22nd Bled eConference

eEnablement:

Facilitating an Open, Effective and Representative eSociety

June 14 - 17, 2009; Bled, Slovenia

Modelling the Effects of Decision Tools in Online Shopping

Ultan Sharkey

National University of Ireland Galway, Ireland.

e: ultan.sharkey@nuigalway.ie

Thomas Acton

National University of Ireland Galway, Ireland.

e: thomas.acton@nuigalway.ie

Kieran Conboy

National University of Ireland Galway, Ireland.

e: kieran.conboy@nuigalway.ie

Abstract

The provision of tools to focus user interaction in analysing data to come to a decision is the core principle of a decision supporting system. This became the inherent characteristic of decision support systems to counter the cognitive overload issues associated with management information systems arising from their proficiency in gathering and collating into larger and larger reports. A similar issue arises in online shopping systems where increased catalogues become less useful without an ability to use that data to decide upon a purchase. With this in mind we argue that it is necessary now to investigate the optimum decision support tools which may be provided in online shopping systems in order to clarify for the management of these systems how best to help customers analyse and synthesise product data to form a purchase decision. In this paper we propose to investigate the methods of supporting the consumer decision by experiment and survey manipulating the methods of decision support provided and measuring the effects on the consumer decision process. This research in progress outlines the extant theories of consumer decision formation, appropriateness of strategies and the validity of supporting particular strategies. We submit that particular analyses methods should be employed and outline a laboratory experiment which we have designed to test the hypotheses formed.

Keywords: eSupported Innovation, eProcess Design, eMarketplaces, eSMEs, online shopping, decision support.

1 Introduction

The decision support systems literature is marked by its references to the use of analyses tools for the purpose of interacting with the data set to produce the decision. The ability to help people analyse and interact with the data is one of the signifiers of a decision support system. Its parent systems, management information systems, are concerned more with access to and the provision of data (Dickson, 1968; Sprague and Watson, 1996; Turban and Watkins, 1986). Of course some authors prefer to bring the realm of decision support further and talk of systems which also propose (Turban and Watkins, 1986) and even make decisions (Dickson, 1968; Mason, 1969). Nevertheless, the concepts of analyses and interactivity appear to be the core components defining decision supporting systems (Dickson, 1968; Sprague and Watson, 1996; Turban and Watkins, 1986). Referring to the issue of information overload, as far back as 1971 Gorry and Scott-Morton (p65) spoke of the greater gains to be had in giving the information users more processing and analytical capabilities than giving additional information. Thus, to support decision making a system must support analyses through user interaction.

Within the realm of online commerce, we have reached a similar tipping-point. Online stores or webshops may contain significant inventories on which a consumer may make a purchase decision. However, providing abundance of choice without providing analyses tools to support the consumer in making that choice may drive sub-optimal decisions (Häubl and Trifts, 2000) or no decision at all for consumers who are overwhelmed and leave the webshop (Collier and Bienstock, 2006). Information systems are well suited to relieving humans of our cognitive burdens induced by this overabundance of choice (Todd and Benbasat, 1992). However, it is recognised that there is insufficient research on the design of features where this decision support is most needed, on product listing pages (Hong, Thong and Tam, 2004; Song, Jones and Gudigantala, 2007). It has also been recognised that there is little known about the features of webshop technology that prompt consumers to shop online (Hausman and Siekpe, 2009). This work seeks to understand how a purchase decision in an online commerce environment may be supported through a discussion on the consumer decision process, how that process may be supported and how sorting capabilities of systems may encourage more compensatory decision strategies.

2 Theoretical Background

In this section we discuss the process of consumer decision making. We then proceed to outline the theory surrounding strategies people employ in decision making tasks and argue that certain strategies produce better decisions. We then discuss the application of decision supporting technology to influence the selection of particular decision strategies, in particular we suggest that sorting and comparison methods may be employed to support compensatory decision. We then advance hypotheses to test these contentions.

