DESIGNING MARKETPLACES OF THE ARTIFICIAL: FOUR APPROACHES TO UNDERSTANDING CONSUMER BEHAVIOR IN ELECTRONIC ENVIRONMENTS[1]

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Steven Bellman*
Senior Lecturer
Graduate School of Management
University of Western Australia
35 Stirling Highway
Crawley, WA 6009
AUSTRALIA
Phone: +61-8-6488-1513, Fax: +61-8-6488-1072
Email: sbellman@gsm.uwa.edu.au

Eric J. Johnson
Norman Eig Professor of Business
Department of Marketing
Columbia School of Business
Columbia University

Gerald L. Lohse
Accenture

Naomi Mandel
Assistant Professor
College of Business
Arizona State University

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* Contact author

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ABSTRACT

Marketers face a myriad of decisions when developing a website for E-Commerce. What advice can we supply based upon our current understanding of consumer behavior? We attempt to organize streams of research that address the development of marketplaces for the digital economy. We start by characterizing computer-based decision environments as Marketplaces of the Artificial, arguing that the unbundling of product information from products presents many decisions and opportunities for the design of decision environments. We then review four areas of research, identifying themes in each area. These are: 1) The economics of search, 2) Cognitive cost approaches, 3) Constructive preference approaches, and 4) Phenomenological approaches. We illustrate each approach, highlighting its assumptions and discussing examples of research questions and results. [120 words]

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INTRODUCTION

When visiting a World Wide Web commerce site, one is confronted with a myriad of graphical, textual, and, increasingly, audio and video elements. Animation is common, as are bright colors, rich textures, and stylized fonts. Indeed, the world of computer mediated choice environments has come a long way from the simple black and white textual displays once used by researchers attempting to study choice processes (Jacoby, Jaccard, Kuss, Troutman, & Mazursky, 1987; Brucks, 1985; Payne, Bettman, & Johnson, 1993). The growing complexity and vibrancy of the graphic design presented by these environments—on computers, mobile phones, indeed almost anywhere (Watson, Pitt, Berthon, & Zinkhan, 2002)—is astounding.

How do consumers react to these electronic environments? How does the organization, design, and complexity of a website affect consumers' search, choices, and loyalty? Because computer-based choice environments are very different from environments typically found in the physical world, we believe these are important questions.

Several studies have examined the design of retail websites and identified store design features that influence online store traffic and sales (Burke, 2002; Gefen, Karahanna, & Straub, 2003; Jarvenpaa & Todd, 1997; Lohse & Spiller, 1998, 1999; Palmer, 2002; Spiller & Lohse, 1997). We contribute to this growing literature by examining and organizing our knowledge about how consumer behavior will be changed in these environments. While we argue that we know quite a bit about consumer behavior that is relevant, much of that knowledge is based on

approaches from different and sometimes disparate disciplines. Because these disciplines differ in the assumptions they make about consumers, they will not always provide answers, or worse, may provide contradictory answers. To organize this knowledge, and to understand the origins of these differences, we identify four separate streams of research. Within each stream we try to identify assumptions and relevant literatures, organizing what we now know about online consumer behavior into these four approaches. Within each stream we provide examples of research in this nascent area. We close by reviewing areas of agreement and disagreement for these approaches, and by discussing the benefits and challenges of integrative research.

What Makes Consumer Behavior in Computer-based Choice Environments Different?

Why are we interested in consumer behavior in computer-based choice environments? After all, there was a great interest in the design of consumer information environments over 25 years ago (e.g., Bettman, 1975), and irrational exuberance over the radical newness of online retailing has waned since 2000. We believe there are some unique features of computer-based choice environments, but more importantly, the successes and failures of online retailing over the last few years represent a giant experiment in new features of environmental design, with lessons for retailers online and offline.

Perhaps the most important difference between computer-based and physical choice environments is the unbundling of product information from physical products. Although this happened with catalog or TV home shopping in the past, such unbundling reaches new extremes with electronic marketplaces. In supermarkets, for example, the information display and product have largely been one and the same: what can be said about the product is often limited to the packaging. The physical form of the product dictates what information can be provided and even

the form of the marketplace. End-of-aisle displays are a function of the physical storage system used: the supermarket aisle. Without aisles, there would be no displays. To illustrate the impact of unbundling products from information, consider that online music stores allow sellers to offer as much (or as little) product information as they wish, including sound clips and reviews from music critics.

This unbundling has a number of implications and has generated many new terms, such as Rayport and Sviokla (1995) replacing the idea of marketplace with marketspace, emphasizing how electronic commerce transcends geography. We term these online environments "marketplaces of the artificial," borrowing a term from Herbert Simon's *The sciences of the artificial* (1969), as they are man-made symbolic environments, unconstrained by the characteristics of physical products.

This lack of constraints is both a blessing and curse. The blessing comes from the freedom of firms to design purchase environments that are unencumbered by packaging and physical distribution. The curse comes because many of these decisions will influence consumer behavior yet lack the guidance provided by past experience. Consider for example the simple question of how information should be organized. As noted by Bettman (1975; Bettman & Kakkar, 1977) many years ago, organization by brand is a direct consequence of using the product to convey information. It is unusual in supermarkets, for example, to separate the price from the package. When price information is reorganized, it can increase in impact (Russo, 1977). In artificial environments, physical forms no longer dictate how information is organized, and the marketer must make choices. Compared with physical markets, designing artificial environments involves many more degrees of freedom, and these choices, even if made

implicitly, will have consequences for how customers behave. Table 1 lists some of the many decisions that must be remade in designing an artificial marketplace.

