimenter walked them through a demonstration version of their designated web site and gave them two minutes to try the web site.[10] The purpose of this walkthrough was to ensure that the decision-making task was not influenced by subjects' unfamiliarity with the review web site. Subjects then began to browse the reviews after the walkthrough and tryout. The subjects were required to make the decision as they normally do. That means that the subjects could take as much time as they felt was necessary to make the decision, they could choose whatever reviews they deemed necessary to read, they could choose to read as many or as few reviews as they wanted, and they could read the reviews in whatever sequence they wanted. They were required to verbalize their thoughts constantly and clearly as they did in the practice session. To avoid distracting the subjects and biasing their decision-making, the experimenter was not visually accessible to the subjects. Once subjects began to perform their task, the only interaction between experimenter and subject was when subjects became silent for more than 10 seconds, at which point they were simply reminded by the experimenter to think aloud. After the training session, almost all subjects could think aloud constantly and as such a reminder was rarely used in the experiment. Subjects' verbal protocols were recorded as they perform their task. We also made a synchronized video recording of their activities on the computer screen.

[10] The product on the demonstration web site is a wireless router so that subjects were not exposed to the information about the digital camera before the primary task.

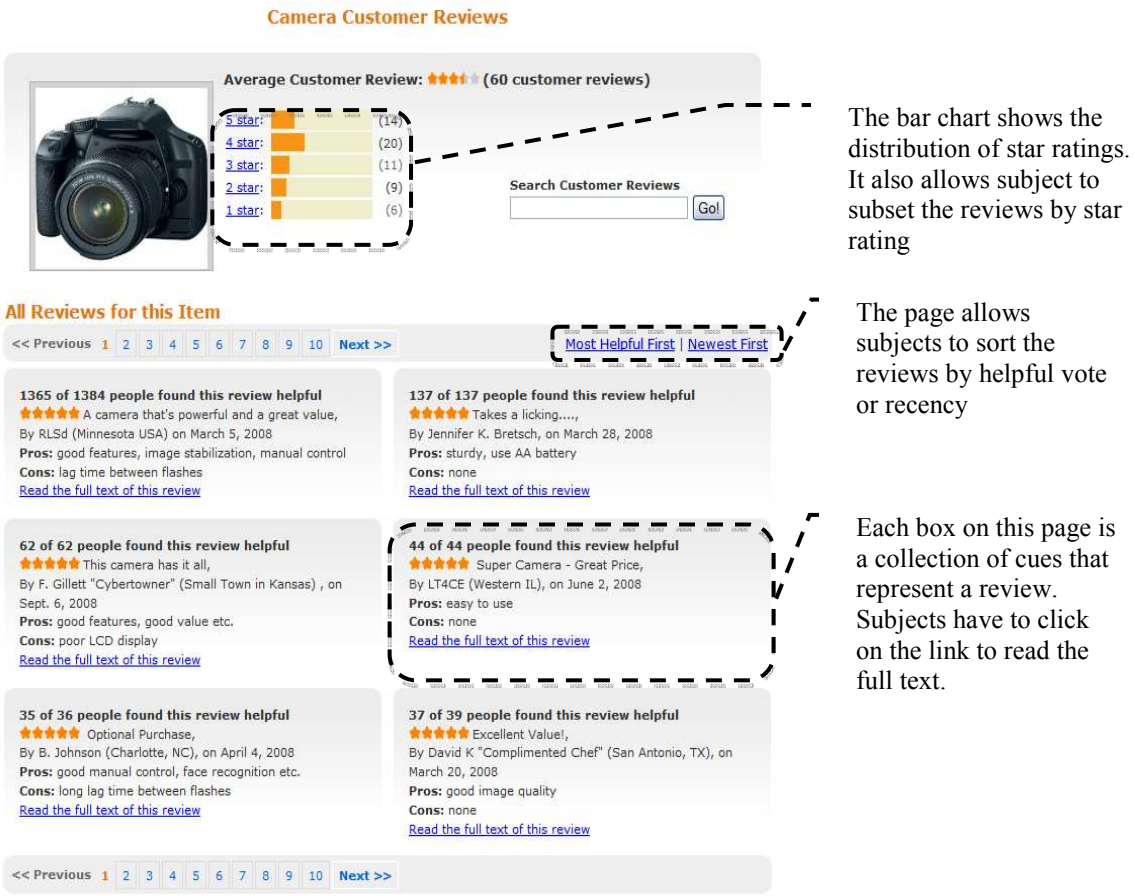


Figure 4.2: Traditional review web site

After subjects finished the experimental task (they indicated that they were ready to make the decision), an interview was conducted to probe into their thought processes retrospectively (see Retrospective Interview in Appendix D). The retrospective verbal protocol can be biased due to the decay of short memory and post-hoc rationalization of thoughts. However, these retrospective protocols are still important because they may provide more statements about the final choice than the concurrent protocols (Kuusela and Paul 2000). Therefore the retrospective verbal protocols were also recorded.

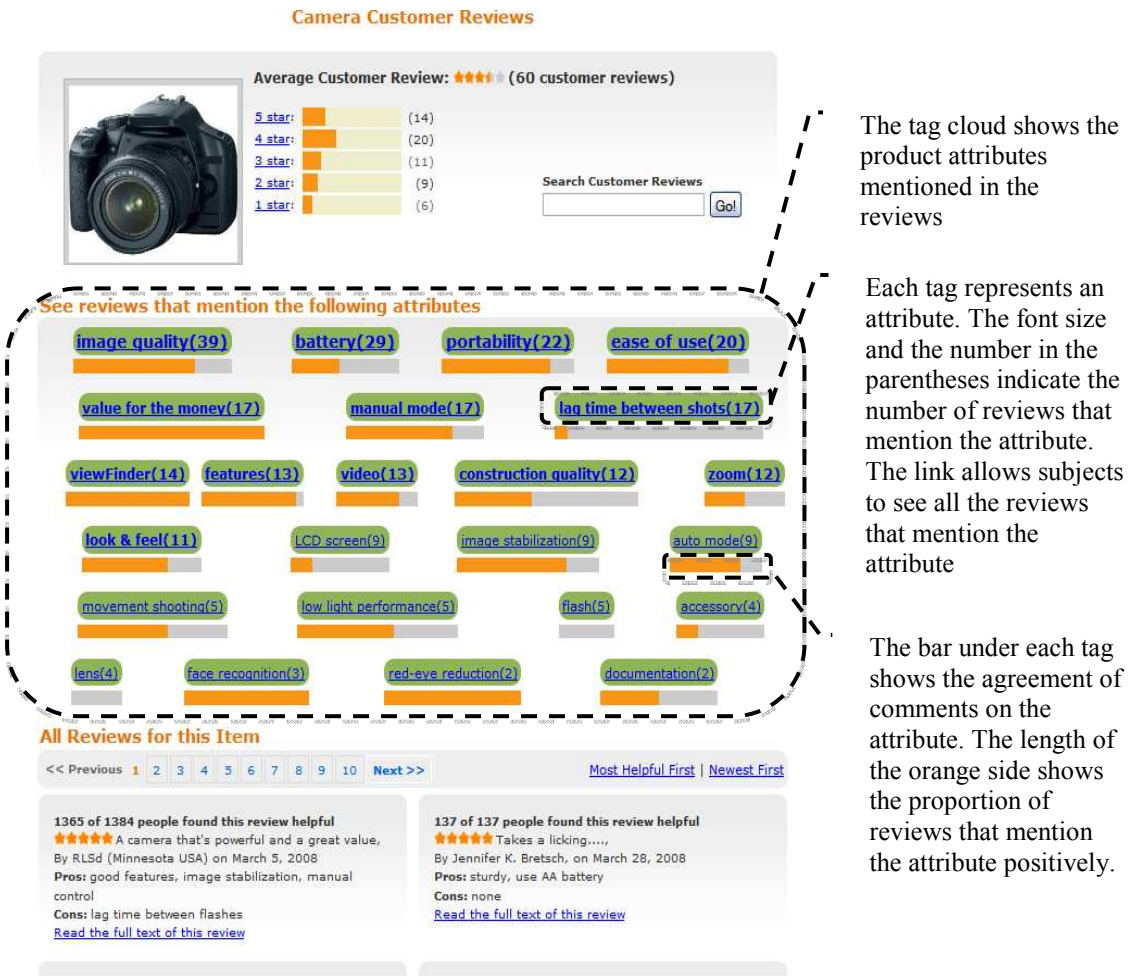


Figure 4.3: Attribute overview web site

Following the retrospective interview, subjects were required to complete another online survey (see *Post-task* survey in Appendix F). A major purpose of the survey is to elicit their criteria used for the decision. Specifically, subjects were required to list the camera attributes they considered as their decision criteria. They then rated the importance of each attribute and evaluated the camera on each attribute. An additional purpose of the *post-task* survey was to elicit subjects' perception of the decision outcomes including their confidence in the decision, perceived decision-making time and effort, justifiability of their decision, and the experienced negative emotion in the decision-making. The items used to measure these constructs can be found in Appendix F.

CHAPTER 5

DATA ANALYSIS AND RESULTS

This dissertation follows Ericsson and Simon (1993)'s guidance in data analysis. Figure 5.1 summarizes the activities of data analysis. The main stages include coding the verbal protocols and analyzing the verbal protocol codes.

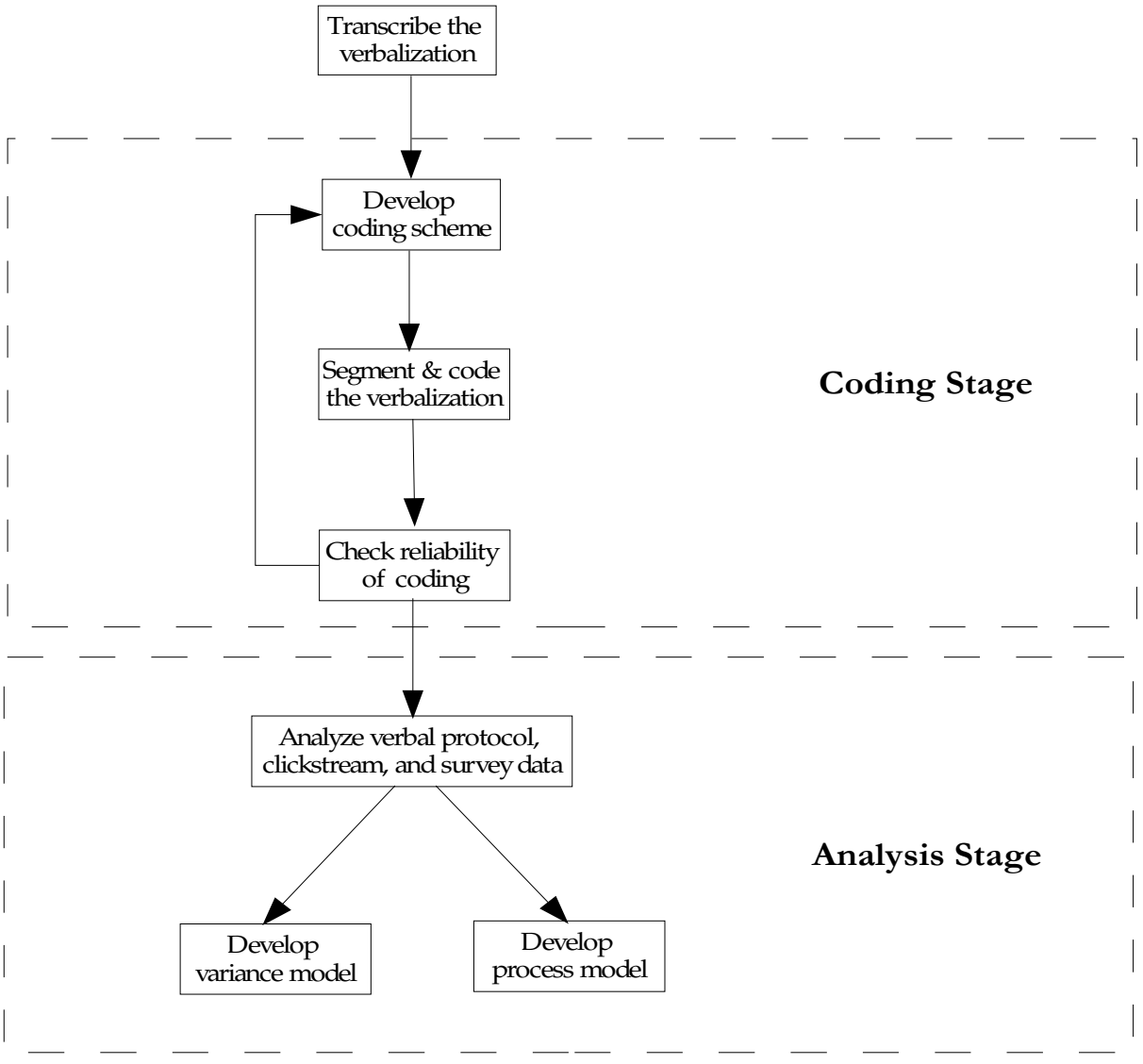


Figure 5.1: An overview of data analysis

5.1 Code the verbal protocol data

The verbal protocols were first transcribed from the videos. Complete protocol data from 62 subjects were available for analysis. Sixty-eight student subjects participated in the study. The loss of the six protocols was largely due to technical problems: the verbalizations for five subjects were not recorded in the videos. The protocol for one subject was only partly available due to the corruption of the video file.

After transcription, a coding scheme was developed to code the protocols. Chi (1997) suggested that a coding scheme can be developed based on the subject domain, the hypotheses being tested, or the research questions being asked. As shown in Figure 5.1, an iterative process was taken to develop the coding scheme for this dissertation. First, a preliminary coding scheme was constructed to capture different activities in information acquisition and choice making. Based on the preliminary coding scheme, two researchers coded two randomly selected protocols independently. Two coders agreed on 332 out of 492 segments, or 67.5 percent for these two protocols. The coded protocols were examined carefully, disagreements were discussed, and the preliminary coding schemes were revised to resolve the disagreement in the coding. Another two protocols were randomly selected and coded by the same two researchers based on the revised coding scheme. The coders were able to achieve a high inter-rater agreement (211 out of 244 segments or 86.3 percent) for these two protocols. Therefore, the revised coding scheme was adopted for coding the protocols.

As shown in Figure 5.2, the coding scheme has three main categories that represent different aspects of information acquisition and choice making. The information source category captures the sections of the review web site from which people gather their information, including proximal cues (e.g. review profile, pros and cons, helpful vote, star rating) and the full text of

the reviews. The information content category captures product attributes people process as they browse the reviews. As shown in the tag cloud of the attribute overview web site (see Figure 4.3), twenty-four attributes are mentioned in the reviews (see Appendix H for these attributes). Different subjects processed a different subset of these 24 attributes as they browsed the reviews. The mental and physical operation category represents specific activities people perform during information acquisition and choice making. Mental activities include the discovery of important evaluation criteria from the reviews, the evaluation of product performance, and the assessment of information consistency and credibility in the reviews. Physical activities include subsetting the reviews by star rating or by attributes and sorting the reviews by helpful vote or recency. The details of the coding scheme are shown in Appendix G.

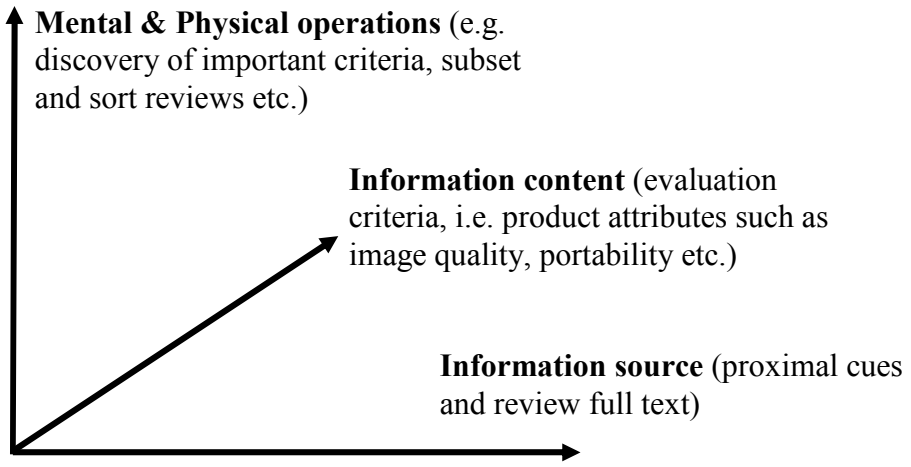


Figure 5.2: An overview of major categories of the coding scheme

The protocols were then divided by the authors into short segments. Although there is no standard definition of a segment, many segmentation schemes are based upon an identifiable single unit such as a complete thought or a distinct or pause-bounded utterance or phrase (Newell and Simon 1972; Payne and Ragsdale 1978). The protocol segmentation in this study was based on the semantic features of the protocols so that each segment consisted of a single task-related

activity or statement. On average there were roughly 177 segments per protocol. After segmentation, each protocol was coded based on the coding scheme.

5.2 Descriptive Analysis

Table 5.1 shows the descriptive statistics of subjects and their information acquisition and decision-making activities. As discussed earlier, subjects were randomly assigned to two conditions. In the first condition, subjects gathered information from the reviews using the traditional review presentation. In the second condition, subjects used the attribute overview review web site, specifically designed for this dissertation.

Table 5.1: Descriptive statistics of subjects and their activities

	Overall	Condition 1 (Traditional)	Condition 2 (Attribute Overview)	Difference (Mann-Whitney U)
N	62	31	31	/
Prior Knowledge	3.87 (1.50)	4.09 (1.47)	3.65 (1.52)	P=0.20
Interest Level	4.37 (1.47)	4.52 (1.48)	4.23 (1.48)	P=0.42
Time Spent (min)	**10.35 (5.98)**	**8.37 (4.34)**	**12.34 (6.77)**	**P=0.005**
# of Reviews Attended	**36.37 (25.79)**	**27.58 (18.26)**	**45.44 (29.36)**	**P=0.003**
# of Full Text Clicked	5.89 (4.32)	4.85 (2.97)	6.97 (5.20)	P=0.14
# of Attributes Processed (from proximal cues)	**6.98 (4.91)**	**5.58 (5.06)**	**8.39 (4.41)**	**P=0.01**
# of Attributes Processed (from review full text)	9.66 (4.62)	9.48 (4.06)	9.84 (5.19)	P=0.70
Likelihood to Buy	4.71 (1.79)	4.71 (1.70)	4.71 (1.90)	P=0.92
Overall Product Evaluation	5.29 (1.08)	5.26 (1.24)	5.32 (0.91)	P=0.77
Attribute Evaluation Bias	**1.22 (0.61)**	**1.38 (0.66)**	**1.07 (0.52)**	**P=0.04**

Note: the row is boldfaced when there are significant differences between two conditions

Half of the 62 subjects (i.e., 31 subjects) were randomly assigned to the traditional review web condition. The other half were randomly assigned to the attribute overview condition. A

Mann-Whitney U test shows that there are no significant differences between the two conditions in terms of subjects' prior knowledge about digital cameras, the product used in the experiment, and their interest level in digital cameras. As such, the difference in the decision processes and outcomes between the two conditions cannot be attributed to subjects' prior knowledge and their interest level.

Table 5.1 shows that on average subjects spent about 10 minutes on the experimental task. Subjects in the attribute overview condition spent significantly more time on the experimental task. Subjects exhibited information selectivity as they browsed the review web site. On average, subjects paid attention to 36 reviews or 60 percent of all available reviews. They noticed these reviews and scanned their proximal cues (e.g. pros and cons), while the other reviews were either unnoticed or intentionally ignored.

On average, subjects read about 6 full texts, a small portion of the reviews they noticed. Table 5.1 shows that subjects in the attribute overview condition paid attention to significantly more reviews, although they did not read more review full texts than subjects in the traditional review web condition. Furthermore, in the attribute overview condition subjects attended to significantly more product attribute information in the proximal cues than subjects in the traditional review web condition. There were no significant differences in the number of attributes subjects attended to in the review full text. These findings are not surprising from a theoretical standpoint. The purpose of the attribute overview design is to mitigate inappropriate information selectivity. The results show that people are less likely to leave out information when they use the attribute overview web site.

There were no significant differences between the two conditions in subjects' decision (likelihood to purchase the digital camera) or their overall evaluation of the product[11]. In addition to the overall product evaluation, subjects were also required to evaluate the product on each of the attributes that were important to them in making the decision. This evaluation might be biased depending on their information selectivity. For example, a product may be rated highly on a specific attribute in most reviews. However, if the subject failed to read these reviews and only read the few that rated the product negatively on the attribute, then the subject may form a biased assessment of the product on that attribute.

To investigate "evaluation bias", we need a norm to which each subject's evaluation can be compared. Before the experiment, two researchers carefully read all 60 reviews contained in the online review system (the two conditions, traditional and attribute overview contained the same set of 60 reviews). After reading each review, the two researchers listed all the attributes mentioned in the review and rated whether these attributes were mentioned positively, neutrally, or negatively in the review. The attribute listing and rating were repeated and revised until the two researchers agreed on more than 90 percent of the ratings.

An evaluation norm can be constructed based on the researchers' ratings. Suppose an attribute is mentioned positively by r reviews, neutrally by s reviews, and negatively by t reviews, then this attribute receives a score: (7*r+4*s+1*t)/(r+s+t). The formula ensures that the score lies on a 1-7 scale.

[11] The means, standard deviations, and distributions across the two conditions were statistically compared. No statistical differences were found.

Subjects' evaluation on product attributes can be compared to this norm by calculating the average absolute deviation from the norm.[12] A large average absolute deviation indicates a potentially biased evaluation. As shown in Table 5.1, the evaluation bias in the attribute overview web condition is significantly smaller than in the traditional review web condition. This provides additional evidence that people are less likely to miss out important information when they use attribute overview design.

Table 5.2 shows preference construction as evidenced by criteria refinement. The table shows the average number of attributes in the initial and final criteria sets in both conditions. It can be seen that the number of attributes in the initial and in the final criteria sets were not significantly different across the two conditions. However, in both conditions the final criteria set has significantly more attributes than the initial criteria set. The attribute number increase was not significantly different across two conditions.

Table 5.2: Descriptive statistics of criteria refinement

	Condition 1 (Traditional)	Condition 2 (Attribute Overview)	# of Attributes Difference Mann-Whitney U test
Initial criteria set	2.912	3.333	$P_{\text{condition 2-condition 1}}=0.336$
Final criteria set	4.794	4.758	$P_{\text{condition 2-condition 1}}=0.592$
# of attributes difference Mann-Whitney U test	$P_{\text{final-initial}}=0.000$	$P_{\text{final-initial}}=0.001$	$P_{\text{condition 2 (final-initial) - condition 1 (final-initial)}}=0.265$

As a complement to Table 5.2, Figure 5.3 shows that although the final criteria set may overlap with the initial criteria set, a significant portion of the attributes (63.6% in condition 1, 62.1% in condition 2) in the final criteria set were discovered from the online reviews. Also, a substantial number of attributes (43.3% in condition 1, 42.9% in condition 2) in the initial criteria

[12] The average absolute deviation is the average of the absolute values of the difference between the subject's rating and the rating in the "norm" on all the attributes in the subject's final criteria set.

set were not included in the final criteria set. These findings highlight the importance of online product reviews in shaping people's criteria for evaluating a product.

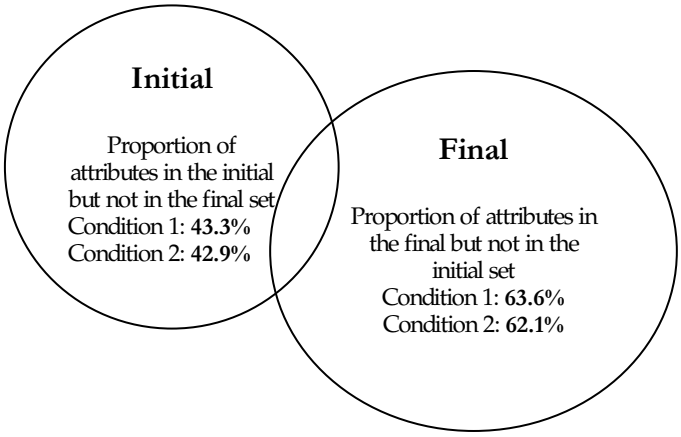


Figure 5.3: A schematic representation of criteria refinement

5.3 Information Selectivity Model

The objective of the information selectivity model is to understand what factors drive people's information selectivity as they browse a review web site. The model focuses on a specific type of information selectivity: a decision as to whether to read the full text of a review after the individual noticed the cues for the review.

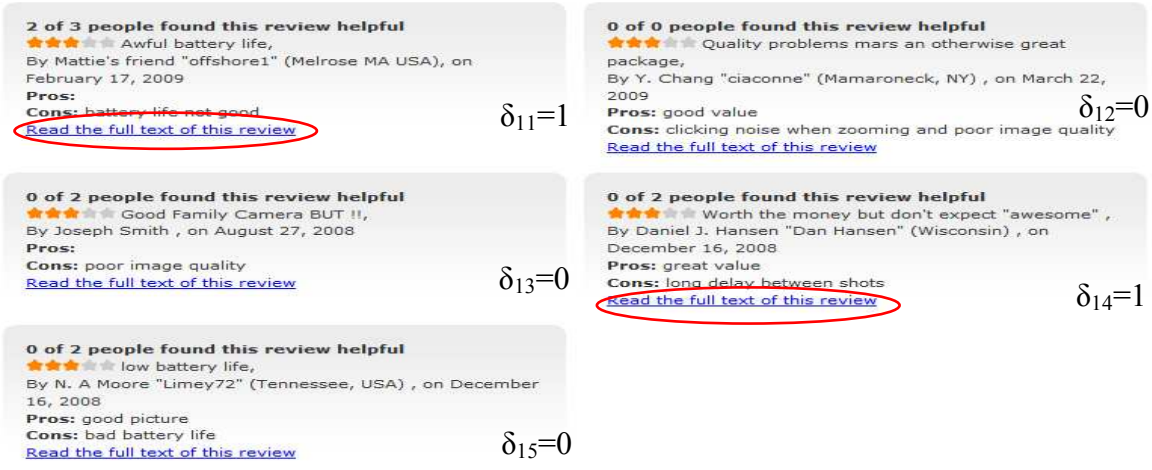


Figure 5.4: An illustration of information selectivity

For example, suppose an individual opens a web page that has five reviews represented by a set of proximal cues (see Figure 5.4). This person will make five "read or not read the full text" decisions on this page: one for each review based on the review's proximal cues.

The information selectivity can be formulated as a binary probit model. I assume that people make the "read or not read the full text" decision based on a utility:

$$y^*_{ij} = \alpha_i + x_j \beta + z_{ij} \theta + \varepsilon_{ij} \quad \text{(Equation 5.1)}$$

Where y^*_{ij} is the utility for subject i to read the full text of the jth review he has noticed ($i=1,\ldots, N$, $j=1,\ldots J_i$, and J_i is the number of reviews noticed by subject i). α_i is an individual-specific parameter that captures the propensity to read the review full text due to unobserved individual characteristics, The vector x_j is a $1\times p$ vector of review-specific covariates that drive exploratory search, β is a $p\times 1$ vector of parameters that characterize the individual's exploratory search, The vector z_{ij} is a $1\times q$ vector of review-specific and individual-specific covariates that drive goal-directed search, θ is a $q\times 1$ vector of parameters that characterize the individual's goal-directed search, and ε_{ij} is a normally distributed error term.

In the experiment, we observed only whether a subject reads the full text, not the subject's utilities. Thus, I assume that a positive utility is associated with the decision to read the full text and a negative utility is associated with the decision not to read the full text. If we code these events as $\delta_{ij}=1$ if subject i decides to read the jth review he has noticed and $\delta_{ij}=0$ if subject i decides not to read the jth review that he has noticed, then we observe δ_{ij} such that

$\delta_{ij}=1$ if $y^*_{ij}\geq 0$, and $\delta_{ij}=0$ if $y^*_{ij}<0$

As an example to illustrate the model, Figure 5.4 shows that the first subject noticed 5 reviews and he chose to read the first and the fourth reviews. Therefore we code $\delta_{11}=1$, $\delta_{12}=0$, $\delta_{13}=0$, $\delta_{14}=1$, and $\delta_{15}=0$ for this subject.

The covariates of the information selectivity model are exhibited in Table 5.3. The covariates capture different factors that drive exploratory search and goal-directed search.

Table 5.3: Information selectivity model covariates and operationalizations

Covariate	Operationalization	What to test
Star ratings (*star1, star2, star4, star5*)	4 dummy variables that indicate star rating (star 3 represents the base case)	Exploratory search, a mechanism of information selectivity, is driven by cues for validity such as star rating, helpful vote, and review age
Helpful vote (*helpful*)	If helpful vote is presented as "N out of M people found this review helpful", *helpful*=N+N/M	
Review age (*age*)	Days elapsed since the review was posted	
Review summary non-specificity (*sumns*)	A dummy variable that indicates whether a review summary provides specific information about the product.	Exploratory search, a mechanism of information selectivity, is driven by curiosity about a review
Information scent based on initial criteria set (*infoscent1*)	Number of attributes in the overlap between review cues and the initial criteria set	Goal-directed search, a mechanism of information selectivity, is driven by information scent
Information scent based on dynamically updated criteria (*infoscent2*)	Number of attributes in the overlap between review cues and the dynamically updated criteria set	

Cues for validity. Star ratings, helpful vote, and review age are proximal cues used by people to judge the validity of a review. Four dummy variables were created to indicate the star rating of a review. The 3-star review rating was chosen as the baseline. Helpful vote is often presented in the form of "N out M people found this review helpful." People may judge the helpfulness of a review based on the number "N" or the ratio "N/M." For example, "100 out of 100" is considered more helpful than "10 out of 10" although the ratio is the same. "100 out of 100" is considered more helpful than "100 out of 101" although the same number people rate the review helpful. Therefore it is important to consider both "N" and "N/M" when constructing the helpfulness measure. In this model, helpfulness was calculated as "N+N/M" so that "N" and the

ratio "N/M" are equally weighted. Review age was measured by days elapsed since the review was posted.

Curiosity. As a measure of curiosity, I created a dummy variable to indicate whether a review summary is specific about certain aspects of a product. For example, the review summary "long lag time between shots" is very specific about the lag time issue. The summary non-specificity dummy is 0 for this review. In contrast, the review summary "buyers beware!" is not specific about what problem the product has. The summary non-specificity dummy is 1 for this review.

Information scent. As a measure for information scent, I count the number of attributes in the overlap between the review cues and the subject's evaluation criteria set. For example, suppose a subject uses two criteria for evaluating a digital camera: image quality and battery life. The review represented by the cue "bulky camera, grainy picture!" has an information scent value of 1 to this individual since the review cue "grainy picture" matches the evaluation criterion of "image quality." Note that information scent has a dynamic property: when an individual changes his or her criteria set, the information scent of a review may change. To capture this dynamic property, I calculated two types of information scent. The first information scent measure was constructed solely based on subjects' initial criteria set. As such, the information scent of a review remained constant during the experimental task. The second information scent measure was constructed based on the dynamically updated criteria set. To calculate this measure, I started from an empty criteria set. Anytime when a subject mentioned that an attribute is important to his or her decision, this attribute was added to his or her criteria set, and the information scent of all the reviews was updated accordingly. At the point in time an individual was making a "read or not read the full text" decision, the most recent information scent value for the review was used to predict that decision.

5.3.1 Capturing information selectivity over time and the effect of review presentation

The factors that influence information selectivity may show temporal effects in that their importance may vary as subjects read more reviews and gain more information. In addition, we hypothesized that the structure of the review web site in how the reviews are presented (traditional versus attribute overview) will also influence information selectivity. The purpose of the model that follows is to explore these two issues.