2.1 Decision processes and analyses of choice

Selecting a product alternative is a multi-attribute decision process (Lee, Wang and Lee, 2001). It is a successive refinement of all product alternatives evaluated (Roberts, 1989), which can be better understood through "tiered levels of behaviour" (Roberts and

Lattin, 1997). Products are valued from a series of sets that can be logically structured to facilitate understanding, see figure 1 below. The super-set, which contains all existing product alternatives, is the *Universal Set* (Andrews and Srinivasan, 1995; Kardes, Kalyanaram, Chandrashekaran and Dornoff, 1993 1993). The consumer may not be aware of all the alternatives in the set (Andrews and Srinivasan, 1995) that sub-set of alternatives of which the consumer is aware, is the *Awareness Set* (Andrews and Srinivasan, 1995; Nedungadi, 1990; Roberts and Lattin, 1991; Roberts and Lattin, 1997). As the name suggests, it is a subset of the Universal Set which a consumer is conscious of and includes those products which the consumer is informed of during the decision process (Andrews and Srinivasan, 1995). All of the alternatives which the consumer proceeds to collect information about is called the *Evoked Set* (Hauser and Wernerfelt, 1990; Roberts and Lattin, 1991). Roberts (1989) describes the Evoked Set as the alternatives “on which a consumer gathers information" and distinguishes it from the *Consideration Set*, describing the latter as the alternatives evaluated. The set which the consumer evaluates further from the Evoked Set is called the Consideration Set (Nedungadi, 1990). The choice is made from this final Consideration Set.

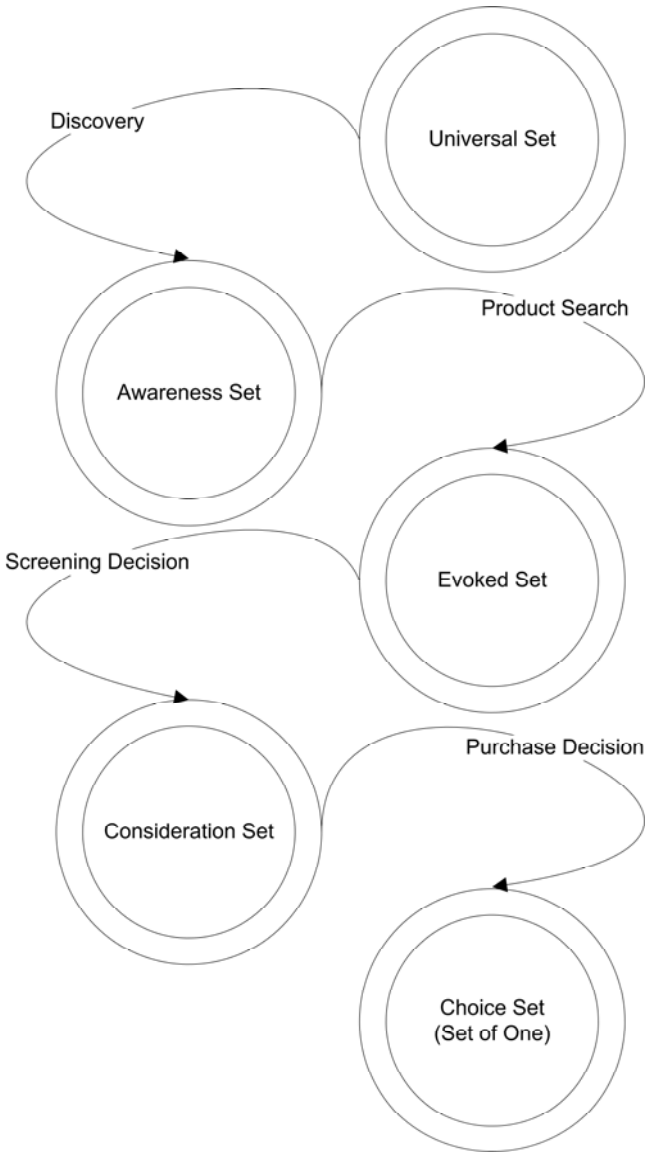

Figure 1: Waterfall diagram of decision process

There is significant support in the literature for the existence of a two stage process for arriving at the consumption decision, a heuristic screening decision followed by the purchase decision itself (Andrews and Srinivasan, 1995; Beach, 1993; Hauser and Wernerfelt, 1990; Kardes et al., 1993; Klenosky and Perkins, 1992). The earlier screening stage tends to employ simpler heuristic and non-compensatory strategies (Beach, 1993; Hauser and Wernerfelt, 1990). Considering the view of consumers as cognitive misers during the purchase decision, switching to less accurate non-compensatory strategies when faced with the larger sets makes sense (Kleinmuntz and Schkade, 1993). Beach (1993) offers a definition of screening as a process governing the "admission of options to the choice set". Beach proposed a theory, referred to as Image Theory, which frames choice as being made through any number of strategies, depending on the strategies known to the decision making consumer. Song et al. (2007) use the term 'winnowing' to describe this process. Whereas the choice decision based on the Consideration Set may invoke many different strategies, the screening decision