Insert Table 1 about here

Table 1 also shows that artificial choice environments pose new questions as well. To begin with, the economics of these new environments create new possibilities. These include:

- The possibility of customizing electronic environments. There are two key elements here: first, computer-based choice environments allow the collection of information about the customer at relatively low cost, through clickstream analysis and the sharing of purchase histories, etc. Second, the cost of customization is lower. Even if one's preferences were known upon entering a store, a retailer will not rearrange the physical display for each consumer. In a computer-based decision environment, such rearrangement is possible.
- The possibility of amplifying the intelligence of the customer by incorporating technology to replace part of the cognitive work that they would normally do. This includes the screening of alternatives and the combining of information about the consideration set (Alba et al., 1997; Montgomery, Hosanagar, Krishnan, & Clay, 2004). Other functions include providing advice about desirable features and alternatives (West et al., 1999).

The efficacy of any of these design decisions depends upon how consumers will react to these changes. While these markets are relatively new, the questions are not, in many cases, novel. Issues surrounding the provision of information became a central focus of consumer research in the 1970s and have continued to be important. Parallel lines of research exist in economics, psychology and elsewhere. In the rest of this paper, we try to integrate the new and

old, examining these questions from the four different perspectives that inform consumer research: the economics of search costs, the cognitive cost perspective, a constructive preferences view, and the phenomenological view.

FOUR APPROACHES

The Economics of Search Costs

The economics of search has had great impact upon both academic and popular views of electronic commerce. The basic idea is both powerful and simple: consumers are seen as optimizing choices conditional upon the cost of search (Stigler, 1961). Departures from optimal choice are due to the cost of gathering information. The dawn of artificial markets has a simple, but significant impact: the reduction of search costs, and consequently, increases in both consumer welfare and market efficiency.

Cost in these models is often measured by the time required to make a search. There is no question that search costs, as measured by time, decreases in electronic environments (e.g., Ratchford, Lee, & Talukdar, 2003). For example, locating and pricing books, CDs and movies is facilitated by shopping "bots" that search multiple on-line vendors in many different countries, providing extensive lists sorted by price, inclusive of sales tax, shipping and handling.

At first, it was thought that consumers in an online environment would have increased bargaining power due to tools such as bots, which can easily scour the Web for product information and the lowest prices. On the other hand, many sellers believed that they would gain the upper hand from this new technology by gathering information about individual buyers and tailoring pricing and promotions to these individuals. In the most extreme scenario, each transaction would be a one-to-one negotiation between buyer and seller, allowing sellers to

extract all the surplus profits normally foregone by setting a single fixed price. Online auctions, in which the maximum price is obtained for each single exchange, provide an illustration of this form of exchange.

At the extreme, an increase in market efficiency due to a reduction in search costs results in Bertrand competition, in which the lowest priced provider of goods establishes market share approaching 100 percent, but with prices limited to near marginal cost (Bakos, 1997). However, such an outcome depends critically upon the details and assumptions operating in a particular electronic marketplace. For example, if product quality information is inexpensive to search, relative to price information, "sellers can enjoy substantial profits: depending on their number, sellers capture between one-half and three quarters of the total surplus" (Bakos, 1997, p. 1689). Similarly, Lal and Savary (1999) outline conditions in which branded goods with important non-digital attributes may earn higher prices in electronic environments. The key to their analysis, much like Bakos', is that quality information about non-digital attributes, such as the fit and feel of a pair of jeans, is difficult to communicate in artificial marketplaces, and consumers will pay more for trusted brands. Picot, Bortenlänger, and Réhrl (1997) argued that sellers also have an incentive to make prices difficult to communicate in electronic markets, to maintain their property rights over the prices they set.

Another condition in which electronic marketplaces can increase prices occurs in auctions. A widespread phenomenon in electronic markets is the use of auctions as a means of setting price and clearing markets. EBay and Priceline are two examples. The genesis of this new ubiquity of auctioning is the reduction in transaction costs brought about by information technology. Along with this decrease in transaction costs comes a potential increase in the number of buyers. In auctions where each bidder has a their own personal value for the good

being auctioned, termed private value auctions (Smith, 1989), the clearing price for the good depends upon the distribution of these individuals' values. As the number of bidders increases, the maximum of this distribution increases, increasing the price. We should note that private values might be known with error. In other words, those bidding on the object might not know the true value. In this situation, the winner of the auction may well be the person who has the highest overestimate (error) in their estimate of value, and the degree of this "Winner's Curse" depends upon the number of bidders (Bazerman & Samuelson, 1983; Kagel & Levin, 1986; Thaler, 1992).

Challenges and Opportunities for Economic Search Costs.

