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Effect of Web Channel Richness and Web Information Richness On Satisfaction and Learning: A Study of Simple and Complex Products

Alain Pinsonneault
Desautels Faculty of Management, McGill University, alain.pinsonneault@mcgill.ca

Shanling Li
Desautels Faculty of Management, McGill University, shanling.li@mcgill.ca

Daniel Tomiuk
Department of Management and Technology, University of Quebec in Montreal, daniel.tomiuk@mail.mcgill.ca

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Alain PINSONNEAULT*, Shanling LI*, Daniel TOMIUK**

* Desautels Faculty of Management, McGill University
** Department of Management and Technology, University of Quebec in Montreal

ABSTRACT

The present paper addresses the following question: What are the effects of web channel richness and web information richness on learning about a product and browsing satisfaction? Based on the extant literature in communications and in marketing, we argue that the effects of web channel richness and web information richness depend on the complexity of products sold. Two hundred and seven professionals, managers, and students browsed 22 web pages selling either complex or simple products. The results indicate that when individuals browsed for complex products satisfaction depended on both informational richness and channel richness. Satisfaction was highest when the two type of richness were high and satisfaction was lowest when both types were low. Learning, on the other hand depended on the informational richness of a web page. Contrary to the expectations, web page richness was also important for learning and satisfaction when browsing for simple products. Satisfaction depended on both web information and web channel richness, whereas learning was higher when the informational richness of a web page was high. This paper contributes to the literature by developing concepts that can serve as the theoretical foundations for studying web site richness. It helps in understanding the relative impacts of the richness of the information presented on a web site and of the richness of the communication tools used. As such, it can help managers and IS professionals to better understand how to effectively design web sites.

Key-words: Web Channel Richness, Web Information Richness, Web site design, Product complexity, B2C.

RÉSUMÉ

Le présent article traite de la question suivante : Quels sont les effets de la richesse de l'information contenue sur un site web et de la richesse technique d'un site web sur la satisfaction des usagers et sur leur apprentissage des produits ? En nous basant sur la littérature en communications et en marketing, nous faisons l'hypothèse que les effets de la richesse d'un site web dépendent de la complexité du produit vendu. Deux cent sept professionnels, gestionnaires, et étudiants ont visité 22 pages web vendant soit des produits complexes ou simples. Les résultats indiquent que la satisfaction des individus qui ont visité les sites web vendant des produits complexes était influencée à la fois par la richesse de l'information et par la richesse technique des sites. L'apprentissage du produit dépendait de la richesse de l'information contenue sur les sites web. Contrairement aux attentes, la richesse d'un site web a également influencé significativement la satisfaction et l'apprentissage lorsque les individus ont visité des sites web vendant des produits simples. La satisfaction était influencée à la fois par la richesse de l'information et par la richesse technique, alors que l'apprentissage était influencé uniquement par la richesse de l'information. L'article contribue à la littérature en proposant les concepts de richesse de l'information et richesse technique de sites web, qui peuvent servir de bases théoriques pour les recherches futures sur le commerce électronique. L'article contribue également à la pratique en démontrant l'importance relative des deux types de richesse et aidant ainsi les gestionnaires et les spécialistes en technologies de l'information à mieux concevoir les sites web.

Mots-clés : Richesse de l'information, Richesse technique, Conception de sites web, Complexité de produits, Commerce électronique.

1. INTRODUCTION

It is estimated that the number of the Internet users in US reached 205 million in 2010 and online retail sales in the US reached about $35 billion during the second quarter of 2008. This is an increase of almost 10% compared to the second quarter of 2007 (US Census Bureau News 2008). One of the salient characteristics of online retailers is that customers purchase products based on the information provided through the web as opposed to getting information by physically manipulating products. Consequently, the information about online products is an important consideration for online retailers and it compels online retailers to tackle new issues concerning what information to present about products and how present it. Retailers need to decide how to describe the online products to improve customers' knowledge that ultimately leads to the purchase of the products. Despite the importance of information in e-business, there exist few theoretically grounded principles to guide the design of web sites (Dreze and Sufryden, 1997; Zhang and Von Dran, 2000). There is a call for theoretically grounded study of web design (Schneiderman, 1998; Young, 2001) and especially for looking at the notion of richness of web sites (Jiang and Benbasat, 2007).