invokes just one – the non-compensatory compatibility test (Beach, 1993). Further, Beach (1993) found that screening and choice decisions are seen as distinctly separate from each other and that decision makers do not bring information forward from the screening decision phase [Evoked set to Consideration set] to the choice decision phase [Consideration set to Choice set] leaving the possibility of sub-optimal choices. This effect echoes what is the availability judgment error described by Chen and Lee (2002), also referred to as the recency effect where more weight is given to more recent events. Zhang (2004) found that the availability to decision makers of multiple preference formats increases decision makers' satisfaction levels, implying that the support of multiple decision strategies by a system may aid in decision quality. The consumer decision process as outlined here presents some interesting questions as to which strategies are appropriate and how we might support their use. We discuss these topics in the following section.

2.2 Decision strategies for purchase decision analysis

Consumers use decision strategies, knowingly or not, in order to minimize the cognitive effort involved in the choice while maximising the accuracy and quality of the decision (Alavi and Joachimsthaler, 1992; Todd and Benbasat, 1999). Todd and Benbasat (Todd and Benbasat), citing numerous empirical studies, argue that the effort expended influences strategy selection more than the desired decision accuracy. People generally prefer strategies that do not require calculations or compromises based on numerical values (Slovic, Fischhoff and Lichtenstein, 1977). Kleinmuntz and Schkade (1993) posited that the feedback to the decision maker with regard to the expended effort is immediate and the feedback as to the accuracy or quality of the decision is not. This trade-off between effort and accuracy is referred to as a cost-benefit perspective, noting that the selection of decision strategy can be influenced by the method used to display information relevant to the decision (Kleinmuntz and Schkade, 1993). Thus, reducing the effort of decision making is a valid target for researchers, but supporting a decision to increase the accuracy and quality, we believe is a more noble goal. Decision maker strategy selection can be influenced by the design of the display of information, and the layout may be designed to support decision-making strategies applicable to the particular problem domain at hand. In fact, Todd and Benbasat (1999) tell us that the best designed systems are those that make it easier for the decision maker to employ the best strategy. Thus we should influence the use of higher quality strategies through the design of product data displays. Zhang et al. (2004) found that exposure of decision makers to multiple data display formats increases satisfaction with decision making. Allowing the consumer to choose the mechanism employed may increase decision satisfaction. This research asserts that managers of online shops should influence the choice of strategy by presenting data to support appropriate strategies and allow the consumer some further control over the data presented. This leads us to consider what the appropriate strategies to support are.

The early stages of the decision process involve relatively greater choice and the tendency appears to be a comparison based on one attribute and rejection of certain alternatives. Later stages involve the weighing of advantages and disadvantages of the then limited set of alternatives (Slovic et al., 1977). Roberts (1989) describes these two types of strategies, in his examination of Consideration Set formulation, as conjunctive when the test is one of sufficient *acceptability* and compensatory when the test is one of sufficient *utility*, *acceptability* being a threshold measure and *utility* being a more

processing intensive function of weighted attribute importance and attribute quantity (Todd and Benbasat, 1999). Thusly, the second stage is a smaller set and strategies employed are more cumbersome in terms of processing - compensatory strategies, while the first stage has a more extensive selection and is more open to the use of strategies which reduce numbers without extensive thought - conjunctive strategies. Research suggests that the decision is of improved quality when a more compensatory strategy is employed (Häubl and Trifts, 2000).

It is the second of these stages that we are most concerned with in supporting online product purchase decision-making, the position being that the consumer has heuristically narrowed the set, perhaps via an initial keyword search or the selection of a category of products. Here we now wish to halt the use of conjunctive strategies and support the use of compensatory strategies. As discussed earlier, compensatory strategies are afflicted by higher cognitive requirements. Decision supporting systems are marked by their assistance in data analyses and any system which assists a consumer in analysing the data at this point must reduce the strain of compensatory strategies, in particular if that system makes analyses easier than otherwise would be. Thus, we are led to contemplate which methods would be useful to online consumers in reducing the effort of analysing product data. In this paper we discuss sorting and comparison capabilities to reduce this strain and induce more use of compensatory decision-making.

