



# The Emergence of Interdependent E-Commerce Constructs

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## Abstract

This paper represents the findings of research studies that address e-commerce design and associated consumer behavior. The innovation of e-commerce has affected not only the marketplace through the facilitation of the exchange of goods and services, but also human behavior in response to the mechanisms of online services. Researchers have identified and hypothesized on relevant subject matters ranging from Web usability, marketing channels and other factors influencing online buying behavior. Though researchers have focused on what appear different aspects of online buying behavior, their studies may be shown to be interrelated and interdependent, even to the extent of revealing constructs upon which e-commerce, in terms of future design and research, could be built.

## 1. Introduction

The innovation of e-commerce has affected not only the marketplace through the facilitation of the exchange of goods and services, but also human behavior in response to the mechanisms of online services. Researchers have identified and hypothesized on relevant subject matters ranging from Web usability, marketing channels and other factors influencing online buying behavior. Though researchers have focused on what appear different aspects of online buying behavior, their studies may be shown to be interrelated and interdependent, even to the extent of revealing constructs upon which e-commerce, in terms of future design and research, could be built upon.

## 2. Constructs

A construct is defined as an abstract or general idea inferred or derived from specific instances (Hyperdictionary). This paper researched a number of studies on e-commerce with each providing examples in order to substantiate their respective hypotheses. Even with the varying number and nature of these studies, some constructs emerge which seem interdependent in contributing to the holistic view of e-commerce and associated consumer interactions. For example, Li, Kuo and Russel (2002) extrapolated from an online survey of 999 U.S. Internet users, that marketing channel knowledge is the strongest predictor of online buying behavior. They draw this construct in the due course of presenting ten hypotheses. Three of their finding demonstrates that there is no difference in price, recreation orientation or age differences between those who make online purchases and those who don't. They

did find that online buyers are better educated and male, with a higher income than those who don't purchase online. As would be expected, they further determined that online consumers are lower in experiential orientation than non-Web buyers and more convenience oriented. The remaining two hypotheses propose that online consumers view the Web as having higher utilities in communication, distribution as well as hold the self-perception that they are more knowledgeable about the Web as a marketing channel, than non-Web consumers. Ultimately however, these authors identify a weakness in their study in that their methodologies for measuring channel utilities may need to be modified to accommodate attributes such as information customization and degree of interactivity.

## 2.1 Web Usability Construct

Becker (2002) in a separate and unrelated study, which in contrast to the focus on individual users studied seventeen U.S. based e-businesses, theorizes on the construct of Web Usability. The weakness with regard to information customization identified by Li et al above, appears addressable via Becker's mechanism of Web Usability. Becker represents Web Usability as the sum of eleven factors, which are navigation, design standards, personalization, design layout, performance, customer satisfaction, design consistency, reliability, security, information content and accessibility. The design standard speaks to the generalized look and feel, which can be achieved by employing, for example, HTML style sheets. We could also include emerging World Wide Web Consortium technologies such as XHTML and CSS, used for data formatting (Chung & McLane, 2002). Personalization is the meeting, through customization (i.e., display of personal data, buying preferences etc.) of individual needs. Design layout is the presentation of the visual content as achieved through the positioning of Web-objects along with colors, fonts, styles etc. Navigation is the traversal mechanisms as well as the breadth and depth of search paths. Design consistency is the uniform placement of Web objects in all of the Web site's pages. Customer service is those added functionalities that enhance the online experience, such as, chat and e-mail. Reliability is the consistent availability of the customer's access to the Website as realized through the mitigation/elimination of any downtime. Security is the access limitation and privacy of personal information. Yeung, Shim and Lai (2003, p. 230) for instance, state that, "Clearly, online payment security and data privacy are the major barriers for any business deploying e-commerce". Performance is the network related metrics of consumer wait and system response times. For example, Liu, Dixon and Murphy (2002) note that in China, "an underdeveloped infrastructure, expensive access, slow access speed...hamper Internet adoption". Information content is described as the accurate and complete translation of text into a native language. Finally, accessibility is how well its comprehension requirements are aligned with the visual, physical and cognitive limitations of the Web user.