Substituting the covariates discussed in the previous section in Equation 5.1, we get the following model:

$$y^*_{ij} = \alpha_i + \beta_1 star1_j + \beta_2 star2_j + \beta_3 star4_j + \beta_4 star5_j + \beta_5 helpful_j$$
$$+ \beta_6 age_j + \beta_7 sumns_j + \theta_1 infoscent1_{ij} + \theta_2 infoscent1_{ij} + \varepsilon_{ij} \quad \text{(Equation 5.2)}$$

$\delta_{ij}=1$ if subject i decides to read the full text of the jth review he has noticed and $\delta_{ij}=0$ if subject i decides not to read the jth review that he has noticed, then we observe δ_{ij} such that

$\delta_{ij}=1$ if $y^*_{ij}\geq 0$, and $\delta_{ij}=0$ if $y^*_{ij}<0$

To capture the temporal effects of information selectivity, a continuous variable was created to indicate the number of review pages visited before the current "read or not read the full text" decision. To examine whether review presentation (traditional versus attribute overview) affects information selectivity, a dummy variable was created to indicate the two review website conditions. The dummy variable is one if the subject was assigned to the attribute overview condition, otherwise it is zero. The temporal effect of information selectivity and the review presentation effect can be modeled as follows:

$$\alpha_i = \alpha_0 + \alpha_1 \text{ page} + \alpha_2 \text{ condition} + \zeta_i^0$$

$$\beta_{ik} = \beta_{0k} + \beta_{1k} \text{ page} + \beta_{2k} \text{ condition} + \zeta_{ik}^1 \ (k=1,\ldots,7)$$

$$\theta_{is} = \theta_{0s} + \theta_{1s} \text{ page} + \theta_{2s} \text{ condition} + \zeta_{is}^2 \ (s=1, 2) \quad \text{(Equation 5.3)}$$

In equation 5.3, the coefficients $\alpha_1, \beta_{1k}, \theta_{1s}$ capture the temporal effect of information selectivity, the coefficients $\alpha_2, \beta_{2k}, \theta_{2s}$ capture the effects of review presentation on information selectivity, the parameters ζ_i^0, ζ_i^1, ζ_i^2 capture the unobserved individual heterogeneity that affects information selectivity. Substituting Equation 5.3 in Equation 5.2, we get the following model:

$$
\begin{aligned}
y^*_{ij} = {} & \alpha_0+\alpha_1\,\text{page}+\alpha_2\,\text{condition}+(\beta_{01}+\beta_{11}\,\text{page}+\beta_{21}\,\text{condition})\,star1_j \\
& +(\beta_{02}+\beta_{12}\,\text{page}+\beta_{22}\,\text{condition})\,star2_j+(\beta_{03}+\beta_{13}\,\text{page}+\beta_{23}\,\text{condition})\,star4_j \\
& +(\beta_{04}+\beta_{14}\,\text{page}+\beta_{24}\,\text{condition})\,star5_j+(\beta_{05}+\beta_{15}\,\text{page}+\beta_{25}\,\text{condition})\,helpful_j \\
& +(\beta_{06}+\beta_{16}\,\text{page}+\beta_{26}\,\text{condition})\,age_j+(\beta_{07}+\beta_{17}\,\text{page}+\beta_{27}\,\text{condition})\,sumns_j \\
& +(\theta_{01}+\theta_{11}\,\text{page}+\theta_{21}\,\text{condition})\,infoscent1_{ij} \\
& +(\theta_{02}+\theta_{12}\,\text{page}+\theta_{22}\,\text{condition})\,infoscent2_{ij} \\
& +\zeta_i^0+\zeta_{i1}^1\,star1_j+\zeta_{i2}^1\,star2_j+\zeta_{i3}^1\,star4_j \\
& +\zeta_{i4}^1\,star5_j+\zeta_{i5}^1\,helpful_j+\zeta_{i6}^1\,age_j+\zeta_{i7}^1\,sumns_j \\
& +\zeta_{i1}^2\,infoscent1_{ij}+\zeta_{i2}^2\,infoscent2_{ij}+\varepsilon_{ij} \qquad \text{(Equation 5.4)}
\end{aligned}
$$

5.3.2 Benchmark models

I estimate and contrast the proposed model (Equation 5.4) with five alternative models. The purpose of this model comparison is to (1) show whether different model specifications can generate consistent results, and (2) find a parsimonious model that has the best predictive power. These alternative models are specified by alternatively restricting the evolving coefficients across review pages (temporal effect of information selectivity), review presentation effects (conditions), or individual heterogeneity. The model specifications are summarized in Table 5.4.

Table 5.4: Summary of model specifications for information selectivity

Model	Temporal Effect of Information Selectivity	Review Presentation Effect	Unobserved Individual Heterogeneity
Proposed Model (Equation 5.4)	**All the coefficients evolve over time (captured by the number of pages**	**All the coefficients vary across the two conditions (traditional versus attribute overview)**	**All the coefficients vary across subjects**

	visited)		
Alternative Model 1 (Equation 5.5)	Coefficients do *not* evolve over time	Coefficients do *not* vary across the two conditions	Coefficients do *not* vary across subjects
Alternative Model 2 (Equation 5.6)	**Only intercept evolves over time**	**Only intercept varies across two conditions**	**Only intercept varies across subjects**
Alternative Model 3 (Equation 5.7)	**All the coefficients evolve over time**	Coefficients do *not* vary across the two conditions	Only intercept vary across subjects
Alternative Model 4 (Equation 5.8)	**All the coefficients evolve over time**	Coefficients do *not* vary across the two conditions	**All the coefficients vary across subjects**
Alternative Model 5 (Equation 5.9)	Coefficients do *not* evolve over time	**All the coefficients vary across the two conditions**	**All the coefficients vary across subjects**

Alternative Model 1 (no temporal effect, no review presentation effect, no individual heterogeneity)

This model does not allow coefficients to evolve across review pages. Also the review presentation effects and individual heterogeneity are not considered in this model.

$$y^*_{ij} = \alpha_0 + \beta_1 star1_j + \beta_2 star2_j + \beta_3 star4_j + \beta_4 star5_j + \beta_5 helpful_j + \beta_6 age_j + \beta_7 sumns_j + \theta_1 infoscent1_{ij} + \theta_2 infoscent2_{ij} + \varepsilon_{ij} \quad \text{(Equation 5.5)}$$

Alternative Model 2 (temporal effect, review presentation effect, and individual heterogeneity only in intercept)

This model allows the intercept to vary across pages. The intercept also includes the review presentation effect, and unobserved individual heterogeneity. The other coefficients do not evolve across pages, and do not include review presentation effect or individual heterogeneity.

$$y^*_{ij} = \alpha_0 + \alpha_1 \text{page} + \alpha_2 \text{condition} + \beta_1 star1_j + \beta_2 star2_j + \beta_3 star4_j + \beta_4 star5_j + \beta_5 helpful_j + \beta_6 age_j + \beta_7 sumns_j + \theta_1 infoscent1_{ij} + \theta_2 infoscent2_{ij} + \zeta i^0 + \varepsilon_{ij} \quad \text{(Equation 5.6)}$$

Alternative Model 3 (temporal effect but no review presentation effect, individual heterogeneity only in intercept)

This model allows all the coefficients to vary across pages, but does not include review presentation effects. Individual heterogeneity is only included in the intercept.

$$y^*_{ij} = \alpha_0+\alpha_1 \text{ page}+(\beta_{01}+\beta_{11} \text{ page}) \textit{ star1}_j+(\beta_{02}+\beta_{12} \text{ page}) \textit{ star2}_j+(\beta_{03}+\beta_{13} \text{ page}) \textit{ star4}_j$$
$$+(\beta_{04}+\beta_{14} \text{ page}) \textit{ star5}_j+(\beta_{05}+\beta_{15} \text{ page}) \textit{ helpful}_j+(\beta_{06}+\beta_{16} \text{ page}) \textit{ age}_j$$
$$+(\beta_{07}+\beta_{17} \text{ page}) \textit{ sumns}_j+(\theta_{01}+\theta_{11} \text{ page}) \textit{ infoscent1}_{ij}+(\theta_{02}+\theta_{12} \text{ page}) \textit{ infoscent2}_{ij}$$
$$+\zeta_i^0+\varepsilon_{ij} \qquad \text{(Equation 5.7)}$$

Alternative Model 4 (temporal effect and individual heterogeneity, but no review presentation effect)

This model allows all the coefficients to vary across pages and includes individual heterogeneity in all the coefficients, but review presentation effects are not considered.

$$y^*_{ij} = \alpha_0+\alpha_1 \text{ page}+(\beta_{01}+\beta_{11} \text{ page}) \textit{ star1}_j+(\beta_{02}+\beta_{12} \text{ page}) \textit{ star2}_j+(\beta_{03}+\beta_{13} \text{ page}) \textit{ star4}_j$$
$$+(\beta_{04}+\beta_{14} \text{ page}) \textit{ star5}_j+(\beta_{05}+\beta_{15} \text{ page}) \textit{ helpful}_j+(\beta_{06}+\beta_{16} \text{ page}) \textit{ age}_j$$
$$+(\beta_{07}+\beta_{17} \text{ page}) \textit{ sumns}_j+(\theta_{01}+\theta_{11}\text{page}) \textit{ infoscent1}_{ij}+(\theta_{02}+\theta_{12} \text{ page}) \textit{ infoscent2}_{ij}$$
$$+\zeta_i^0+\zeta_{i1}^1 \textit{star1}_j+\zeta_{i2}^1 \textit{star2}_j+\zeta_{i3}^1 \textit{star4}_j+\zeta_{i4}^1 \textit{star5}_j+\zeta_{i5}^1 \textit{helpful}_j+\zeta_{i6}^1 \textit{age}_j+\zeta_{i7}^1 \textit{sumns}_j$$
$$+\zeta_{i1}^2 \textit{infoscent1}_{ij}+\zeta_{i2}^2 \textit{infoscent1}_{ij}+\varepsilon_{ij} \qquad \text{(Equation 5.8)}$$

Alternative Model 5 (review presentation effect and individual heterogeneity, but no temporal effect)

This model includes review presentation effects and individual heterogeneity in all the coefficients, but evolution across pages is not considered.

$$y^*_{ij} = \alpha_0+\alpha_2\text{condition}+(\beta_{01}+\beta_{21}\text{condition}) \textit{ star1}_j+(\beta_{02}+\beta_{22}\text{condition}) \textit{ star2}_j$$
$$+(\beta_{03}+\beta_{23}\text{condition})\textit{star4}_j+(\beta_{04}+\beta_{24}\text{condition})\textit{star5}_j$$
$$+(\beta_{05}+\beta_{25}\text{condition})\textit{helpful}_j+(\beta_{06}+\beta_{26}\text{condition})\textit{age}_j$$
$$+(\beta_{07}+\beta_{27}\text{condition})\textit{sumns}_j+(\theta_{01}+\theta_{21}\text{condition})\textit{infoscent1}_{ij}$$

$$+(\theta_{02}+\theta_{22}\text{condition})infoscent2_{ij}$$

$$+\zeta_i^0+\zeta_{i1}^1 star1_j+\zeta_{i2}^1 star2_j+\zeta_{i3}^1 star4_j$$

$$+\zeta_{i4}^1 star5_j+\zeta_{i5}^1 helpful_j+\zeta_{i6}^1 age_j+\zeta_{i7}^1 sumns_j$$

$$+\zeta_{i1}^2 infoscent1_{ij}+\zeta_{i2}^2 infoscent2_{ij}+\varepsilon_{ij} \quad \text{(Equation 5.9)}$$

5.3.3 Information selectivity model estimation and comparison

The proposed model and the alternative models were estimated using a Bayesian approach implemented with Markov Chain Monte Carlo (MCMC) methods. A normal prior was assigned to the random coefficients (all the ζ's in Equation 5.4-5.9) that capture individual heterogeneity. These random coefficients are assumed to be independent of each other.

$$\zeta_i \overset{iid}{\sim} N(0,\sigma_\zeta^2)$$

A uniform prior between 0 and 100 was assigned to the variance of the random coefficients. This uniform prior represents an uninformative prior.

$$\sigma_\zeta \sim U[0,100]$$

For each model in Equation 5.4-5.9, let α, β, and θ denote three column vectors that contain the α's, β's, and θ's respectively. m is the number of fixed coefficients (i.e. the number of α's, β's, and θ's for each model in Equation 5.4-5.9).The variance of these fixed coefficients (on the diagonal of Σ) is assigned a very large value (i.e. 10000) that represents a diffuse (uninformative) prior distribution.

$$\begin{pmatrix}\alpha\\ \beta\\ \theta\end{pmatrix} \sim MVN(0,\Sigma),\ \Sigma = 10000 I_m$$

Before the estimation, all covariates except the dummy variables were centered by subtracting the mean and then divided by the standard deviation. The interaction terms were

constructed based on the standardized measures. The run length and burn-in iterations were planned after inspecting Raftery-Lewis diagnostic from a trial run. The convergence was monitored via the traceplot of parameters and convergence diagnostics (e.g. Geweke diagnostic, Heidelberger and Welch convergence diagnostic).

The Deviance Information Criterion (DIC) (Spiegelhalter et al. 2002) was used to compare the proposed model with alternative models. DIC is a hierarchical modeling generalization of the AIC (Akaike information criterion) and BIC (Bayesian information criterion, also known as the Schwarz criterion). It is particularly useful in Bayesian model selection problems where the posterior distributions of the models have been obtained by Markov chain Monte Carlo (MCMC) simulation. The model with the smallest DIC is estimated to be the model that has the best predictive power. DIC takes into account both the fit and parsimony of a model. The posterior means, 95% coverage interval, and DICs are shown in Table 5.5

Table 5.5: Information selectivity model estimates

Covariate	Alternative Model 1 Posterior Mean [95% Coverage Interval]	Alternative Model 2 Posterior Mean [95% Coverage Interval]	Alternative Model 3 Posterior Mean [95% Coverage Interval]	Alternative Model 4 Posterior Mean [95% Coverage Interval]	Alternative Model 5 Posterior Mean [95% Coverage Interval]	Proposed Model Posterior Mean [95% Coverage Interval]
star1	**0.661 [0.412, 0.911]**	**0.720 [0.426, 0.983]**	**0.621 [0.341, 0.892]**	**0.608 [0.302, 0.900]**	**0.845 [0.429, 1.262]**	**0.641 [0.279, 1.029]**
star2	0.208 [-0.071, 0.494]	0.260 [-0.046, 0.581]	0.217 [-0.051, 0.529]	0.171 [-0.061, 0.470]	0.191 [-0.131, 0.631]	0.135 [-0.110, 0.508]
star4	-0.165 [-0.407, 0.074]	-0.128 [-0.402, 0.142]	-0.124 [-0.382, 0.060]	-0.126 [-0.385, 0.050]	-0.127 [-0.540, 0.102]	-0.098 [-0.418, 0.098]
star5	-0.001 [-0.243, 0.234]	0.026 [-0.403, 0.142]	0.048 [-0.205, 0.274]	0.033 [-0.219, 0.268]	-0.216 [-0.701, 0.120]	-0.129 [-0.504, 0.176]
helpful	**0.298 [0.234,**	**0.317 [0.247,**	**0.273 [0.196,**	**0.283 [0.190,**	**0.405 [0.278,**	**0.304 [0.174,**

	0.364]	**0.379]**	**0.348]**	**0.381]**	**0.545]**	**0.441]**
age	-0.010 [-0.086, 0.066]	-0.022 [-0.104, 0.056]	0.000 [-0.067, 0.076]	-0.012 [-0.110, 0.075]	-0.166 [-0.327, -0.007]	-0.099 [-0.269, 0.028]
sumns	**0.299 [0.140, 0.454]**	**0.317 [0.168, 0.481]**	**0.306 [0.127, 0.485]**	**0.282 [0.089, 0.463]**	**0.220 [0.013, 0.451]**	**0.218 [0.018, 0.456]**
infoscent1	-0.007 [-0.071, 0.055]	-0.032 [-0.106, 0.037]	-0.014 [-0.090, 0.039]	-0.014 [-0.086, 0.043]	-0.034 [-0.166, 0.050]	-0.020 [-0.123, 0.040]
infoscent2	**0.092 [0.024, 0.156]**	**0.147 [0.070, 0.236]**	**0.141 [0.061, 0.222]**	**0.132 [0.040, 0.229]**	0.127 [-0.003, 0.271]	**0.127 [0.000, 0.263]**
page		**-0.156 [-0.265, -0.054]**	-0.238 [-0.548, 0.026]	-0.243 [-0.518, 0.029]		-0.206 [-0.456, 0.021]
condition		-0.025 [-0.294, 0.212]			-0.229 [-0.681, 0.212]	-0.177 [-0.581, 0.224]
*star1*page*			-0.201 [-0.508, 0.113]	-0.220 [-0.529, 0.105]		-0.215 [-0.518, 0.091]
*star2*page*			0.133 [-0.155, 0.495]	0.099 [-0.172, 0.427]		0.079 [-0.165, 0.377]
*star4*page*			0.017 [-0.220, 0.282]	0.018 [-0.212, 0.268]		0.007 [-0.199, 0.241]
*star5*page*			0.170 [-0.031, 0.469]	0.219 [-0.030, 0.525]		0.188 [-0.053, 0.460]
*helpful*page*			**-0.148 [-0.241, -0.055]**	**-0.161 [-0.268, -0.057]**		**-0.152 [-0.255, -0.059]**
*age*page*			0.066 [-0.020, 0.182]	0.079 [-0.020, 0.201]		0.072 [-0.039, 0.183]
*sumns*page*			0.074 [-0.130, 0.298]	0.061 [-0.124, 0.280]		0.041 [-0.133, 0.235]
*infoscent1*page*			0.001 [-0.073, 0.068]	-0.001 [-0.077, 0.070]		-0.004 [-0.077, 0.058]
*infoscent2*page*			**-0.084 [-0.165, -0.004]**	**-0.093 [-0.187, -0.006]**		**-0.090 [-0.182, -0.005]**
*star1*condition*					-0.174 [-0.708, 0.337]	-0.068 [-0.549, 0.376]
*star2*condition*					0.007	0.036

					[-0.465, 0.403]	[-0.350, 0.385]
*star4*condition*					-0.007 [-0.325, 0.393]	-0.025 [-0.289, 0.248]
*star5*condition*					0.378 [-0.031, 0.904]	0.286 [-0.077, 0.729]
*helpful*condition*					-0.112 [-0.283, 0.048]	-0.037 [-0.203, 0.116]
*age*condition*					**0.225 [0.021, 0.438]**	0.164 [-0.002, 0.364]
*sumns*condition*					0.068 [-0.204, 0.326]	0.067 [-0.198, 0.306]
*infoscent1*condition*					0.039 [-0.067, 0.208]	0.015 [-0.054, 0.120]
*infoscent2*condition*					-0.043 [-0.218, 0.114]	0.001 [-0.167, 0.152]
DIC	-3963.534	-3877.919	-3917.217	-4042.406	-4036.713	-4050.713

Note: the posterior mean is boldfaced if the 95% coverage interval covers the same sign as the posterior mean

It can be seen from Table 5.5 that these models provide consistent results. One-star rating (*star1*), helpful vote (*helpful*), non-specific review summary (*sumns*), and information scent based on dynamically updated criteria (*infosent2*) have significant impact on the decision to read a review's full text. The proposed model, favored by DIC also shows that the effects of helpful vote (*helpful*) and information scent (*infoscent2*) decrease as subjects browse more pages. A detailed discussion on the results will be presented in the next chapter.

5.4 Preference Construction Model

The objective of the preference construction model is to predict (1) what attributes people include in their final criteria set and (2) the importance of the criteria in the final criteria set. To predict the presence of an attribute in the final criteria set, suppose y_{ij} is a dummy variable that

indicates whether attribute j is in subject i's final criteria set (i=1,…, N, j=1,…J, and J is the number of attributes that might be considered). A model can be formulated as follows:

$$y_{ij}= \alpha_i+x_{ij}\ \beta+\varepsilon_{ij} \qquad \text{(Equation 5.10)}$$

The vector β is a $p\times1$ vector of parameters, x_{ij} is a $1\times p$ vector of attribute-specific and individual specific covariates, α_i is an individual specific parameter that captures individual heterogeneity, and ε_{ij} is a normally distributed error term. When predicting the presence of an attribute in the final criteria set, we can use a binary probit or logit to estimate the parameters because of the binary nature of the dependent variable y_{ij}. The covariates of the preference construction model are exhibited in Table 5.6. The covariates represent different factors that drive subjects' criteria refinement.

Initial criteria. A dummy variable was created to indicate whether an attribute is present in the subject initial criteria set. The variable is 1 if the attribute is in the initial criteria, otherwise it is zero.

Frequency of attribute processing. I used the number of times a subject processed information about an attribute to measure frequency of attribute processing. The more frequent an attribute was processed by the subject, the more likelihood the attribute was included in the final criteria set.

Recency of attribute processing. As a measure of the recency of attribute processing, I created a dummy variable that indicates whether the attribute is one of the seven most recent attributes processed by a subject. The number seven was used because it is supposedly the number of objects an average human can hold in working memory (Miller, 1956).[13] The variable is one if

[13] In Miller's original paper, the number is seven plus or minus two.

the attribute is one of the seven most recent attributes processed by the subject, otherwise it is zero.

Relevance of an attribute to the context. A dummy variable was created to indicate whether a subject believed the attribute was relevant in this context. The variable is 1 if the subject believed the attribute was relevant. The variable is -1 if the subject believed the attribute was irrelevant. The variable is zero if the subject did not make any comment about the relevance of the attribute. Note that a subject might comment on attribute relevance multiple times. The variable was coded based on the most recent comment on the relevance of the attribute.

Consistency of information. A dummy variable was created to indicate whether a subject believed the information in the reviews was consistent about an attribute. The variable is 1 if the subject believed the information was consistent. It is -1 if the subject believed the information was inconsistent. The variable is zero if the subject did not make any comment about information consistency. Note that a subject might comment on information consistency multiple times. The variable was coded based on the most recent comment on information consistency.

Post-hoc justifiability. Post-hoc justifiability refers to the extent to which a decision can be justified post-hoc by including/excluding attributes or adjusting the importance of an attribute in the criteria set. To reduce cognitive dissonance, people tend to drop attributes that disfavor the emerging choice (or actual choice) from the criteria set or deemphasize these attributes. Based on this idea, a composite index was constructed to measure post-hoc justifiability.

First, a dummy variable was created to indicate the subject's decision. The variable is 1 if the subject's self-reported likelihood to buy the digital camera is greater than 5. The variable is -1 if the subject's self reported likelihood to buy the digital camera is less than 3. The variable is zero otherwise. Second, another dummy variable was created to indicate the subject's assessment

of product performance on an attribute while performing the experimental task. The variable is 1 if the subject's assessment is positive; it is -1 if the subject's assessment is negative. The variable is zero otherwise. A subject might make assessment of an attribute multiple times. This dummy variable was coded based on the most recent assessment before the decision. The composite index was calculated as the product of these two dummy variables.

The composite measure reflects whether the assessment on an attribute made by a subject favors the subject's decision. When the composite measure is -1, the subject either decided to accept the digital camera and made a negative assessment on an attribute or decided to reject the digital camera and made a positive assessment an attribute. In either case, the assessment on the attribute "disfavors" the subject's decision. Therefore, the subject may drop this attribute from his or her criteria set or deemphasize the attribute to reduce cognitive dissonance. Similarly, when the composite measure is 1, the assessment of the attribute favors the subject's decision (it is either a positive assessment on an attribute that favors accepting the digital camera or a negative assessment that favors rejecting the digital camera). Therefore the subject may include the attribute in the criteria set or assign greater importance to this attribute so that the decision can be better justified.

Table 5.6: Preference construction model covariates and operationalizations

Covariate	Operationalization	What to test
Initial criteria (*initial*)	A dummy variable that indicates whether an attribute is in the subject's initial criteria set	The impact of initial criteria
Frequency of attribute processing (*frequency*)	Number of times a subject processed information about an attribute	Learning & forgetting in criteria refinement
Recency of attribute processing (*recency*)	A dummy variable that indicates whether an attribute is one of the seven most recent attributes processed by a subject	
Relevance of an attribute to the	A dummy variable that	Biased information processing to

context (*relevance*)	indicates whether a subject believed an attribute was relevant in this context	reduce cognitive costs and cognitive dissonance
Consistency of information (*consistency*)	A dummy variable that indicates whether a subject believed the information was consistent about an attribute	
Post-hoc justifiability (*justifiability*)	Decision (accept=1, reject=-1)*self-reported attribute performance while performing the task	

5.4.1 Benchmark models

Substituting the covariates discussed in the previous section in Equation 5.10, we get the following model:

$$y_{ij}= \alpha_i+\beta_1 initial_{ij}+\beta_2 frequency_{ij}+\beta_3 recency_{ij}+\beta_4 relevance_{ij}$$
$$+\beta_5 consistency_{ij}+\beta_6 justifiability_{ij}+\varepsilon_{ij} \quad \text{(Equation 5.11)}$$

To examine whether review presentation affects people's criteria refinement. A dummy variable was created to indicate the two review website conditions (i.e., traditional vs. attribute overview). The dummy variable is one if the subject was assigned to the attribute overview condition, otherwise it is zero. Similar to the information selectivity model, the review presentation effects can be modeled as follows:

$$\alpha_i= \gamma_{00}+ \gamma_{10}\text{condition}+\zeta_i^0$$
$$\beta_{ik}= \gamma_{0k}+ \gamma_{1k}\text{condition}+\zeta_{ik}^1 \quad (k=1,\ldots,6) \quad \text{(Equation 5.12)}$$

Substituting Equation 5.12 in Equation 5.11, we get the following model:

$$y_{ij}= \gamma_{00}+ \gamma_{10}\text{condition}+(\gamma_{01}+ \gamma_{11}\text{condition}) initial_{ij}$$
$$+(\gamma_{02}+ \gamma_{12}\text{condition}) frequency_{ij}+(\gamma_{03}+ \gamma_{13}\text{condition}) recency_{ij}$$
$$+(\gamma_{04}+ \gamma_{14}\text{condition}) relevance_{ij}+(\gamma_{05}+ \gamma_{15}\text{condition}) consistency_{ij}$$
$$+(\gamma_{06}+ \gamma_{16}\text{condition}) justifiability_{ij}+\zeta_i^0+\zeta_{i1}^1 initial_{ij}$$

$$+\zeta_{i2}^{1}\, frequency_{ij} + \zeta_{i3}^{1}\, recency_{ij} + \zeta_{i4}^{1}\, relevance_{ij}$$

$$+\zeta_{i5}^{1}\, consistency_{ij} + \zeta_{i6}^{1}\, justifiability_{ij} + \varepsilon_{ij} \qquad \text{(Equation 5.13)}$$

Similar to the preceding section, I specified four different models (one proposed model and three alternative models) to test the preference construction question. The proposed model allows all the coefficients to vary across the two conditions (traditional versus attribute overview) and to vary across different subjects. The alternative models are specified by alternatively restricting the review presentation effect (conditions), or individual heterogeneity. The model specifications are summarized in Table 5.7.

Table 5.7: Summary of model specifications for preference construction

Model	Review Presentation Effect	Unobserved Individual Heterogeneity
Proposed Model	**All the coefficients vary across the two conditions (traditional versus attribute overview)**	**All the coefficients vary across subjects**
Alternative Model 1	Coefficients do *not* vary across the two conditions	Coefficients do *not* vary across subjects
Alternative Model 2	**Only the intercept varies across the two conditions**	**Only the intercept varies across subjects**
Alternative Model 3	Coefficients do *not* vary across the two conditions	**All the coefficients vary across subjects**

Alternative Model 1 (no review presentation effect, no individual heterogeneity)

$$y_{ij} = \gamma_{00} + \gamma_{01}\, initial_{ij} + \gamma_{02} frequency_{ij} + \gamma_{03}\, recency_{ij} + \gamma_{04} relevance_{ij}$$

$$+ \gamma_{05} consistency_{ij} + \gamma_{06} justifiability_{ij} + \varepsilon_{ij} \qquad \text{(Equation 5.14)}$$

Alternative Model 2 (review presentation effects and individual heterogeneity only in the intercept)

$$y_{ij} = \gamma_{00} + \gamma_{10}\text{condition} + \gamma_{01}\, initial_{ij} + \gamma_{02} frequency_{ij} + \gamma_{03}\, recency_{ij} + \gamma_{04} relevance_{ij}$$

$$+ \gamma_{05} consistency_{ij} + \gamma_{06} justifiability_{ij} + \zeta_{i}^{0} + \varepsilon_{ij} \qquad \text{(Equation 5.15)}$$

Alternative Model 3 (individual heterogeneity in all coefficients but not review presentation effects)

$$y_{ij} = \gamma_{00} + \gamma_{01}\, initial_{ij} + \gamma_{02} frequency_{ij} + \gamma_{03}\, recency_{ij}$$
$$+ \gamma_{04} relevance_{ij} + \gamma_{05} consistency_{ij} + \gamma_{06} justifiability_{ij}$$
$$+ \zeta_i^{0} + \zeta_{i1}^{1}\, initial_{ij} + \zeta_{i2}^{1}\, frequency_{ij} + \zeta_{i3}^{1}\, recency_{ij} + \zeta_{i4}^{1}\, relevance_{ij}$$
$$+ \zeta_{i5}^{1}\, consistency_{ij} + \zeta_{i6}^{1}\, justifiability_{ij} + \varepsilon_{ij} \qquad \text{(Equation 5.16)}$$

5.4.2 Model estimation and comparison

Before the model estimation, all covariates except the dummy variables were centered by subtracting the mean and then divided by the standard deviation. The interaction terms were constructed based on the standardized measures. For the model that predicts the presence of an attribute in the final criteria set, a binary probit model was estimated using a Bayesian approach implemented with Markov Chain Monte Carlo (MCMC) methods. The same priors used in the information selectivity model were used for the proposed and alternative models. Table 5.8 shows the results of the models that predict the presence of an attribute in the final criteria set.

Table 5.8: Models that predict the presence of an attribute in the final criteria set

Covariate	Alternative Model 1 Posterior Mean [95% Coverage Interval]	Alternative Model 2 Posterior Mean [95% Coverage Interval]	Alternative Model 3 Posterior Mean [95% Coverage Interval]	Proposed Model Posterior Mean [95% Coverage Interval]
initial	**1.011 [0.792, 1.231]**	**1.013 [0.787, 1.243]**	**1.091 [0.807, 1.377]**	**1.238 [0.863, 1.623]**
frequency	**0.491 [0.393, 0.590]**	**0.507 [0.399, 0.622]**	**0.632 [0.467, 0.824]**	**0.599 [0.371, 0.851]**
recency	**0.502 [0.299, 0.702]**	**0.485 [0.283, 0.695]**	**0.415 [0.152, 0.670]**	**0.452 [0.137, 0.793]**
relevance	**0.780 [0.576, 1.019]**	**0.799 [0.579, 1.030]**	**1.014 [0.627, 1.467]**	**0.782 [0.261, 1.410]**
consistency	-0.285 [-0.635, 0.060]	-0.281 [-0.609, 0.048]	-0.305 [-0.933, 0.140]	-0.388 [-1.311, 0.157]
justifiabililty	**0.323 [0.096, 0.546]**	**0.317 [0.102, 0.539]**	**0.355 [0.050, 0.681]**	**0.406 [0.032, 0.828]**
condition		-0.011 [-0.183, 0.186]		-0.251 [-0.498, 0.008]

*initial*condition*				-0.322 [-0.851, 0.214]
*frequency*condition*				0.088 [-0.193, 0.402]
*recency*condition*				-0.130 [-0.577, 0.247]
*relevance*condition*				0.445 [-0.284, 1.174]
*consistency*condition*				0.219 [-0.559, 1.252]
*justifiabililty*condition*				-0.114 -0.696, 0.372
DIC	-3143.181	-3156.892	-3667.236	-3657.799

Note: the posterior mean is boldfaced if the 95% coverage interval covers the same sign as the posterior mean

The proposed model and the alternative models generate consistent patterns. These models support that the presence of an attribute in the initial criteria set (*initial*), the frequency and recency of processing the attribute (*frequency* and *recency*), the relevance of the attribute to the context (*relevance*), and the post-hoc justifiability (*justifiability*) have a significant impact on the presence of that attribute in the final criteria set. The consistency of information about an attribute (*consistency*) does not have significant impact on the presence of an attribute in the final criteria set. Note that DIC favors the alternative model that includes individual heterogeneity but no review presentation effect (Alternative Model 3). This is probably because adding the review presentation effect increases model complexity (more parameters) but does not quite improve predictive power. The results will be discussed in greater detail in the next chapter.

The same specifications (Equation 5.10-5.16) can be used to predict the importance of an attribute in the final criteria set. The only difference is that the dependent variable now becomes the self-reported attribute importance. The results of the proposed model and the alternative models are shown in Table 5.9.

Table 5.9: Models that predict the importance of an attribute in the final criteria set

Covariate	Alternative Model 1 Posterior Mean [95% Coverage Interval]	Alternative Model 2 Posterior Mean [95% Coverage Interval]	Alternative Model 3 Posterior Mean [95% Coverage Interval]	Proposed Model Posterior Mean [95% Coverage Interval]
initial	**6.336 [4.974, 7.668]**	**6.329 [4.886, 7.686]**	**6.731 [4.273, 9.241]**	**7.443 [4.088, 11.058]**
frequency	**2.684 [2.165, 3.200]**	**2.736 [2.243, 3.253]**	**4.124 [3.212, 5.069]**	**3.659 [2.340, 5.046]**
recency	**3.644 [2.401, 4.837]**	**3.575 [2.388, 4.771]**	**2.189 [0.752, 3.737]**	**2.849 [0.811, 4.975]**
relevance	**5.591 [4.390, 6.825]**	**5.552 [4.391, 6.740]**	**5.313 [3.589, 7.102]**	**5.586 [2.920, 8.226]**
consistency	-1.514 [-3.398, 0.461]	-1.510 [-3.384, 3.692]	-3.409 [-7.534, 0.764]	-3.793 [-9.829, 2.093]
justifiabililty	**2.482 [1.144, 3.835]**	**2.459 [1.138, 3.782]**	**3.334 [1.340, 5.369]**	**4.366 [1.669, 7.177]**
condition		-0.648 [-1.674, 0.281]		-3.710 [-1.109, 0.905]
*initial*condition*				-1.509 [-6.496, 3.315]
*frequency*condition*				0.819 [-7.193, 8.274]
*recency*condition*				-1.338 [-4.153, 1.345]
*relevance*condition*				-0.451 [-3.870, 3.001]
*consistency*condition*				0.696 [-7.193, 8.274]
*justifiabililty*condition*				-2.137 [-6.213, 1.569]
DIC	10655.935	10655.577	10309.550	10316.290

Note: the posterior mean is boldfaced if the 95% coverage interval covers the same sign as the posterior mean

It can be seen from Table 5.9 that the presence of an attribute in the initial criteria set (*initial*), the frequency and recency of processing the attribute (*frequency* and *recency*), the relevance of the attribute to the context (*relevance*), and the post-hoc justifiability (*justifiability*) have a significant impact on the importance of that attribute in the final criteria set. The consistency of information about an attribute (*consistency*) does not have significant impact on

the importance of an attribute in the final criteria set. These different models generate consistent results, but DIC favors the alternative model that includes individual heterogeneity but no review presentation effects (Alternative Model 3). Similar to the previous models that predict the presence of an attribute in the final criteria set, adding the review presentation effects does not quite improve predictive power but increases model complexity (more parameters).