2.3 Sorting as a support for analyses

Sorting is a discrete information processing task (Häubl and Trifts, 2000). It is a decision-supporting function (van der Heijden, 2006). The ability to sort increases a decision makers' ability to identify, and thus avoid, sub-optimal choices. The ability to sort helps a decision maker determine the relative utility of the alternatives (Häubl and Trifts, 2000; Todd and Benbasat, 1992). Thus, sorting can be seen as supporting compensatory strategies more than conjunctive strategies. There is an argument to be made for a careful sorting of the default product data display returned to a customer in an online shopping environment. Product data display or product lists, in this sense, being the presentation of a product catalogue or, presenting the results of a keyword search (Diehl, 2005). Schkade and Kleinmuntz (1994) discuss the sorting of a catalogue by product name, supporting a customer who knows the name of the product sought and similarly, the sorting of a product catalogue by price range supporting a customer seeking a product within a certain budget. In an online environment, sorting alphabetically by the product title or sorting arbitrarily, usually according to the order of product records in a database, is often the default sort method employed. However, as a product keyword search inevitably searches the product title, among other fields, default sorting by product title is mooted by most competent search mechanisms. Further to this, there is some evidence that decision makers tend to use only the information provided to them and to process that information in whatever form it is presented to them (Cai and Xu, 2008; Lurie and Mason, 2007). This lends credence to what is well accepted heuristically; the products at the top of a product list are more likely to become part of a consumers consideration set. Schkade and Klienmuntz (1994, p321) provide the American Airlines SABRE system example, where the result set always began with an American Airlines flight listed first, and the ensuing legal challenge to rebalance the situation, the point being that the first result places are known to be more important. Thusly, a product list sorted by product name or arbitrarily does little to serve the decision-making customers' needs, raising the question as to what we should sort by.

Kleinmuntz and Schkade (1993) advocate for a careful design of information display in order to encourage better decision processes. Cai and Xu (2008) found that where the product list was sorted by quality, the higher quality products dominated the consideration set and thus the choice, however cautioned that this sort method tended to place higher priced products higher in the listings, due to the tendency of quality and price to correlate, which may have implications for the vendors' price image. There is some discussion surrounding the manipulability of the factors consumers take into account when making a purchase decision through the principles of concreteness; consumers exclusively use what information they are presented with in the manner or form that this information is presented to them in, and the principle of constructive preference; consumers judgments on product features may only arise when they are browsing product lists (Cai and Xu, 2008; Häubl and Murray, 2003; Slovic et al., 1977). Häubl and Murray have previously proposed that one can influence consumer preference and consequently purchase decisions by leveraging these concepts. Similarly, Lurie and Mason (2007) assert that the default format of presentation is often assumed to be the most appropriate for making the decision, particularly by novices. Considering these points, it is logical to infer that consumers form preferences, construct a consideration set and make the choice influenced by the ordering and organisation of data before them. Thus default presentation forms are important. Further, whichever data is provided to the consumer and is more readily tractable and manipulable by the advanced consumer should allow the consumer to construct better preferences and better quality consideration sets. Alba et al. (1997) explain that managers of online shopping environments are forced to present the default in line with what is likely desired by the larger segment of the market, which implies should the consumer have the power to re-order the data presented to suit their specific preferences the resultant consideration set would be of better quality. Xu and Kim (2008) raise the issue of scarcity in virtual spaces describing the lessening value of list placement due to the order effect. The core of their study was in vendor comparison websites however they suggest that search tools such as sorting may be used to "improve the depth of online space" (Xu and Kim, 2008, p485). Decision making is affected by the sort order of the alternatives (Diehl, 2005). Considering the importance of sorting the list of alternatives presented to the consumer and the problems observed by Diehl (2005) in consumer preference for continued search in an agent-ordered environment, we submit that given the ability to sort a product list by the attributes available within the system, consumers will form a higher quality consideration set and will be more confident in their decision making.