The present paper is a step in that direction. Drawing on media richness theory (Daft and Lengel, 1986) and media synchronicity theory (Dennis, et al., 2008), it develops the concepts of web channel richness (WCR) and web information richness (WIR), and explores their effects on browsing satisfaction and learning about products. The primary goal of this paper is to study whether e-commerce could apply media richness theory and whether customers' learning about products and browsing satisfaction will increase with the richness of web information, namely, web information richness (WIR) and web channel richness (WCR). We also test whether both WIR and WCR play the same roles in improving customer learning and browsing satisfaction with respect to complex or simple products. Our findings show that customer learning and browsing satisfaction do increase with rich web information and rich channels. For complex products, customer learning and satisfaction are the highest when both WIR and WCR are high. For simple products, WIR seems more important than WCR to improve customer learning and browsing satisfaction.

The paper is organized as follows. Section 2 synthesizes the literature and empirical evidence on media richness theory. Section 3 develops the concept of Web Channel Richness and Web Information Richness and presents the hypotheses as they relate to learning and browsing satisfaction. Section 4 describes the instrument development and validation and the research method. The fifth section presents the results, and the sixth section discusses the results. The last section concludes by a discussion of the implications of this study for research and practice.

2. LITERATURE REVIEW

In this section, we briefly summarize the media richness theory and its

application to electronic technologies in the last three decades. In late 1980s and early 1990s, the media richness studies focused on comparing among traditional communication media (e.g., face to face, phone, memo). The studies concluded that communication of unequivocal messages are most effectively conveyed through lean media such as e-mail or fax and vice versa. In the late 1990s and 2000s, the study on media richness extended to new electronic media web and how richness might help to facilitate the e-commerce. We first review the literature on media richness and then discuss its application to web-based communication in the context of e-business.

2.1. Media Richness Theory

According to the media richness theory (Daft and Lengel, 1986), media differ in richness, that is, in their capacity to bridge different frames of reference, to make issues less ambiguous, and to change understanding in a given time interval. Media richness is conceptualized as the bandwidth of a communication channel (Burke and Chidambaram, 1999). Rich media, such as face-to-face, are capable of communicating more social, non-verbal, and complex cues (e.g., gesture, vocal inflection, touch, stance), and provide faster feedback than leaner media (e.g., letters and memos). Media richness theory provides a task-medium fit explanation of media choice (individuals choose the medium whose richness matches the complexity of the task to be performed) and a task-medium fit explanation of managerial performance (choosing a medium with the requisite richness for a given task improves performance). When the channel is inappropriate to the complexity of the situation, messages are likely to be misinterpreted or misunderstood (Trevino et al., 1990; Trevino et al., 1987), lead participants to engage in compensating activities in order to clarify messages content, and create communication inefficiencies such as delays and redundancies (McGrath and Hollingshead, 1993). Daft and Lengel (1984) suggest that rich media are needed to perform complex organizational tasks because such tasks require the processing of personal, improvisational, complex, equivocal, and non-linear information, which cannot be done through existing coding schemes. Thus, managers need to create or find solutions to these tasks outside the realm of existing procedures or routines, and to do so, they need to rely on judgment, creativity, and intuition (Rice, 1992). The low predictability of this process makes it difficult to specify the information that will be needed in advance. Further, communication will be more effective when made via media that allow rapid feedback (Kim, 1988). In addition, interpreting complex information inherent to complex tasks often depends on the joint construction of meaning and on social and interpersonal cues (e.g., a persons' credibility, expertise, or status) that need to be communicated along with the message (Withey et al., 1983). Lean media do not satisfy these task requirements. They oversimplify complex topics and do not enable the exchange of sufficient information to facilitate a manager's understanding (Daft and Lengel, 1984).

Media richness theory also postulates that simple tasks (those for which there exist predetermined and well-known procedures and routines) are most effectively performed through lean media. Managers facing such tasks do not have to rely on shared experience or process complex, social, and personal information to understand a given problem. Rather, they can use more formal and quantitative information and lean media such as memos, letters, and reports are sufficient to perform these tasks (Daft and Lengel, 1984). Using rich media for simple tasks is claimed to be inefficient because they provide a variety of potentially conflicting excess cues, which can distract the receiver's attention from the simple message and foster unnecessary cognitive stimulation (Edwards, 2001; Paulus and Dzindolet, 1993). The overabundance of information and cues provided by rich media in the context of simple tasks are likely to make the decision process unnecessarily complex and long and reduce decision quality (Daft and Lengel, 1984; Lengel and Daft, 1988; McGrath and Hollingshead, 1993).

Table 1 and Table 2 summarize the studies that have tested media richness theory.