For a number of reasons, we might have predicted that search extent would not increase in electronic markets (Peterson & Merino, 2003). An important challenge for the economic search costs perspective is understanding why search extent may have decreased, even though search costs have been dramatically lowered. Johnson, Moe, Fader, Bellman, and Lohse (2004), who analyzed ComScore Media Metrix data rather than self-reports, found that the average household visited just 1.1 book sites, 1.2 music sites, and 1.8 travel sites. In contrast, Hauser and Wernerfelt (1990) report that offline consideration sets range from a high of 8.1 for autos down to 4.2 for food and beverages and 3.7 for health and beauty products. Wu and Rangaswamy (2003) show that incorporating direct measures of online search nearly halves the size of imputed consideration sets (from 4.52 to 2.45 SKUs). The basic question facing research in this area is can be viewed in economic terms as "what is the elasticity of search to time costs?" With some exceptions (Ratchford & Srinivasan, 1993), this question has not been answered. Does the Internet have a neutral or positive elasticity of search?

Another challenge for analytic modeling would seem to be to better understand the competitive dynamics of search costs. Important analytic questions surround the idea that making search easy or hard is a decision variable under the control of sellers. For example, much of the impact of electronic marketplaces is based on the assumption that the consumer's cost of searching is lowered equally for all vendors. However, we know that vendors can take actions that lower search costs differentially. Just like competitors in the physical world, online vendors can increase their online and offline visibility with increased advertising budgets, and links with more popular sites (Drèze & Zufryden, 2004; Ilfeld & Winer, 2002). They can also, like offline vendors, seek placement at the beginning of lists, such as Yellow Pages directories and search engines, by choosing a suitable name like AAAaardvark, or paying for top listing. Firms in electronic marketplaces with smaller budgets are able to some extent to procure top placement in the results of search engine queries using visible and invisible text and meta-tags.

Vendors may also take action to inhibit consumer search by designing stores that do not readily facilitate comparison, for example, by blocking data gathering visits by shopping bots. However, early fears about the impacts of shopping bots seem misguided in the face of research showing that consumers willingly pay higher prices for commodity items from stores with well-known brand names (Smith, 2002; Smith & Brynjolfsson, 2001). Trifts & Häubl (2003) demonstrate that providing access to competitors' prices can actually increase customer loyalty, especially when prices are roughly the same. If consumers were engaged in active price patrolling, we would expect to see cheaper prices online compared to offline, and narrow price dispersion, but repeated studies show this is not the case (Brynjolfsson & Smith, 2000; Clay, Krishnan, & Wolff, 2001; Clemons, Hann, & Hitt, 2002; Pan, Ratchford, & Shankar, 2002).

More fundamental questions concern the empirical implementation of these models. How are search costs measured? Hann and Terwiesch (2003) take advantage of the unique characteristics of a name-your-own-price store to calculate some surprisingly expensive online interaction costs, ranging from €3.54 for a portable MP3 player to €6.08 for a PDA. Similarly, since the definition of search costs typically includes opportunity costs of time as well as out-of-pocket costs we might ask if search costs differ across consumers? Hann and Terwiesch found that online frictional costs did not differ with demographics, but now that more than half (54%) of the population of the U.S. (U.S. Department of Commerce, 2002) and other countries are online, are higher income (greater opportunity cost) consumers still more likely to use electronic environments? Finally, the extent of search depends on the perceived benefits of search as well as its perceived costs. Neglecting the benefits of search for the searcher can lead us to overestimate the amount of search that searchers will undertake. Brynjolfsson, Hu, and Smith (2003) argue that, conservatively, the increased product variety at large online booksellers such as Amazon.com has enhanced consumer welfare in the U.S. by over $731 billion, seven times the welfare gain from increased competition. Also, search cost models need to include the distribution of prior beliefs among consumers (Moorthy, Ratchford, and Talukdar, 1997). A consumer who believes that all brands are equally acceptable, or that one brand clearly dominates, will only search for one brand (Ratchford, 2001). Pirolli and Card (1999) model moment-to-moment decisions, based on the "scent" of information acquired, about the benefits of continuing to "forage" for information in one "patch" of information compared to moving to an alternative source, or abandoning the search (see also Ratchford, Talukdar, & Lee, 2001). The amount of search undertaken also depends on situational factors such as motivation and

opportunity (time availability), which tend not to be included in economic models (Beatty & Smith, 1987; Bloch, Sherrell, & Ridgway, 1986).

Economic models of search cost represent an important area, both because they inform and underlie so many of our expectations about the outcomes of participating in electronic markets. More importantly, to foreshadow a theme of our conclusion, they represent an important opportunity for collaboration across approaches.

Cognitive cost perspective

There is much in common between an economic view of search costs and what we will term a cognitive cost perspective. Both assume that decision-makers know their own utilities and are attempting to maximize that utility subject to the constraints imposed by these costs. In this sense they are both optimization models, but there are two major departures. The first is that a cognitive cost perspective does not treat search costs as a unitary construct, but decomposes search costs into various components. This has important implications. For example, if we decompose search costs into the cost of searching for price information, and a cost of establishing a vendor's credibility, the conclusion of Bertrand competition evaporates (Bakos, 1997). This seems consistent with ideas in Lal and Savary (1999) and the experimental results of Lynch and Ariely (2000). Interestingly, shopping bots have added eBay-style ratings of vendors to increase the likelihood that unknown vendors will be considered.

The second major departure from an economic view of search costs is the inclusion and emphasis on cognitive costs. The basic idea is that thinking has costs in addition to external search (Shugan, 1980; Johnson & Payne, 1985). For example, economic models usually assume that once information about a brand has been found, it can be recalled without cost (e.g., Ratchford, 2001). This would be a dangerous assumption to make in real life marketplaces

(Nedungadi, 1990). The very decrease in the price of gathering information increases the importance of an understanding of cognitive costs. To quote Herbert Simon:

> What is scarce when information is plentiful? I think we all know the answer from personal experience: when information is plentiful, time to attend is scarce. Attention is the scarce factor in an information-rich society (1997, p. 173).