Considering that consumers use the data given to them to form preferences as they form the consideration set and that allowing the consumers to choose the mechanism of display is thought to increase satisfaction, we advance the following hypotheses:

H1: Product lists sorted by the customer lead to higher quality consideration sets than product lists sorted automatically.

H2: Product lists sorted by the customer lead to higher decision confidence sets than product lists sorted automatically.

Given that the more readily the consumer can manipulate, analyse and the salient product attributes, in line with constructive preference theory, we advance the following hypotheses:

H3: Product lists sorted by the customer on more than one attribute i.e. nested lead to higher quality consideration sets than product lists sorted on one attribute.

H4: Product lists sorted by the customer on more than one attribute i.e. nested lead to higher decision confidence sets than product lists sorted on one attribute.

As discussed above, the earlier stages of the decision process tend to involve conjunctive strategies, comparing on one attribute as a basis for rejection of alternatives. The ensuing reduced set is then generally evaluated by weighing alternatives on attributes and counterbalancing the utility of them (Slovic et al., 1977). Häubl and Trifts' (2000) work suggests that decision quality improves when a compensatory strategy is invoked.

Lee, Wang and Lee (2001) argue that a product list helps customers compare the value of attributes of alternative products but "suffers from information cluttering" as the options increase. If support for comparison were provided on the reduced set which Slovic et al. (1977) refer to, this overload issue is avoided and better strategies supported at the latter stages of decision making because the alternatives are displayed closer together supporting compensatory strategies. Häubl and Trifts (2000) employed a similar functionality in their work and referred to it as a comparison matrix. These are simply tables which allow screening and sorting (van der Heijden, 2006). This functionality, which is to support easier comparison of alternatives based on attribute sorting, the proximity of the alternatives and the reduced cognitive burden of the reduced set, should improve consideration set quality and decision confidence. Therefore we advance the following hypotheses:

H5: Consumers who use a consideration set member comparison tool create higher quality consideration sets than consumers who do not have a comparison tool.

H6: Consumers who use a consideration set member comparison tool have a higher decision confidence than consumers who do not have a comparison tool.

Figure 2 models the proposed influence of the decision supporting tools on the decision. The next section details how we intend to test this model through testing the hypotheses advanced.

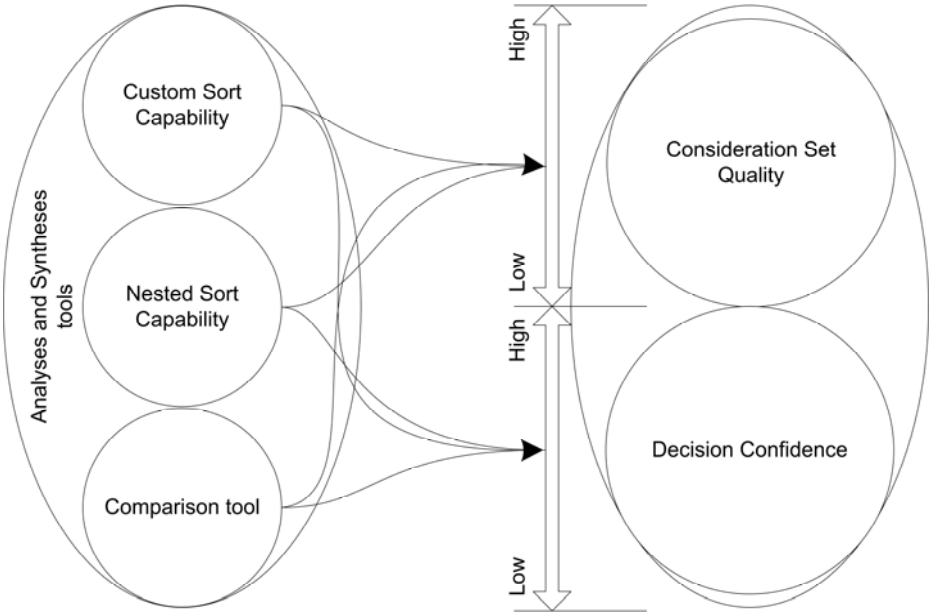

Figure 2: Analyses and syntheses tools influence on Consideration Set Quality and Decision Confidence.