Two observations can be made based on Tables 1 and 2. First, the empirical evidence supports the media richness theory (for both the media choice and media performance explanations) when applied to complex tasks. Studies indicate that managers facing complex and equivocal tasks or working in an unstable context tend to choose rich media (see Table 1, e.g., Barnard, 1991; Daft et al., 1987; Hunter and Allen, 1992; Reinsch and Bewick, 1990; Rice and Shook, 1988; Straub and Karahanna, 1998). Further, individuals using rich "traditional" media for complex tasks were found to outperform those using lean media (see Table 2, Hollingshead, et al., 1993; Rice, 1992; Rice and Shook, 1990a).

Second, the empirical evidence does not support the assumption of the theory that the relationship for opposite types of media (rich vs. lean) are also opposite. That is, individuals performing simple tasks will choose lean media, and their performance should be higher when using lean media and lower when using rich media. Rather, it seems that individuals tend to prefer rich media, even for simple tasks. For instance, it was found that lower-level managers relied as much on rich media as did top-level managers (see Table 1, e.g., Fann and Smeltzer, 1989; Jones et al., 1988-89; McCleod and Jones, 1987; Rice et al., 1989; Rice and Shook, 1990b). Further, no significant differences were found between the performance of individuals using lean media for simple tasks and the performance of individuals using rich media for simple tasks (see Table 2, Dennis, and Kinney, 1998; Hollingshead et al., 1993; Rice, 1992).

2.2. Web Media Richness: Web Information Richness (WIR) and Web Channel Richness (WCR)

Media richness theory assumes that the richness of a message is determined by the characteristics of the medium carrying it, such as immediacy of feedback or cue-carrying capacity: the larger the bandwidth of the conduit, the

Study	Media Studied	Findings
Supporting Task-Medium Fit		
Daft et al. (1987)	Face to face, telephone, addressed documents, unaddressed documents	Rich media for ambiguous communications; Lean media for unambiguous communications.
Trevino et al. (1987) Trevino et al. (1990) Trevino et al. (2000)	Face to face, telephone, E-mail, written media (e.g., memo), letter, fax and meeting	1. Rich channels for highly ambiguous content; lean media for low ambiguous content 2. Rich media for highly equivocal messages. 3. Equivocal tasks lead individual to choose and use meetings over letters.
Sherblom (1988)	E-mail	E-mail for simple exchange of information.
Lengel and Daft (1988)	Face to face, telephone E-mail, memos, letters, tailored computer reports, flyers, bulletins Generalized computer reports	Preference of rich channels (face to face) increased as topics became non-routine. Preference of lean media for routine tasks by managers.
Reinsch and Bewick (1990)	Face to face, telephone, written documents, voice mail	Richer media were preferred for complex messages.
Rice and Shook (1990a)	Voice mail	Voice mail (a rich medium) was used more heavily in less analyzable environments.
Russ et al. (1990)	Letter, Face to face, flier/bulletin, Formal memorandum, Single-purpose report, telephone, note, public address system, standardized report, telex/telegram	The reduction of message equivocality weighed heavily on media selection. Results support that, at higher managerial levels, richer media is preferred.
Barnard (1991)	Face to face, meetings, letters/memos, computer files, other files, telephone, fax	Richer media used by managers when dealing with problems that are perceived to have a higher level of uncertainty.
Schmitz and Fulk (1991)	Formal numeric text, formal written text, E-mail, personal written text, telephone, face to face	Although results showed that 'perceived' richness of e-mail varied across respondents, the rankings of 'perceived' richness of the media generally followed the richness continuum predicted by media richness theory.
Hunter and Allen (1992)	E-mail	Results support Media Richness Theory. Medium use is predicted by communication task requirements.
Fulk (1993)	E-mail	Perceived medium richness contributed to attitude and use of e-mail.
D'Ambra and Rice 1994)	Email, face to face, telephone voice mail, facsimile, forms, note, letter, secretary, single purpose report, standard report	Direction of correlations supported that for tasks with high level of equivocality, rich media (i.e, telephone, face to face) was preferred. However, results show that, initially, voice mail was chosen infrequently but subsequently became highly rated across all tasks analyzed. Authors suggest that other factors, aside from media richness, affect choice.
Straub and Karahanna (1998)	*Study 1*: Face to face, telephone, e-mail, fax *Study 2*: Face to face, telephone, voice mail, e-mail, fax	Study 1 Social presence predicted all media choices. Rich media were chosen for high social presence tasks (high interpersonal, sensitive). Lean media were chosen for low social presence tasks. Study 2 Tasks requiring social presence were a good predictor of face-to face choice over e-mail.