Or to put it more bluntly, "despite the increase in computing speed touted by Moore's law, a particular CPU has not changed its capacity: that of the human decision-maker" (West et al., 1999, p. 286).

Most cognitive cost approaches have their origins in the literature on human computer interaction. Usability testing practitioners such as the Nielsen Norman Group (www.nngroup.com) and Creative Good (www.creativegood.com) propose and test solutions for problems with particular interfaces that make it difficult for consumers to complete online transactions. Academic researchers have identified the component operations that are common across all interfaces, such as word processing software—selecting a word, moving a cursor, etc.—and determined the most efficient combinations of these components (e.g., the GOMS Model, goals, operators, methods, and selection rules: Card, Moran & Newell, 1980). The most notable business application of this theory has been in the design of a telephone operator workstation that saved millions of dollars for NYNEX (Gray, John, & Atwood, 1993). There is also a literature in marketing that has applied similar concepts to understanding some market-based phenomena (Shugan, 1980).

These models have also influenced research into the design of computer displays for judgment and inference. For example Kleinmuntz and Schkade (1993) used a cognitive cost model to examine when graphical displays or tables produced better judgments (see also Hoch & Schkade, 1996; Stone & Schkade, 1991). Hoque and Lohse (1999) used information search and

cognitive cost components to predict how differences in display format such as size and necessity to scroll influenced the choice of a business to patronize from an online Yellow Pages directory.

A series of studies by Payne, Bettman, and Johnson (1993) applied the concept of cognitive cost to understanding preferential choice. The basic idea is that decision-makers trade-off some accuracy in representing their preferences for a savings in cognitive effort. The key implication of this work was that a change in environmental design changes the cost associated with certain choice procedures. According to this perspective, changing a choice environment might change which rules are the most efficient, in the sense that they provide a reasonable representation of the underlying preferences, while minimizing cognitive effort.

Bettman, Johnson, and Payne (1990) measured the time required to use the various components of strategies. These estimates were then used to predict how long it took to make a decision in a task, and, subsequently, which decision strategies were used.

Insert Table 2 about here

Table 2 contains a list of the cognitive components employed by Bettman et al. (1990) along with estimates of the time required to execute these operations. Bettman et al. found that these operators did a very good job (cross-validated R^2 = .81) in predicting decision latency, and more importantly, individual differences in these estimates helped predict which decision procedures were used in various new decision environments. Similar results were found for subjective ratings of effort as well. Recently, however, Lurie (2004) has found that the time allocated to a READ operator may not be constant, but increases with the amount of information (uncertainty reduction) conveyed by the value being read.

How can this be applied in designing computer-based decision environments? The last column of Table 2 includes examples of design decisions that will increase or decrease the cost of an operation and references, referencing prior research. To encourage the use of a decision rule, in the cognitive cost perspective, one would reduce the relative cost of operations that make up that procedure. Thus design decisions encourage or discourage processing by raising or lowering cognitive costs.

Consider one example: some environments allow consumers to sort alternatives using a single attribute. Peapod is one example. Can we predict how this would influence choice? From a cognitive cost perspective, this reorganization makes some decision procedures much easier. Lohse and Johnson (1998) found that computer-based displays that allowed sorting on an attribute, for example, trying to select the cereal with the lowest fat (a lexicographic decision procedure), increased the observed importance of that attribute. Such a procedure is very effortful in the absence of sorting, but becomes trivial when sorting can occur. Wu and Rangaswamy (2003) identified 43% of Peapod shoppers as price seekers, who use the sort procedure to discover the cheapest SKUs in a category.

More generally, the observed importance of attributes would seem to be affected by the cost of processing those attributes. In line with these ideas, Degeratu, Rangaswamy, and Wu (2000), Lynch and Ariely (2000), and Wu and Rangaswamy (2003) have concluded that consumers are *not* generally more price sensitive when shopping online. In fact, consumers may conduct *less* price comparison online when the store provides information on relevant non-price attributes (Degeratu et al., 2000) and when product quality information is made easier to process (Lynch & Ariely, 2000). Wu and Rangaswamy (2003) found that the majority, 57 percent, of Peapod shoppers were not price seekers, who sacrificed the price savings available from

searching for the convenience of using an unchanging personal shopping list (see also Danaher, Wilson, & Davis, 2003).

A more general view of some kinds of shopping agents can be generated from a cognitive cost approach. By asking a display to sort, eliminate or rearrange alternatives and attributes, one moves some of the effort of decision-making from the consumer to the agent (Bechwati & Xia, 2003). Haübl and Trifts (2000) examined two such aids, one that assisted in screening alternatives, a sort of electronic Elimination by Aspects, and a rearrangement of alternatives that made comparisons easier, a sort of electronic Additive Differences procedure. Their studies show that: (1) information processing changes in a way that would be predicted by a cognitive cost perspective with processing by the decision-maker being replaced by processing by the aid, and (2) that one of the procedures, which aided in the elimination of alternatives, significantly improved the quality of choices that were made.