3 Methodological framework

As discussed, the strategies users invoke when proceeding through the steps of a purchase decision are affected by the format the data is displayed in (Häubl and Trifts, 2000). It follows that the way the management of an online store chooses to sort the data at each point in the users experience of the system may encourage or discourage certain user behaviours. Therefore it is likely there are a number of ways in which the presentation of the data affects the decision process and the decision outcome. Similarly, the ability of a user to self-determine the sorting order is likely to affect the decision process and the decision outcome. Some of these proposed affects of the data presentation and manipulability are modelled in figure 2 above. These affects warrant investigation in the context of deepening the understanding of what the consumer does and proposing directions for management of these systems, a point which has been recognised, albeit marginally, in similar research (Xu and Kim, 2008, p485).

We propose to test the model through controlled laboratory experiment testing the hypotheses advanced above. The manipulated conditions shall be realised via features of an open source General Public Licence (GPL) webshop system. A GPL system was chosen to help fortify the validity of this research and its applicability to management particularly to those online stores who are employing the particular system used and its similar counterparts. The manipulated factors are Nested Sorting [Has/Has Not]; Custom Sorting [Has/Has Not]; System Standard Sorting [Has/Has Not (i.e. randomised)]; and Comparison tool [Has/Has Not]. The subject system shall be populated with digital cameras to affect the product catalogue in such a way that the choices made by the subjects can be independently deemed to be good or bad decisions regardless of the subjects preferences. This is achieved by constructing dominated and non-dominated alternatives. Empirical measurement of decision systems is typically achieved through the loading of the subject system with *dominated* and nondominated alternatives, best elucidated by Häubl and Trifts (2000), “An alternative is dominated if

there is at least one other alternative that is superior on at least one attribute while not being inferior on any attribute. That is, a dominated alternative is known to be within the efficient frontier of any consumer. By contrast, an alternative is *nondominated* if no other alternative is superior on an attribute without, at the same time, being inferior on at least one other attribute." Thusly, preferences shown by the subject for nondominated alternatives indicate poor decisions (Häubl and Trifts, 2000; van der Heijden, 2006). In this manner the quality of the consideration set produced may be deemed. We propose to employ a screen capturing program in a similar manner to Xu and Kim (2008) to measure the extent of sort function usage and usage of comparison tool functions across the treatments.

Kamis and Stohr (2006) describe two formulations of decision confidence. One is an objective, calculated variance of a value and the second, which they used in their study being the self-reported subjective confidence of the decision-maker in the decision. Adidam and Bingi (2000) refer to decision confidence as being a subjective measure. Here we refer to decision confidence as the post-choice subjective level of belief that one has made the best choice. There are also studies which use a pre-choice confidence level (E.g. Bearden, Hardesty and Rose, 2001) often referred to as consumer self-confidence. We propose to measure the construct in a similar manner, through post-task exit questions.

We propose to draw the participant sample from a number of different graduate programs at university. Many other studies in commerce and information systems have used students as representative of the Internet using population (Ahuja, Gupta and Raman, 2003; Ives, Olson and Baroudi, 1983; Lee and Kozar, 2006; Negasha, Ryan and Igbaria, 2003; van Iwaarden, Wiele, Ball and Millen, 2004). Aladwani and Palvia (2002) administered a 55-item instrument to 104 students between 18 and 21 years old. Palmer (2002) conducted his survey with 35 undergraduate and MBA students. Garrity et al., (2005) advocated the use of students as a sample, an indication of their place as consumers and future of web technology. This suggests a sample of university students may be representative of the general population of electronic commerce consumers and would be appropriate for this research.

4 Expectations

We expect the results to indicate that product data sortable by a single attribute which support a basic level of comparison will produce better quality consideration sets and higher levels of confidence in that decision more than default or randomised sort in the product catalogue. Further, we expect that nested sort will outperform these functions to a significant degree. The results that would appear to be of most interest at this point would be the magnitude of these affects on the dependent variables.

We anticipate that the results of the experiment will support the use of sorting functionality as a dominant factor in the production of higher decision confidence, higher quality consideration sets and thus higher quality product choice. While it is expected that the sortable configurations will be the better decision-aiding functions in their ability to support data point comparisons, it is also expected that the subjects using systems with sortable configurations and comparison tools will also make at least as good or better decisions as the subjects using the solely sortable configurations but

attain a higher degree of confidence in the decision made. We predict that the subjects with the nest-sortable configuration will attain the highest quality consideration set of any of the participant groups.