Table 1: Studies on Media Richness: Task-Medium Fit Explanation of Media Choice (chronological order).

Partially or Not Supporting Task-Medium Fit		
McCleod and Jones (1987)	*Oral Media*: business meals, scheduled Meetings, unscheduled Meetings, social activities, telephone, tours *Written Media*: Computer reports, letters, memos, noncomputer reports, Periodicals	Contrary to Media Richness Theory, upper managers did not prefer oral to written communication. Rather, executives used and valued a wide media mix.
Jones et al. (1988-89)	Face to face meeting, face to face, others telephone, addressed documents unaddressed documents	Lower-level managers relied more on richer media than top-level managers.
Fann and Smeltzer (1989)	*Sources of Information*: family and friends, customers and employees, bankers/lawyers/accountants, suppliers and vendors, newspapers/magazines, competitors, trade/professional meetings	Owner/managers of small firms continued to rely heavily on rich media even as information equivocality decreased. At start-up (i.e. high environmental complexity or high equivocality), rich media was primarily used. During 'stability' (i.e., lower environmental complexity or lower equivocality) the use of leaner sources of information increased but reliance on richer sources of information remained.
Rice et al. (1989)	E-mail	Contrary to Media Richness Theory which suggests that individuals in higher job categories should rely more heavily on richer media, results showed that managers used e-mail more than persons in lower job categories (e.g., technicians).
Rice and Shook (1990b)	Face to face, meetings, memos/letters, telephone e-Mail	Contrary to Media Richness Theory, managers did not always use lean media (i.e., e-mail) less than clerical workers in various organizations.
El-Shinnawy and Markus (1992)	Voice mail, e-mail	E-mail was preferred to reduce uncertainty. Voice mail was not preferred to reduce equivocality.
Rice (1993)	*Traditional media*: face to face, telephone, meeting, text *"New" media*: desktop video/video conf., voice mail, e-mail	Appropriateness of traditional media was associated with use. Appropriateness of new media was weakly associated with use.
Markus (1994)	E-mail, telephone	Social processes rather than media characteristics determine media. Appropriateness of media is socially defined.
Lee (1994)	E-mail	Richness was not inherent to the medium, but varied with the organizational context
Webster and Trevino (1995)	*Study 1* Traditional media: face to face, telephone, letters, memos "New" Media: e-mail Study 2 Traditional media: face to face memos "New" Media: e-mail , voice mail	Media richness explanation is more important than social explanations in explaining media choice for traditional media. Social explanation is more important than media richness explanation in explaining media choice for new media.

Table 1: Studies on Media Richness: Task-Medium Fit Explanation of Media Choice (chronological order).

Study	Media studied	Findings
Supporting Task-Medium Fit Explanation of Performance		
Rice and Shook (1990a)	Voice mail	In less routine environments (i.e., tasks requiring higher analyzability), voice mail (rich media) improved ability to obtain and distribute information.
Rice (1992)	Video conferencing, voice mail, e-mail, online databases	Some support for the medium-task fit effects on performance. Lean media used for analyzable tasks lead to better performance than rich media used for unanalyzable tasks.
Hollingshead et al. (1993)	Face to face, computer mediated typing	Partial support. Intellective task: rich medium outperformed lean media. Idea generation and decision making tasks: no difference between rich and lean media.
Partially or Not Supporting Task-Medium Fit Explanation of Performance		
Kinney and Watson (1992)	Face to face, telephone, computer mediated text	Medium-task fit had no effect on decision time, consensus change, and satisfaction
Valacich et al. (1994)	Face to face, video communication, audio communication, computer-mediated typing	Task-medium fit did not improve performance.
Dennis and Kinney (1998)	Video communication , computer-mediated typing	Equivocal task: rich medium had no effect on decision quality, decision time, consensus change, communication satisfaction
Burke and Chidambaram (1999)	Face to face, computer-mediated typing (synchronous), computer-mediate typing (asynchronous)	Complex task: synchronous performed better than face to face (richest medium)
Suh (1999)	Face to face, video conferencing, telephone, computer-mediated text (synchronous)	No task-medium effects on decision quality or decision time

Table 2: Studies on Media Richness: Task-Medium Fit Explanation of Performance.