A dynamic view of cognitive costs

Cognitive models normally contain the minimum number of cognitive cost components that would be used by a skilled user (Olson & Olson, 2003). Less experienced users take longer on tasks because they use less efficient combinations of task components (Card, Moran, & Newell, 1983). The power law of practice suggests that the costs (in log time) associated with a task decrease with the log of the number of times the task is performed (Newell & Rosenbloom, 1981), due to increasing skill in method selection (Crossman, 1959) and the "chunking" of task input-output combinations (Rosenbloom & Newell, 1987). Johnson, Bellman, and Lohse (2003) showed that this power law applies to repeat visits to websites. The power law has a very important implication: experience with a given procedure, for example, using a particular website, lowers its cost relative to alternative methods. The result, in marketplaces of the

artificial, is an increase in switching costs due to "cognitive lock-in," which in electronic markets characterized by cognitive rather than physical costs may be an important addition to other forms of lock-in (for these see, e.g., Farrell & Shapiro,1988; Klemperer, 1995; Williamson 1975). If the costs of searching are added to the prices of goods, buying repeatedly from one site, rather than searching, may be rational behavior even when better choices are available (Stigler & Becker, 1977). If a consumer is forward-looking, repeated visits to one site could be seen as an investment in skill capital (Ratchford, 2001) that yields exponential savings over time. However, in marketplaces characterized by similar sites, practice on one site will be transferable to other sites, increasing search efficiency throughout the marketspace and reducing cognitive lock-in to the first site (Murray & Häubl, 2002).

Challenges and Opportunities for Cognitive Cost Approaches

One important research challenge facing the cognitive cost approach is whether the results of laboratory-based computer-shopping environments can be generalized to those in the field. Most research uses delicate environments that do not suffer from issues of caching, network delays, and other sources of extraneous variance. But increasingly, researchers are using real consumers, in real environments, to conduct their research (Johnson, 2002).

Another important direction for research is the exploration of individual differences in cognitive costs, and potential connections to differences in preferred decision processes. The power law suggests that the same individuals will have preferences for different kinds of features (such as online help vs. shortcuts) in computer-based shopping environments, depending on their level of experience with a site (Jarvenpaa & Todd, 1997). In addition, revealed preferences for design features and decision processes may serve as basis for customization of offers, across individuals and across different visits from the same individual (Moe, 2003).

One intriguing implication of the power law of practice is that individuals will tend to repeatedly visit sites, even when the first site is chosen by happenstance, and switching to another site might maximize their "utility". In other words, if we try to predict repeat visits to a particular shopping site based on what we can observe as that site's attributes, we will underpredict loyalty. Johnson et al. (2004), using a simple probability model, showed that while 70 percent of CD and book shoppers, and 42% of travel shoppers, are apparently loyal to just one site, they still have some propensity to search but rarely exercise it. Because of this lack of search, online marketplaces can sustain a mix of competitors with diverse prices, rather than gravitating to a Bertrand competition outcome in which a "winner takes all" (Adamic & Huberman, 2000).

A dynamic approach to cognitive costs suggests several sets of research questions: first, do different electronic markets exhibit the same type of learning demonstrated by Johnson et al. (2003)? Can power law parameters (the intercept, or first-visit time, and the slope of the learning curve) be used to determine the long-term market share of such marketplaces? Since the level of cross-site sampling is low (Johnson et al. 2004), consumers are not basing their skill investment choice on comparisons of the "ease-of-learning" for different sites. Widespread investment in sites with "flat" learning curves that do not yield savings in household costs may be harming consumer welfare.

A Constructive Preferences View

Both Economic and Cognitive views of search costs share the underlying assumption that there exist underlying preferences that are both well defined and articulated. In contrast, a constructive preferences view suggests that preferences are not always so well defined, and that they are often invented as a function of the task and its environment. Because the decision

environment can actually influence how these preferences are constructed, it can influence what is chosen (Bettman, Luce, & Payne, 1998). While the idea itself obviously applies to physical environments, it seems to be particularly appropriate in electronic environments, because many of the facets of these environments can easily be manipulated, with significant effects on brand beliefs and attitudes (Klein, 2003). Since such manipulation can be 'customized' at the individual level (e.g., Moe, 2003), the potential for influencing choice is very significant.

One example of how the choice environment can influence revealed preferences is contained in Haübl and Murray (2003). They varied which attributes were used by a recommendation agent to compare products. Shoppers based their decisions on these attributes, even when the attributes used would ordinarily seem trivial. Cooke, Sujan, Sujan, and Weitz (2002) demonstrated how recommendation agents could influence choice through assimilation and contrast effects. They collected lists of favorite music CDs from their participants. When a simple recommendation agent reproduced a participant's list, plus brief details about of a couple of unfamiliar CDs, participants assumed that they would like these unfamiliar CDs just as much as they liked the ones they knew. But when the unfamiliar CDs were described in more detail, the favorable context could be ignored and unfamiliar CDs received, on average, less favorable ratings.

An even more subtle manipulation was used in Mandel and Johnson (2002). Here groups of consumers went shopping for hypothetical products in identical shopping environments, save but one detail, the color of the wallpaper on the introductory page. They hypothesized that this wallpaper would prime the importance of an attribute suggested by the wallpaper (Herr, 1989; Higgins & King, 1981; Schmidt, 1994; Yi, 1990). They found, for example, that green wallpaper, in which U.S. dollars were embedded, primed thoughts about money, increasing the

importance of price information when participants made their information search, and the likelihood that the cheapest option would be chosen. In contrast, a flame-like background primed safety and increased the importance of that attribute. While one major result of this study was the connection of priming to choice, the more important result was the demonstration that wallpaper, a seemingly inconsequential element of a computer-based environment, can influence choice.