The results of this research will be applicable to many ecommerce systems, in particular, and more immediately to the businesses which employ open-source General Public Licensed webstore software systems, but also to businesses which employ proprietary webstore software systems. It is expected that the results of this research will make it easier for the management of Internet commerce businesses to decide what decision support tools are appropriate at what stages of the consumer decision process.

References

Ahuja, M., Gupta, B. and Raman, P. (2003) An empirical investigation of online consumer purchasing behavior, Communications of the ACM, 46 (12), pp. 15.

Aladwani, A. M. and Palvia, P. C. (2002) Developing and validating an instrument for measuring user-perceived web quality, Information & Management, 39 (6), pp. 467-476.

Alavi, M. and Joachimsthaler, E. A. (1992) Revisiting DSS Implementation Research: A Meta-analysis of the Literature and Suggestions for Researchers, MIS Quarterly, 16 (1), pp. 95-116.

Alba, J., Lynch, J., Weitz, B., Janiszewski, C., Lutz, R., Sawyer, A. and Wood, S. (1997) Interactive home shopping: Consumer, retailer, and manufacturer incentives to participate in electronic marketplaces, Journal of Marketing, 61 (3), pp. 38-53.

Andrews, R. L. and Srinivasan, T. C. (1995) Studying Consideration Effects in Empirical Choice Models Using Scanner Panel-Data, Journal of Marketing Research, 32 (1), pp. 30-41.

Beach, L. R. (1993) Broadening The Definition of Decision-Making - The Role of Prechoice Screening of Options, Psychological Science, 4 (4), pp. 215-220.

Cai, S. and Xu, Y. J. (2008) Designing Product Lists for E-commerce: The Effects of Sorting on Consumer Decision Making, International Journal of Human-Computer Interaction, 24 (7), pp. 700-721.

Chen, J. Q. and Lee, S. M. (2002) An exploratory cognitive DSS for strategic decision making, Decision Support Systems, 36 (2), pp. 147-160.

Collier, J. E. and Bienstock, C. C. (2006) How do customers judge quality in an E-tailer?, Sloan Management Review, 48 (1), pp. 7.

Dickson, G. W. (1968) Management Information-Decision Systems - New Era Ahead, Business Horizons, 11 (6), pp. 17-26.

Diehl, K. (2005) When two rights make a wrong: Searching too much in ordered environments, Journal of Marketing Research, 42 (3), pp. 313-322.

Garrity, E. J., Glassberg, B., Kim, Y. J., Sanders, G. L. and Shin, S. K. (2005) An experimental investigation of Web-based information systems success in the context of electronic commerce, Decision Support Systems, 39 (3), pp. 485-503.

Gorry, G. A. and Morton, M. S. S. (1971) Framework for Management Information Systems, Sloan Management Review, 13 (1), pp. 55-70.

Häubl, G. and Murray, K. B. (2003) Preference construction and persistence in digital marketplaces: The role of electronic recommendation agents, Journal of Consumer Psychology, 13 (1-2), pp. 75-91.

Häubl, G. and Trifts, V. (2000) Consumer decision making in online shopping environments: The effects of interactive decision aids, Marketing Science, 19 (1), pp. 4-21.

Hauser, J. R. and Wernerfelt, B. (1990) An Evaluation Cost Model of Consideration Sets, Journal of Consumer Research, 16 (4), pp. 393-408.

Hausman, A. V. and Siekpe, J. S. (2009) The effect of web interface features on consumer online purchase intentions, Journal of Business Research, 62 (1), pp. 5-13.

Hong, W. Y., Thong, J. Y. L. and Tam, K. Y. (2004) Designing product listing pages on e-commerce websites: an examination of presentation mode and information format, International Journal of Human-Computer Studies, 61 (4), pp. 481-503.

Ives, B., Olson, M. H. and Baroudi, J. (1983) The measurement of user information satisfaction, Communications of the ACM, 26 (10), pp. 785–793.

Kardes, F. R., Kalyanaram, G., Chandrashekaran, M. and Dornoff, R. J. (1993) Brand Retrieval, Consideration Set Composition, Consumer Choice, and The Pioneering Advantage, Journal of Consumer Research, 20 (1), pp. 62-75.