## 2.2 Marketing Channel Construct

What seems to emerge here is that Web Usability is a construct upon which marketing's communication channel construct rests. In other words, when the Web site's intent transitions from conveying information to a true commercial venture, what appear super-imposable on the Web-usability infrastructure are the marketing channels; namely, communication channel, transaction channel and distribution channel. Li et al, argue that these three channels may or may not overlap through a commerce-oriented Website. The function of these marketing channels includes information, promotion, negotiation, ordering, financing, risk taking, physical possession, payment and the actual transfer of product ownership.

The purpose of the communication channel is to provide the customers' information needs for decision-making. Li et al argue that the communications channel can be judged on its characteristics of quality, quantity, and recency of information. It could be further argued that the communication channel, by holistically addressing the attributes of information, evolves the eleven Web Usability factors into the marketing activities of information and promotion. In short, this communication channel facilitates and perhaps even enhances, the flow of various types of information between sellers and buyers. If this line of reasoning is pursued, then the transaction channel seems responsible for the marketing functions of negotiations, ordering, financing, risk taking and payment. In essence, the transaction channel holds the

range of activities between ordering and payment between buyers and sellers. The distribution channel could then be said to hold the remaining marketing functions of physical possession and the actual transfer of product ownership.

## 2.3 Design Construct

Nah and Davis (2002) take a different approach to Web Usability by simply distilling it to the ease of two distinct activities; namely, search and navigation. They present search, as an information seeking behavior directed by goals. They give the example of a user seeking specific population growth data in her hometown over the last five years. In contrast, they make navigation synonymous with the common behavior of browsing, defining it as an activity where the information space is explored without an explicit goal in mind. They also offer that, searching tasks are best supported by a hierarchical information structure, such as those used by many online stores (Nah & Davis, 2002 p. 100) in opposition to exploratory tasks, which are best supported by a network structure and a graphical browser. They suggest three design strategies or constructs, which are related in a top-down fashion: (1) the task to be performed, (2) how information is structured within the system, and (3) navigational support (p. 100).

Katz and Byrne (2003) use the same terms of searching and browsing to actually mean a subset of a goal-directed, information seeking behavior. They (p.199) define search as the use of a site-specific search function accessed by typing a search query into a text field and browsing as the alternative methods of navigating a particular Web site, particularly the traversal of the site's menu of hierarchy (p. 199). Furthermore, they hypothesize on information scent: In the context of shopping online, information scent could refer to the amount of information a user could attain regarding the location of a product in a site based solely on the design of the site's home page...Presumably, information scent can play a large role in a user's decision to traverse the menus or use the site search function (p. 201). Since all e-commerce transactions begin with either navigation/browsing or searching (as defined by Nah and Davis), these constructs along with the subset offered by Katz and Byrne, could act as strategic predecessors in building Becker's Web Usability segments.

## 2.4 Purchasing Decision Support Construct

Similarly, the decision support system presented by Nah and Davis could be said to precede Li et al's marketing channels. Nah and Davis (2002) define the decision support construct as one that supports the stages of the purchasing decision. The stages include product search, criteria management and comparison support. Product search contains the metaphor type of the site (search engine or browsable Web structure) and information structure (network or hierarchical). Criteria management is concerned with the product presentation type (graphics, colors, size, etc.) and how the information on the product is provided (reviews from professionals, customers, etc.). Of interest is Becker's note that, many localized Web sites use national colors (e.g., yellow appears on many Germany Web sites) for navigation bars, images, and other Web objects to promote customer loyalty and national pride, as well as for branding the customer experience (Becker, 2002 p. 273). Lastly, comparison support involves the comparison scope (inter-site or intra-site) and comparison tools. In a Web site's transition from conveying information to a true commercial venture with marketing channels, Nah and Davis's three, decision support criteria could serve as the intermediary framework on which the e-commerce portion could be based.

## 2.5 Qualitative HCI Construct

The degree of interactivity, left opened by Li et al, is investigated in yet another separate study by Sun Lim of fourteen interviewees. Lim argues that systematic analysis of human-computer interaction (HCI) must be predicated on the understanding of how and why users perform their activities (Lim 2002). He bypasses quantitative methods like the study of the progression of movement within Web pages,

temporal differences in online actions, etc., in favor of a qualitative framework of study construct, which seeks to comprehend the cognitive processes fueling online behavior. The tool that Lim uses is the Self-Confrontational Interview. In this technique, the subjects are asked to perform the behavior being analyzed, i.e., online activity, which is then recorded. Subsequently, the subjects view their recorded actions and are asked to recount both thoughts and emotions as best they can recall. The interviews are then transcribed to correlate the actor's actions with their thoughts and emotions.