5.5 The Process Approach: a Preliminary Analysis

The previous sections take a variance approach to understanding the factors that drive people's information selectivity and preference construction. The variance models, based on statistical techniques, tell us what factors may cause which outcomes. However, it does not provide a direct account of how the underlying processes unfold over time and how they lead to the final judgment or choice. Different from the variance approach, a process approach is concerned with understanding how things evolve over time and why they evolve in this particular manner (see Van de Ven and Huber 1990). Mohr (1982) makes a clear distinction between what he calls "variance theory" and "process theory." Whereas variance theories provide explanations for phenomena in terms of relationships among dependent and independent variables (e.g., greater information scent leads to greater likelihood of reading the full text of a review), process theories provide explanations in terms of the sequence of events leading to an outcome (e.g., a subject examined one-star reviews and two-star reviews and then decided to reject the product). Process theories emphasize temporal ordering and probabilistic interaction between entities (Mohr 1982).

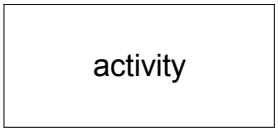
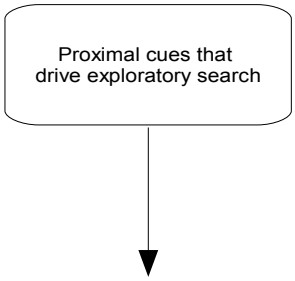
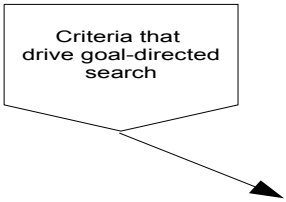
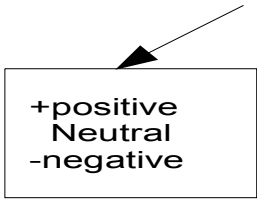
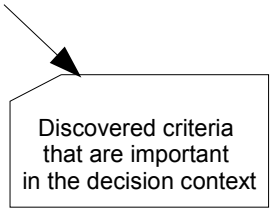
The verbal protocol data consist of rich information about events, activities, and choice ordered over time. Thus the verbal protocol data is ideal for developing a process model. However, as Langley (1999) points out, a process database poses considerable challenges. The

complexity and ambiguity of the data make it difficult to know where to start. The open-ended inductive approach typically used in process research often makes it difficult to decide what is relevant and what is not (Miles and Huberman 1994).

This section presents the results of our preliminary process analysis. The objectives of this analysis include (1) visually representing the processes underlying each individual's information acquisition and judgment or choice making, and (2) based on these visual representations of the underlying processes, discovering patterns of behavior.

The most commonly repeated observation about verbal protocol analysis is how extremely time-consuming the process is, with analysis/sequence time ratios ranging from 5: 1to 100: 1 (Fisher and Sanderson 1996). To alleviate this, researchers often sample a subset of all the subjects' protocols (Chi 1997). For this preliminary process analysis, I randomly sampled 16 protocols, 7 from the traditional condition and 9 from the attribute overview condition. Based on the coding, I made a flow chart for each protocol to represent the sequences of activities performed by the subject. The notation used in the flow charts is introduced in Table 5.10. The flow charts are shown in Figure 5.5-5.20.

Table 5.10: Notations that represent information acquisition and decision process

Notation	Explanation
	The rectangle represents an activity performed by a subject. The activities include exploratory search, goal-directed search, and final decision-making.
	The arrow represents an action taken by a subject. The actions include sub-setting reviews by star rating, sorting reviews by helpful vote or recency, clicking on a review's full text etc.
	The rectangle with rounded corners and a down arrow represents proximal cues (e.g. helpful vote, star ratings, pros and cons etc.) that drive exploratory search, that is, what (if any) proximal cues each subject is processing.
	The pentagon with an arrow represents the set of evaluation criteria that drive goal-directed search
	The rectangle with an arrow pointing into it represents a collection of attributes processed by a subject. The plus sign indicates that an attribute is mentioned positively in the proximal cues or review full text. The negative sign indicates that an attribute is mentioned negatively in the proximal cues or review full text. If an attribute does not have a sign before it, it is mentioned neutrally in the proximal cues or review full text.
	The pentagon with an arrow pointing into it represents criteria discovered in the reviews that are deemed important by the subject.

5.5.1 Traditional review web site process charts

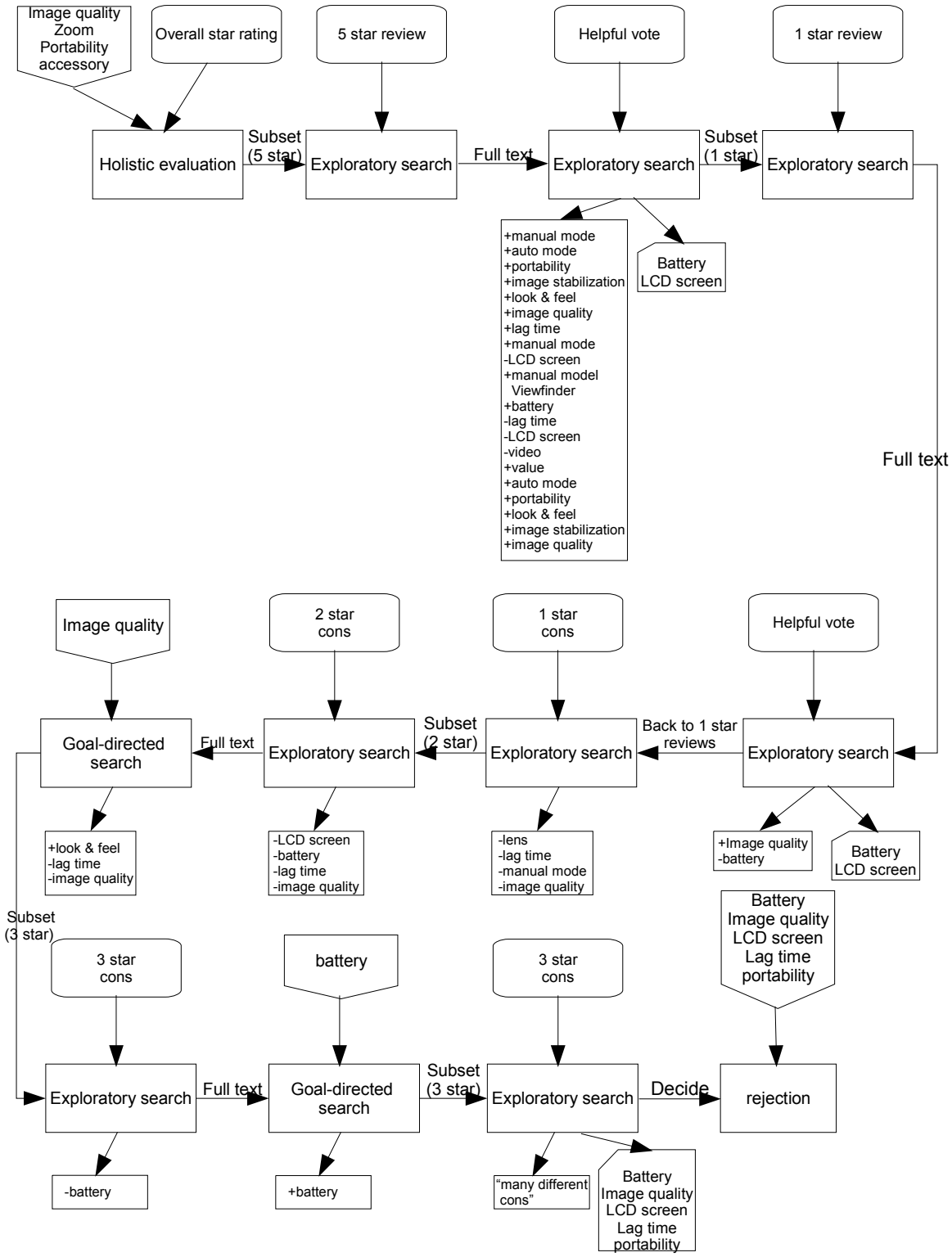


Figure 5.5: The flow chart of information acquisition (Subject 2 – Traditional)

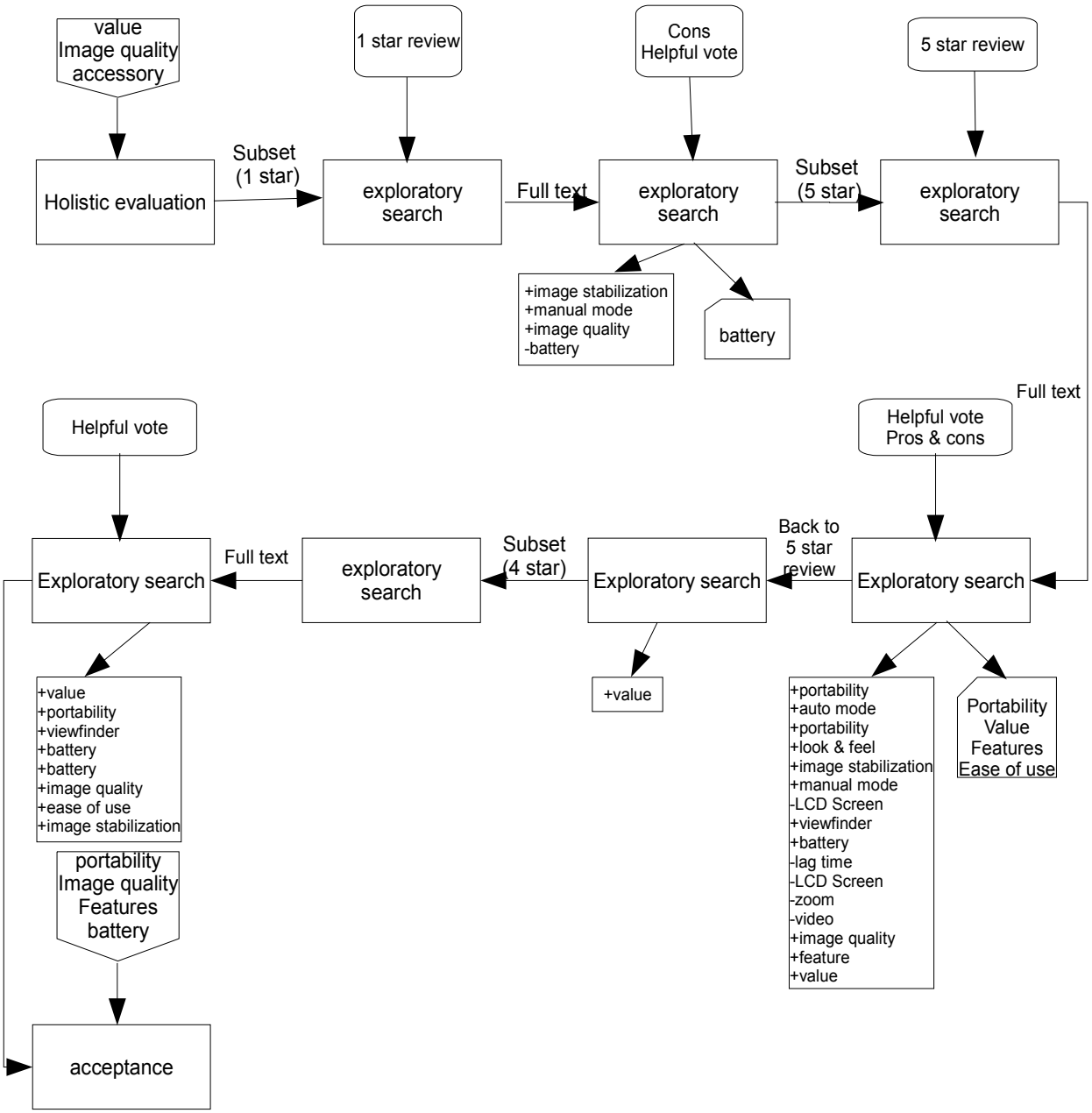


Figure 5.6: The flow chart of information acquisition (Subject 13 – Traditional)

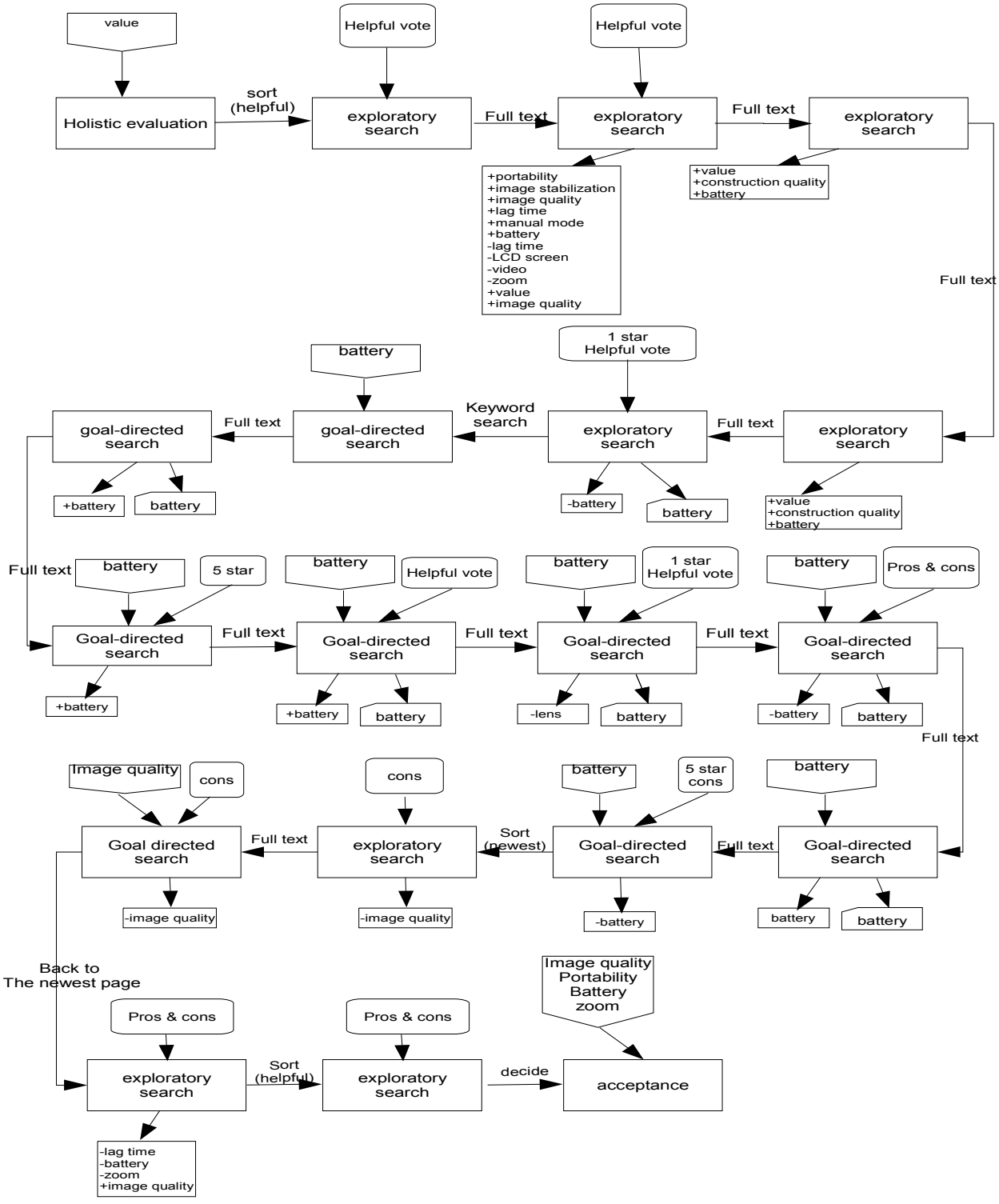


Figure 5.7: The flow chart of information acquisition (Subject 20 - Traditional)

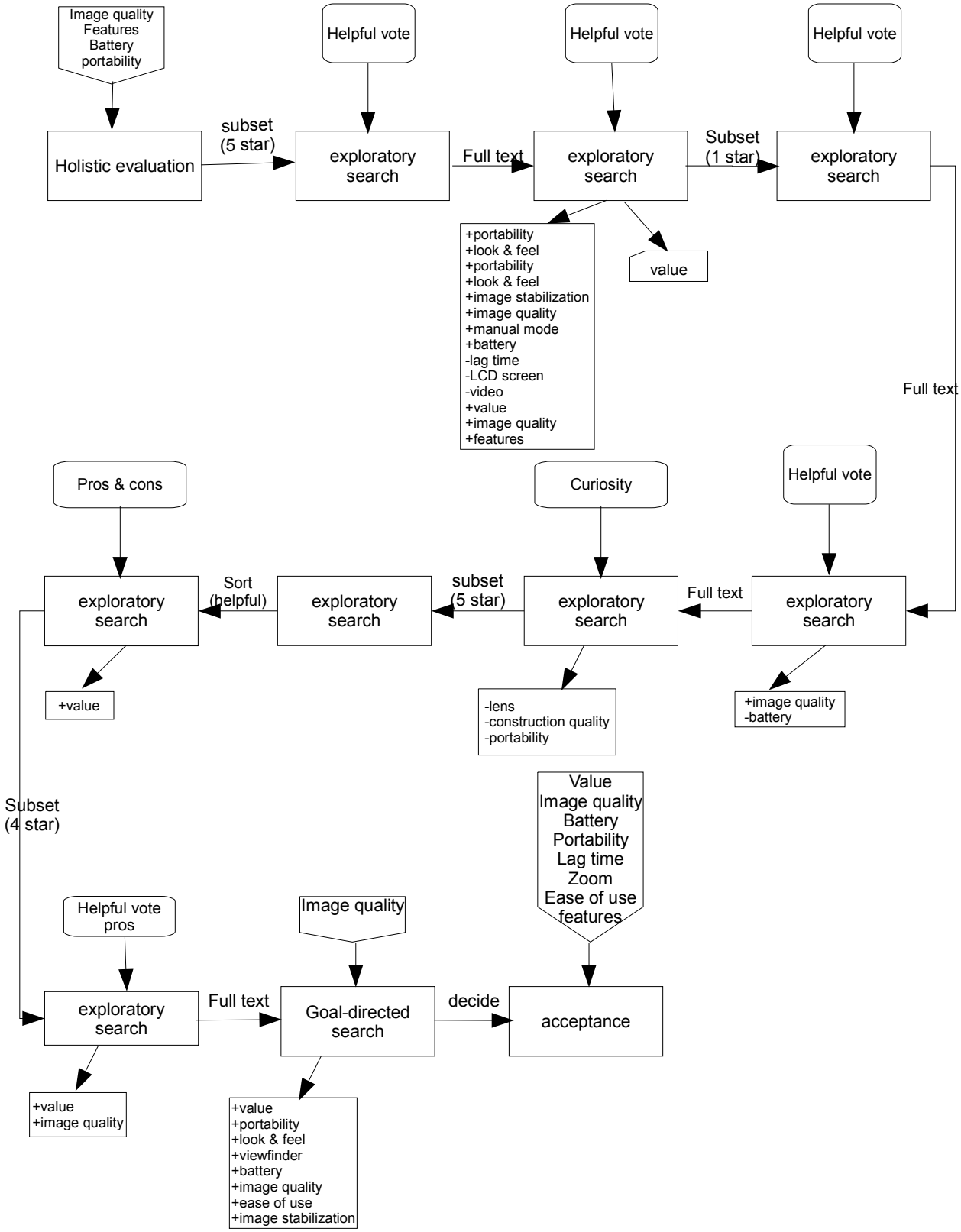


Figure 5.8: The flow chart of information acquisition (Subject 25 - Traditional)

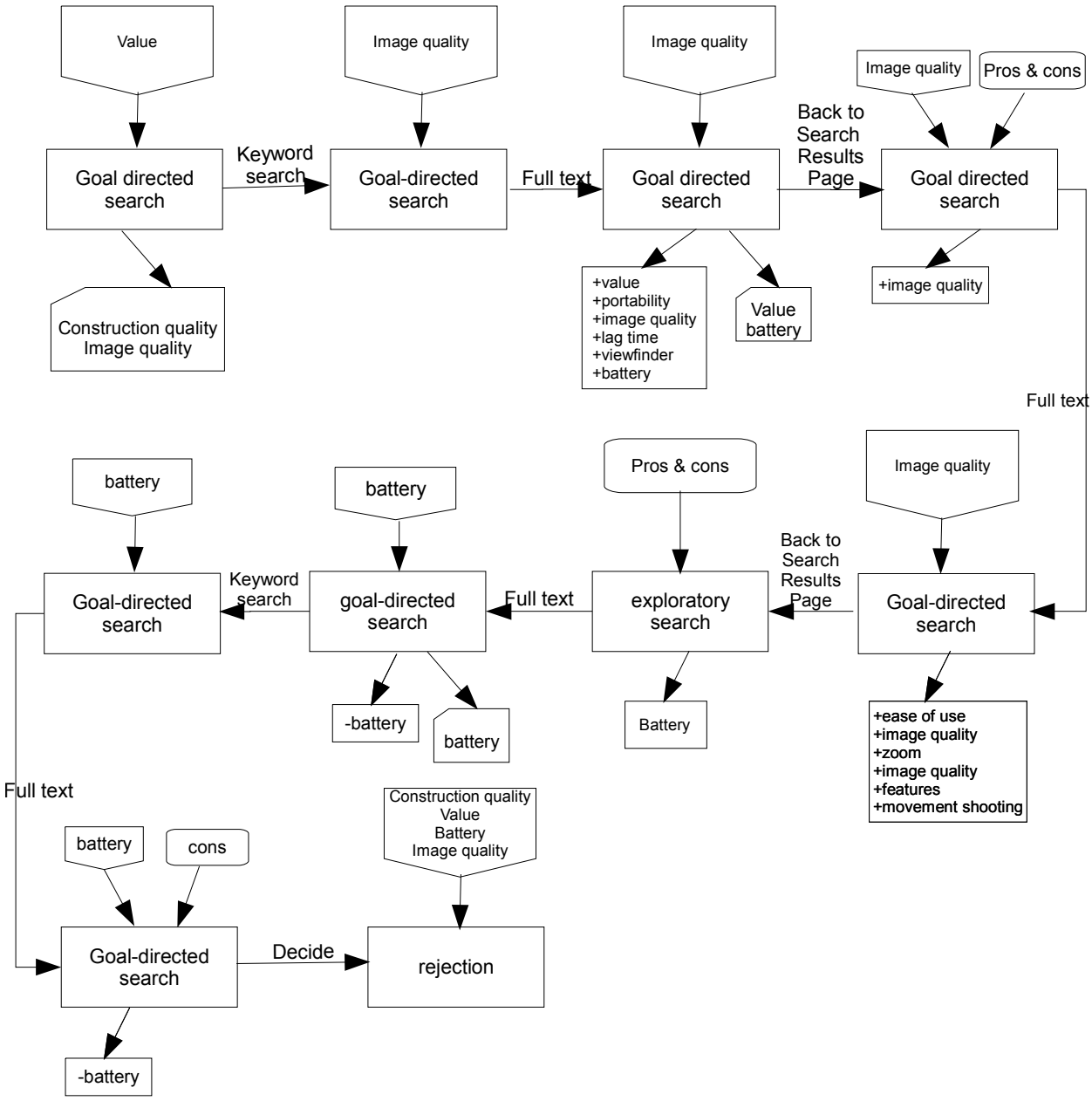


Figure 5.9: The flow chart of information acquisition (Subject 38 - Traditional)

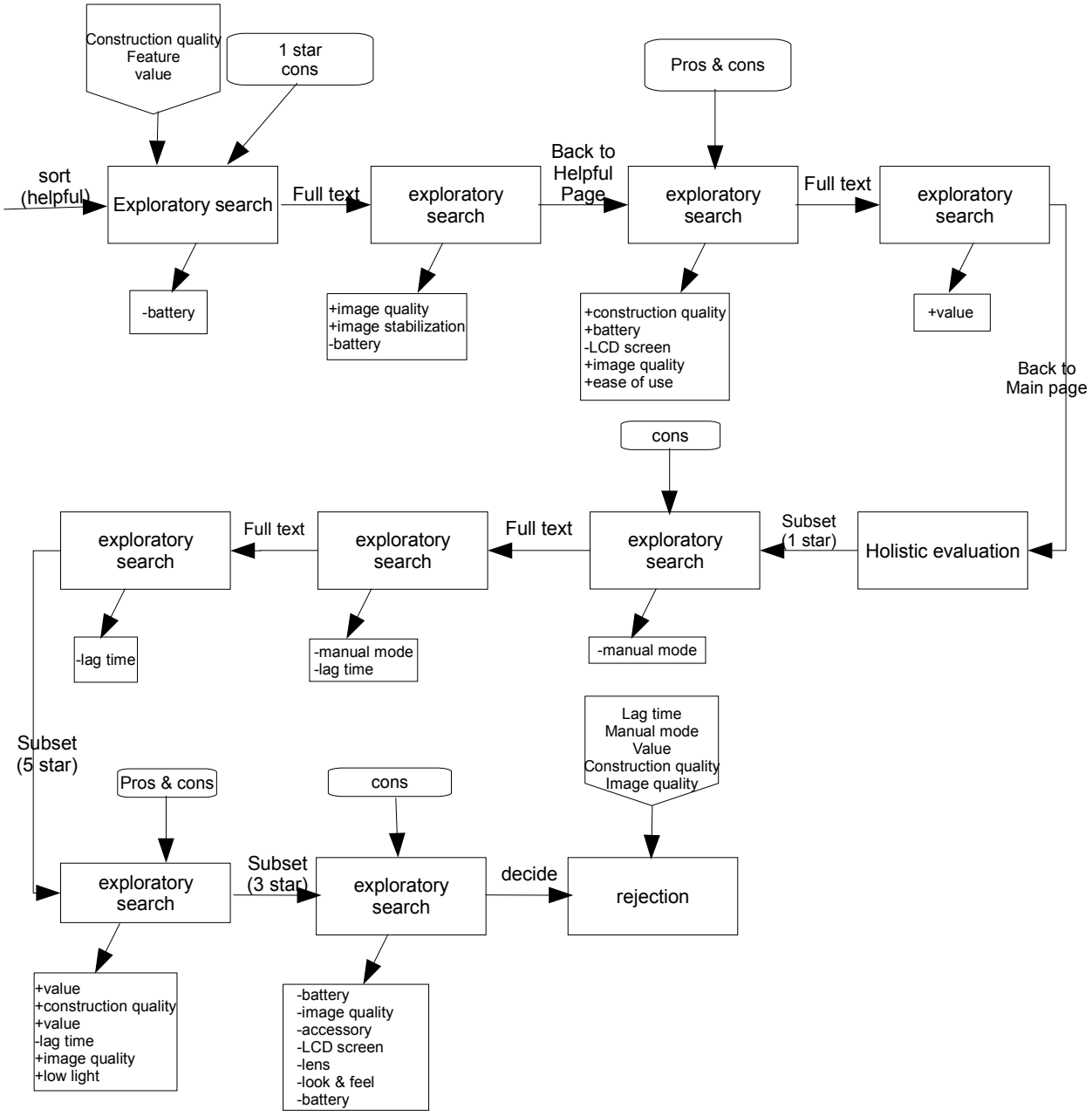


Figure 5.10: The flow chart of information acquisition (Subject 45 - Traditional)

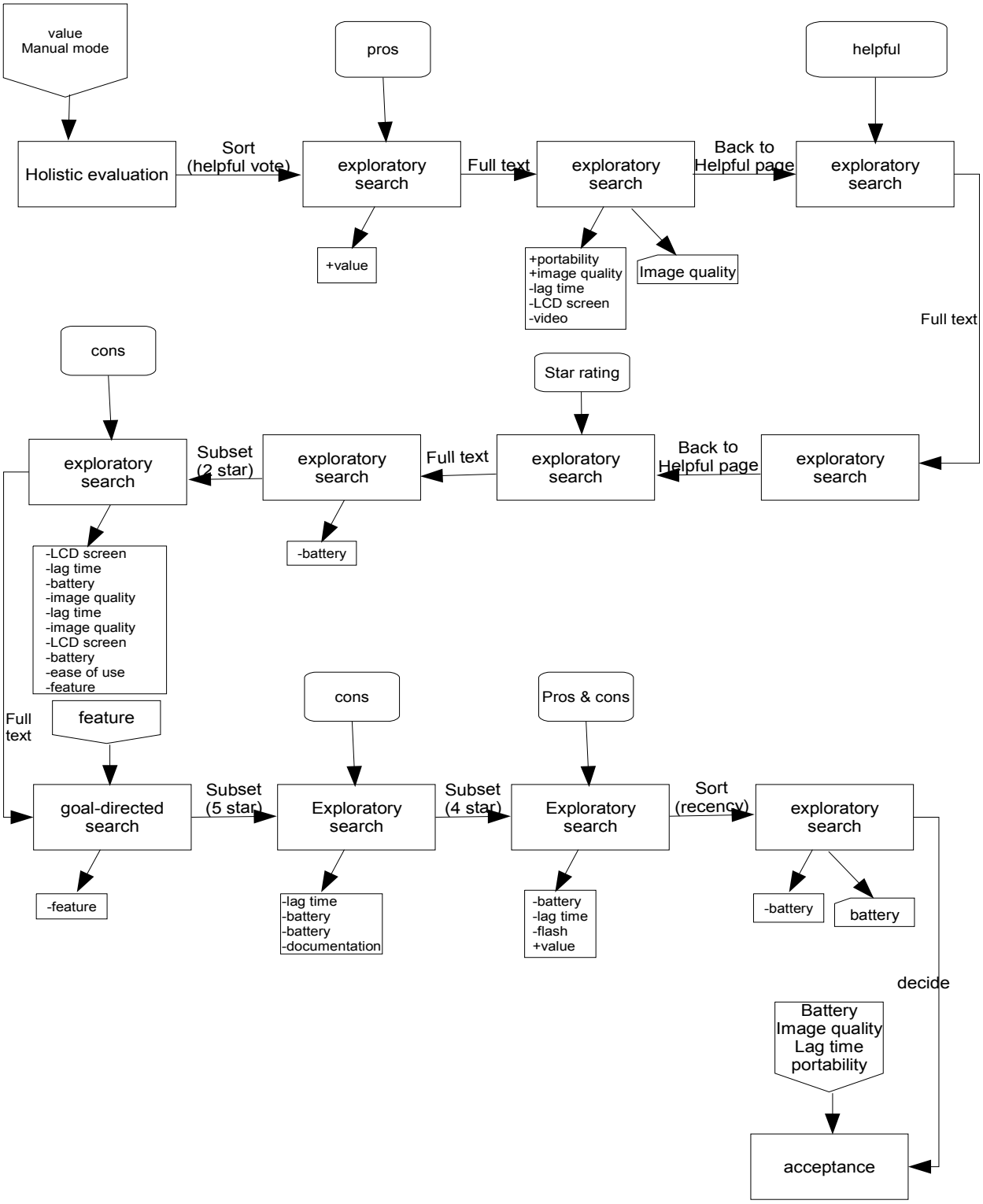


Figure 5.11: The flow chart of information acquisition (Subject 52 - Traditional)