One of the more robust phenomena in decision research is that some preferences are affected by the description of the options, in particular by the identification of an option as the default or status quo alternative. This seemingly harmless detail can lead to large market failures, for example, in insurance (Johnson, Hershey, Meszaros, & Kunreuther, 1993). Samuelson and Zeckhauser (1988) argue that initial assignments to retirement plans have great inertia, despite significant gains that could occur to alternative allocations. There have been many explanations for these results including "laziness" and loss aversion (Tversky & Kahneman, 1991).

Bellman, Johnson, and Lohse (2001) showed that default settings have powerful effects, even in seemingly "effortless" electronic environments. Much of the effort in the protection of privacy is based on the fair information principle of choice. The two alternatives are termed "opt-out" or "opt-in" based upon whether the default option is the automatic collection of personally identifying information or if the consumer must first give explicit permission for such information to be collected. While the two options are identical in end states (information either is or is not collected) Bellman et al. found that the framing of the default option also influenced choice. A negative framing ("Do NOT send me emails") requiring an active response, which apparently indicated "opt-in" if no action was taken, gained emailing permission from nearly 100

percent of respondents. This study has been considered in Congressional debate on policy surrounding the collection of consent. Bellman et al. recommended the use of two unchecked radio buttons (one for "opt-in" and one for "opt-out"), which have no default interpretation if left unchecked, but in their study this did not significantly diminish the participation rate.

Challenges and Opportunities for Constructive Preferences

The basic idea that preferences are constructive seems particularly relevant to a medium that consists of an artificial environment that could be easily changed. However, several opportunities stand out, both because of relevance, and because they depend upon unstable (labile) preferences. In general, the unbundling of product information from physical products in electronic environments can be accompanied by an unbundling or bundling of consumer costs. Here, the ideas of mental accounting (Thaler, 1985) and temporal segregation (Gourville, 1998) seem particularly relevant. For example, sellers typically make the total price of a bundle difficult to compute so consumers base their choices on the explicit portion of a price bundle (e.g., the list price) rather than delivery and other extras (Morwitz, Greenleaf, & Johnson, 1998). Smith and Brynjolfsson (2001) analyzed the choices of visitors to an online shopbot. These consumers had been presented with a total price automatically calculated from its constituent partitions, which saved them the effort of finding this information and performing the calculations themselves. In contrast to the typical offline situation, Smith and Brynjolfsson found that extras such as delivery were more important than list price for choices made using this online shop bot. Another useful area of investigation would appear to be the influence of order effects upon preferences. Houston, Sherman, and Baker (1991), for example, have demonstrated strong serial order effects in judgment (although see Bijmolt, Wedel, Pieters, & DeSarbo, 1998).

Does positioning an alternative first on a web page render it a reference brand, at least for inexperienced consumers?

Finally, perhaps the most important questions facing the constructive preference view is how long lived these effects will be? For example, Haübl and Murray found that their consumers would later use the random attributes "recommended" by their agent to choose between products when the agent was not present. With market experience and education will these effects diminish, or will they have long-term market share implications? Answers to these questions have important strategic and public policy implications. The lability of preferences when combined with the potential for customization seems to be a particularly important avenue for further research.

Phenomenological Views

In contrast to the previous approaches, which emphasize the cost of search, phenomenological views emphasize the experience of using the computer-based choice environment, and more generally, the experience of using the medium itself. Instead of carrying a cost, hedonic experiences are intrinsically rewarding and hedonic search may be very wide-ranging (Babin, Darden, & Griffin, 1994; Holbrook, & Hirschman, 1982; Kivetz, 2003; Moe, 2003). Flow experiences (Csikszentmihalyi, 1975), in which a person focuses his or her attention on the task, such as surfing the Web, and screens out irrelevant thoughts, can result in the person losing all sense of time (Hoffman & Novak, 1996). In this flow state, time has little opportunity cost and this increases the extent of search. At the other extreme, phenomenological views look at experiential states in which using an electronic environment has a very high psychological cost, for example, computer anxiety (Suri, Lee, Manchanda, & Monroe, 2003), or frustration with delays (Garbarino & Edell, 1997), or emotionally negative choices in general

(Luce, Payne, & Bettman, 1999; Stone & Kadous, 1997). Phenomenological views also recognize that online stores are designed not only to aid decision making, but to make an impression, and these two goals can conflict as impression-making features often increase cognitive load (Tractinsky & Meyer, 1999; Tractinsky, Katz, & Ikar, 2000).

One stream of research in physical retail environments has investigated the effects of the information load (the novelty and complexity) of an environment on perceptions of stimulation and pleasantness, and consequently on approach/avoidance behavior (Donovan & Rossiter, 1982; Mehrabian & Russell, 1974). Menon and Kahn (2002; see also Huang, 2000) extend this research to online retail environments. They show that when a consumer experiences a high level of stimulation at one site, s/he may seek a lower level of stimulation at a second site, or no more shopping at all, to conserve cognitive resources. In contrast, if examination of the first site is highly pleasurable, the consumer is *more* likely to engage in exploratory behaviors at a second site, including browsing, unplanned purchasing, and seeking out unusual products or categories. Stimulation and pleasure are independent, so a consumer visiting a site that was both highly stimulating and highly pleasurable would be in two minds (mixed approach/avoidance) about visiting a second site.