Lim (2002) surmises that such qualitative understanding of human interaction will in turn contribute to improve Web usability. For example, he finds that online consumers favor sequential progression from larger activity units to smaller component units. This is illustrated in the narrowing process where online buyers begin with a search engine to identify pertinent stores and then funnel further to a range of stores within which to select a range of products until they get to the item they wish to purchase. Similarly, consumers expect hyperlinks to elaborate on parent hyperlink. This appears to further support the direction that Becker's Web usability factor of navigation should be divided to produce Nah and Davis's hierarchical model of search activity.

Lim also introduces the concept that Websites should mimic real life scripts. In other words, any online purchasing interface, should imitate a brick-and-mortar process. For example, if when one needs to purchase an airline ticket, all one has to do is state different destinations to the travel agent, then an online ticket system should mirror requiring the same, and not more information, in order to provide the service. A study of an interviewee is given in this exact same scenario where the online interface requires more data input/additional traversal paths and the ensuing tension and confusion experienced by the consumer. This correlates with what Nah and Davis (2002) identify as cognitive overhead, the challenge of maintaining several tasks or hyperlink trails simultaneously (p. 99). They term the user's experiences in planning, managing and executing digressions from a course of action (p. 100), as the digression problem. In drawing a comparison between Becker's Web usability factor of accessibility and designing Web sites for real life scripts/cognitive overhead, it initially appears unrelated. For in fact, Becker discusses accessibility in terms of mitigating consumer's physical impairments and from an international perspective, the users' reading and language comprehension limitations. However, it could be argued that comprehension limitations exist not only due to physical or foreign language translations and understanding, but also as a byproduct of the consumer's specious expectation to use their real life shopping scripts to function in an Internet store and/or the consumer's inability to cope with the increasing cognitive demands. If this perception is considered, then Becker's view of accessibility is given an entirely new dimension.

Visual indicators as presented by Lim (2002), involve those clues which consumers have become accustomed to in a brick-and-mortar store. For example, one may look for box cover or a product design and logo rather than simply a product name when shopping. Becker's Web usability factor of information content might need to be deliberately stratified to accommodate emerging categories of information content such as these visual indicators. Nah and Davis (2002), take this further by calling for future studies in effective visual representations. For example, they query whether or not products should be presented on the Web using 3D imaging with interior and exterior views, for items such as automobiles. Li et al claim that such experience-oriented functionalities (e.g., 3D, virtual reality and surround video) will be dominant characteristics of the next generation of e-commerce stores. They state that simulating the real-life shopping experience, with which the consumer is familiar, will drive future, online consumer marketing.

Lim (2002) is careful to point out though, that functionality has to be dominant over aesthetics. He gives an example where a technically savvy user continued on a Website despite lack of functional clarity. A less technically competent user, he states, would simply have given up. There may be some correlation between this hypothesis and that of Li et al, which describes some online consumers belief that the Web has higher utilities in communication. It could be argued that the belief, the higher expectation of communication utility of the Web and the self-view of competency of experienced online consumers, allows them to persist in Web sites, which fail to meet the design layout, consistency and navigation as defined by Becker.

However, Lim (2002) makes the last point of guarding against Web site designs that encourage conditioning of automatic actions, as opposed to the thorough processing of information. For instance, a design layout that calls for pop-windows as a means of a communication channel, would fail in its intent if the shopper instinctively responds to remove these perceived obstructions to their line of vision, by summarily closing all pop-ups. Here again, Becker and Li's (2002) definition of design layout and communication channel respectively, achieve a greater level of granularity through the filter of Lim's

hypothesis.