5.5.2 Attribute overview review web site process charts

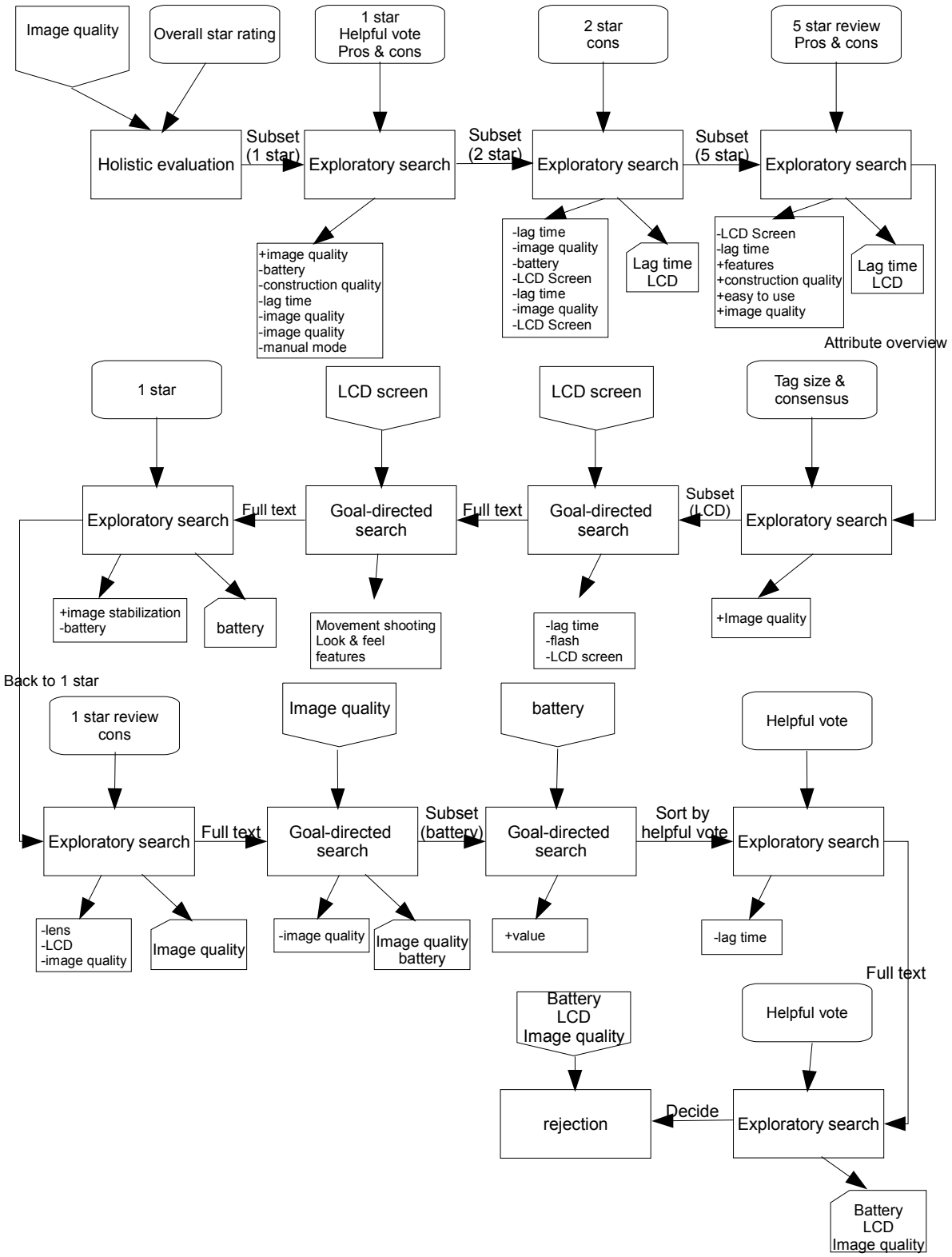


Figure 5.12: The flow chart of information acquisition (Subject 6 – Attribute Overview)

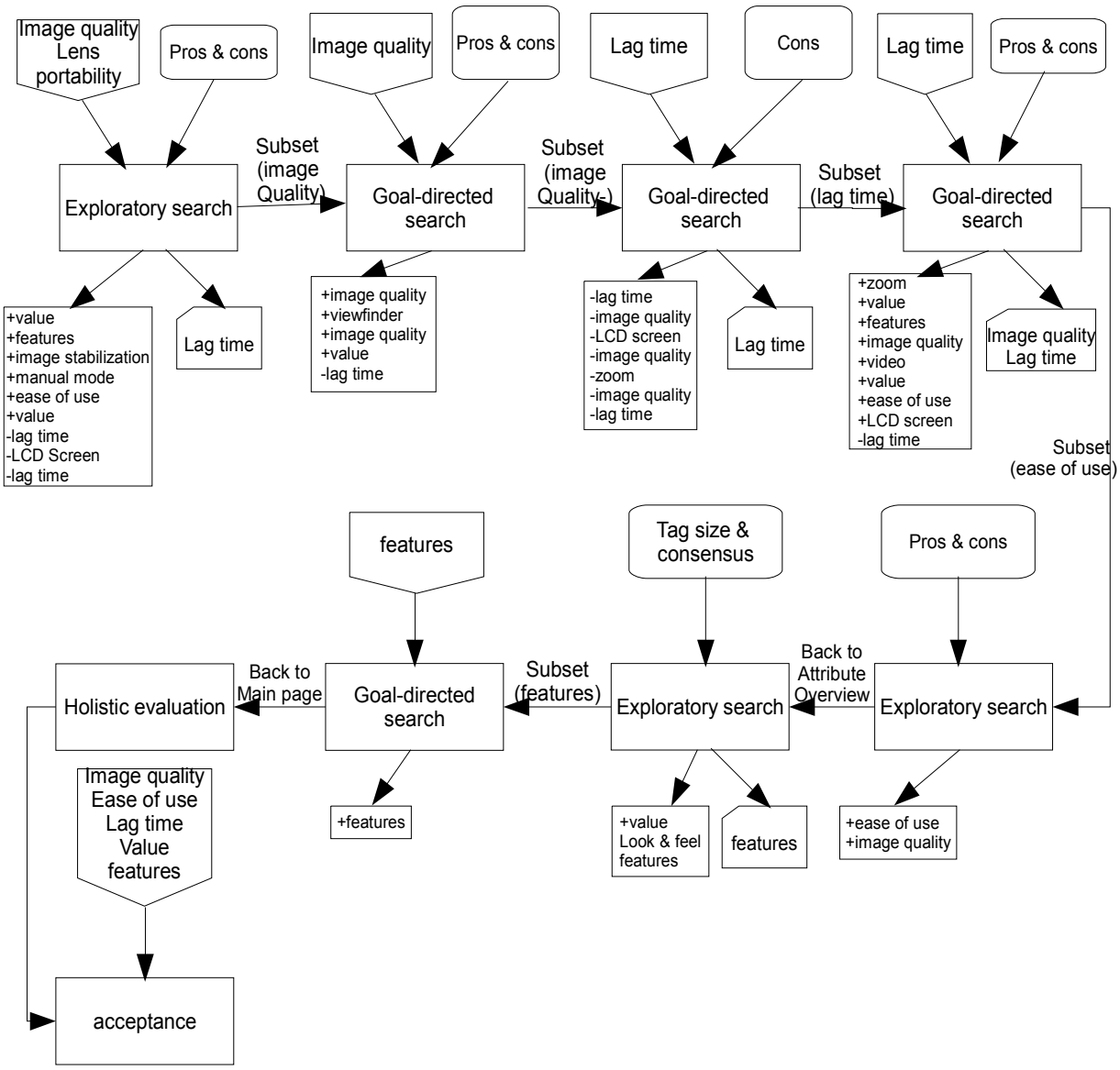


Figure 5.13: The flow chart of information acquisition (Subject 12 – Attribute Overview)

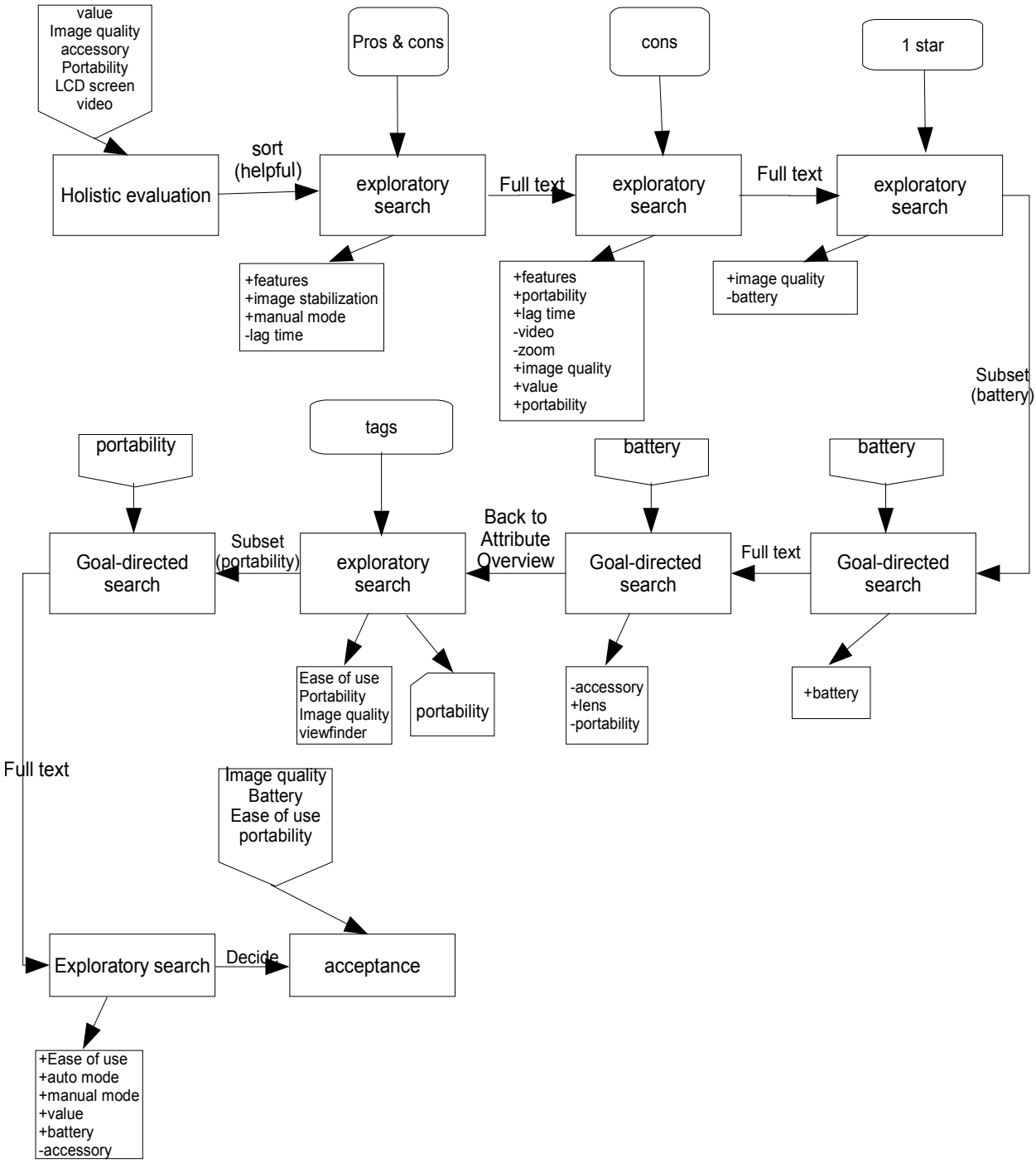


Figure 5.14: The flow chart of information acquisition (Subject 14 – Attribute Overview)

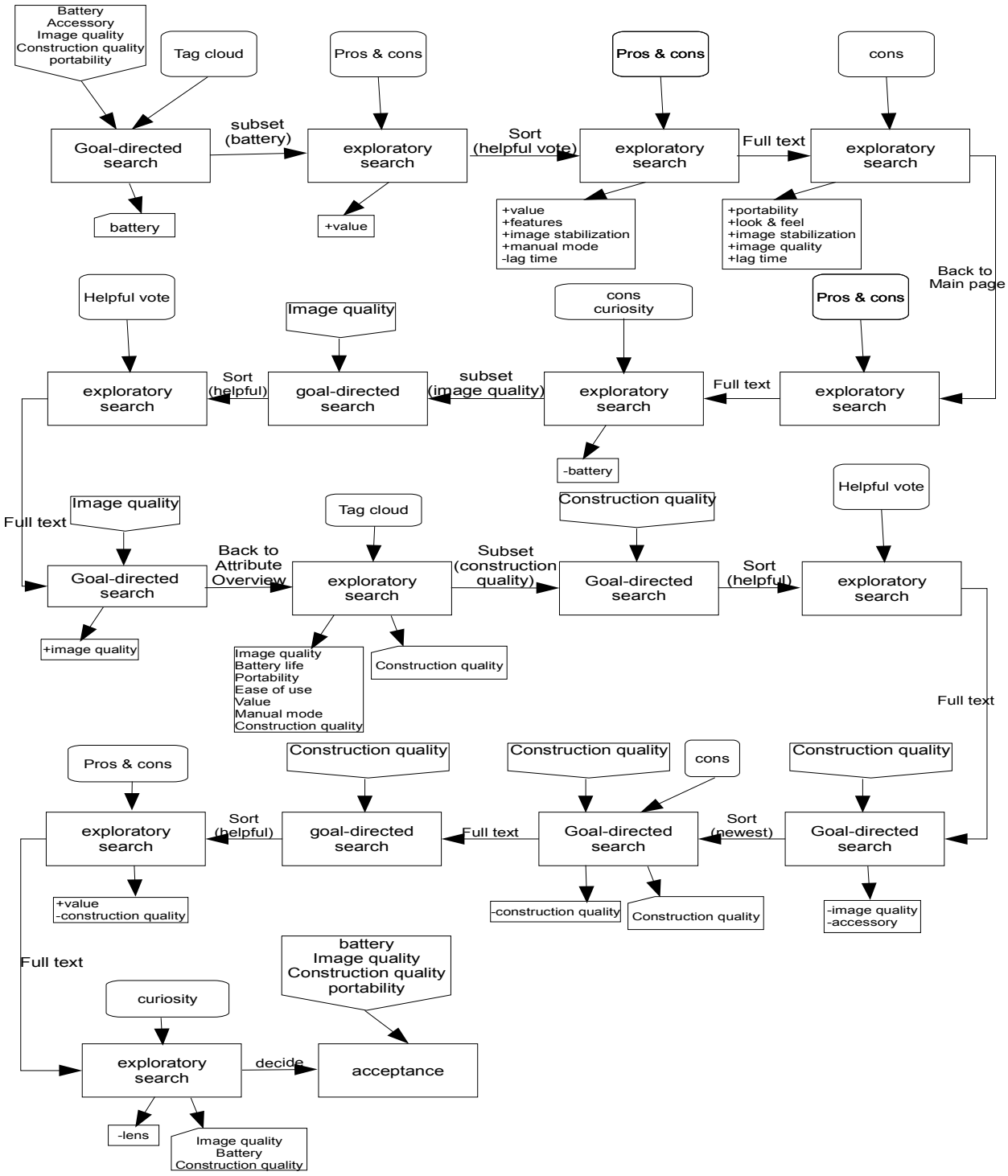


Figure 5.15: The flow chart of information acquisition (Subject 23 – Attribute Overview)

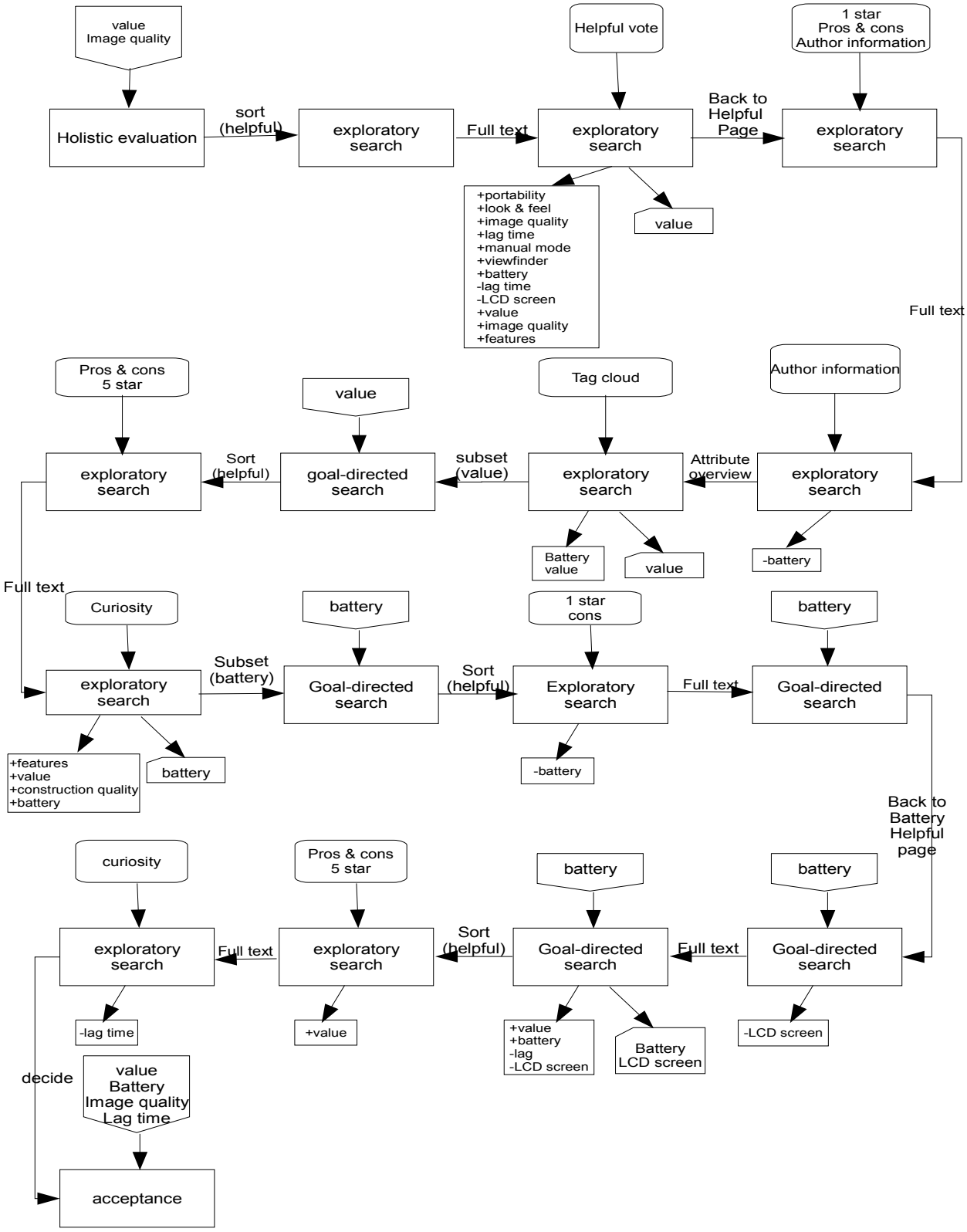


Figure 5.16: The flow chart of information acquisition (Subject 26 – Attribute Overview)

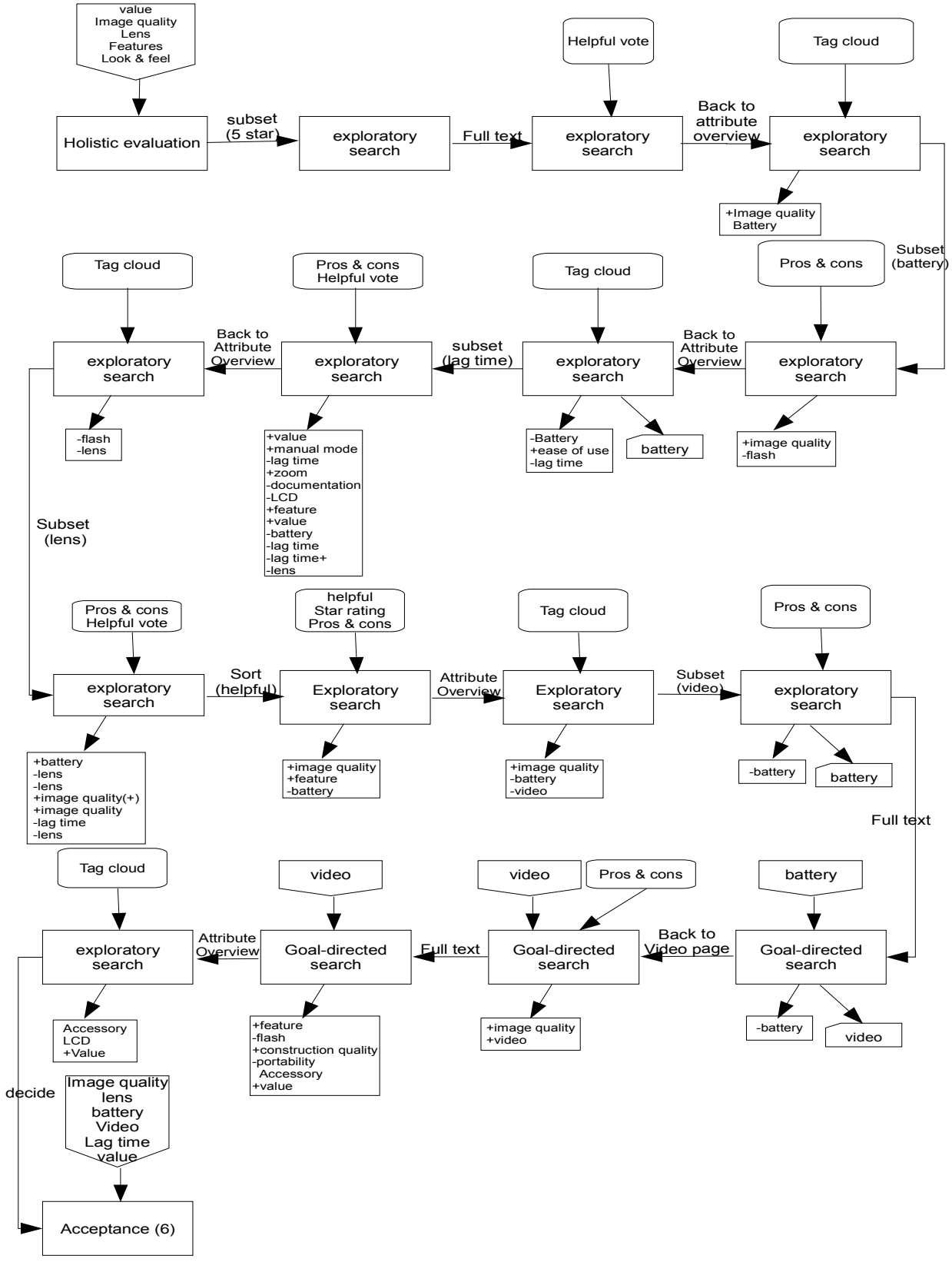


Figure 5.17: The flow chart of information acquisition (Subject 40 – Attribute Overview)

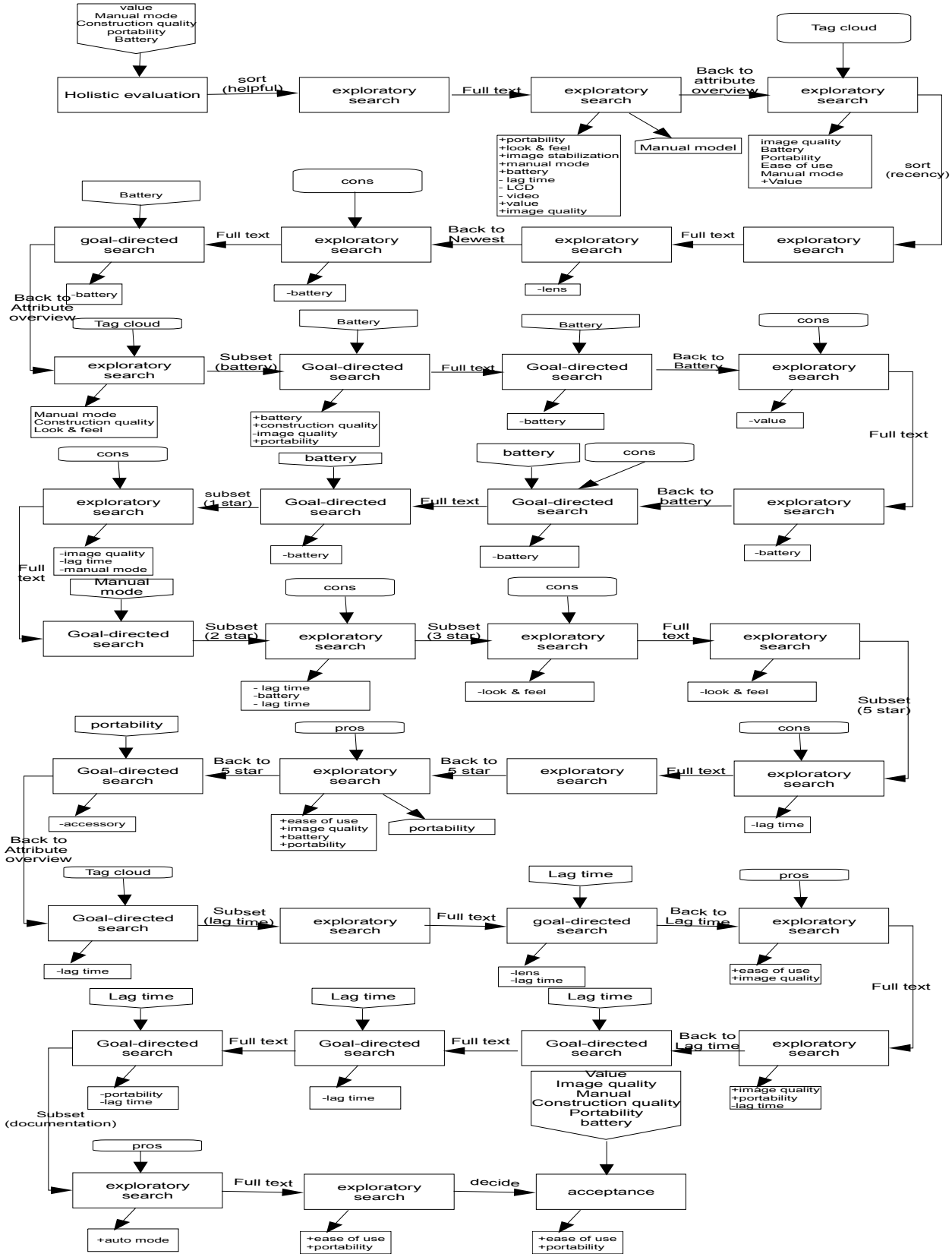


Figure 5.18: The flow chart of information acquisition (Subject 42 – Attribute Overview)

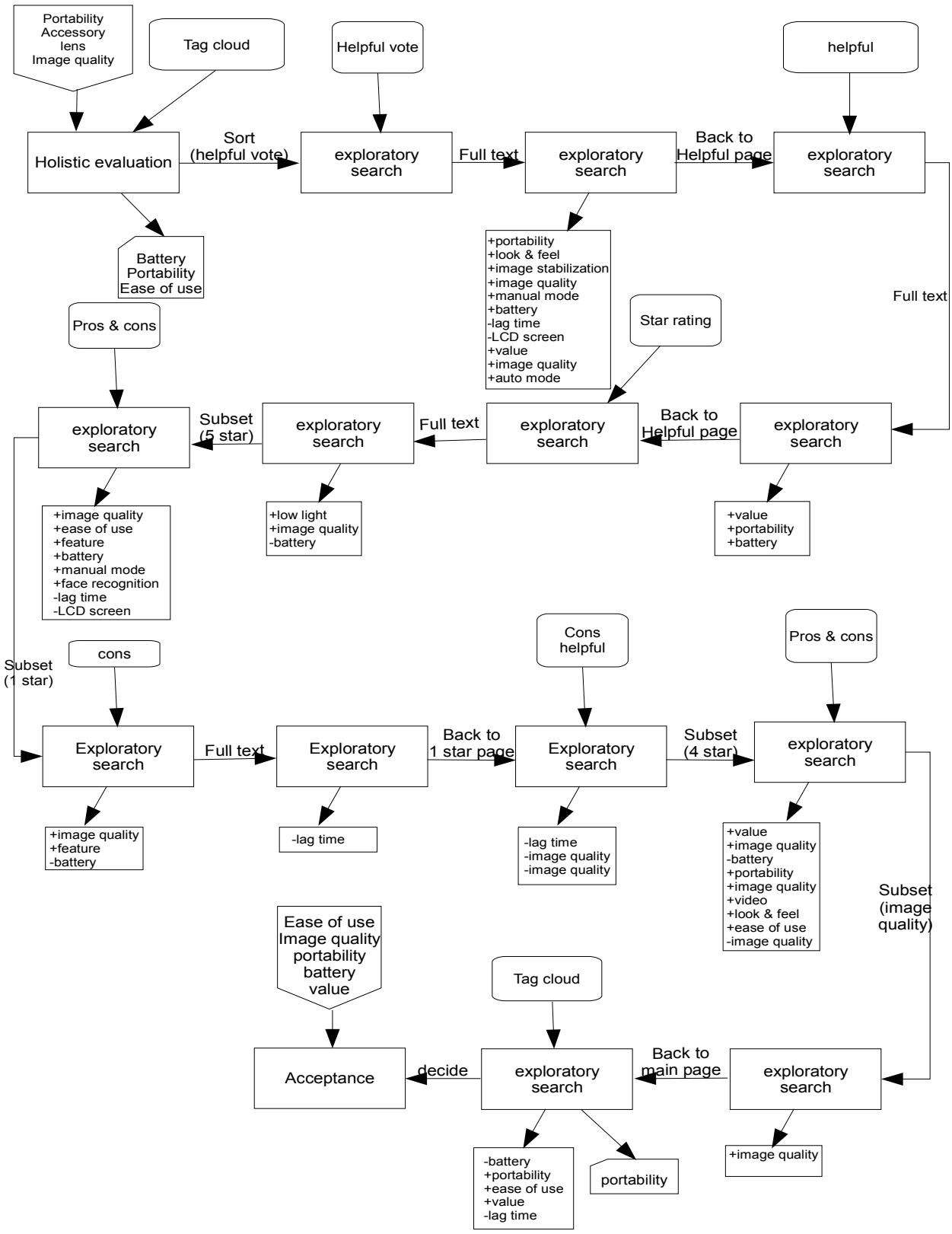


Figure 5.19: The flow chart of information acquisition (Subject 47 – Attribute Overview)

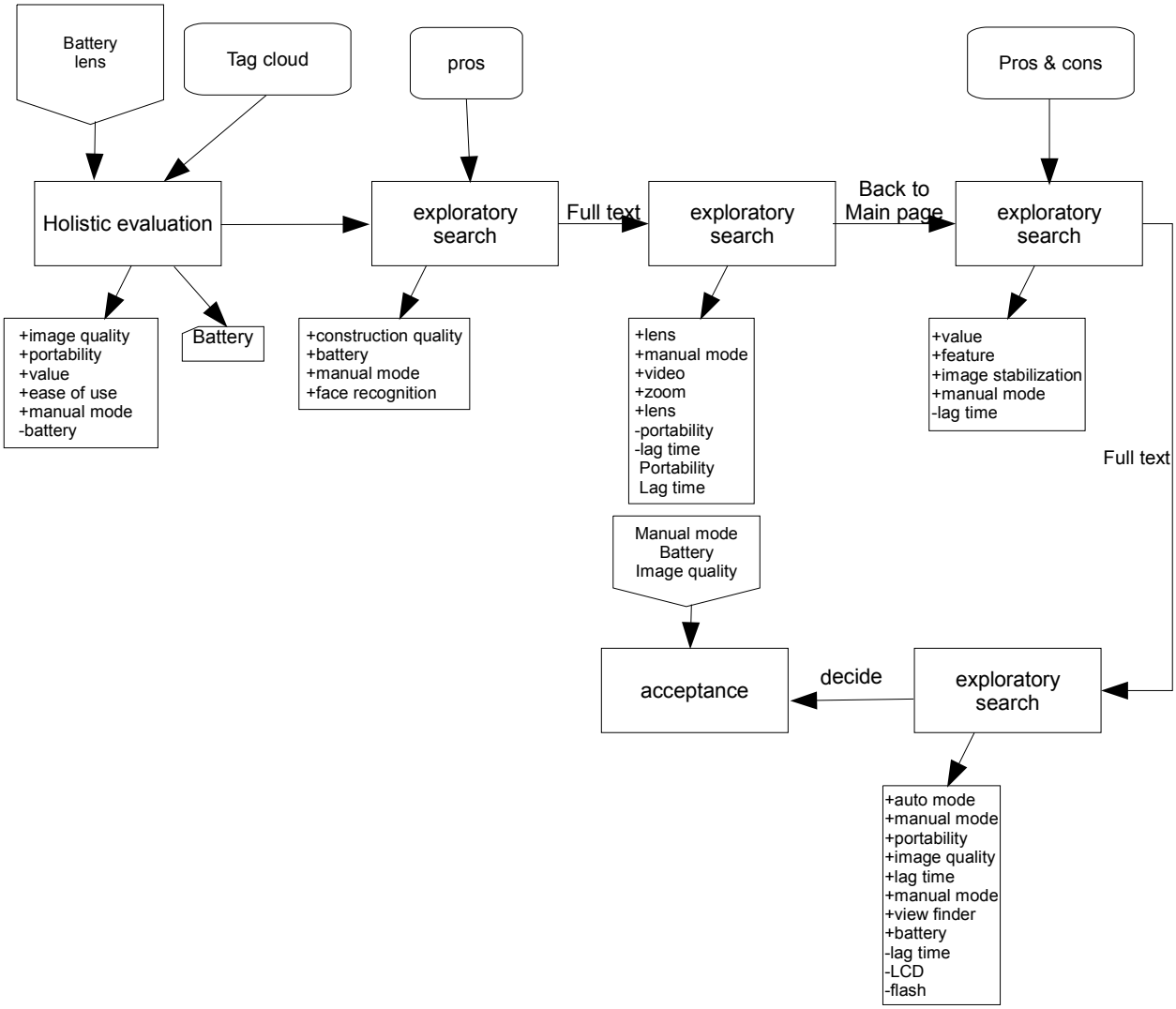


Figure 5.20: The flow chart of information acquisition (Subject 54 – Attribute Overview)

5.5.3 Summary of findings from the process approach

The visual representations of the information acquisition and decision-making process (Figures 5.5-5.20) reveal a few patterns that cannot be detected in the variance model results. First of all, 12 out of 16 processes start with a holistic evaluation of the product: these subjects first examined the review profile that includes the average star rating and a bar chart showing the distribution of the star ratings. There are two possible reasons for this pattern. First, people may start from the holistic evaluation simply because the review profile is the first thing they noticed on the review page. Second, people may attempt to get a big picture of the information environment before starting their information acquisition activities. Anchoring and adjustment is a common heuristic people use in judgment and decision-making. The review profile, which serves as an anchor, enables the anchoring and adjustment heuristic. The review profile also reduces uncertainty about the information environment by telling people what information to expect. For example, if the review profile shows that the majority of the reviews are one star reviews, people would expect a lot of negative information from the reviews.