These results suggest that in order to induce exploratory behavior or to convince consumers to try novel products, marketers should design website entrances that contain pleasing, enjoyable stimuli. On the other hand, if a marketer wishes to induce loyalty to his/her own store, they should design a website entrance that stimulates the visitor but is not particularly pleasant—perhaps a common enough description of online stores.

Another important question related to the experience of computer-based choice environments concerns cognitive demands imposed by information selection as well as

information provision (Ariely 2000; see also early research by Jacoby, 1977; Jacoby, Speller, & Berning, 1974; and Jacoby, Speller, & Kohn, 1974). Electronic communication offers a much higher level of interactivity than traditional mass communication because it allows the user to control the information presented. Ariely argues that interactivity offers both the benefit of allowing consumers to explore information more freely and the cost of increased resources 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 decision task required a high level of cognitive resources, the performance of subjects in the highly interactive condition first decreased and later increased relative to their less interactive counterparts (due to learning effects).

Challenges and Opportunities for Phenomenological Approaches

The idea that the very experience of using the Web and other electronic environments has an effect on search behavior and decision making has great intuitive appeal. The idea of time distortion, for example, resonates with anyone who has spent hours on a task when they intended to spend 15 minutes surfing. However, operationalising and manipulating concepts such as flow, level of stimulation, or degree of interactivity represent challenges to the widespread use of these concepts. An interesting question would be isolating the antecedents that produce each of these states. As they are currently used in research, these concepts are consequences of site design. For example, Stevenson, Bruner, and Kumar (2000) found that less complex website wallpaper design (lower information load) was more likely to associated with antecedents of approach behavior in the form of favorable attitudes toward the site and the advertised brand (see also Koufaris, 2002). However, while flow experiences can occur during hedonic or goal-directed

search (Novak, Hoffman, & Duhachek, 2003), it appears that consumers are more likely to achieve flow during their exploratory "first 100 days" of using the Internet, while more experienced Web users view using the Internet as more like "work" (Novak, Hoffman, & Yung, 2000). Stafford, Stafford, and Schkade (2003) have found that the Internet provides three dimensions of uses and gratifications, process (flow), content (information), and communication (e.g., online chat), the third of which is unique to the Internet medium but less controllable by marketers compared to the other two. Further phenomenological research would serve both to inform the construction of artificial markets, and further clarify the status of these concepts in consumer research.

PROSPECTS AND CHALLENGES

We started with two goals: the first was to organize and review the nascent literature on consumer behavior in these choice environments, the second would be to see what, if any, advice this would offer in understanding consumer behavior in aiding the design of these environments.

One may be tempted to synthesize a picture of consumer behavior from these four approaches. That may be a foolhardy adventure. Each approach seems to address different levels of analysis, all quite relevant to the task of designing computer-based decision environments. An economic search cost approach, for example, addresses the relationships among vendors, and their competitive reactions. A cognitive cost and constructive preferences perspectives may be best suited to the particulars of the design of individual decision environments. Phenomenological approaches may help us characterize the experience of shopping in computer-based environments as a whole. All these approaches have value, and seem relevant to the designers of artificial marketplaces.

Insert Table 3 about here

At the same time this begs an important question: how do these different levels of analysis interact? What are the specific things that can be done to produce better computer-based decision environments? Much research we have discussed would seem to have fairly immediate tactical implications. For example sorting or not sorting along price or quality attributes can increase or decrease price sensitivity (Diehl, Kornish, & Lynch, 2003; Lynch & Ariely, 2000; Olson & Widing, 2002; Wu & Rangaswamy, 2003). Yet the eventual status of electronic commerce would seem to depend on interaction between these approaches. To address issues of competitive reactions to sorting decisions, for example, it would appear necessary to employ game-theoretic models.

A few examples of potentially interesting cross-stream research agendas include:

- The development of models of search costs that include the cognitive costs that make up a large part of search costs in on-line environments (e.g., Gigerenzer, Todd, & the ABC Research Group, 1999; Saad & Russo, 1996; Zwick, Rapoport, Lo, & Muthukrishnan, 2003). An additional element is an understanding of how these cognitive costs change with experience.
- Both economic search costs and the cognitive cost view suggest that the time required to complete an action is an appropriate measure of cost. Clearly, the perception of time is an area of interest and a clear result of this literature is that the perceived cost of time depends upon context (LeClerc, Schmitt, & Dubé, 1995). Here important insights into the perception of time might come from a phenomenological approach. Examples of these questions include: does the perception of time differ when one is in

a flow state? Can distracting sounds and animation reduce the perceived load time of web pages (e.g., Dellaert & Kahn, 1999) and increase the amount of online search?

- The increased prevalence of electronic auctions suggests a number of questions that are appropriate for both an economic and constructive preferences perspective. For example, Ariely and Simonson (2003) show that higher prices are constructed for auctioned commodity items when consumers restrict their search to the narrow context of the auction site, especially when a high starting price (minimum bid) is set. Kamins, Drèze, & Folkes (2004) received higher final bids for coins auctioned with a high external reference price (setting a reserve price), compared to setting a low external reference price (a minimum bid).