## 2.6 Trust Construct

Going beyond effective technical infrastructure, design and communication, a critical element influencing all e-commerce behavior is the construct of trust. Wang and Vassileva (2003, p. 1) distinguish between trust and reputation as; trust is "an agent's belief in another agent's capabilities, honesty and reliability based on its own direct experiences", while reputation is the same belief, but based on other agents' recommendations. Smith and Brynjolfsson (2000) also offer that an Internet market, in response to lower search costs, yields a Perfect Bayesian Equilibrium in which buyers and sellers select actions based on their beliefs about each other. Nah and Davis (2002) define trust as "the willingness of the consumer (trustor) to be vulnerable to the actions of an online party (trustee) by engaging in online relationship exchanges with the party" (p. 105). They outline thirteen principles of trust under three major categories of Content, Design and External Certifications and References.

Under Content as it pertains to trust, Nah and Davis (2002) state that it is necessary for e-commerce Web sites to provide the identity of the company (address, contact information, mission statement, etc.) disclose performance history of the company and have a clear privacy and security policy. Becker notes that the "same security issues facing US users regarding the misuse and unauthorized distribution of credit card numbers, addresses, phone number, income and other personal data extend to all users in the international, online market" (Becker, 2000 p. 270). Nah and Davis elaborate that these policies should have information outlining, "how and what types of consumers' personal and transaction information will be collected, how they will be used" and "how they will be protected from unauthorized access" (p.107). They also indicate that the Web site must provide accurate and comprehensive product and pricing information along with a candid disclosure of all customer relationships aspects. The latter includes specifications of each participant's obligations and responsibilities, guarantees and pertinent compensation along with support for mediation services and dispute resolution.

Under Design, Nah and Davis suggest that the following traits will promote trust; timely and professional website design, reliable and secure technology, informed consent and personalization. Nielsen (cited in Nah & Davis, 2002, p. 107) states that, "a professional appearance brings confidence to consumers, clear navigation conveys respect for the customer and an implied promise of good service, and typos or difficult navigation communicate disregard for the users". Nah and Davis suggest that informed consent can be achieved by providing consumers the technical functionality to opt-in/opt-out of those online interactions that can either potentially benefit or harm the users. They go on to say that with the customers' privacy protected, personalization (such as selective recommendations to customers) can provide the experience that will increase the levels of trust and loyalty. Becker defines personalization as meeting the needs of a user and Nah and Davis complements this by suggesting that customer's needs must be understood via mechanisms such as data mining and collaborative filtering.