Second, the flow charts confirm that both exploratory search and goal-directed search exist in the information acquisition and decision-making process. In the majority of the flowcharts, there are more exploratory search activities than goal-directed search activities (See Tables 5.11 and 5.12). Figure 5.21 shows the ratio of goal-directed search in the overall, the first half and the second half of the sequence for each subject.[14] It can be seen that the ratio of goal-directed search to exploratory search is higher in the attribute overview condition than in the traditional condition. This is not surprising because with the tag cloud the attribute overview web site makes goal-directed search easier. Figure 5.21 also shows that in both conditions the ratio of

[14] Subject 38 is considered as an outlier because he only used the search function to gather information. Therefore his data are not shown in Figure 5.21

goal-directed search is higher in the second half of the process than in the first half of the process. This is probably because in the second half of the process people have a better understanding of what information they should be looking for (or in other words, they have a refined criteria set). However, given the small sample size, these conclusions should be made with caution.

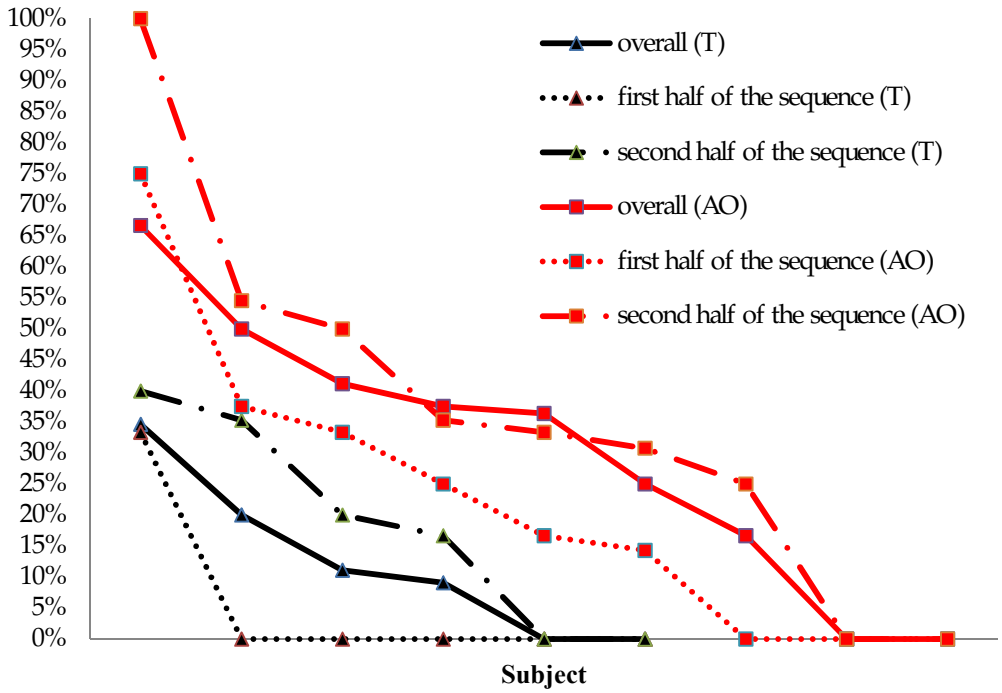


Figure 5.21: The ratio of goal-directed search in the sequences

Third, the flow charts show that the two mechanisms of information selectivity (i.e., exploratory and goal-directed search) can be performed on both the review full text and on the proximal cues (e.g. pros and cons, review summary, attribute tags in the attribute overview web site). Note that in the variance model, information selectivity was defined in terms of people choosing or not, to read the full text of a review. However, as Tables 5.11 and 5.12 show, in both conditions, a substantial proportion of information selectivity is based on proximal cues. In an extreme case (subject 12), the individual gathered information solely based on proximal cues.

This confirms the importance of depth of field in the review presentation. Depth of field is the extent to which a review web site provides both contextual overview and detailed information. People differ in their willingness to process detailed information (e.g. a review's full text). Depth of field increases the fit between heterogeneous needs for detailed information and information presentation. For those who are reluctant to process detailed information, they can browse only the proximal cues. Those who are interested in greater detail may choose to read the full reviews. Tables 5.11 and 5.12 also show that, in both conditions, information selectivity based on full text and based on proximal cues distribute evenly in the first and second half of the processes. Again given the small sample size here, it is not clear if this pattern can be generalized to a larger population.

Table 5.11 Descriptive statistics of the process model (Traditional)

		Traditional Condition						
		S2	S13	S20	S25	S38	S45	S52
# of goal-directed search/# of exploratory search	Overall	2/8	0/9	9/17	1/8	8/1	0/8	1/10
	First half	0/5	0/3	3/6	0/4	5/0	0/4	0/5
	Second half	2/3	0/4	6/11	1/4	3/1	0/4	1/5
Subset by star/sort by helpfulness/subset by attribute	Overall	3/1/2	4/0/0	0/2/0	4/1/0	0/0/0	3/2/0	3/3/0
	First half	3/0/1	3/0/0	0/0/0	2/0/0	0/0/0	0/2/0	0/3/0
	Second half	0/1/1	1/0/0	0/2/0	2/1/0	0/0/0	3/0/0	3/0/0
# of full text	Overall	4	3	12	4	4	4	4
	First half	2	2	7	2	2	2	3
	Second half	2	1	5	2	2	2	1

Fourth, note that both the traditional and attribute overview web site allows people to search the reviews using user-defined keywords. However, very few people actually utilized this search function (one subject in this sub-sample and two in the entire dataset). The search function is placed in a salient position on both web sites. The web site introduction before subjects performed the task ensures that subjects know how to use the search function properly. The retrospective interview also confirms that subjects were aware of the search function.

Interestingly, for most people, goal-directed search is not to actively search the reviews using keywords, but to allocate attention to reviews that are potentially related to their evaluation criteria among the reviews they noticed (i.e., goal-directed search driven by the information scent of the review).A possible explanation is that active goal-directed search using keyword is more cognitive demanding than passive goal-directed search following information scent. Finding a proper keyword to search is a non-trivial task. It requires product knowledge and trial and error. The verbal protocols show that subjects often tried a few different keywords before they got the desired search results.

Table 5.12 Descriptive statistics of the process model (Attribute Overview)

		Attribute Overview Condition								
		S6	S12	S14	S23	S26	S40	S42	S47	S54
# of Goal-directed search/# of exploratory search	Overall	8/4	4/4	3/5	7/10	5/15	3/15	12/21	0/13	0/4
	First half	2/4	3/1	1/3	1/5	1/6	0/9	6/10	0/5	0/2
	Second half	6/0	1/3	2/2	6/5	4/9	3/6	6/11	0/6	0/2
Subset by star/sort by helpfulness/subset by attribute	Overall	3/1/2	0/5/2	0/1/2	0/4/3	0/5/2	1/1/5	6/1/3	4/3/1	0/0/0
	First half	3/0/1	0/3/1	0/1/1	0/2/2	0/3/1	1/1/3	2/1/2	1/3/0	0/0/0
	Second half	0/1/1	0/2/1	0/0/1	0/2/1	0/2/1	0/0/2	4/0/1	3/0/1	0/0/0
Full text	Overall	4	0	4	6	6	2	14	4	2
	First half	2	0	2	3	3	1	7	3	1
	Second half	2	0	2	3	3	1	7	1	1

Finally, Table 5.11 shows that in the traditional condition a major proportion of the information environment restructuring is based on star rating, while in the attribute overview a major proportion of the information restructuring is based on helpful vote and on attributes. The traditional review web site does not allow people to subset reviews by attribute and, therefore, no

one in the traditional condition could subset the reviews by attribute. However, it is not clear why people in the traditional condition are less likely to restructure the reviews based on helpful vote. This is probably due to the design of the attribute overview web site. In the attribute overview web site, when people choose to read the reviews that mention their attribute of interest (by clicking on that attribute tag), they can further restructure the reviews by helpful vote but not by star ratings. Therefore, if people often subset the reviews by attribute (which is the case in attribute overview condition), the chances of restructuring the reviews by helpful vote is higher than the chances of sub-setting the reviews by star rating.

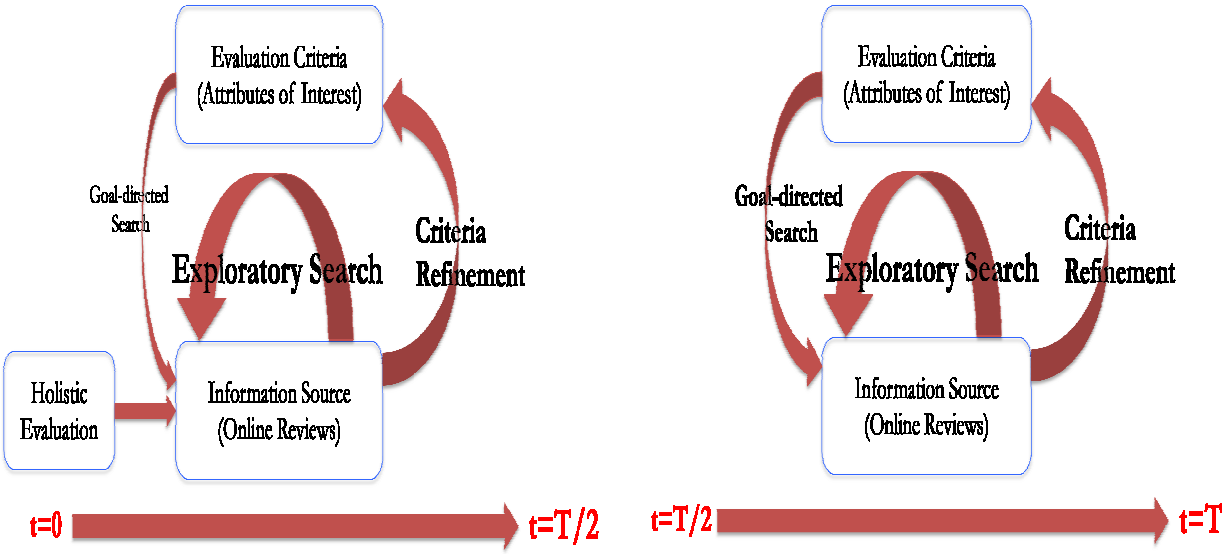


Figure 5.22 a refined conceptual model based on the preliminary process analysis

The findings from the preliminary process analysis can be used to refine the conceptual model. As shown in Figure 5.22, the process of information acquisition and decision-making can be divided into the early and late stages. The early stage starts with the holistic evaluation (i.e. the review profile that shows average star rating and star rating distribution). Exploratory search is the dominant mechanism of information selectivity. The occurrence of goal-directed search might be very low in the early stage. In the late stage, exploratory search is still the dominant

mechanism of information selectivity. However, compared to the early stage, people generally perform more goal-directed search in the late stage.

Please note that these are preliminary results based on 16 protocols and clickstream data. Further insights, additional refinements to the conceptual model, and differences across the two conditions will likely emerge once all 62 protocols are charted and analyzed.

CHAPTER 6

DISCUSSION AND CONCLUSION

6.1 Discussion on the Information Selectivity Model Results

The conceptual model posits that exploratory search and goal-directed search are two mechanisms underlying information selectivity. Exploratory search is driven by (1) cues for validity including star rating, helpful vote, and review age, and (2) curiosity. Goal-directed search is driven by information scent of the reviews. Table 6.1 summarizes the major findings of the information selectivity model.

Table 6.1 Summary of major findings for information selectivity model

Information Selectivity Mechanism	Factors that Influence Information Selectivity		Finding
Exploratory Search	Cues for validity	Star Rating	One star has a significant positive impact on the decision to read a review full text
		Helpful vote	Helpful vote has a significant positive impact on the decision to read a review full text
		Review age	Review age does *not* have a significant impact on the decision to read a review full text
	Curiosity	Review summary non-specificity	Review summary non-specificity has a significant positive impact on the decision to read a review full text
	Review presentation	Traditional vs. attribute overview	Review presentation (traditional vs. attribute overview) has *no* significant direct effects. Review presentation does *not* moderate the

			impact of cues for validity and curiosity.
	Temporal effect	Review pages that have been visited	The more pages that have been visited, the smaller the impact of helpful vote on information selectivity.
Goal-directed Search	Information scent	Information scent based on initial criteria	Information scent based on initial criteria does *not* have a significant impact on the decision to read a review full text
		Information scent based on dynamically updated criteria	Information scent based on dynamically updated criteria has a significant impact on the decision to read a review full text
	Review presentation	Traditional vs. attribute overview	Review presentation (traditional vs. attribute overview) has *no* significant direct effects. Review presentation does *not* moderate the impact of information scent.
	Temporal effect	Review pages that have been visited	The more pages that have been visited, the smaller the impact of information scent on information selectivity.

Using 3-star as a baseline, the model shows that the one star rating, a cue for validity, has a significant impact on subjects' decision to read the full text of a review. This result makes sense if one considers the credibility of 1-star reviews. The author of a book or other interested party may "hype" his or her own book by publishing glowing reviews. However, the author cannot prevent others from posting 1-star reviews. In addition, people may want to see what the major drawbacks of the product may be. They can then explore these and decide whether they are showstoppers before exploring any advantages. These possible reasons may explain why

people may use 1-star as a cue for validity. This finding is also consistent with negativity bias, a principle that holds across a wide range of domains (Rozin and Royzman 2001). According to the negativity bias principle, the perceived validity of information should be affected by its valence such that more negative information is deemed more valid. This claim was derived from the findings that negative instances tend to demand more attentional resources and that more elaborate processing can render messages more persuasive (Hilbig 2009).

The information selectivity model shows that helpful vote received by a review has a significant impact on subjects' decision to read the full text of a review. This is consistent with previous studies that showed that reviews that were voted as helpful have a stronger influence on consumers' purchase decisions than other reviews (Chen et al. 2008). On a review web site, an adverse selection problem can arise because people do not know whether the reviews are truthful until they purchase the product. Therefore helpful vote can be used as a cue for validity because it serves as a signaling device to alleviate the adverse selection problem.

The model does not support the impact of review age on information selectivity. The lack of significant effect might be due to the nature of the product we selected for the experiment: a digital camera. The review age may have a significant impact on information selectivity for products that can be upgraded regularly (e.g. software). Digital cameras may be upgraded by the manufacture over time, but he upgraded version is considered as a different product and will have its own collection of reviews. Therefore people may not associate review age with validity.

The review summary non-specificity has a significant positive impact on the decision to read the full text. Nonspecific review summary (e.g. "buyers beware!") is likely to induce curiosity, which leads to a decision to read the full text to get more detailed information. Daniel Berlyne (1949, 1950) conceptualized curiosity as a reaction to ambiguous stimuli that involved

feelings of uncertainty or interest. These feelings were assumed to motivate exploration of stimuli in order to acquire new information. Therefore, the effect of nonspecific review summary on information selectivity is likely to operate via curiosity, or a feeling of "information gap" as defined by Lowenstein (1994).

An interesting finding about information scent is that information scent based on subjects' initial criteria (criteria stated by subjects before they perform the experimental task) does not have significant impact on information selectivity, whereas information scent based on dynamically updated criteria (criteria stated by subjects while they perform the experimental task) does have a significant positive impact. This finding highlights the adaptations of goal-directed search to the structure and constraint of information environment. As subjects browse the review pages (i.e. the information environment in this context), they may find that certain attributes held in their initial criteria set are never mentioned in the reviews. Instead of spending time and cognitive resources to locate information about the rarely mentioned attributes, they can focus on other attributes that they encountered or can be easily located in the reviews. As such, people adapt their goal-directed search to what the information environment can offer. This finding also provides evidence for the constructive nature of preferences. People may dynamically update their criteria as they gather information from the reviews. Only the information scent based on dynamically updated criteria can predict people's information selectivity.

The results show that the impact of helpful vote (a cue for validity) and information scent decreases as people browse more review pages. This is consistent with the notion of diminishing returns of information search (Stigler 1961). The results also suggest that different review presentations do not have an impact on the decision to click on the review's full text, as

evidenced by the non-significant coefficient of the condition dummy (traditional vs. attribute overview). Furthermore, the impact of information scent does not vary across review presentation schemes as evidenced by the non-significant interaction terms between the two information scent variables and condition.

6.2 Discussion on the Preference Construction Model Results

The conceptual model posits that people refine their criteria for evaluating a product as they browse online product reviews. The criteria refinement is shaped by memory processes such as learning and forgetting and biased information processing resulting from people's intention to reduce cognitive costs, information conflict, and cognitive dissonance. Table 6.2 summarizes the major findings of the preference construction model.

Table 6.2 Summary of major findings for preference construction model

Preference Construction Mechanism	Driving Factor	Finding
Learning & Forgetting	Prior criteria	The presence of an attribute in the initial criteria set has a positive impact on the inclusion of this attribute in the final criteria set and on the importance of this attribute in the final criteria set
	Frequency of processing	The frequency of processing an attribute has a positive impact on the inclusion of this attribute in the final criteria set and on the importance of this attribute in the final criteria set
	Recency of processing	The recency of processing an attribute has a positive impact on the inclusion of this attribute in the final criteria set and on the importance of this attribute in the final criteria set
	Review presentation (traditional vs. attribute overview)	Review presentation (traditional vs. attribute overview) has *no* significant direct effects. Review presentation does *not* moderate the impact of learning and forgetting.

Biased information processing	Relevance of an attribute	The perceived relevance of an attribute has a positive impact on the inclusion of this attribute in the final criteria set and on the importance of this attribute in the final criteria set
	Consistency of information	The perceived consistency of information about an attribute does *not* have a significant impact on the inclusion of this attribute in the final criteria set and the importance of this attribute in the final criteria set
	Post-hoc justifiability	When subjects decide to accept (or reject) a product, they are more likely to include attributes that favor (or disfavor) the product and consider these attribute as important
	Review presentation (traditional vs. attribute overview)	Review presentation (traditional vs. attribute overview) has *no* significant direct effects. Review presentation does *not* moderate the impact of biased information processing.

The results show that people's initial criteria have a significant impact on both the inclusion and importance of attributes in the final criteria set. This finding reveals that preferences are not constructed anew on each occasion. The construction process is anchored on the initial criteria set. This is consistent with the early descriptive results shown by Figure 5.3 that the initial and final criteria sets are not two completely different sets, but they overlap to some extent.

Both the frequency and recency of processing an attribute have a significant positive impact on the inclusion and the importance of this attribute in the final criteria set. The conceptual model views criteria refinement as the output of the human memory and inference system. Therefore it is not surprising the memory processes influence the final criteria set.

Inclusion of an attribute in the final criteria set depends on effective encoding this attribute in memory and successful retrieval of this attribute at the time of decision. Frequency of processing an attribute maximizes the likelihood that sufficient attention has been paid to this attribute for encoding and the attribute related memory trace has been sufficiently consolidated. Recency of processing an attribute minimizes the likelihood that the attribute related memory trace has decayed or has been interfered by competing memories. As such, frequency and recency of processing an attribute influence the inclusion of this attribute in the final criteria set. At the same time, frequency and recency of processing an attribute lead to the ease-of-retrieval effect. It is well documented in the literature that people often unconsciously misattribute ease-of-retrieval to importance: since an attribute comes to mind easily, it must be important (e.g. Schwarz et al. 1991). Therefore frequency and recency of processing an attribute also influence the self-reported importance of this attribute in the final criteria set.

In addition to the involuntary memory processes, the results also support that criteria refinement is shaped by people's intention to reduce cognitive costs, information conflict, and cognitive dissonance. The perceived relevance of an attribute has a significant positive impact on the inclusion of this attribute in the final criteria set and the importance of this attribute in the final criteria set. This finding is consistent with the principle of diagnosticity (Feldman and Lynch 1988). Diagnosticity reflects whether a piece of information is relevant to the issue at hand. The concept of diagnosticity assumes a principle of cognitive economy, as suggested in the following quote: "We view the consumer as a 'cognitive miser' who attempts to make the decision using whatever information is salient. Other relevant inputs are retrieved from long term memory or are sought externally only if the original salient information is insufficiently diagnostic to attain the task objective (Feldman and Lynch 1988, p. 171)". Including more

attributes in the criteria set increases the cognitive costs of trade-off making. According to the diagnosticity principle, people should only include the attributes that are relevant to the current decision context so that they can reduce the cognitive costs.

Interestingly, the results do not support the impact of information consistency on criteria refinement. The original argument about the effect of information consistency is that conflicting information about an attribute incurs cognitive costs to resolve the conflict; as a result people may exclude that attribute from their criteria set to save cognitive costs. A possible explanation to this non-significant effect is that the way people avoid information conflicts is not necessarily to exclude the attribute with conflicting information from their criteria set. People may subjectively discount the validity of certain information when they see conflicting information, so that the conflicts can be resolved at minimal cognitive costs.

The results show that post hoc justifiability affects criteria refinement. Specifically, when subjects decide to accept (or reject) a product, they are more likely to include attributes that favor (or disfavor) the product and consider these attribute as important. This is consistent with the notion of consolidation in Svenson's diff-con theory. Svenson (1992, 1996, 1999) suggested that in the post-decision phase people continue to consolidate the chosen alternative's advantages over the rejected alternatives. The post-decision consolidation allows people to reduce cognitive dissonance.

Finally, results show that the there are no significant differences in criteria refinement between the traditional review web site and the attribute overview web site. Specifically, the variance models show no differences between the two conditions (traditional vs. attribute overview) implying that information selectivity (i.e., which reviews to read) and preference

construction (i.e. evaluation criteria refinement) are influenced by the same factors across the two conditions.

6.3 Discussion on the Preliminary Process Analysis

The process approach provides a few insights that cannot be generated from the variance models. The flow charts (Figure 5.5-5.20) show that the process of information acquisition and decision-making may follow an anchoring and adjustment pattern. People often start their information acquisition from a holistic evaluation of the product, based on the review profile that shows the average star rating and a bar chart showing the distribution of the star ratings. The holistic evaluation may serve as an anchor in the process of information acquisition and decision-making. A common finding about anchoring and adjustment is that overall evaluations appear biased toward the anchor evaluation. Tversky and Kahneman (1974) argued that adjustments tend to be insufficient, so the final evaluation is likely to be biased in the direction of the initial anchor evaluation. This may explain why many online WOM studies still have a reasonable predictive power even if they only examine the numeric rating in the review profile.

The process analysis confirms that both exploratory search and goal-directed search exist in the information acquisition process. Exploratory search seems to be the dominant mechanism of information selectivity, as evidenced by the large number of exploratory search activities throughout the process of information acquisition. The occurrence of goal-directed search might be very low in the early stage, but it generally increases as people gather more information. This finding seems to be robust across the two review presentation schemes (traditional vs. attribute overview).

In the variance model information selectivity is confined to people's decision of whether or not to read a review's full text. The process analysis reveals that the decision of whether to

read the full text is only one part of information selectivity. The two mechanisms of information selectivity (i.e., exploratory and goal-directed search) can be performed on both the review full text and on the proximal cues (e.g. pros and cons, review summary, attribute tags in the attribute overview web site).

6.4 Comparing the Traditional and Attribute Overview Web Site

An important research question of this dissertation is to compare the attribute overview web site, a supposedly improved design, with the traditional review web site in terms of both process and outcomes. The variance models show that review presentation (i.e. traditional vs. attribute overview) is not a significant factor in information selectivity and preference construction. This implies that the same set of factors affect people's decision of whether to read a review's full text. However, the preliminary process analysis shows that the process which people use when processing the reviews differs across the two conditions. The ratio of goal-directed search to exploratory search is higher in the attribute overview condition than in the traditional condition. The tag cloud in the attribute overview web site is very likely to make goal-directed search easier. Therefore, although information selectivity (i.e., which reviews to read) and preference construction (i.e. evaluation criteria refinement) are affected by the same factors across the two conditions, the preliminary qualitative analysis suggests that review presentation leads to processual differences in that people both explore more reviews and engage in more goal-directed search.

Mitigating inappropriate information selectivity and increasing the depth of field are two objectives of the attribute overview design. The descriptive analysis (Table 5.1) results show that (1) subjects in the attribute overview condition spent significantly more time on the experimental task, (2) subjects in the attribute overview condition paid attention to significantly more reviews,

and (3) subjects in the attribute overview condition processed significantly more product attribute information in the proximal cues than subjects in the traditional review web condition. These results support that using the attribute overview web site people are able to learn about more aspects of a product from information of different granularity. Therefore, the attribute overview review design both alleviates inappropriate selectivity and increases depth of field.

More importantly, the descriptive analysis further shows that the attribute level evaluation bias is lower in the attribute overview condition. This is likely because subjects in the attribute overview condition spent more time and processed more information resulting in a more "objective" evaluation. Given the evidence provided by the descriptive analysis and by the process analysis, the attribute overview is a better review presentation interface in terms of mitigating inappropriate selectivity and evaluation biases.

6.5 Limitations

This dissertation is not without limitations. First, it focuses on a product (i.e. digital camera) that can be easily decomposed into a set of attributes. This is not the case for all products as it may be difficult to decompose some products into constituent attributes. Nelson (1974) differentiated "search goods" and "experience goods." A good is defined as a "search good" when full information for product attributes can be known prior to purchase. A good is defined as an "experience good" when either condition holds: (1) full information on attributes cannot be known without direct experience, (2) information search for attributes is more costly/difficult than direct product experience. Note that experience goods (e.g. book, movie, video game) may be decomposed into product attributes. However, for experience goods, there is a low correlation between product attributes observable prior to purchase and the satisfaction or benefits at the time of consumption. Because of this difference, it is not clear to what extent the

model in the dissertation applies to experience goods. Future study may further investigate this issue.

Second, in the experiment subjects made decisions on a single option. In reality when making purchase decisions, consumers tend to use a two-stage procedure to reach their decisions. In the first stage, consumers typically screen a large set of available products and identify a subset of the most promising alternatives. Subsequently, they evaluate the set of alternatives in more depth, perform relative comparisons across products on important attributes, and make a purchase decision. The processes underlying the two-stage procedure may be more complex than the processes described in the conceptual model. However, the information selectivity and preference construction mechanisms (i.e. goal-directed and exploratory search, learning and forgetting, biased information processing) can still apply to the two-stage procedure.

Third, in the experiment subjects were asked to make a hypothetical, not a real choice. The reliance on a hypothetical task presumes that the hypothetical task is a good, approximate reflection of actual choice, and involves the same processes that lead to the real choice. However, real choices are typically precise, have higher stakes, and are often more emotionally charged. Since hypothetical choices do not have any consequences, they might be rapid and mindless, requiring fewer cognitive resources. Fortunately, Kang et al. (2011) showed that neural processes in hypothetical and real choices are highly overlapping in the domain of consumer goods purchase. Thus, conclusions about the underlying processes drawn from the hypothetical choice should be a reasonable representation of the psychological processes underlying real choice.

6.6 Contributions

6.6.1 Contribution to the online WOM literature

Different from many existing online WOM studies that focus on statistical correlations between online WOM and aggregate market outcomes, this dissertation develops a descriptive model that explains the cognitive processes underlying people's use of online WOM. The descriptive model takes into account two important aspects of information acquisition based on online WOM that are largely ignored in the existing literature. These two aspects are (1) information selectivity, i.e. people only process a subset of the available information, and (2) preference construction, i.e. people construct their preferences as they gather information from the environment.

The rise of the Internet has led to an explosive growth of information. For example, as of April 2011, the Internet Movie Database (IMDb) lists 1,854,221 movies, TV productions, and video games. More than 4 billion messages are sent through Facebook every day. The average number of tweets per day posted on Twitter in February 2011 was 140 million. Because of the biological constraints of the human mind, information selectivity is inevitable in the information-intensive environment, just as Herbert Simon suggested in the quote:

"In an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it" (Simon 1971, pp. 40–41).

In the domain of online WOM, given the large volume of reviews, it is important to investigate the question of how people allocate their attention and limited cognitive resources.

This dissertation shows that information selectivity is controlled by both top-down goal-directed search and by bottom-up exploratory search. Both the criteria held in memory and the cues for validity influence information selectivity. Through the exploratory search driven by the cues, people dynamically update their criteria, which further affect their goal-directed search. As such, the conceptual model emphasizes the dynamic interaction between human memory and the information environment. A common practice in the online WOM literature is to regress the characteristics of reviews on certain aggregate market outcomes. Many prior studies are completely silent about human memory and the interaction between memory and review characteristics. Admittedly, such negligence is largely due to lack of access to individual-level data and due to computational complexity. The descriptive model developed in the dissertation opens a new possibility to investigating the impact of online WOM. Aggregate market outcomes emerge from a group of individual choices. There is a growing realization across the social sciences that one of the best ways to build useful theories of aggregate outcome is to create working computational models of social units (e.g., an individual consumer) and their interactions, and to observe the global structures or outcomes produced by multiple units (Goldstone 2005). Needless to say, the key to this computational approach is to develop models that govern the individual social unit's behavior. Therefore this dissertation not only enriches our understanding of how people's information acquisition and choice-making based on online reviews unfold over time, it also lays out the foundation for building more realistic models of online WOM at the aggregate level.

6.6.2 Contribution to information foraging theory

The original intent of information foraging theory is to understand how information seeking, gathering, and consumption are adapted to the flux of information in the environment

(Pirolli and Card 1999). The adaptive information seeking behavior examined in theory is people modifying strategies or the structure of the environment to maximize their rate of gaining valuable information. Although the theory generates valuable insights into the question of information acquisition in the information intensive environment, the validity of the theory is limited by assuming that people have fixed information goals. This assumption is reasonable in certain contexts. For example, when people use a search engine to gather information, they often have specific information goals in mind. Information foraging theory can easily predict what links people will visit among the results returned by the search engine. However, in many situations people do not have fixed information goals. As demonstrated by the information selectivity model, the information scent based on the criteria reported before the experimental task cannot predict which reviews people will select to read. Only the information scent based on dynamically updated criteria can predict review selection. Therefore, the adaptive information seeking behavior is not only reflected in people modifying their strategies or the structure of the information environment, it is also demonstrated in people refining their information goals during information acquisition.

Information foraging theory is also limited to the goal-directed search. Information scent is defined as the semantic similarity between the cues representing information sources and people's information goal. The information selectivity model supports the role of exploratory search in information acquisition. Information scent can gain greater predictive power by including the factors that drive exploratory search. For example, the information scent formula can be extended as:

$$EIS(G,R) = \sum_{i \in G} (\sum_{j \in R} W_j S_{ji}) + \beta_h h + \beta_s star + \beta_c curiosity - \sum_{i \in G}^{N} \omega(n_i) \qquad \text{(Equation 6.1)}$$

In the equation above, EIS(G,R) refers to an extended information scent of review R with respect to the criteria set G. The first term of the equation is the original version of information scent. The terms *h* and *star* denote the helpful vote received by review R and the star rating of review R. These terms capture the role of cues for validity. The term *curiosity* captures the ambiguity, uncertainty, or novelty of the cues that may activate curiosity. Finally n_i is the number of reviews that are relevant to the criterion i and processed by the individual before he or she reads review R. $\omega(n_i)$ is a positive monotonic function of n_i, thus it reduces the contribution of information related to criterion i to the information scent when people collect more and more information for the criteria i (i.e., n_i increases). A possible functional form for $\omega(n_i)$ is

$$\omega(n_i) = a_j + b_j n_i \qquad \text{(Equation 6.2)}$$

Where b_j reflects the jth individual's propensity to read the review full text. The smaller b_j is, the more review full texts will be read to collect information for the criterion i.

6.6.3 Contribution to the constructive preferences perspective

As discussed in the theory development section, the constructive preferences perspective assumes that people select from a repertoire of cognitive strategies (or heuristics) to make decisions. The selection of strategies depends on the tradeoff between accuracy and effort. An important theme of the constructive preferences stream of work is to identify different strategies used in judgment and decision-making. A major challenge of this approach is that it does not provide a unifying account of why people use different strategies and when they use what strategies. As Lee and Cummins (2004) pointed out, although there is nothing wrong with arguing that different people make decisions in different ways in different situations, it is a less than a completely satisfying conclusion. Pinker (1997) put the concern more bluntly: "In psychology, invoking 'strategies' to explain funny data is the last refuge of the clueless" (p. 282).

A potentially fruitful way to provide a unifying account is to examine preference construction through memory processes. Our memories not only define who we are and what we do, they also determine what we like and how we choose. Despite the strong anecdotal evidence of the involvement of memory processes in preference and choice, their role in preference construction has largely been ignored in existing models of judgment and decision-making (Johnson & Weber 2000; Weber et al. 1995). The preference construction model in this dissertation takes into account the role of memory processes (i.e. learning and forgetting) in shaping the final criteria. These memory processes are shown to be significant in predicting both the presence and the importance of attributes in the final criteria set. The other criteria refinement mechanism, biased information processing can also be traced back to a different aspect of human memory, the cognitive capacity limitation. Newell and Bröder (2008) suggested several aspects of human memory that can be used to explain judgment and decision-making. These aspects include (1) capacity limitation, (2) automaticity vs. controlled processing, (3) learning, (4) categorization, and (5) metacognition. Future studies may investigate preference construction along these lines.