Indeed the real excitement in this area may be in the synthesis of these approaches into frameworks that will have broad applicability. Increasingly it appears that both theoretical and experimental results have relevance in these settings. At the same time, there is an increasing ability to test theory in contexts that are highly relevant to practice. In many ways what may emerge will be an interesting blend of economic, cognitive and decision-making theories that may be based on rich empirical results (see, e.g., Dellaert & Haübl, 2004).

What lies ahead appears to be an exciting interdisciplinary adventure. While there are sure to be challenges, the intellectual opportunities seem large. Moreover, researchers are aided in this adventure by the very same tools that make commerce possible (Johnson, 2002). The ability to gather data quickly at a fine level of detail seems very appealing. These data can be of at least two types: first the existence of on-line research panels and one-shot studies can gather significant amounts of data quickly (e.g., Bellman, Lohse & Johnson, 1999). The second kind of data is that gathered under the normal course of businesses, both by on-line commerce firms and

by specialized market research firms. A fine example of this latter approach are the analyses by Degeratu et al. (2000) and Wu and Rangaswamy (2003) of the search streams constructed by Peapod buyers. A final aspect of these tools is the potential for experimentation. Random assignment to different versions of electronic markets is much more easily accomplished than random assignment to physical markets, and is easily utilized by real-life marketers as well as academic researchers.

The research we have described could be used to paint two different visions of the future of artificial markets. On one hand beckons a vision of an efficient, frictionless market, a utopia of increased consumer surplus and greater product variety accompanied by the fear of decreased margins and profitability among sellers. So far, electronic markets for consumers have not lived up to this promise, but future developments in bandwidth and processing may render current findings obsolete. On the other hand, one could paint a much more fearful vision of inefficient markets with increased friction due to higher cognitive switching costs, with consumers being manipulated by subtle elements of the electronic medium. Again, this doesn't seem to be the case at the moment, but we can only imagine the cognitive loads and construction of preference tactics that may eventually become widespread. In the first vision, consumer sovereignty is manifest, in the second, consumers are unable to make decisions in their interest, and find it difficult to switch vendors. Like most dialectics, the emergent truth will probably lie somewhere between these extremes. It is our hope that future research will help those choices to be well informed.

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Table 1: Some Design Decisions for Artificial Markets

❖ **Amount of Information** ➢ Types of alternatives ➢ Number of alternatives ➢ Types of attributes ➢ Number of attributes	❖ **Organization of Information** ➢ Breadth of Stores ➢ Breadth of Product Classes ➢ By Attribute ➢ By Brand
❖ **Graphic Design Decisions** ➢ Backgrounds ➢ Frames ➢ Fonts ➢ Multimedia Objects	❖ **Credibility Assurance** ❖ **Degree of Customization** ❖ **Explicit management of search costs.** ❖ **Provision of Intelligent Agents.**

Table 2: Decision Operators and Estimated Times from Bettman, Johnson and Payne (1990), with Impact of Design Decisions

Operator estimated	**Latency** (sec.)	**Examples of design decisions which would impact latency**
READ: Read an alternative's value on an attribute	1.19	Putting information on same or different web pages. (Bettman & Kakkar, 1977; Bettman & Zins, 1979; Jarvenpaa, 1990; Kivetz & Simonson, 2000; Lemon & Nowlis, 2002; Lynch & Ariely, 2000)
COMPARE: Compare two alternatives on an attribute	.09	Sorting information (Diehl, Kornish, & Lynch, 2003; Häubl & Trifts, 2000; Lohse & Johnson, 1998; Lynch & Ariely, 2000; Todd & Benbasat, 2000; Wu & Rangaswamy, 2003)
DIFFERENCE: calculate the size of the difference of two alternatives on an attribute	.32	Presenting bar graph comparisons (Carswell, Bates, Pregliasco, Lonon, & Urban, 1998; Jarvenpaa & Todd, 1997; Meyer, 2000; Meyer, Kuskin Shamo, & Gopher, 1999; Simkin & Hastie, 1987)
ADD: concatenate the values of an attribute	.84	Manipulating the number of digits. (Johnson, Payne, & Bettman, 1988)
PRODUCT: weight one value by another	2.23	Presenting attributes on a common scale. (Stone & Schkade, 1991; Stone & Schkade, 1994)
ELIMINATE: Remove an alternative or attribute from consideration	1.80	Allowing customers to select attributes and alternatives for further consideration. Ordering by attributes (Häubl & Trifts, 2000; Widing & Talarzyck, 1993)

Table 3: Summary of the Four Approaches

Stream	Nature of Preferences	Sources of Variance in Preferences	Role of Agents/ Decision Aids
Economic Search Costs	Exist, modified rationally by time and opportunity costs	Variation in response speed, product cost and price variability	Lower search costs through automation
Cognitive Search Costs	Exist modified (adaptively) by perceived decision effort and quality	Organization of information in display, sorting vs. other formats (see Table 2)	Aid by combining information
Constructive Preferences	Occasionally murky. Influenced by irrelevant cues	Wallpaper, choice of attributes, context effects	Provide assistance in identifying important attributes, particularly those not known at time of decision
Phenomenological Influences	Include the shopping experience	Perceptions of cognitive load, stimulation, pleasure	Unclear