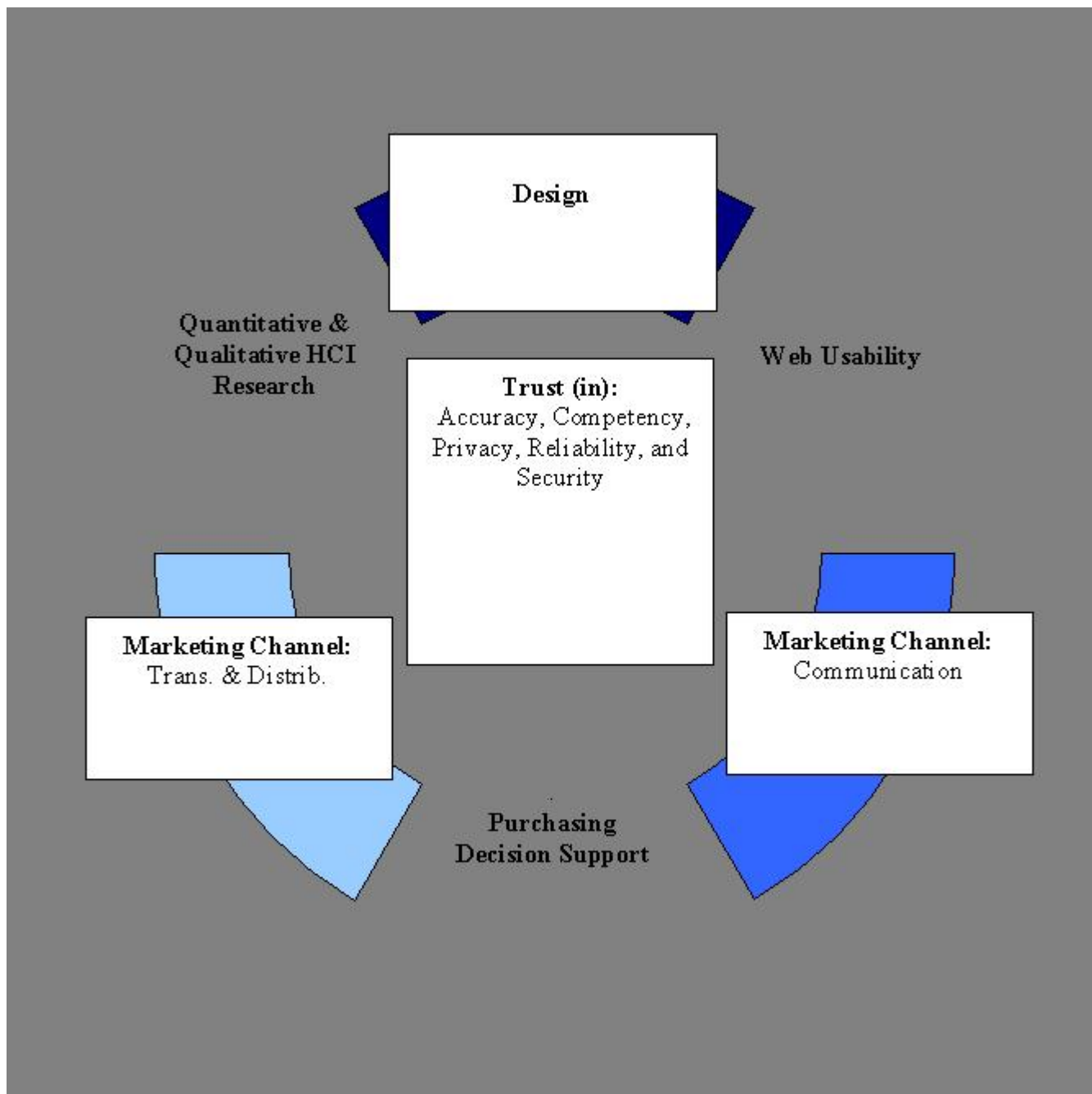
Xu and Yadov (2003 p. 406), indicate "three sources of trust between trading parties in business relationship: familiarity, calculativeness, and values" with "the most practical trust source is calculativeness: trading parties estimate the trustworthiness of each other through calculation based on the other party's past performance, which is reflected by reputation".

Under External Certifications and References, Nah and Davis propose four guidelines for fostering trust indirectly. Credibility of online services can be cultivated by obtaining certifications either in the form of approvals from professional associations or from third party assurance services, which certify security and privacy practices. Online traders can be afforded protection from Internet fraud through escrow services. Reputation systems, which gather, disseminate and compile participant feedback, are also effective in aiding consumers' assessment of an online service's trustworthiness.

Finally, credibility can be enhanced by association, via hyperlinks to and from, with other credible third parties. It could be argued that trust, (in the accuracy of information, competency of the vendor to deliver expected service, privacy of client information, reliability of performance and security of all data transfers and transactions), permeates the entire cycle of e-commerce constructs.

### 3. Conclusion

Consumer shopping behavior is being fundamentally changed by electronic commerce. Recent, independent and seemingly unrelated studies, show general patterns of dependencies or constructs, in how the virtual marketplace, as presented by e-commerce Web sites, need to be approached in terms of construction in order to accommodate consumers' needs. Nah and Davis's design paradigm of the task to be performed, structure of the information within the system (with Katz and Byrnes subsets of information seeking) and navigational support, all appear to be a unifying design construct in building Becker's eleven segments of Web Usability. In turn, Web Usability itself seems to be a construct upon which Li et al.'s marketing-communication channel rests. Another of Nah and Davis's constructs, the three, purchasing decision support criteria of product search, criteria management and comparison support, could then serve as the intermediary framework on which the e-commerce portion, including Li et al.'s remaining marketing channels of transaction and distribution, could rest. The maturing marketing channels are then likely to complete the construct circle (see Fig. 1) as constructs themselves in evolving and effectively leveraging not only the current quantitative mechanisms of data mining, collaborative filtering, real-life scripts (mimicking shopping and support), but also in contributing to the genesis and use of new constructs of qualitative techniques, such as Lim's Self-Confrontational Interview, cognitive overhead research and social constructs of trust.



(Fig. 1)

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