Another criticism of the constructive preferences perspective is that this stream of work has overstated the magnitude of preference construction by using methods that maximize the likelihood of obtaining effects at the expense of external and ecological validity. Simonson (2008) suggested that constructive preferences are often demonstrated using a well-controlled experimental task and carefully designed stimuli. This may result in methodologies and decision tasks with low realism and generalizability. One way to alleviate the concern regarding realism and generalizability is to conduct experiments with fewer controls and intervention. The experimental setting for this dissertation has more realism than a typical lab-controlled

experiment: the task scenario is relevant to the subjects and the experiment has minimum interventions over the subjects' performance of the task. Therefore another contribution of this dissertation is that the preference construction was tested in a relatively more realistic setting.

6.6.4 Implication for practice

Consumers experience satisfaction and dissatisfaction not only with the selected product but also with the purchase decision process itself (Czepiel & Rosenberg 1977). Researchers argue that while increasing consumption satisfaction is important to manufacturers, choice making satisfaction might be more important to retailers (e.g. Heitmann et al. 2007). If implemented effectively, our proposed design principles (see Table 3.3) may help e-retailers increase consumer choice making satisfaction, which further increases customer loyalty and repeat purchases.[15] The consequences of enhanced customer loyalty in a business-to-consumer (B2C) context are increased revenue, reduced customer acquisition costs, and lower costs of serving repeat purchasers, leading to greater profitability (Reichheld 1993).

Clearly, the categorization principle is a critical step in implementing the proposed design. To categorize the reviews, e-retailers need to (1) generate a comprehensive list of attributes for each product and (2) assign individual reviews to the attribute categories accurately. E-retailers can generate the product attribute list using either a top-down approach or a bottom-up approach: the product attributes list can be pre-defined by E-retailers through interviewing a panel of product experts or constructed from the existing reviews using a text-mining technique. Although the bottom-up approach may generate the attributes that matter to

[15] The decision outcome data was collected from the pretest and pilot. Both the quantitative and qualitative data show that attribute overview web site allows subjects to make a more confident choice and better justify their choice. Probably because of the between-subject design and small sample size, the quantitative data from the full-scale experiment show no significant differences in the decision outcomes between two conditions.

real users, it has at least two disadvantages. First, the comprehensiveness of the attributes list depends on the volume of existing reviews. It may be impossible to generate the attributes list if a product has too few reviews. Second, because consumers may refer to the same attribute in different ways, the generated attributes list may have redundancy. Therefore, the top-down approach is recommended.

There are also two approaches to assigning individual reviews to attribute categories. In the first approach, when consumers write their reviews, e-retailers may provide the product attribute list and ask them to comment on the attributes on the list. This approach allows e-retailers to easily categorize the reviews once a review is written. However, the reviews may lose richness because of the restriction on writing reviews. For example, when writing a review, consumers may provide first-person experiences of using a product, their consumption background and demographic information. The restriction on writing reviews may discourage them from providing valuable information. Moreover, this restriction potentially forces review providers to consider more attributes than they would without such a restriction. Thus, this approach may change the review providers' thought process and their product assessment. A different approach is to rely on semantic matching algorithms to automate the review assignment. In this approach, there is no restriction on review writing. Once a review is written, it will be indexed and assigned to product attributes categories using computer algorithms. Clearly, the challenge for e-retailers is to find the most effective algorithm. The effectiveness of these algorithms can be evaluated against the four goals of choice or judgment making outlined earlier (i.e., justifiability, confidence, evaluation cost, and experienced negative emotions). We recommend that e-retailers set up behavioral experiments with real customers to assess the effectiveness of different algorithms.

This dissertation raises a fundamental question about online customer reviews as a major form of user-generated content: what goals can these reviews support? We argue that if presented properly, reviews can help consumers form an unbiased understanding of a product and construct a set of criteria for evaluating a product. They can also assist consumers in making an accurate choice and in reducing the cognitive costs of making such a choice. We report principles (see Table 3.3) that can improve the presentation of reviews to achieve these goals. The principles not only help consumers make an accurate choice and reduce the cognitive costs, but also increase their choice justifiability and reduce experienced negative emotion in the choice making. Improving consumers' choice making will enable organizations to potentially attract more visitors and reap greater benefits from reviews.

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APPENDIX A: Pre-experiment survey

For each of the statements below, please indicate to what extent you agree with the statement (1=strongly disagree, 7=strongly agree). Please answer the questions conscientiously.

Maximization scale Source: Nenkov et al (2008)	1. No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities.
	2. When I am in the car listening to the radio, I often check other stations to see if something better is playing, even if I am relatively satisfied with what I'm listening to.
	3. I often find it difficult to shop for a gift for a friend
	4. Renting videos is really difficult. I'm always struggling to pick the best one.
	5. I never settle for second best.
	6. No matter what I do, I have the highest standards for myself.
Need for Cognition Source: Yang and Smith (2009)	7. I don't like to do a lot of thinking
	8. I try to avoid situations that require thinking in depth about something.
	9. I prefer to do something that challenges my thinking abilities rather than something that requires little thought.
	10. I prefer complex to simple problems.
	11. Thinking hard and for a long time about something gives me little satisfaction.
Need for cognitive closure Source: Federico et al. (2006)	12. I get very upset when things around me aren't in their place
	13. Generally, I avoid participating in discussions on ambiguous and controversial problems.
	14. I prefer to be with people who have the same ideas and tastes as myself.
	15. I feel uncomfortable when I do not manage to a give a quick response to problems that I face.
	16. Any solution to a problem is better than remaining in a state of uncertainty.
	17. I prefer activities where it is always clear what is to be done and how it needs to be done.
	18. I prefer things to which I am used to those I do not know, and cannot predict.

APPENDIX B: Pre-task survey

Knowledge about digital camera	How do you rate your knowledge about digital cameras (including both point and shoot and single-lens reflex)? 1=very limited knowledge, 7=expert on digital camera
	Have you ever purchased a digital camera? 1=yes, 2=no
	Have you ever researched digital cameras? 1=yes, 2=no
	Do you often use a digital camera? 1=yes, 2=no
	Do you currently have a digital camera? 1=yes, 2=no
Interest in digital camera	Are you interested in digital cameras? 1=not interested at all, 7=extremely interested
Cognitive Reflection Test Source: Frederick (2005)	Below are three questions that vary in difficulty. You may or may not answer all of them. Answer as many as you can.
	A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?
	If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
	In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

APPENDIX C: VPA Training Session Script

In this experiment, your role is to perform a task that will be described to you shortly and at the same time to give a running comment on what you are attempting to do, what procedures you are using and all other task-related thoughts. In other words, I am going to ask you to THINK ALOUD perform the task you are given. What I mean by "think aloud" is that I want you to tell me EVERYTHING you are thinking from the time you begin to perform the task until you finish the task. I would like you to talk aloud CONSTANTLY from the time you begin to perform the task until you have finished the task. I don't want you to plan out what you say or try to explain to me what you are saying. Just act as if you are alone in the room speaking to yourself. It is most important that you keep talking. If you are silent for any long period of time, I will ask you to talk. Please try to speak as clearly as possible, as I will be recording you as you speak. Since this does not come naturally to most of us, I will give you a demonstration of what I mean by think aloud and then we will start with two practice problems.

[Play the think-aloud demonstration video]

Notice that in the video this person thinks aloud constantly: (1) she speaks aloud every piece of information she pays attention to. (2) More importantly, she tells us what she thinks about every piece of information she pays attention to. (3) She also tells us what she is thinking as she makes every move (e.g. clicking on a link or button, going to a different page). That is what I want you to do in the warm-up exercises. Here's your first exercise question:

In this exercise, we practice speaking aloud the information you pay attention to and making comments on the information you pay attention to. I will give you a job posting with some

information highlighted. Let's assume you only pay attention to the highlighted information. Information not highlighted is ignored. Please speak aloud the highlighted information and make comments on them.

Possible comments include:

(1) Your reaction to the information such as whether you understand what this information means, whether this information is good or bad to you, or whether you believe this information.

(2) Relate the information to your background such as what this information means to you, or what you are going to do after knowing this information.

[Subjects do the warm-up exercise 1]

Here's your second exercise question:

This exercise is an extension to the first exercise question. In this exercise, we practice speaking aloud the information you pay attention to, making comments on the information you pay attention to, as well as thinking aloud as you make every move (e.g. click on a click or button). You already know how to do the first two things. For the third one, when you click on anything, tell me what you think.

You may tell me:

(1) An overall comment on the job posting. For example, is it good one? Are you qualified for this position?

(2) What you are attempting to do next? For example, "I need to look at more postings".

(3) Whatever comes into your head. For example, "I am bored", "I am confused", "I am lost".

In this exercise, I want you to search for a job related to IT project management in the following

web site and then decide one position to apply for.

https://jobs3.netmedia1.com/cp/search.jsp

You may or may not look at everything in a job posting. It is OK if you decide to ignore some information in the job postings. I would like you to talk aloud CONSTANTLY from the time you begin to perform the task until you have finished the task. Please speak aloud whatever information you pay attention to and tell me everything comes into your head. I don't want you to plan out what you say or try to explain to me what you are saying. Just act as if you are alone in the room speaking to yourself. Do not worry about grammar or speak incomplete sentences. It is most important that you keep talking.

[Subjects do the warm-up exercise 2]

APPENDIX D: Task presentation, initial criteria elicitation, and retrospective interview

(1) Decision Scenario:

Suppose you are considering buying a camera for your best friend as a birthday gift. Your friend occasionally takes long trips, and he is starting to show some interest in photography. I will show you a web site with a camera and real customer reviews on this camera. Your task is to decide whether this camera is a viable option you would consider.

(2) Task Requirements:

You may read a few reviews that can best help you make the decision. Just make the decision as you normally do. That means you can take as much time as you feel necessary to make the decision. You can choose whatever reviews you feel necessary to read. You can choose to read the reviews in whatever sequence you feel necessary. And in any review, you can choose to pay attention to whatever information you feel necessary.

(3) Initial Criteria Elicitation:

Tell me what aspects of this camera do you think you need to know to make the decision?

(4) Retrospective Interview

1. How did you make the decision? Please describe the steps you went through to make your decision.

2. As you were browsing the reviews, did you identify any important factors that you did not think of before you read the reviews?

3. There are so many reviews on the web site. How did you decide which reviews to read?

APPENDIX E: Product reviews used in the experiment

proximal cues	full text
1,365 of 1,384 people found the following review helpful: 5.0 out of 5 stars A camera that's powerful and a great value, March 5, 2008 By RLSd (Minnesota USA)	I own a DSLR and consider myself a photography enthusiast. I wanted a small compact camera with me when I don't want to lug around my DSLR + lenses and equipment. After a previous good experience with the old model of this brand, the new model seemed like a good choice. Since I'm an advanced photographer, I'll focus on the advanced features of this camera. The auto modes work as well as any other camera in its class, but the extensive manual features is what sets apart this model. What I like about the camera: + Compact, stylish. It's smaller than older models of this series, and the dark grey color gives it a seriousness compared to the typical bright silver finish. + Image stabilization works very well, it allows me to take blur-free photos 2-3 stops below the recommended shutter speed, that means at 35-50mm f2.8 1/10 sec shots are CONSISTENTLY possible indoors without using flash. + Good image quality. Expected from this brand, but even better is adjustable contrast, saturation, and sharpness settings, along with the typical JPG compression and resolution sizes. + Fast and responsive. I was surprised how responsive this camera is even compared with my DSLR. Shutter lag is very low for a compact digicam, and when I pre-focus with manual focus, it's even faster. + Manual modes. Aperture priority and shutter priority are great, the M mode is even better than other models of this series because now there's a light meter on the right side that adjusts live based on what the camera thinks is the optimal exposure setting. And you can adjust aperture/shutter speed and see how it affects the final exposure. Ideally a live histogram would be even better, but this is very handy. + Manual focus. Although the LCD resolution is not good enough, even with the point zoom option, manual focus helps in close-up work and pre-focusing for action or creative photography. + Manual flash modes. In addition to automatic flash. The manual flash allows me to adjust the flash power in 3 levels, and prevents a pre-flash. This last part is important for using a remote optical slave flash. I can basically take professional looking studio pictures with this camera with my external flash equipment. + Optical viewfinder. I don't use this much yet, but can come in handy in bright sunlight conditions, or when battery conservation is needed.

	+ Battery performance seems improved over previous models too. The official specs give it 220 shots on regular alkalines and 500 on rechargeable NiMHs. Good news is they use common AA batteries that you can buy anywhere instead of proprietary models with specific chargers. Now the negatives. I hope Canon can improve these aspects in their future models. - Slow flash recycle times. This is to be expected from a camera that takes AA batteries. Would be nice if the LCD didn't blank out after a full flash discharge. Not a big deal since I use an external flash anyway, and the camera's flash is manually set to medium output as trigger (so recharge is faster). I would not want to give up the AA battery convenience for a faster flash recycle time though. - Higher resolution LCD. The 2.5" 115k resolution LCD is ok for framing and casual browsing, but higher resolution would be nice. -Live histogram while shooting. This feature is available when reviewing a photo, but not live. Other manufacturers have implemented this, and Canon should also, especially since the unofficial CHDK software mod allows such a feature. - Larger aperture would be nice. Such as f/2.0 (instead of f/2.6) at the wide end, and f/4.0 (instead of f/5.5) at the telephoto end. That way a lower (& less noisy) ISO can be used in dim conditions or when fast shutter speeds are needed to freeze action. All the electronics in the world can't replace a good large lens. Also allows more creative depth of field control. - A wider wideangle would be nice, 28mm instead of 35mm (35mm equiv). I'd rather see a wider wideangle than a longer zoom. - Video feature is not ideal. Optical zoom is not available during recording of video. And the more efficient MPEG4 compression is not used, so video files tend to be large. Also noticed at 640x480 resolution, the highest fps is now 20 instead of 30 from other models of this series. A definite step backwards. - Noise at higher ISOs. This is due to the smaller sensor on compact cameras. But 8 MP is probably the most pixels that can be crammed into a small 1/2.5" sensor. I'd rather have a cleaner picture at 6-7 MP than a noisy 8 MP picture. And if in-camera noise reduction is used, I'd like to see an adjustable setting for how much is being applied. - And if I were to be really critical: There's no indicator of what optical zoom level I'm at. Slight image noise is noticeable even at ISO 80 when I zoom in really close on a monitor view. When at the widest angle & aperture, there's slight barrel distortion and blurriness on the corners. Not many compact cameras can do better in terms of image quality, but I'm pointing them out here because even though this camera beats most of the competition, it still has room for improvement.

	So overall it's a great camera for the price. Offering great image quality with the auto settings for the casual user, but also a powerful set of features for the more advanced photographer.
137 of 137 people found the following review helpful: 5.0 out of 5 stars Takes a licking...., March 28, 2008 By Jennifer K. Bretsch	There are already great reviews out about this camera. I'd like to add that I bought this camera just before a 2-week trip to China. Well, it performed like a charm and I couldn't be more happy with my purchase, especially for such an affordable camera that has so many features. On the second day of my trip I was fumbling with the camera and dropped it from a height of 4 feet onto concrete. My heart was in my throat. Everyone stared. For the remainder of the trip the camera was just fine; not even a crack or scratch. I'm amazed. And because I had almost no time to look through the camera manual before I started taking photos, I'll add that this camera is very user-friendly and easy to figure out right out of the box. I especially like the image stabilization and video capture features. I was also pleasantly surprised by the long battery life. I took about 700 pictures on one set of batteries. Overall, a great camera.
62 of 62 people found the following review helpful: 5.0 out of 5 stars The Canon A590IS has it all., September 6, 2008 By F. Gillett "Cybertowner" (Small Town in Kansas)	This model, based on price, is considered to be a budget or entry level camera. However, especially at this price point, it is feature rich including many not found in more expensive models. The feature set will appeal to a wide variety of people from those who want nothing more than an auto-focus point-and-shoot to the camera buff who wants a full set of manual controls, including manual focus, and to everyone in between. I was especially pleased that it included a viewfinder on this model, something that is being dropped from many product lines in favor of only an LCD screen. Anyone who has ever tried to compose a shot in bright sunlight only to find the LCD screen washed out or impossible to see will appreciate this feature. I applaud this company for developing a small camera with more attention to function rather than to style and minimal size. Many cameras can be found with dimensions smaller than a playing card or credit card but lack even basic controls, much less easy to use buttons. While this camera may not fit in the pocket of your jeans, it will fit into a jacket pocket or a moderately sized shirt pocket. Rather than being a flat or rounded rectangle this camera design feels good in your hand and feels secure during use. Performance and picture quality was another pleasant surprise at this price point. Picture noise is not noticeable until ISO 400 and degrades rapidly at ISO 800 and above. Translated to laymen's terms, this means your shots will be crystal clear unless you specifically set the ISO to a high number for non-flash, low-light shots. Image stabilization is excellent throughout the three settings (off is also selectable). There are three auto-focus modes plus off including face detect which will automatically detect up to 9 faces in a shot and adjust the camera settings automatically so that faces are correctly exposed in your shot. Unless one of your subjects is moving fast, the camera detects the movement and adjusts according. The 4X optical zoom is a rarity in this price range with most not exceeding 3X. Combined with the 4X digital zoom you have a camera that is capable of mild wide angle to moderate telephoto. Color rendition is excellent and I have read a number of technical reviews that place it as nearly perfect. One of your many shooting options is "vivid" which increases contrast and heightens the colors in your shot. The camera's ability to shoot movies with sound is better than expected. However the company did reduce the performance from a previous model's predecessor to only 20 fps in 640x480. To

	get 30 fps you must drop down to the 320x240 size. Unlike my old digital, you can continue to shoot in movie mode until your memory card is full, not in shorter segments. Redeye reduction is accomplished with two methods which can be combined or shut off entirely, a redeye light and digital correction. Unfortunately, no camera manufacturer I am away of offers something that will work with pets so their eyes will often come out glowing green or gold in a flash shot. The company's decision to power this camera with AA batteries was sound. Avoiding a proprietary battery aided them in keeping the cost low. Replacement of a proprietary battery can cost upwards of $40. I would recommend purchasing a set of 2500 mAh NiMH rechargeable batteries and a good charger if you use your camera a lot. If you find your batteries dying and unable to plug in your charger, you can always pick up a set of AA batteries nearly anywhere. Battery life with the A590IS is reportedly one of the best with up to 450 shots. But if you are like I am and use all the bells and whistles as well as flash, expect battery life to be much lower, typical with any camera. As with anything, there are always some cons. Writing to the memory card is a bit slow, especially in continuous shooting mode although still respectable for a camera in this class. I found that it did improve when I upgraded to a faster SD card (class 6+). As with all cameras of this series, flash recycle time leaves something to be desired approaching 5 seconds. Unless you are someone who wants to take rapid-fire shots using a flash, performance is acceptable. The LCD view screen is pretty low resolution and displays a lot of noise. Much to my relief the actual shots turn out much better than what you see on the view screen. When in movie mode with sound, I found that using the zoom or other buttons translates into an audible sound during playback. In summary, I suppose it is possible to find a budget camera that will exceed this camera in one or two categories but the it has good, solid, balanced performance in all areas. I'd much prefer solid performance over stellar performance in one or two areas and below average performance everywhere else. It is by no means a high-performance SLR, but at $149 I can buy 10 of these before approaching what I paid for my SLR 10 years ago and I don't need to drag along 2 camera bags to take good quality shots. If I'd paid over $500 for this camera I'd probably rate it at 4 stars, but at $149 it earns a solid 5 stars for performance, features, and quality with the Pro's far outweighing the Con's. A note about using SDHC (high capacity) memory cards. The a590IS comes with a regular 32mb SD card but can utilize the SDHC format. Make sure your computer (or other device) can utilize the SDHC format before buying a SDHC card as the format is not the same as an SD card. The SDHC is nearly idential in size and shape to the SD card which has led to some confusion. However, all is not lost. There are plenty of very inexpensive card readers out there that can read the SDHC format and upload to your computer or other device. SCHC cards are most often found in 4gb, 8gb, and 16gb capacities.
44 of 44 people found the following review helpful:	I have had this camera a little less than a month and have already taken 1200 pictures on it! 1089 of these were on on a trip to Alaska, while the rest were "practice" shots to become familiar with the camera. I am very impressed with the results as the beauty of our trip comes through perfectly in the photos.

5.0 out of 5 stars Super Camera - Great Price, June 2, 2008 By LT4CE (Western IL)	I bought this camera as a backup to my aging Canon S2IS with its 12X zoom, just in case it decided to quit during the trip. The S2 survived and was used almost as much as this camera - just the opposite of what I expected. The size and convenience of the larger LCD screen on this camera quickly made it a favorite of mine, and my wife's. Because the controls were very similar on both cameras, it was easy to learn, and switch between cameras. The newer Zoom Browser software is better than the S2's, but similar and was easy to learn. I have not figured out how to disable the flash on the Auto setting, other than after I turn the camera on. The camera takes great shots inside with some light, and the flash washes some of these out, if used. I feel the default setting should be "Off" for the flash, even in the Auto setting, but can understand why it is "On". I just have to remember to turn the flash off whenever I turn it on. The only complaint I had of it was the slowness of taking a picture. However, I discovered in my haste to get a new memory card before the trip, I had picked up an SD card, rather than an SDHC card. I feel the new SDHC card I ordered will solve that problem. I used the Landscape setting for many shots of Mt. McKinley, Denali, glaciers, and others with great results. Thanks to Amazon and the reviews submitted by other owners, I am really enjoying this camera and the unbelievable beauty of Alaska that it captured!
35 of 36 people found the following review helpful: 5.0 out of 5 stars Optional Purchase, April 4, 2008 By B. Johnson (Charlotte, NC)	This camera is really nice. I like that you can add external lenses (sold seperately) to the camera. If you are interested in this option, check out the bundle package from 49 St. Photo (sold through Amazon) that includes two lenses and lots of other goodies for only $100 more. My favorite features of this camera include manual mode (or shutter or aperature priorty), auto rotates pictures, long battery life, great movie quality w/ sound, can turn off digital zoom, has an easy mode, face detection is cool, and you can add an external lens. Cons to the camera include a little bit bulky, slow recharge time after each picture, and that's about it. I never write reviews but I felt I needed to for this since I liked it so much.
37 of 39 people found the following review helpful: 5.0 out of 5 stars Excellent Value!, March 20, 2008 By David K "Complimented Chef" (San Antonio, TX)	This camera takes fantastic photos! I've had trouble in the past with shaky pictures from other digital cameras. But with the built-in image stabilizer, they are clear and beautiful, even up close! I've gotten some great shots. I can even take close up photos of books to show on computer monitor and the text is clear and readable. Love the movie mode, too. I like the ease of point and shoot, but if you want to change manual settings are available too.
18 of 19 people found the following review helpful:	I bought this as our first digital camera. We just came back from a trip to England where we took more than 300 pictures. We haven't printed them yet, but they look great on our computer. We even took some action shots during a soccer/football match, and most of those look great also. We took all our shots

5.0 out of 5 stars Great point and shoot, April 11, 2008 By Peter D. ONeill "Pete O." (USA)	in the auto mode. When we were considering buying this camera, it was a bit confusing to read all the reviews about the more exotic features of this camera. I suppose it's nice to have all those features available on this camera, but I'm not sure those features are relevant to someone like me who is simply looking for a good "point and shoot" camera. I'm glad I bought this camera, and would recommend it to my friends.
13 of 13 people found the following review helpful: 5.0 out of 5 stars Great Camera!, July 22, 2008 By Keith (Ohio)	I really like this camera. It is easy to use, takes great pictures, and has plenty of zoom. I looked at so many cameras before purchasing this one. This one had the best features and quality of all the cameras in this price range. I was really impressed with the quality of the video it produced, as I didn't expect very much from a digital camera. I am glad I got a camera with a view finder as I have found on very sunny days at the ballfield, the LCD can be a little difficult to see details of what you are capturing. The viewfinder, though, shows you enough of what you are shooting and comes in handy. The night scene mode really is a blessing as I have taken night shots with and without this mode, and it makes such a huge difference in night photography. Speed is not an issue as well. I took a picture of my son jumping into the pool and I caught him just as he was entering the water. There was relatively no blur and it looks as if he is standing on top of the water! I also took pictures of him throwing a baseball and there was no blur in those photos as well. Again, this camera exceeded my expectations and I doubt that anyone would be disappointed in purchasing this camera. Plus it's hard to go wrong with its quality.
9 of 9 people found the following review helpful: 5.0 out of 5 stars An all around fantastic camera!, September 14, 2008 By Frank L. Morales (Vancouver, WA USA)	So allow me to start by saying i'm just your average "joe-user" who enjoys snapping photos while on vacations and out with friends. Recently i owned an Olympus Stylus 810 and was very, very pleased with it. Unfortunately i dropped it damaging the entire lens assembly and it was going to cost $140 to repair. With a week at the beach coming up i didn't have time to research a lot. On a friends recommendation i made this purchase. Now my goals are to have a smaller sized camera that will allow nice point and shoot photography but has some manual (even minimal) controls as i do enjoy photography and if i decide to go further, i'll be familiar with the manual controls and such. So after getting this camera i did a few test runs to get it all working w/ my MacBook Pro laptop. Here's my experience thus far: Install on Windows Vista and Mac OS X Leopard were both absolutely flawless. Software went right in, once connected downloading the images and viewing them was a one click event. The software bundled is actually quite nice. I no longer have iPhoto (thanks Leopard) so i was unsure what to use for basic photo management. Not to worry Canons bundled software, "ZoomBrowserEX" does a fantastic job of that.

	Now as far as options go Im by no means skilled in the realm of cameras, however from my limited experience i can say this camera packs quite a large array for such a small price tag. The auto modes work very well, not to mention having the ability to just pop it into "Manual" mode and tweak by hand! All it takes is 20-30min of reading on the internet and you can be messing with the settings and taking some great low light, artistic, etc... photographs. I also found it's quite easy to use single handed. A lot of times on my beach trip i was holding onto a rock to balance myself and only had my right hand available. Switching into say "Macro" mode is very simple. Same goes for things like zoom, flash, etc... overall very user friendly design. Picture quality has been absolutely stunning! I truly did not expect it from a camera under $160. As with most "point and shoot" cameras when upping the ISO level to take dim light shots without a flash it does tend to get grainy. Although this camera does counter balance that a little, and does a good job, it's still noticeable. That's where the "Manual" mode came in for me. Being able to adjust shutter and aperture etc... really allowed me to take some exceptional low light shots that are not grainy at all. So my overall impression is absolutely pleased! For the money i doubt you'd find a better camera with as many features that can produce the quality of photos this can. I was impressed to see how small it is in person and exactly just how well constructed it feels. Also the thing i loved is there's a huge wealth of accessories like extra lenses such as telephoto, macro, lens filters, etc... Amazon has a "kit" that looks like a fantastic deal that comes with most of those things including a tripod. That is definitely going to be my next purchase. So if you're looking for a great camera that can "point and shoot" and has the manual controls if you think you may be interested in getting into photography, this is my recommendation hands down. I posted 11 photos in the "Customer Photos" section. Feel free to check them out to hopefully get an idea of what this camera can do with "default" settings, i was blown away. Lastly as i'm finding out photography is all about your "eye" and knowing enough about your hardware to capture what you "see." I'm not much for taking pictures of people i really enjoy closeups and different angles, so that's what i'm learning to capture with this camera. Hopefully my pictures will be a decent display of what this camera can do. Just remember if you don't like your photos it's probably not the cameras fault! There will never be a one stop solution, but overall this one is fantastic! Hope it helps, Happy picture taking, Frank L. Morales II
8 of 8 people found the following review helpful: 5.0 out of 5 stars More than your money's worth!, May 31, 2008 By Bruce Fields (New	I bought this camera as a gift for my girlfriend because it satisfied my two main requirements: 1) it could be operated by someone who is not interested in learning the basics of camera design and features, and still produce reliable, quality photographs and 2) be capable of doing much more if one should so desire. Apparently, the model one step down (the 580, I believe) is void of manual override controls, so for a small amount more one can get that capability in this

York, New York USA)	model. After using the camera for a few weeks I have determined that it actually does produce very sharp, nicely color toned pictures if you simply put it on AUTO or P, point, remember to hold the shutter half way down for a second to focus, and shoot. Perhaps learning when to force the flash to provide fill would be a handy, not too complicated step to learn, one which would greatly improve most backlit shots. I'm still trying to teach that :-) (it's only one button, hey!!) but I think I will eventually succeed. All in all, you can carry it anywhere and use it quickly and easily and without any real knowledge or skill manage to eke out a decent (if not really lovely) exposure. If you understand something about how modern cameras are programmed, the manual controllability of this little demon will delight you. In bright light situations, it's a good thing to be able to use the traditional viewfinder which is not always provided these days in many other point and shoots. And if you wanted a quality shot, understanding how to use the many features intelligently, I think you will be amazed that the file produces such a high quality photograph. Five years ago it would have cost many hundreds more to achieve this quality, and now it's available for a pittance. Progress. I haven't delved into the technical aspects of this camera here because I am assuming that most people who are looking for this kind of one would not be that interested. Suffice to say, this little camera does lots of stuff and it does it all with ease and grace and for a low price. Sounded good to me, and I'm glad I bought it. You could do different for the price, but not, I don't think, better. Highly recommended.
7 of 7 people found the following review helpful: 5.0 out of 5 stars Just bought this great camera, December 28, 2008 By Bea (San Francisco, CA)	I recently bought this camera from Amazon at a great price. So far, I am really enjoying it--it's my first digital camera and it is simple to use. Here are a few details about the camera that I didn't know before I bought it. Batteries: It does come with batteries. Two AA batteries were included, which only lasted two days (which I expected from regular batteries). I've since bought rechargeable batteries, based on other reviewers' advice. Memory card: A memory card is included, but it only has enough room for about twenty pictures. Just enough to test the camera out and take a few practice photos of my office. Good thing I ordered another memory card along with the camera. View finder: Not only does this camera have the standard digital camera "screen", it also has an old-fashioned (like from regular cameras) view finder. I like this because I can take a picture even if there is glare on the digital screen. Also I find it helpful to look through the small view finder when there is a lot of motion. Easy shot: The "easy" mode is really truly easy, and it produces really good pictures. Design: Aside from the price, I picked this camera after looking at it in a retail store because of the user friendly design. Unlike many other digital cameras, it is not a small thin square. It has a rounded side that makes it easy to grip and more substantial feeling. At the same time, it is very light and small and easy to carry in my purse or coat pocket. Overall ease of use: I found the camera to be simple to use and all of the included instructions to be useful and easy to follow.

	I really do love this camera so far and would highly recommend it.
5 of 5 people found the following review helpful: 5.0 out of 5 stars I recommend this camera, January 11, 2009 By SJ (MA USA)	Easy to use even if this is your first digital camera Produces good results Manual and automatic modes - Great value for its price - Small size, light and easy to carry - Uses AA batteries that are available everywhere - Takes short movie clips also - It does not come with a case so I bought PSC-85 Deluxe Soft Case Also bought a Sandisk 2GB SD card.
5 of 5 people found the following review helpful: 5.0 out of 5 stars Great camera, January 9, 2009 By L. Kollman (Riverside, IL)	I owned a Powershot A70 for years and when I was in the market for a new camera, I thought I would try the Kodak EasyShare M863. I had tons of problems with that camera- flash wasn't working right, (it had to be sent in for warranty repair twice), images were blurry/not crisp and I could not see the LCD screen in bright sunlight (no viewfinder). After so many problems I saw that Amazon had a good deal and good reviews on this camera. I have been using it for a few months now and so far I love it. The picture quality is excellent (so much better than the Kodak), I love that is has a viewfinder in addition to the LCD screen and I love that it is easier to hold and take a steady picture with one hand (the slim cameras are very difficult to hold steady). Another nice feature is that in "playback" mode, you can view what settings you had the camera in when you took the picture which is helpful when playing with the different settings to see what achieves the best picture. My only complaint like everyone states is that it really uses the batteries. The batteries that came with the camera seemed to last a while but once those ran out and I switched to my rechargeables, it seems like I have to replace the batteries after every picture session. I always keep extra charged batteries with me but I don't remember going through them so quickly with the A70. Overall though I am willing to sacrifice a low battery life with high quality, easy to take pictures.
6 of 7 people found the following review helpful: 5.0 out of 5 stars Remarkable Camera for the Money, November 6, 2008 By Yazdikhast	I read a lot of reviews while selecting this camera. Kudos to RLSd, F. Gillett, & Molly P., among others. Forget the stars - it was their accurate realistic detail that really helped. Lacking their expertise, I'll confine myself to a few areas that concerned me until I actually used this camera. This was partly due to other reviews that weren't as well done. First is the size and "chunkiness" issue. It's chunkier than some of its peers, but only a bit. It slides into a jacket or jeans pocket very nicely. In exchange for the chunkiness you get a camera you can grip securely and hold steady. You also get a shape you are far less likely to drop, even holding it in one hand while scrambling over the rocks. Finally, you get a view finder, not just a screen. During a recent two weeks in Greece, that was a Godsend, as the bright Aegean sun totally wiped out the electronic image. Second there is the battery issue. I read complaints from folks who said the camera ate batteries and died after too few shots. I'm not sure what was going on there, but you need to research the batteries the way you did your camera. The new Energizer lithium batteries got off about 400 shots, half with flash, before I had to replace them. And because it was a new toy, I was constantly using the camera to show my shots to my wife, which burned still more power.