Kleinmuntz, D. N. and Schkade, D. A. (1993) Information Displays and Decision-Processes, Psychological Science, 4 (4), pp. 221-227.

Klenosky, D. B. and Perkins, W. S. (1992) Deriving Attribute Utilities from Consideration Sets - An Alternative to Self-Explicated Utilities, Advances in Consumer Research, 19 657-663.

Lee, J., Wang, P. and Lee, H. S. (2001) A visual one-page catalog interface for analytical product selection, In Electronic Commerce and Web Technologies, Vol. 2115 (Eds, Bauknecht, K., Madria, S. K. and Pernul, G.) Springer-Verlag Berlin, Berlin, pp. 240-249.

Lee, Y. and Kozar, K. A. (2006) Investigating the effect of website quality on e-business success: An analytic hierarchy process (AHP) approach, Decision Support Systems, 42 (3), pp. 1383-1401.

Lurie, N. H. and Mason, C. H. (2007) Visual representation: Implications for decision making, Journal of Marketing, 71 (1), pp. 160-177.

Mason, R. (1969) Basic Concepts for Designing Management Information Systems, AIS, Research Paper No. 8.

Nedungadi, P. (1990) Recall and Consumer Consideration Sets - Influencing Choice Without Altering Brand Evaluations, Journal of Consumer Research, 17 (3), pp. 263-276.

Negasha, S., Ryan, T. and Igbaria, M. (2003) Quality and effectiveness in Web-based customer support systems, Information & Management, 40 757-768.

Palmer, J. W. (2002) Web Site Usability, Design, and Performance Metrics, Information Systems Research, 13 (2), pp. 151-167.

Roberts, J. (1989) A Grounded Model of Consideration Set Size and Composition, Advances in Consumer Research, 16 749-757.

Roberts, J. H. and Lattin, J. M. (1991) Development and Testing of a Model of Consideration Set Composition, Journal of Marketing Research, 28 (4), pp. 429-440.

Roberts, J. H. and Lattin, J. M. (1997) Consideration: Review of research and prospects for future insights, Journal of Marketing Research, 34 (3), pp. 406-410.

Schkade, D. A. and Kleinmuntz, D. N. (1994) Information Displays and Choice Processes - Differential-Effects of Organization, Form, and Sequence, Organizational Behavior and Human Decision Processes, 57 (3), pp. 319-337.

Slovic, P., Fischhoff, B. and Lichtenstein, S. (1977) Behavioral Decision Theory, Annual Review of Psychology, 28 1-39.

Song, J., Jones, D. and Gudigantala, N. (2007) The effects of incorporating compensatory choice strategies in Web-based consumer decision support systems, Decision Support Systems, 43 (2), pp. 359-374.

Sprague, R. H. and Watson, H. J. (1996) Decision support for management, Prentice-Hall, Upper Saddle River, N.J.

Todd, P. and Benbasat, I. (1992) The Use of Information in Decision-Making - An Experimental Investigation of the Impact of Computer-Based Decision Aids, Mis Quarterly, 16 (3), pp. 373-393.

Todd, P. and Benbasat, I. (1999) Evaluating the impact of DSS, cognitive effort, and incentives on strategy selection, Information Systems Research, 10 (4), pp. 356-374.

Turban, E. and Watkins, P. R. (1986) Integrating Expert Systems and Decision Support Systems, MIS Quarterly, 10 (2), pp. 121-136.

van der Heijden, H. (2006) Mobile decision support for in-store purchase decisions, Decision Support Systems, 42 (2), pp. 656-663.

van Iwaarden, J., Wiele, T. v. d., Ball, L. and Millen, R. (2004) Perceptions about the quality of web sites: a survey amongst students at North-eastern University and Erasmus University, Information & Management, 41 (8), pp. 947-959.

Xu, Y. J. and Kim, H. W. (2008) Order Effect and Vendor Inspection in Online Comparison Shopping, Journal of Retailing, 84 (4), pp. 10.

Zhang, Q., Chen, J. C. H. and Chong, P. P. (2004) Decision consolidation: criteria weight determination using multiple preference formats, Decision Support Systems, 38 (2), pp. 247-258.