	Hard to beat that. Are they the right choice for everyone? Maybe not. They are not rechargeable, so there's an ecological price to pay. Around the house I may switch to something greener, but for overseas trips, I'll stick with them. Another issue is the lag time between flash shots. Let's be real. If you want instant turn-around time, you shouldn't be looking at a $130 camera that uses a pair of AAs. If you want a camera for fast-breaking sports and photo-journalism, don't get this camera. That said, I didn't think it took insufferably long. I can't think of any shots I failed to get due to recycle time. Some folks had tales of woe about taking all these wonderful shots, only to have them disappear from the chip. When the camera arrives, read the little book, esp. the part on formatting your chip. That should prevent such sorrow from striking. Incidentally, one little discussed but really cool feature is the zoom capability when examining photos already in the can. You can zoom in to an incredible degree and find things in pix you've already taken that you didn't even know was there. (Honestly, honey, I had no idea she was topless.) I was stunned by the clarity. Do I have any complaints? A few. The manual is good but it has one of the worst indexes I've ever seen. Don't assume it omits a topic just because it isn't in the index. Flip through the pages and you'll find what you need. On occasion, I was disappointed in the inability of the camera to handle sharp lighting contrasts. Granted, Greek sunlight and shadow can create some extreme challenges, but it's still a limiting factor. The flash is useful but don't ask too much of it. You have to be quite close to your subject, esp. at night. If you are outdoors, it's easy to be too far away without realizing it. I guess that's about it. My bottom line is that I love this camera and I'm pleased and amazed with the shots I brought back from my recent trip. It's a great transitional camera for someone like myself who finally decided to leave his old 35mm gear and give in to digital. The auto setting is really good, but it permits manual control as well. Am still experimenting with that but am encouraged by what I see. I would buy this camera again in a heartbeat.
32 of 34 people found the following review helpful: 4.0 out of 5 stars Canon Powershot A590IS, May 4, 2008 By D. Walters "Florida Boy" (Asheville, NC)	This is an excellent camera for the money! It is small enough to carry in a pocket but still large enough to feel good and have a viewfinder so that you can turn the viewing screen off to save the battery. We have taken several hundred photographs so far and are still on the first set of batteries. The photos are excellent quality and the camera is easy to use but sophisticated enough to allow a wide variety of individual priority's such as aperture or timing. It also has the image stabilizer so that unfamiliar people can take photos without blurring them. I would buy it again without hesitation.
20 of 20 people found the following review helpful: 4.0 out of 5 stars I'm Happy, August 24,	I purchased this camera as an upgrade/companion to my old camera S2 because I needed a smaller camera to carry in my purse, and this camera to be very similar to the S2 -- so I thought I wouldn't have to rely too heavily on the owner's manual to learn how to do everything (this has turned out to be mostly true). This camera is superior to the S2 in many ways. It's lighter. It's smaller

2008 By Molly P. (Portland, Oregon USA)	(about 10% smaller in length and height, and half the size of the S2, depth-wise.) It uses 2 AA batteries instead of 4. It has 8 megapixels instead of 5. Best of all, it doesn't have a separate lens cap that likes to fall off all the time! (It has an automatic lens cover instead.) However, the optical zoom is considerably less on this one (4x instead of 12x) and it's a bit more difficult to take videos (you have to put the camera in video mode with this camera, whereas with the S2 you just had to press the record button.) One thing I really miss on this camera is the rotateable LCD screen that the S2 had; but I guess if this camera had one of those, it couldn't be as small as it is! One of the reasons I chose this particular camera, as opposed to selecting one of the many other, smaller cameras currently on the market, was that this camera has a viewfinder in addition to the LCD screen. Viewfinders on digital cameras are hard to come by anymore, but they are very useful if you're trying to take a picture when it's bright outside (making the LCD picture almost impossible to see.) Overall, I am happy with the camera. I like the fact that it's small (by no means the smallest camera on the market, but small enough for my purse or even a coat pocket). I like that it can take good photos in many different conditions. I am most impressed with its ability to get good shots outside at night, even without the flash. I took a photo of some friends in front of a Ferris wheel at the fair. The sun had just set, so the sky was dark, and while there were lights around from the rides, the lighting conditions weren't ideal. The photo still came out beautiful and bright, with the lights from the Ferris wheel noticeable, yet my friends weren't washed out or too dark in the photo. I also took "experimental" shots of the different rides at the fair. Depending on which mode I used, I could either get a clean shot of a lit-up ride with the black sky in the background, or I could get an "artsy" shot (while the ride was moving) using a setting where the shutter was a bit slower. A few cons: The battery life isn't anything to write home about; I had to change the batteries twice during a recent 5-day vacation (to compare, I only had to change the batteries once on a 10-day vacation with the S2 a few years ago.) Also, I still get blurry photos from time to time, for no apparent reason. The subject is still, my hands are steady, and yet photos can still turn out blurry. This can be kind of frustrating. This used to happen with the S2, too, though, so maybe it's just me. If you want the smallest camera on the market, or one with the most megapixels or zoom capabilities, then this camera may not be for you. If you want a camera that's kind of in the middle of everything (except picture quality), check this one out. For the amount of features it has and the quality of the photos, I think the price is good.
11 of 11 people found the following review helpful: 4.0 out of 5 stars Good Camera - Good snapshots, July 22, 2008	I bought this camera to take with me when my DLSR or my super zoom is just too heavy or too bulky to take along. The old saying is that the best camera for the job, is the camera you have!! I did not wish to spend a lot of money but wanted to still have image stablization, control over exposure and aperture, and decent image quality, all while using SD memory cards since I have many. This camera is a reasonable compromise. The images are acceptably crisp and can be made even sharper in post processing, the manual controls work great, and the

By BostonAaron (Boston, MA)	size certainly allows me to put it into my pocket. If you are looking for a snapshot camera it can certainly produce the goods. I haven't found the slow recycle time of the flash to be a problem and and the rechargeable NiMH batteries I'm using are still going strong after a couple of hundred pictures with about a third being taken with flash. You can adjust the vividness of the color along with the sharpness and the contrast to taste. The exposures seem accurate and exposure conpensation can be used to help with "blown" skies, a problem with many digital cameras, it seems. Having the memory card located with the batteries certainly saves in manufacturing cost (only a single door) but when I remove the card, sometimes the batteries also fall out, but this isn't really a serious issue - I just have to be careful. I do wish that this camera had a wider angle lens (maybe 24 mm equivalent in 35 mm camera terms) since there are times I want effects that these wide angle lenses produce. Of course I knew that the camera did not do this when I bought it and many casual users would probably not miss this feature unless they previously had a camera that a lens of this type. In summary, given this camera's price point, it's an excellent value.
8 of 8 people found the following review helpful: 4.0 out of 5 stars Canon PowerShot A590 IS, December 29, 2008 By Daniel R. Najuch "Dan N." (New York, USA)	I purchased this camera to replace my 3-year-old Konica/Minolta Dimage 6. The Konica had a 12X optical zoom, one of the reasons I purchased it in the first place. But the 12X optical zoom made the camera a little bulky. Too bulky to slip into my coat pocket or a small carrying case. Because of that, I found myself taking fewer and fewer photos. Enter this camera. So far, I am totally happy with this camera. First of all, its size is perfect for me. It fits neatly into a coat pocket, or sometimes into even my pants pocket. Though it only has a 4X optical zoom, its 8MP ability allows me to PhotoShop the scenes I can't zoom in on enough with very little loss of resolution. I take the majority of my photos at the 5MP setting. At this setting, with a 4 Gb card, I can store over 2700 photos. The color settings are great too. I have the options of B/W, sepia, neutral, vivid, and custom. And the vivid setting lives up to its meaning; the colors just pop! I also chose this camera because of the shutter and aperture priority settings; I like to make my own settings on occasion. Most of the compact digitals out there now no longer allow that. But it still has enough presets for those who don't want to fiddle...full auto, easy, program, portrait, landscape, night snapshot, kids & pets, indoor, sunset, and video. Since I haven't taken any video with it yet, I can't comment on that feature. The view screen doesn't have as many pixels as some of the other compact digitals. So if you compare what you see on the view screen with those having more pixels, it won't be as sharp and clear. But don't think that will take away from the actual finished photo...it doesn't. The view screen image on most digitals is very hard or next to impossible to see in bright sunlight. That's why this camera is great. It has a viewfinder; something else one doesn't see much any more. It may seem a bit old-fashioned, but when the sun is at your back and you're trying to frame your subject, and the view screen becomes useless, you'll be very glad you have a viewfinder. All in all, a great little camera; well worth the money. I absolutely recommend this camera. I've heard a rumor that the company has discontinued this model, so get one while you still can.

11 of 13 people found the following review helpful: 4.0 out of 5 stars Not Great, Just OK, September 11, 2008 By NboroGirl (Boston)	I purchased this camera about 3 months ago from Amazon, which had the best price. I spent a bit of time learning about the features, trying them out, testing the camera, and finally, USING the camera. All in all I am mostly pleased with this camera. My previous digital camera was an Olympus D550 zoom, which took great pictures and was very easy to use. This camera is also easy to use, if you want to keep it in AUTO mode, which I often do. If you want to use a different mode or change one of the settings, there are so many different combinations and possibilities that I find it can be a bit overwhelming. I think I just need to get used to it more. I thought I was pretty proficient with it at first, but if I don't use it frequently and consistently, I tend to forget which menu the feature I'm looking for is on. One thing I really like about this camera is the feel of it in my hands. I was torn between one of the smaller Camera SD models and this one, but this camera felt so good and comfortable in my hand, I figured it would be easier to hold it steady. (My sister has a Canon SD camera and it is so small, her pictures often come out blurry because she has difficulty holding it steady when she takes a shot.) My old Olympus was much bigger than either camera, so I figured this camera would be an improvement over it and I shouldn't worry so much about the size. I also liked the idea of having it use AA batteries, vs. the rechargable one in the smaller cameras. (While on vacation, my sister would go to take a picture and lament that her battery needed charging. With AA batteries, if you run out of power, just go buy more.) I am pleased with the photos I have taken so far, for the most part. It does not do well outdoors at dusk, but my Olympus didn't, either, and I suspect more savy users would know what to set to make these kinds of photos come out better. One thing I noticed in a lot of my photos is that if there is a lamp or light near the subject, or if the subject is near a window letting in bright light, you'll get a bright, overexposed area in the photo. I never noticed this problem with my Olympus, and friends/relatives who have taken shots of the same subject with their cameras did not have this problem. For this reason I am taking away one star. One thing I was concerned about after reading a lot of the reviews here was bettery life. I preferred a camera that ran on AA batteries, but not if it was going to eat up batteries. My Olympus ran on 4 AA batteries, so I bought rechargeable ones. This camera only uses 2 AA batteries, so I figured I'd be changing batteries often. Not so! I started off using the 2 Panasonic batteries that came with the camera. I figured I'd use them up just playing with the camera. I kept turning it on and off as I was reading the manual, trying the different menus and features. Surely they'd be dead in a couple of days. Nope. I took many test shots in different lighting, with different settings, and downloaded them to my laptop. Still the batteries continued working. I took a LOT of photos at my and my husband's anniversary party, when all our relatives came in from out of town, but still the batteries lasted. Then I took the camera on a trip and took many more photos, then a couple of birthdays, then my son's college apartment and STILL the batteries lasted. (I must've taken over 100 photos, not to mention my training sessions). It's been a month since I've used the camera and just now I noticed the low battery warning is coming on, so I replaced the Panasonics with

	2 rechargeable batteries. I am happy with my purchase. When I compared photos that I took with my camera with the same photos my relatives took with their digital cameras, many of them much more expensive than my A590, I generally preferred my photos, and at the very least my photos were equally as good. As I mentioned above, the only photos that weren't as good was when there was bright light from a window or lamp near (though not necessarily behind) the subject. UPDATE 12/15/08: The first time I reviewed this camera, I had only used it on a few occasions. I was pretty happy with it at the time. However, it's been six months and the more I use it, the unhappier I become with it. It's enough to make me consider buying a new, different camera. I wonder if it's too late to return it. Yes it's easy to use and yes, it has a lot of nice features. But generally it doesn't take very good pictures. Some shots come out very nice - especially ones taken outdoors in full light. But there are too many problems with pictures taken if the light isn't just so. If there is a light on in the background, you get bright halos around the light source. If you use natural light on indoor shots, the colors look washed out. Even indoor shots taken with the flash look washed out. Then there's the problem with batteries. If I buy regular batteries, they seem to last pretty well. If I use chargeable batteries, I get about 2 or 3 shots before the low battery light comes on, and maybe 2 or 3 after that before they need to be replaced. Someone suggested that maybe the problem was with the batteries or my charger, but I didn't have this problem with my old camera, which used the same batteries/charger. The fact that regular batteries last much longer does give merit to this theory. I now give this camera 2.5 stars because of the so-so photos it takes, and the somewhat faded looking colors. If I had to do it again, I would buy a different camera.
4 of 4 people found the following review helpful: 4.0 out of 5 stars Excellent camera for snapshots, December 23, 2008 By Lonnieatkinson "Lonnie" (Portland, Or)	The good: I bought this camera for it's excellent price and brand name association. It's a great camera on the go. Takes AA batteries (get rechargeable for extended shooting time) a big plus in my needs. Takes incredible sunset pictures, indoor pictures, Landscapes, movies are excellent too. Most all pictures turn out great nearly every time. Image stabilization is a bonus for the price. The limitations: Longer than normal cycle time when taking flash photos or outdoor bright photos. Macro leaves much to be desired. Many other point and shoot cameras have amazing macro ability. This camera does not. Zoom function while nice has a tendency to introduce blur with or without the image stabilization on. Overall, I love this camera. For the price and it's multitude of functions and the easy mode which is perfect for those who just want to turn on a camera and take great pics, this is a perfect camera. Note: I have taken over 4,000 pictures with this camera. And take it with me everywhere.
3 of 3 people found	For a point and shoot, you can't beat the value on this Camera. It is intuitive to use, has an "easy" setting, and produces great resolution in the photos. My wife

the following review helpful: 4.0 out of 5 stars Awesome Pics, Slow Flash, December 20, 2008 By Christopher P. Jones "Chris" (Albuquerque, NM, USA)	(not mechanically inclined) is able to take photos that rival professional quality. The video function works great, and you can even zoom while filming, something our previous camera wouldn't do. The only drawback is the long wait for the flash to reset, but that is offset by being able to use rechargeable AA batteries. Would highly recommend this camera. My mom is buying one for my dad this Christmas.
2 of 2 people found the following review helpful: 4.0 out of 5 stars Great camera, January 10, 2009 By Zico Gordon (Kingston, Jamaica)	I bought this camera b/c it was so similar to my first ever digital camera which was excellent but as time went by I decided to upgrade and was conned into buying a panasonic lumix LS70. It took crappy pictures even my old Camera took better pictures, so not even a year and I decide to get a new camera and bought this camera and I am not disappointed. The camera takes excellent pictures, easy to use if I just want to take some quick shots and good manual settings for when I want to experiment with taking some shots. I actually like the size, most people may not like it but I am notorious for dropping my tech items and it would be the death of compact cameras in my hand. Even with its size it will fit in a average sized jeans pocket or even a small purse in the case of a woman. The only setback why I gave it a four is that when the flash is on there is a delay for taking the next shot but I believe most can live with that. Advice - get some 2400nimh AA batteries it helps with the lag. Highly recommend
2 of 2 people found the following review helpful: 4.0 out of 5 stars Nice camera, some slight issues, January 4, 2009 By Good Gracia (Upper Michigan)	My son bought this camera for me this Christmas and I'm still learning how to use it, but I'll do some pros and cons here: Pros: View finder, large LCD screen, great macro setting, nice size with hand grip. Cons: Long delays between shots, grainy at long range, flash too bright, no neck strap. I really like the feel of this camera, and I love the view finder, but overall it's a step down from my present camera. I have a Konica Minolta Dimage Z20, 5 megapixels and 8X optical. I love that camera but it's too bulky to take everywhere. It doesn't have the image stabilizer but it seems to take clearer pictures than this camera does. However, the macro on this camera is much better than the KM, and that's important to me. I'm really concerned with the long delay between shots, and if anyone can tell me how to fix this, I would appreciate it. I'm not especially techno-savvy and that thick manual is pretty intimidating! (But at least it comes with a manual.)
2 of 2 people found the following review helpful:	I'm not the most technical person so keep that in mind =) I bought this camera to replace out 5 year old Kodak EasyShare DX4530. It was dropped one too many times and gave up. I would rate that camera as a 5 star

4.0 out of 5 stars Excellent for the price, December 30, 2008 By K. J. Lehman (Chicago IL)	(non professional) camera as a comparison. I did not want to spend a lot and the reviews and price on this camera were good. I have had it for a couple months and have been pleased. The pictures, for the most part, turn our very nice. There are many options for picture taking ie...kids&pets, portrait, action, etc. and other setting to play with if you know what they mean or do. I mostly keep it on auto. Low light picture taking is difficult. The flash is VERY bright so if you want mood lighting (taking a pic of kids blowing out candles) you are out of luck! The flash tends to wash things out, especially if you are a little close. The contrast in pictures is something I regularly have to fix with photo editing software. I sometimes also have to fix the definition as pictures sometimes come out soft. I have had an issue with odd reddish shadows once in a while but I'm not sure why. Zooming in on things makes them a bit grainy. The video feature is great! You would not want to use the camera as a video camera but if you need to catch that spontaneous moment, it will do. The camera itself seems sturdy. The rubbery plastic door that closes over the USB port is the only part I'm concerned about breaking. For a small camera it is pretty heavy. If you want something to slip into your jeans this is probably not the right camera. It is perfect for a small purse though. It is small in length and height but it is pretty wide because of the battery compartment. For the price, and as an everyday camera, I am very happy.
2 of 2 people found the following review helpful: 4.0 out of 5 stars I like it., June 14, 2008 By jth747 (WV, USA)	I bought this camera for a pocket, take it anywhere. It takes great pictures, just the right size for a small camera for my hands. Despite this, i have dropped it twice, once on pavement, once on concrete. To my amazement, it survived unscathed both times. Can't guarantee these results, but I am pleased. Only drawback I see is it is mediocre on battery life. Highly recommended.
6 of 8 people found the following review helpful: 4.0 out of 5 stars Not bad, May 28, 2008 By Bonds (Northglenn, CO United States)	Let me start by saying I returned this camera already. The main reason was because the wife wanted to go back to something smaller aka a subcompact camera. I had to agree with her there after a few days of using the camera. Second, she did not like the recharge time between flash pictures. I didn't time it, but it seemed like at least 5 or 6 seconds. I guess that's fairly typical of cameras with 2 AA batteries, but I could be wrong. The subcompact we had before (Canon SD600) seemed alot better in this regard. It used a proprietary lithium rechargeable battery though. My beef with the camera was the video wasn't as good as our previous SD600 camera. And I guess the specs don't lie because they state 20 fps for 640x480 video instead of 30 fps with most other digital cameras. The Image stabilization seemed like it made the video more stable, but it also made panning with the camera more choppy. It wasn't a huge beef as I don't take alot of video with a digital camera, but it was annoying they made the video worse. I also thought the construction was a bit cheap with the shell of the camera being plastic instead of metal. The zoom lever seemed a bit cheap too.

	Now the good. I like the dial on the camera. It lets you quickly select a shooting mode. Very handy. On a subcompact you have to select modes through the menus at least on the old cameras we had. The pictures seem fairly nice. I wouldn't say they were better than our previous camera, but certainly I didn't notice they were that much worse either. The fact it uses AA batteries is convenient because AA batteries are everywhere and the access to the batteries, memory card and ports are easier to work with. (It's not as tiny as on a subcompact.) And this camera has lots of manual settings. ULtimately though the camera wasn't as sleek and small as the subcompact we had before. It didn't take as nice of video and it seemed slower in between pictures specifically flash pictures.he only advantage to this one over a ~$200 subcompact would seem to be the convenience of AA batteries and a slightly greater zoom although perhaps some would find a larger camera easier to hold.
1 of 1 people found the following review helpful: 4.0 out of 5 stars Great camera for close ups!, May 17, 2009 By Happy Mom -	I bought this camera specifically to take close up pictures to upload onto my etsy shop. [...] if you want to see how well the pictures come out. They are awesome. The only problems I have so far is short battery life (I'm not sure if that's my fault for not turning the camera off??), and the pixels were actually too big for etsy. Reading the owner's manual showed me clearly how to change the pixels, and it even displays the pixels on the camera in case you forget what the symbol stands for. The pictures for my shop were taken with the flash off, and macro (flower icon) on. It also takes nice crisp photos of the family, red eye doesn't seem to be much of a problem, and the images all look really good - even when I was just taking practice snapshots of my husband on the computer, kids giving me silly looks, etc. My aunts, both artists and photographers, both have this camera as well and highly recommended it to me. One aunt pointed out how easy it is to use the buttons - they are well placed on the camera. Consumer reports also had good things to say about this camera.
1 of 1 people found the following review helpful: 4.0 out of 5 stars Novice photographer, April 16, 2009 By Big Belly "Big Belly" (Ohio)	I am a complete novice photographer looking for a snap shooter that would help me take better photos. I have no idea how or why I would want to set an F stop (to give you a better idea of my skill level). After reading through the manual and using some of the different predefined settings, I was able to snap some pretty acceptable photos. I really like the face identification feature. It helps. You do need to be judicious with the digital zoom. A little too much and, well, grainy would be the best description of the outcome. All in all, the camera is easy to use and does a pretty good job
1 of 1 people found the following review helpful: 4.0 out of 5 stars One major problem if . . ., March 24, 2009	First of all, going from a 3 Megapixel camera I bought five years ago and found totally adequate to finally getting this 8-Megapixel wonder is an incredible experience. The fact that I paid 1/3 less for this camera than my previous digital snap-shooter makes the experience even more incredible! It does everything as advertised for the tyro AND advanced photographer. Put it on Auto and you just press the button and an acceptable image appears on the

By Jan Sershen "Hyjanks" (Canon City, CO USA)	LCD screen and goes into memory. Go through the Menu, set white balance, maximum resolution, aperture or shutter speed and you've got the potential of producing a really good shot. As the title for this review suggests, however, there is one thing about this camera that I found disturbing. It's the "press the shutter button half way to focus then press all the way to take the picture" maneuver that is not overridable in the Menu. This may not be a problem if the purchaser is the only one using this camera, but give it to a complete stranger to take a picture of you and the wife in front of the Golden Gate Bridge and you are going to end up with a picture that will probably be out of focus. Let's face it, the average Joe you give the camera to to take a picture of you will have no idea of what you're talking about when you instruct him on proper shutter button etiquette. A second, minor thought. After reading the instruction book thoroughly, one is left with the impression that the largest capacity SD card it will accept is a 512 Megabyte job. Which is not true. I loaded an 8 Gigabyte, Sandisk Ultra III card into the slot and it works perfectly. All in all, I would recommend this camera to snap-shooter and advanced photographer alike. Just don't toss the thing to a fellow tourist to take a picture of you unless you want the image to be out of focus.
1 of 1 people found the following review helpful: 4.0 out of 5 stars point and shoot for grandma, January 8, 2009 By Essie Shoemaker (Midwest, USA)	We have another model and bought this as a gift for my 80 year old mother who had expressed an interest in a digital camera. (And also purchased some rechargeable batteries and a recharger). It is not a pocket size, but it is pretty small. It seems to take fine pictures for her purposes. With a short hands-on experience, she is comfortable with it. Despite a little arthritis in her hands, she can open the battery/SD card compartment to change batteries or take the card out for reading on her computer. We chose it because it had a view finder as well as the screen. (I appreciate using the viewfinder when I don't have my reading glasses handy since then I can't focus well on any 'screen'. I imagined that the same would apply for my mother). It can be a little slow in taking pictures, but from our experience with another model, that will be alleviated when we get a fast (class 6) SDHC card for her. It came with a 512MB card that was nothing special. It would be sensible to upgrade that as soon as possible with something like a 4 or 8GB class 6 card and high speed card reader. The only thing I do not like (perhaps I just didn't read the manual carefully enough to figure it out) is I cannot change the stored image names to a more unique and identifiable naming scheme that uses the date in the name. The best I can do is specify that it never reuse a number over, but it starts at img_0001.jpeg and goes from there.
1 of 1 people found the following review helpful: 4.0 out of 5 stars Great Camera, January 7, 2009 By H. Bailey (TN)	Plenty of features in a compact design, a great camera for beginning and intermediate photographers. The camera isn't quite a shirt-pocket camera, but small enough to be easily carried. The 2.5" LCD is bright and crisp. The only issue with the LCD is the 'noise' in low light conditions or when using the digital zoom. The noise is filtered out of the picture, but is still visible in the LCD.

	The red-eye reduction feature is buried in the menu system, which makes it difficult to easily turn on or off, but the function can be assigned to the print button for one-touch access. The red-eye reduction feature works extremely well compared to older generation cameras. A lamp is used prior to exposure to reduce red-eye and any red-eye you may get is removed during processing. The various shooting modes are great when used as intended. The action shot (high speed shutter) was available on older models, but is missing on this model. I have yet to blur an action shot, but I've only taken action shots in bright sunlight. If you need a faster shutter in low light conditions, it can be manually adjusted in the Tv mode. Once again, plenty of features, and plenty of manual adjustments for the creative photographer. If you intend on shooting 8MP photos, invest in a good SDHC Class 4 or better memory card. The SDHC cards have faster transfer rates than standard SD cards. The class rating on SDHC cards indicates the minimum write speed in MB/Sec. A class 4 SDHC card will write an 8MP photo to memory in slightly less than 1 second. A faster write means you're ready for the next shot sooner.
1 of 1 people found the following review helpful: 4.0 out of 5 stars Excellent outdoor camera, December 19, 2008 By Archman (Lincoln, CA USA)	Purchased the camera to take pictures on our Hawaii cruise. The following reflects our requirements: 1. Small and portable with good grip (not too skinny) 2. Good zoom (3x or higher) 3. LCD and viewfinder 4. AA batteries 5. Inexpensive 6. Image stabilization 7. Good reviews from amazon After considering other point and shoot cameras, my wife and I settled for the 590IS. It met all of our requirements and the pictures came out amazing. Almost all of the outside pictures had exceptional details. It made cropping and reducing picture size for sending out to friends and families very easy. One buddy (photographer) noted how well this camera took pictures inside the house....not too noisy (within 5 feet, further and you will need an external flash which is expensive). Another photographer buddy actually recommended this camera independently of my research. We are glad that we received this camera prior to the trip. We are truly delightful with the results. One note for those taking a lot of inside pictures. You will need an external flash unit (High-Power Flash HF-DC1 - about $100) to get good pictures beyond 5-7 feet. I will start trying the manual controls for some creative picture taking.
1 of 1 people found the following review helpful: 4.0 out of 5 stars Good buy for the price, but there are better cameras out there, December 17, 2008 By Modern Blue	This camera comes with no internal memory at all, which I found to be a downside. A 32 MB SD card was included which holds a couple dozen photos, so you'll want to order a higher capacity one with this camera. I bought the Transcend 4 GB SDHC SD Class 6 Flash Memory Card TS4GSDHC6E [Amazon Frustration-Free Packaging] and it can hold over 1000 photos taken at full resolution. The battery life is excellent on this camera. I've already taken 150+ photos with the children and the batteries have not yet run out.

Argonaut "Exploring our world one...	What most impresses me with this camera is one of the few point and shoot digital cameras that can accept a wide angle or telephoto lens. I plan to order the wide angle lens and put it into my daughters stocking. (Just google search for lens and several options will show up.) You can also add filters or an underwater kit. I love that it's so versatile. It's also very, very well made, but heavier than most point and shoot cameras.
4.0 out of 5 stars Canon A590IS good for a cheap entry level camera, October 24, 2009 By Lance D. Ripplinger (Jackson Hole, WY USA)	This series of cameras is the entry level and cheapest generally of the company's digital cameras. They use plastic bodies and are not as nice a quality as the Digital Elph line they make. That said, if you are looking for a camera in the entry level, that also runs on AA batteries (Their Elph line uses a rechargeable Li-ion battery pack), these are the way to go. This particular model has all the features you would expect on much more advanced models at a cheap price. You get all the auto modes including various scene mode options (although no Sport mode) and full manual modes on the camera as well, which enable you to pretty much do whatever you want with the camera. That is a plus if you are a camera buyer looking for something to learn and grow into, or in my case an avid Digital SLR user who wants a small camera when lugging around your DSLR and gear is impractical. The specs on this camera: 8MP sensor with Digic III image processor 4X optical zoom 2.5" LCD with viewfinder as well (a rare thing these days) Face Detection The lens is also Image Stabilized to reduce blur and camera shake. Power source: 2 "AA" size batteries Pros in my opinion: A full line of manual features (for example the "M, P, Tv and Av modes) "AA" batteries for power, although many out there don't like them. Its just my preference. If you are on a trip, and you forget your charger for your camera that uses one of those Li-ion batteries, you're screwed. With this camera, you can buy batteries anywhere. I use Duracell's rechargeable 2650mAh rated NIMH type and I seem able to get around 400 shots before putting new ones in. The camera is also easy to hold, because of the large grip. Most of the new A line have been shrunk and don't have the same grip anymore, which I don't like. Cons: The lens mechanism is slow when you want to change your focal length. The noise in the images is pronounced, even at pretty low ISO's because of the fact that 8MP is packed onto such a tiny sensor. I don't know if that problem can ever be solved. But, I haven't really played with the newer models, because maybe they do better now. Potential lens problem: the lens gears fail and the lens no longer retracts. This is pretty rare though, and newer models seem to have that issue worked out better. No Sport Mode! You can forget trying to capture fast moving subjects very well. Even after the cons, I would reccomend it if you want an inexpensive camera or you are looking for your first digital camera. They have better reliability than other brands in this class of camera (especially over Kodak and Olympus!). I make this statement based on my years of experience selling these products. I

	have rarely seen this camera come back with problems. The only real problem I have seen on it is the lens mechanism failing. So all in all, I recommend this camera. It beats the competition for quality and features. Also note, I recommend you use a type 4 or type 6 SDHC memory card, not the slow type 2 SDHC cards. The faster cards make the camera operate much better in terms of responsiveness. I use Sandisk's Ultra II line of card. They read and write up to 15mb /s and make a big difference over the slower regular line of cards from them or any other manufacturer for that matter. I hope this review was helpful on deciding on this camera. In my humble opinion, they are the best at this price point. :)
10 of 11 people found the following review helpful: 3.0 out of 5 stars Canon A590IS - Possibly Good Camera With Some Flaws, January 31, 2009 By JWCPA	I would rate this camera only as average at this time because of the battery problems outlined below. Have not used the camera enough to rate the quality of the photos, features, and general operation at this time. Also, the included SD card with the camera was a measly 32 MB, basically nothing in this day and age of large image files and cheap memory. To get decent photos capacity and a spare, I bought two on-sale Kingston 2 GB SD cards, one from Meritline.com for ca. $7 (free shipping) and one locally at Inkspot for ca. $5. My advice to others is that if you suspect your camera has a problem not due to your use/handling and the camera is still under warranty; return it ASAP for repairs. I bought camera early last December as a Christmas present, from Amazon since it seem to have the best price at the time including free shipping. Selected this camera model based on Consumer Reports' recommendation, mostly favorable user reviews on Amazon and some other websites, and the camera price and features. I was a bit concerned about some reviewers complaining of low battery life, but thought perhaps they were a small minority, maybe their problems were due to the way some used thier cameras/settings, and there's always a few lemons sold in any product line. 2. The camera out of the box seemed to be functional for all the features I tested, but after playing with the camera to learn how to use it, and a few dozen shots, the low battery inidcation came on. after a few number more shots (est. a few dozen), the battery replace indication came on and the camera shut down. These were the Panasonic alkaline AA batteries that came with the camera. At this time my voltmeter measured the batteries at ca. 1.35v. 3. To reduce power use, changed some settings to turn LCD off after a short time, and the IS (Image Stabilization) from always on to on only during shots. Put in new Berkley & Jensen (BJ's) alkalines, same low battery indication after a few dozen shots. After about a dozen more shots, the replace battery indication came on and the camera shut down. After checking the battery contacts, letting the camera sit for a while, etc., no change in behavior, i.e. camera can be turned on for a few shots with low battery indication on, then change battery indication comes on and camera shut down. The BJ's batteries voltage was 1.45v at this time.

	4. A friendly camera repair place person told me about the company's website online repair setup and gave me an Internet address, but even then it was not easy to find page, the website search did not find it for me. Go to any consumer camera model support; look at the bottom part of the page for links to "Repair Request" or "Repair & Tracking. Gee, I wonder why their web site doesn't make it obvious, could it be that they really don't want to hear from us, especially for warranty stuff... ?!?! So I decided to return camera for warranty repair (no cost except my shipping camera to them). I mailed the camera (included 2 sets of batteries I used) to the company's Elk Grove Village, IL facility by US Mail, insured and with post office deliver confirmation. They received it in a few days, confirmed receipt to me via E-mail, and I received it and my batteries back by FedEx ca. 3 days later. Factory documentation returned with the camera noted that: - Low batteries was cause of problems, said nothing about any adjustments ("Unit has battery shortage. Check all functions, repair to good working order."), but since the camera behaves differently after getting it back, I suspect they adjusted both the battery low and the battery replace indicators' voltage threshold settings even though nothing was said about it. - "...found the optical assembly was inoperative and the focus did not operate properly. Adjustments were carried out on the optical assembly." I did not notice any wildly out of focus photos by the out-of-the-box camera using the Auto focus mode; perhaps they're addressing the manual focus mode that I did not test. 5. After I received the camera back from them, I put in the original used Panasonic and BJ's akalines (approx. 1.35v and 1.45v, respectively, similar to as previously measured), and still got the low battery indication with both sets. 6. Decided to put in a new set of BJ's alkalines, measured at ca. 1.59V. Camera set for AUTO mode, IS on only during shots, face detection on. Occasionally used the zoom feature, once or twice for every 25 set of shots. - After 100 shots in succession, most with flash used, battery voltage checked to be ca. 1.43v. - After 32 more shots, low battery indication came on, did 12 more shots, turned camera off, batteries checked at ca. 1.35v - When camera turned back on, low battery indication not on, but came on again after 5 shots. When got up to 191 shots total, camera to off, batteries checked to be ca. 1.38v. - Turn camera back on, low battery indication on again after 13 shots, camera off, checked batteries at ca. 1.34v. - At 204 total shots with the set of new BJ's alkalines, the battery replace indication came on, and the camera shut down shortly after. Can turn on camera again of 2-3 shots before the replace indication/shutdown occurs again. The number of shots here appears to match the camera manual specification page that list ca. 200 shots for akaline batteries.

	7. For the second set of testing, I used a fully charged set of Ultra Pro NiMH 2500 mAH-rated AA batteries (ca. 1.43v - 1.45v measured). Made all shots indoors, those where flash used were of house interior, those without flash used was through window (daylight). - Erased all the previous 217 images from the SD card. - After 150 shots, half with flash, half without, no low battery indication, turned camera off for ca. 45 min. for lunch. - When camera turned back on, low battery indication showed, camera off, checked batteries at ca. 1.33v. - When camera turned on, no low battery indication showed, but indication showed again after 23 shots using flash, continued to 25 shots using flash. - Continued shooting 25 shots at a time alternating between flash and no flash, for 175 more shots. After a total of 350 shots (half with flash) have been taken with the NiMH batteries, batteries measured ca 1.27 - 1.29v. - Continued shooting 25 shots at a time alternating between flash and no flash, for 150 more shots. After a total of 500 shots (half with flash) have been taken with the NiMH batteries, batteries measured ca 1.26 - 1.27v now. At this point, I gave up test shooting, as I have not seen the battery replacement indication after 500 shots. The number of shots here appears to in line with the camera manual specification page that list "approx. 450 images" for NiMH batteries. Fooled around for few more test photos, and the battery replace indication/camera shutdown occurred after ca. dozen flash shots past 500. 8. Some observations about the camera: - It looks like I'll have to accept the low battery indication on most of the time. My guess is that there some kind of design and/or manufacturing defect where the camera electronics/software does not accurately detect how much of the battery capacity is remaining. Judging from the various user reviews, it may not be present in all sold units of this model, as not everyone sees this problem. However, if the camera can perform OK for several hundred shots until the battery replacement indication/shutdown (esp. with NiMH which I want to use), I can live with that. - The flash can take more than 5 sec. to recover for the next flash shot. - The camera seems to work differently on alkalines vs. NiMH 2500 mAH-rated rechargables, as it continues working at lower voltage for rechargables. I know that the discharge curves, and capacity and voltage ratings for the alkalines and NiMH batteries are different, the alkaline are rated at 1.5v (actual ca. 1.6v new), and rated capacities numbers can be similar to the NiMH (over 2500 mAH). The NiMH batteries are rated at 1.2v (actual ca. 1.4v new), capacities can be vary (typ.1000-2800 mAH). The initial voltage of both battery types drops fairly quickly from their nominal ratings during use but after the initial drop, the NiMH types tend to have a flatter voltage vs. use time curves than the alkalines. - Since battery monitors typically can only see voltage as an indirect measure of capacity remaining, why should the camera decide that the lower NiMH battery voltage is still OK, while a higher voltage on the alkalines is not? If the alkalines and NiMH rated capacities can be simialr, why don't they perform similarly, or are the alkaline capacity ratings done differently than the NIMH? The camera's documentation implies the camera treats the battery types differently as it explicitly notes the performance difference in their camera spec. for nominal number of shots for alkalines vs. NiMH batteries. My Internet research also seems to indicate that the battery rating numbers may or may not all be done via a standard method, and different manufacturers' batteries can

	perform significantly differently under the same conditions, so as to make the capacity ratings less than useful.
8 of 10 people found the following review helpful: 3.0 out of 5 stars Canon goes cheap, in a bad way., September 6, 2008 By Happy Jester "happyjester" (FL, USA)	Just a note to anyone consider this camera. I bought mine and tested for 3 hours. This is to replace my older camera (Which is not a perfect camera, but quite a good one!) Short story: Stay away from it, it is not better than the 3 year old camera! Very disappointed at them for putting out this subpar product. CONS: -Pictures are soft, almost out of focus. Compared A/B with the 510 on same shots identical settings at 3 Megapixels. 510 wins hands down. -Plastic case instead of metal. Cheap and light feel. If it falls, it is toast. -Screen is larger, but also are the pixels. So, same resolution at a larger screen = very poor poor LCD image quality. -Most of the advanced features, such as focus review etc, rely heavily on the LCD, which is of poor quality, so the new features are useless! -Uninmpressed by the Image Stabilization feature. But maybe I was expecting miracles here. -No Panorama mode. (510 had a stitch mode where you could panel Left to Right and overlap the pics). I used this a lot in the old camera. -Batteries and SD card in same compartment. When I take the SD card out, the batteries tend to fall out. Its just a cumbersome process! -The so called 8 megapixels in this CCD are a bit of a joke. There wasn't a huge difference between taking a 3 megapixel pic and stretching up in Photoshop, compared to the same pic at 8 Megapixel. Very soft!
3 of 3 people found the following review helpful: 3.0 out of 5 stars Canon A590: Impressions So Far, April 22, 2009 By Robert Fleischman (St. Louis) -	I bought this camera so my wife could break into digital photography. She wanted a digital P&S that had an optical finder. There are not too many of these--this brand is the only one I could think of, and not even all models of this brand have an optical finder. Some just have the LCD screen. I tried a few shots at home before we left on a trip to Europe. It seemed to be working all right, so we took it along. She also brought her trusty Olympus Stylus film camera, "just in case." Here's what we found out: first, the camera turned out to be a battery eater. According to the instructions, you should get about 200 shots on a pair of AA alkalines. Well, my wife got more like 30 or 40. One set of batteries was good for about 4 to 6 hours of shooting. She couldn't get a whole day of shooting out of it, even though she turned the camera off when not shooting. Fortunately, I had several sets of spares along. When these ran out, I bought four Kodak AA alkalines in a Paris store. They were gone in a couple of days, so we made a shopping thrip and bought some German batteries. They were maybe a little better--she shot for several hours in the Musee de l'Orangerie. I am thinking the camera may be defective. No chance to follow up on that yet, as we just got back. I had a scare: the pictures viewed on the LCD screen had an out of focus look. I worried that all her pictures might be bad. But the good news is that after

	downloading to the computer, her shots, viewed on my 17" monitor, are tack sharp! A fine lens! There were only 2 or 3 unsharp shots out of 579 total, and they are probably ther result of operator error. I can also say I'm very favorably impressed with the its color management. Good, satisfying color that does not disappoint. I don't think the dynamic range from highlight to shadows is very great. The camera, in the hands of an amateur with no time to learn photography, produced quite few blown highlights on scenes that ranged from shadow to bright sky areas, and definitely favors the shadows, which remain readable at the expense of blown highlights. Probably an exposure tweak toward the underexposure side would help things a lot. Of course, almost all digitals are limited in this regard; point-and-shoots perhaps more so than DSLRs. So, summing up: Image quality: Excellent, for such a small camera. Color management: Very good. Exposure latitude: could be better. Ease of use: pretty good! Battery life: A big problem with our sample. We may or may not have a defective sample, and this needs to be followed up on. I'll try to post a followup note when I find out more.
2 of 2 people found the following review helpful: 3.0 out of 5 stars Can it be or was it bad luck?, May 30, 2009 By Andy Sharon (Oregon, USA)	Bought this camera as a present to my son before his trip to the far east. I looked for a reliable and advanced camera. I have several cameras of this brand and as such assumed that this one is a natural candidate. To our regret, after being in use for 2 months, the lens retractor ceased to work and the camera had to be repaired. Of course, as it was bought in the US, the warranty was uselees. We had to pay. Second time, the shutter had to be readjusted and we paid again. Pictures are good and the 8MP render very clear and sharp photos. Pitty we had to spend time to fix it twice. It is not an easy job when one traveles on the far east countryside.
1 of 1 people found the following review helpful: 3.0 out of 5 stars Same battery problem as Mary R, May 9, 2009 By M. Karpowich "his mom" (Florida)	We bought this camera as a replacement for the A75 at Xmas for our son. The first thing we noticed is the depletion of batteries. They seem to drain very quickly. The A75 used 4 re-chargeable batteries and lasted a long time. This one eats batteries, even though, I suppose 2 shouldn't last as long as 4 these don't last at all. I haven't figured out what to do for our upcoming trip. I'll probably have to lug 2 digital and one cam on the trip. Along with beaucoup batteries. We're gong cross country this is going to be a pain. I'm glad it isn't just my imagination, but a real problem. I'll have to wait to have the company fix it as the trip in in less than 10 days. We had the A75 ccd problem fixed after a similar trip 2 years ago and ruined photos of one of a kind that couldn't replicated. This should be fun.
6 of 9 people found the following review	In looking for a point and shoot for my aged mother who is very anxious to embrace digital photography, I was naturally drawn to this camera based upon

helpful: 3.0 out of 5 stars A warning to those with less than nimble fingers.., November 28, 2008 By D. White	it's popularity and reviews. Here's the catch - the ergonomics of this camera, while OK, are not suited by any stretch to those who may be challenged with even the slightest hand/finger challenges. This applies pretty much across the board to most point and shoot cameras, and smallish electronics - they're just not comfortable unless you've got young nimble hands. Why can't these manufacturers take into account those who are a bit physically challenged as well? It's because they design in vacuums - I challenge them to put on a pair of lightweight gloves, then design. At least that will give some perspective.
2 of 3 people found the following review helpful: 3.0 out of 5 stars A590IS - Awful battery life, February 17, 2009 By Mattie's friend "offshore1" (Melrose MA USA)	I've had this camera for only about a month now. I didn't expect the two AA batteries or the SD card that came with it to be anything spectacular. They weren't. Replaced the card with a 1gb eFilm PRO SD card and solved that problem. But the batteries -- After the supplied batteries quickly died, I replaced them with a pair of 2300 mAh Lenmar rechargables - fully charged. I expected to be off and running with a reasonable amount of battery life on hand. Not so. That wretched little, red low battery flashing icon came on in less than two hours of non-constant camera use. Two additional, freshly charged, batteries had the same result. I'm thinking this may be partially my fault as I did use the LED screen and flash about half that time. But I really do think I should have gotten more use from these batteries. So, I have purchased a pack of four Sanyo NiMH, Eneloop batteries and await their arrival. I did a lot of research on which batteries to purchase and try, and these seem to come out on top. It is claimed these particular batteries don't leak juice, just sitting there, the way others will. I have a Nikon dSLR and a Canon SD870IS and I'm just not used to low battery life. I wish this camera had the same type of battery that's in the 870. Perhaps I see the need to change the approach I have of tending to battery life with my use of this camera. I've shut the LED off (on the 590) except for a few seconds of post-view after a shot. I have to use the LED to compose with the 870IS, but won't with this one. I also find that it gives me a "softer" print than the 870, but I can live with this. I really only want it as a camera that can travel with me that I dont have to worry about. But, it would be nice to get some mileage out of it if I'm along the coast of Maine, or some such place for the day where it would get a good amount of use. I do really like this camera, but give it only three stars because I have no confidence in it's ability to last a reasonable amount of time. It hasn't done that yet. Perhaps the new batteries and my new approach (which I don't really think I should have to take) will make a difference here. I'll edit this whole thing if that's my experience after a reasonable amount of time. Maybe I should have gotten a new model and use 870IS as my travel companion. That would have been a great idea, but the 870IS is too expensive for the casual attitude I could have with this camera. Again, I do like this camera, but it does chew up the batteries - at least for me. I hope that changes. If it does, I'll report that. Until then. . . .
3.0 out of 5 stars Quality problems mars an otherwise great package, March 22, 2009 By Y. Chang "ciaconne" (Mamaroneck, NY)	I know it's probably a bit too late to write reviews for an end-of-life product, but I got mine on clearance sales. The camera is the last of this series: bargain basement prices packed with pro-sumer features like manual exposure control and AF. Coupled with CHDK, it presents an unbeatable value. The latest series seems to have removed all the manual controls, dumbing it down as a cheap low end point and shoot camera, for good reasons: you'll have to pay up for those controls, which is now available only starting from other line.

	Other fortes have been harped ad nauseam, so I will not elaborate. My problem with this camera has been its quality control, and in particular optical quality. I have bought mine on clearance from Staples in about February of 2009, loaded CHDK, and shoot away. The camera appears to be fine, except the image has a severely blurred out upper left corner. So severe you can see in even small images. I tried to overlook the problem, since it worked well otherwise. However, I couldn't get over it, since it is just too obvious and too fatal a flaw (what good are the features if image quality doesn't deliver?). So I got another one at another sale. The new one had weird clicking noises when lens zoomed out at power-on, and isn't as smooth when zooming. There were also some scratches on the body, and weird black gunk on the lens barrel. The image results also showed a severe blurring across the entire top 15% of the image, which is quite bad. I exchanged that one, and the new one had similar lens clicking noise when power-on, also not as smooth as the older one I had when zooming, but it wasn't as bad. Still, I thought I'd probably got the best copy from my first purchase, and should be content. That is until I did a side by side comparison of the images they took, since I got the new one to see if that would take care of the corner blurriness problem. Quite to my shock, it is better across the entire field: simply much sharper. I have posted one of the side-by-side results on amazon's user images (right now it's the last of over a hundred images..:P) I also posted results at my flickr: http://www.flickr.com/search/?q=test%20canon&w=87084332@N00 The tests were conducted using identical controls, and all attempts have been made to eliminate factors that may skew results. It was extracting the difference in optical performance, and only that. Between the clicking noise and poor image quality, I ended up keeping the one with better image. However, the quality issues left me feeling short-changed, and that I just couldn't win with either. The excellent value package is thus marred with questionable quality, which is a shame indeed.
0 of 2 people found the following review helpful: 3.0 out of 5 stars Good Family Camera BUT !!, August 27, 2008 By Joseph Smith	I purchased this camera, to replace a much older Sony Cyber-shot, which took great pictures for a 3.3MP, I just figured times have changed and it is time to purchase a new camera... To make a long story short and get to the bottom line.. this Camera is an OK camera, but not for me.. the picture quality was my complaint. I was expecting a wonderfully sharp / clear picture with 8MP.. not so... I realized that I wanted not more of a camera just more of a better picture.. I would recommend this camera to people who are not that particular and if that's the case why purchase something with all the bells & whistles this camera has..? Hope this helps anyone out there considering this camera.
0 of 1 people found the following review helpful: 3.0 out of 5 stars	It's a great camera for the price. However it is VERY slow between photo shots (about 3 second minimum). Takes great pictures though and was a very good, cheap, replacement for our previous camera which had issues with the flash.

Worth the money but don't expect "awesome", December 16, 2008 By Daniel J. Hansen "Dan Hansen" (Wisconsin)	
0 of 1 people found the following review helpful: 3.0 out of 5 stars low battery life, December 16, 2008 By N. A Moore "Limey72" (Tennessee, USA)	The camera itself is fine, the pictures are good, the only problem - at least with the first one - is the battery life. The batteries that came with the camera lasted maybe 1-2 days (of not heavy use), canon rechargeable batteries lasted about the same, then new batteries lasted long enough to open the shutter and then failed! We have returned the camera and are ordering a new one - hopefully this will be better.
11 of 12 people found the following review helpful: 2.0 out of 5 stars Great idea, not so great results, September 8, 2008 By Dawn "NJHeart2Heart" (Parsippany, NJ)	I am a digital SLR user, but since I use a long zoom often, I wanted a simple camera that I could switch to for quick landscapes, instead of switching lenses all the time. I really liked this camera instinctively; the size was small, it had a viewfinder, which is rare on compacts these days and it felt very comfortable to hold. The on/off was excellent, and the initial response was very good. However, after using it heavily for a full week I was dissappointed. Though I didn't do much reading of the manual, I have a digital SLR so wasn't too concerned about working the controls. I knew that the LCD view was not a great resolution, but it became more irritating the more I tried to review photos right after shooting them and as a result, I also did not realize that it's vibration performance was less than stellar. When reviewing my photos after uploading to my PC, When I tried to get to the menu to adjust the review timing (to shorten it), I couldn't find it and it was more difficult to tweek it's performance than I thought, even for a basic adjustment like slight compensation changes. As is all too typical a problem with point and shoots, it had a considerable lag time between photos. The biggest problem, which caused me to return it for a full refund is that the decals on the mode dial RUBBED off by the end of my trip. I'm saddened about this camera, since it seemed to have everything that I needed in a reasonable price.
2 of 2 people found the following review helpful: 2.0 out of 5 stars Lens error... replaced... waiting for the other shoe to drop., June 1, 2009 By E. Fagen (Colorado)	I bought the camera in January 2009 and got the dreaded lens error in April 2009. Since it was under warranty, I sent it back to the manufacturer, and they replaced the parts for free. Since then, the lag time has seemed to double. I feels like almost 10 second before I can take another shot, which is longer than it was before they fixed it. I'm a little nervous its going to fail again. It takes good low light pictures, which is what I was looking for. And the scenery pictures are good too. I got it for $100 on amazon, which was a good deal. But, be warned. Keep the box it came in for when you need to send it back.
1 of 1 people found the following review helpful: 2.0 out of 5 stars Issues after 1.5 years,	The camera itself works great. In fact the video it takes is surprisingly good quality. The only issue I have after 1.5 years of use is that the battery meter keeps saying the batteries ared dead when they're not. The camera will shut off and I'll have to open the battery compartment and close. Then it works fine for another 5-10 minutes. I will have to keep doing this. This occurs with every

December 9, 2009 By Axol -	type of battery I've tried. Energizer, Duracell, Generic and my Sanyo Enelopes.
1 of 1 people found the following review helpful: 2.0 out of 5 stars Too much noise compared to older cameras., March 23, 2009 By Julien Pierre "Software engineer and amateur ... (Santa Clara, California)	I bought this camera after I returned the 10 megapixel version of this series, which had a terrible amount of noise. This camera is 8MP, and has a little bit less noise than the 10 MP one. But it is still unacceptable for indoor shots, even at ISO 80. Most pictures look grainy. I had chosen this camera because it is one of the few with a viewfinder, has AA battery support, and SDHC card support - I own many rechargeable AAs and SDHC cards that I use in my Pentax K200D DSLR, my primary camera. I was looking for a secondary lighter camera. This one isn't it, unfortunately. Much older cameras with fewer megapixels, like my Olympus C3030Z, or Nikon Coolpix L1, never had this kind of problem. This camera is a prime example of the manufacturer trying to pack too many megapixels into a tiny sensor. The only reason I kept this camera is that I bought it with 2 printers that were free after rebate and worth $100 each. If it weren't for them, I would have returned this camera too. I still do not know what else to buy as a replacement, since good P&S options with viewfinders seem to be very limited these days.
3 of 4 people found the following review helpful: 2.0 out of 5 stars Slow shots, December 28, 2008 By KD	Cute little camera, but has a huge delay between shots. I have kids, so we usually take a few pictures for each shot to make sure we get one good one, but it is impossible to do with this camera. All the reviews said it takes good pictures indoors, but the pictures we got were awful.
2 of 3 people found the following review helpful: 2.0 out of 5 stars Disappointed, February 20, 2009 By T. Lambrechts (Belize Central America)	I thought this camera was pretty good, until the LCD screen cracked when it was less than a year old. Of course the factory presumes that the owner caused the crack due to an 'impact', so the repair is not covered by warranty and the repair cost is almost the same as a new camera.
2.0 out of 5 stars Complete waste of money!!!, August 31, 2009 By N. Jump "norahsmom" (Yorkville, IL)	I was so excited to finally replace my old Sony Cybershot, which I had for over 5 years. I decided on this camera because of all the wonderful reviews - why they were given, I have no idea. While the pictures this camera takes are amazing, the battery life is absolutely pathetic! The first set of AA's that came with the camera were a generic brand, so I attributed having to replace them so soon (only after a week and taking maybe 20 photos) to that. However, no matter what brand I use, the life of them in this camera is horrendous - literally not lasting more than a week - and I'm not taking hundreds and hundreds of

	photos here. I will most definately be going back to a rechargable battery setup like my Cybershot. If you want to go on vacation and have carry 12 AA's with you to get through the week, this camera is for you. If not, look elsewhere.
2.0 out of 5 stars Horrible battery life and delay between shots, August 3, 2009 By D. Hurst "dachsylady" (Texas)	This is my second digicam, and I agree with the other reviewers that you get a lot of bang for your buck with this camera. HOWEVER, if I had to do it over again, I wouldn't buy this camera. This model (unlike my previous, older model) uses only 2 batteries instead of 4. I am constantly changing them out which is a big enough pain here at home, and I can only imagine what it would be like if I was traveling. Also, there is a huge delay between shots...even longer than my older camera which I can only put down to it having two batteries. Those two problems outweigh everything else that I like about this camera. I know the trend is for ever smaller profiles, but when you sacrifice usefulness for size, it's not worth it.
27 of 48 people found the following review helpful: 2.0 out of 5 stars Nice Camera for More Professional Use - Not Necessarily Personal Use, July 9, 2008 By J. Windham "Book and Movie Lover" (Grand Cane, La USA)	When it came time to buy a digital camera I wavered between this one and the Sony CyberShot. I bought the this one for three reasons: 1. more megapixals 2. 4x zoom 3. price was right And make no mistake, this is a nice camera. BUT...for what I was wanting, just a basic, personal use camera, it's not ideal. It has a lot of nice features on it that I will never use. It's not the easiest camera to figure out and use. The dials/menus take some studying. My mother bought the Sony Cybershot and after seeing her camera, I wish that I had too. If you are looking for just a good basic camera, shy away from this model. Don't get pulled in by the extra features...unless you have some training in photography and know how to use the manual settings, most of the extra features you won't use. And the basic features are not as "user friendly" as you would expect.
106 of 135 people found the following review helpful: 1.0 out of 5 stars Great Camera with a Major Problem, April 21, 2008 By Charles Whitlatch "cwhitla" (Duluth, GA USA)	I wanted a small camera that took decent photos in available light and had high ISO sensitivity. Image stabilization and a wide range of manual setting were also high on my list. This camera delivers all of that. I was pleased with the quality of the shots even up to ISO 800. ISO 1600 was roughly equivalent to what ISO 400 was on my previous small camera so this one can cover a lot of range in lighting situations. What caught me almost totally by surprise was the extremely poor battery life. Even without using the flash it seems abysmal. I have taken approximately 60-70 test shots and gone through 2 sets of alkaline and one charge from a pair of NiMH rechargeables. Admittedly this was using the flash about 30% of the time but that's still totally unacceptable. I realize that AA batteries don't have the life of a proprietary lithium ion, but this camera's battery life is so bad it makes it almost unusable to me. Seemed like whenever I turned around it was telling me that the batteries were low and needed replacement. I used a battery tester to check them and found that they still registered pretty good so I'm wondering if the camera's battery level sensitivity is just wrong. Either that or this thing sucks power worse than any camera I have ever owned. Whatever the case, I am truly sorry I purchased this otherwise fine camera. I would much rather have decent battery life than the dubious

	"convenience" of replacing AA cells all the time. Update: With freshly charged 2500 mAh Ni-MH cells I am seeing an improvement in battery life, at least initially. So far I've taken 36 pictures and no low battery message yet. My previous usage was more intermittent so we'll see if these higher capacity rechargeable bring the camera up to what I consider reasonable battery life. My experience with alkalines is still totally unacceptable in my opinion.
6 of 8 people found the following review helpful: 1.0 out of 5 stars Surprisingly disappointed., February 11, 2009 By Scott Gitlin "EssGee" (Howard Beach, NY)	I purchased this camera based on the mostly exceptional reviews on many sites. However, after using it one time and downloading the pictures to my computer the aperture priority (Av) and manual (M) modes would not function. I could not power on the camera in either mode. If I was in a different mode and turned the function dial to either Av or M, the camera would shut off. Since I had the camera for over 3 weeks, I got an RMA from the manufacturer and sent camera back. Received a camera back with same problem and different serial number. What followed was a lot of grief arguing with the customer care. Fortunately, Adorama/Amazon stood by the product and gave me a full refund.
1 of 1 people found the following review helpful: 1.0 out of 5 stars Buyer beware, December 23, 2009 By M. McLean (SoCal)	This camera was highly recommended from a very trusted source, and the reviews were mostly positive. I expected a lot from it, and for a brief period, (maybe 4 months) it worked well. Then the problems began. Lens errors. Yes, despite the manufacturer's insistence that this sort of thing "never" happens, the mechanical lens error you will read about in other people's reviews of this camera happened to me. I bought it hoping they wouldn't, but alas, I am apparently a sucker. Next time, I shall heed the warnings of my fellow consumers. No more products of this manufacturer for me.... As time wore on, the lens error became more and more of a problem. After another three months, I called the company. The (arrogant) tech support guy just said, "Oh, this happens when the batteries are weak." "Oh really?" I said, unwrapping a new set of Energizer AA's. "Let me just stick these puppies in here and see what happens... Huh. Well, would you look at that. So much for your battery theory pal." After embarrassing him thusly, his only "solution" was to send the camera in for the company to look at it (at my expense). This would take a minimum of six weeks, after which there was no guarantee I would not continue to have the same problem with the camera. I mean, come on--a design defect is a design defect, after all. I was certainly not the first person to have this problem with this camera. Not only that, but no camera for SIX WEEKS?? I would not have survived. Sadly, before I could pack the thing up and send it in, I dropped it from the staggering height of three feet. You guessed it, end of camera. This company makes cheap crap with poor durability and cheap lens mechanisms. So guess what I did? Yup, I bought myself a Nikon. I've had three of them with ZERO problems over the years. This is number four. My replacement is working beautifully, and is smaller to boot. Excellent image quality too. I will not buy any camera from this company again. Fool me once, it's your fault. Fool

	me twice, it's mine. Buyer beware.
6 of 10 people found the following review helpful: 1.0 out of 5 stars Pictures are not sharp , February 7, 2009 By N. M. Becker (Florida)	I purchased this camera while on vacation. After returning home and viewing the pictures, I realized that none of them had a sharp image quality. I began to experiment with many settings and with many options. Some pictures were better than others but everyone has less definition and less crispness to the images than my old HP 2 megapixel camera. All of the pictures, if viewed at 100% of their size, had blurred or softened edges on picture frames, edges of houses, lamp shades, etc. The smaller I made the picture, the less noticeable it became but it still was not clear. I don't know if this is what is referred to as noise but I do not want to have to adjust the sharpness of every picture I take with editing software. Based on so many good reviews, I began to think that I must have gotten a defective camera and returned it to the chain store in my home location. I purchased another one from Amazon. In the mean time, I read all the instructions for the different settings so that I would understand how to use it. I did not want the poorness of pictures to be operator error. When the new camera arrived, I took comparison pictures. I had the same results. The colors are good but the sharpness is not there. I took identical shots with my old HP and with the new Camera. This camera has good color and the pictures are larger but the definition and quality of the image is just not there.
3 of 6 people found the following review helpful: 1.0 out of 5 stars Slow, Slower and Slowest(?), March 2, 2009 By Brett Valentine "bvalentine002" (Shelby, Twp. Mi, USA)	After much research and deliberation, I bought this camera as for daily family use. I really wanted to like it. I tried all the setting and played with the options, and even tried different memory cards. BUT, I just couldn't get away from the rediculous delay between shots and the rediculous delay after pressing the shutter button. I did some testing and it avaraged 5-6 seconds between photos. It averaged 3-4 seconds from the time I pressed the shutter button until it took the photo. 8-10 seconds per photo is just too much when you have kids!
1 of 3 people found the following review helpful: 1.0 out of 5 stars Very disappointed, November 8, 2009 By S. Moss (Missouri)	I bought this camera as an upgrade to my old PowerShot A520. With my old camera it was really hard to take a bad picture, so when I started having problems I decided to upgrade just in time for vacation. I am a typical occational camera user, vacations, special occations, a pretty day etc. With my old camera I only used minimal settings, portrait, movement, night, nothing fancy. Since this camera looked similar, I thought they would perform similar....boy was I wrong. The picture quality is horrible. I was shocked when I came back and more than 90% of my vacation pictues were grainy. I tried to take some pictures in a night club, I changed my settings several times and never did get a clear picture. This weekend was my son's birthday party and I had the setting on kids and pets. I tried to get some pictures of him and his friends driving goKarts, all of them were blurry until they stopped moving??? The rest of the pictures, what a

	surprise, came out grainy. I got out the user manual and basically found out if the situation is this, change the settings to this, this and that. If the situation is this, then change the settings again, and again, and again. This is way to complicated. I don't want to spend 10 minutes adjusting the camera setting every time I want to take another picture. Time is up on this camera. I am looking for something else. I am extremley disappointed in this model.

APPENDIX F: Post-task survey

Camera evaluation	How likely is this camera a viable gift option for your friend?
	How would you evaluate this camera?
Final criteria elicitation	Please write down the product attributes that you considered when you made your assessment of this camera. You may or may not fill in all the blanks below.
	Please evaluate this camera on each of the attributes you just listed.
	Please allocate 100 points among the product attributes you just listed. The more important an attribute is to you, the more points it should receive — please insure that the numbers you allocate sum to 100.
Review web site evaluation	The review web site enabled me to judge the relevance of the reviews to what I was looking for.
	The review web site enabled me to easily identify relevant reviews.
	The review web site gave me control over the type of information I wanted to see.
	The review web site provided you with an overview of the customer reviews
	The review web site provided you with detailed information of the customer reviews
	The review web site provided you with both an overview and the detailed information of the customer reviews
Decision Outcome: justifiability	The review web site enabled me to easily justify my assessment of the camera to other people.
	The review web site enabled me to easily explain my assessment of the camera.
Decision Outcome: confidence	The review web site enabled me to make confident assessment of the camera.
	The review web site allowed me to confidently evaluate this camera.
Decision Outcome: time & effort	Using the review web site to make the assessment required a lot of effort.
	Using the review web site to make the assessment was time-consuming.
Decision Outcome: experienced negative emotion	Using the review web site to make the assessment was frustrating.
	Using the review web site to make the assessment was upsetting.
	Using the review web site to make the assessment was annoying.

APPENDIX G: Verbal protocol coding scheme

Category 1: Information content

The category captures product attributes subjects processes as they browse the review web site.

This category has two sub-categories:

1.1 Attributes in the prior decision criteria set
1.2 Attributes that are not in the prior decision criteria set

Category 2: Information source

This category captures different sections of the review site from which subjects gathered information. This category has nine sub-categories

2.1 Review profile

Subjects may gather information from the profile of all reviews (e.g. the average star rating, number of reviews per star category). This section is often attended when the subject stays on the review main page

2.2 Attribute overview

Subjects may gather information from the tag cloud. This section is often attended when the subject stays on the review main page of the attribute overview web site.

2.3 Attribute-level review profile

After subjects click on an attribute, they may gather information from the attribute-level review profile shown on the top of the page.

2.4 Star rating

Subjects may use the star rating as a cue for validity.

2.5 Pros

Subjects may use the “pros” information as a cue for validity.

2.6 Cons

Subjects may use the “cons” information as a cue for validity.

2.7 Helpful vote

Subjects may use the “helpful vote” information as a cue for validity.

2.8 Recency

Subjects may use the date when the review was posted as a cue for validity.

2.9 Review full text

Subjects may collect information from the review full text.

Category 3: Physical and Mental activities

This category captures the physical activities and mental activities subjects performed while they were browsing the reviews. This category has eight sub-categories.

3.1 Sort reviews by helpful vote

3.2 Sort reviews by recency

3.3 Subset reviews by star rating

Subjects choose to focus on the reviews with a certain number of star ratings.

3.4 subset reviews by attribute

Subjects choose to focus on the reviews that mention certain attribute.

3.5 Comment on the relevance of an attribute to the context of the decision

3.6 Comment on the performance of the product

This could be the overall performance or performance of an attribute

3.7 Comment on the validity of information in the review

3.8 Comment on the consistency of information

APPENDIX H: Digital camera attributes shown in the tag cloud

Attribute	Explanation
Image quality	The quality of pictures produced by the camera
Battery	Battery type and battery life
Portability (is it small or light weight?)	Whether the camera is easy to carry around
Ease of use	Whether the camera is easy to operate
Value for the money	Whether the camera offers good value
Manual mode	The performance of manual mode
Lag time between shots	The delay between two consecutive shots
Viewfinder	The usefulness of viewfinder
Feature	The usefulness of features provided by the camera
Video	The quality of video produced by the camera
Construction quality	Whether the camera is sturdy
Zoom	The performance of zoom
look & feel	Whether the camera looks good and feels good in hand
LCD screen	The performance of LCD screen
Image stabilization	The usefulness of image stabilization
Auto mode	The performance of auto mode
Movement shooting	The quality of movement shooting
Low light performance	The performance of

	the camera under low light condition
Flash	The performance of the flash
Accessory	Whether necessary accessories (e.g. memory card, case) comes with the digital camera
Lens	The performance of the lens
Face recognition	The performance of face recognition
Red eye reduction	The performance of red eye reduction
Documentation	Whether the manual is well organized