richer the content of the communication and, conversely, the narrower the conduit, the leaner the content. However, the richness of the information communicated over an electronic medium may not be totally determined by the medium's technical characteristics (Dennis et al., 2008; Jiang and Benbasat, 2007; Lee, 1994; Ngwengama and Lee, 1997) and therefore, the two constructs should be distinguished and separated. Research indicates that the richness of the content of communications (we call *Web Information Richness or WIR*) may change over time although the richness of the conduit (we call *Web Channel Richness or WCR*) may not (Burke and Chidambaram, 1999; Walther, 1992, 1994; Walther and Burgoon, 1992). Carson and Zmud (1999) suggest that the perceived richness of the information communicated over a given channel (e-mail) depended on the users' expertise. Similarly, Zack (1993) found that as group members

worked together and communicated through electronic means, they tended to develop a shared understanding and common frames of reference, which allowed them to communicate efficiently and effectively with fewer words. Groups with a history of working together were able to communicate more complex messages (richer) on a lean medium than newer groups.

In addition, messages sent over a given electronic communication (e.g., e-mail) tend to have a wider range of richness than their paper equivalent (e.g., memo). For instance, e-mail has been found to attenuate social and contextual cues, disinhibit behaviors, deregulate communications, and favor the transmission of information that would not have been conveyed through an equivalent "traditional" medium (Sproull and Kiesler, 1986, 1991).[1] People tend to compensate for the social and contextual limits of electronic communications through the use of particular language, symbols, and format (Walther, 1992). Greetings and salutations are used in electronic media as reminders of status positions and names as reminders of gender (Sarbaugh-Thompson and Feldman, 1998). In electronic communications, individuals tend to become increasingly aware of how to craft messages to convey differing levels of formality or how to use channel-specific meta-language to communicate subtleties. Smiley faces ":)", frowns ":(" and exclamation points are often used in electronic mails to indicate mood, humor, irony, or intensity, but not in "traditional" media (Carlson and Zmud, 1999). Therefore, the richness of the content (information richness) of a given electronic medium such as e-mail can vary more than the richness of the content of its paper equivalent (e.g., memo). Rowe and Struck (1999) found the use of new media was more related to culture analysis that helps understand the information richness theory.

Dennis et al. (2008) suggested that while media richness theory is supported for "traditional" media (i.e., face to face, telephone, documents), it needs to be adapted to "new" electronic media (e.g., e-mail, web, video and computer conferencing) (Denis and Kinney, 1998; El-Shinnaway and Markus, 1992; Strabu and Karahanna,

[1] This effect can be explained by the fact that electronic media have been found to lessen both private self-awareness (focusing on personal aspects of oneself, like perceptions, thoughts, and feelings) and public self-awareness (giving attention to oneself as a social object and being concerned with appearance, with being evaluated by others, and with the impressions made in social situations) (Matheson and Zanna, 1988, 1989, 1990; Pinsonneault and Heppel, 1998). Lessening private self-awareness leads individuals to feel immersed in a group, to become unaware of their internal processes, standards, and values, and to be less able to retrieve them in order to compare and adjust their behavior (Diener, 1980; Pinsonneault and Heppel, 1998; Prentice-Dunn and Rogers, 1982). Group members thus regulate their behaviors based on group norms and standards rather than on internal values, self-regulation, and behavioral constraints. However, research indicates that electronic media make these norms and values less evident to individuals (Short et al., 1976; Sproull and Kiesler, 1986; 1991) and lower public self-awareness, which reduces concerns with social standards, conformity, and social evaluation and favors the transmission of a wider range of messages (Diener, 1980).

1998; Webster and Trevino, 1995).[2] In particular, the richness of the content of the medium should be distinguished from the richness of the channel itself (Dennis et al., 2008, Jiang and Benbasat, 2007). Recently many studies explored the impact of information richness on e-commerce. For example, Jahng et al. (2007) investigated the effect of the richness of consumer's interaction to use business-to-consumer (B2C). The study showed that interaction richness has positive impact on consumers' attitude towards B2C. The study finds that the impact is stronger in the case of purchasing a high-complexity product than a low-complexity product. The study by Blano et al. (2010) showed that when a picture of the product appears together with textual information, users remember more information and consider it easier to remember if that information appears schematically. Daras and Alvarez (2009) illustrated the possible characteristics of the future media technologies. They stated that the new media formats are moving from textual-based to a media-based Internet, where rich audiovisual content, 3D representations, virtual and mirror worlds, lifelogging applications, etc. become a reality. The new media technologies will create more values to the e-commerce.

Following media richness theory and the research on web information richness, we propose that WIR and WCR have different impact on online customers' learning about the products and browsing satisfaction. Also, the richness in WIR and WCR required to describe products is likely to differ depending on the characteristic of products, namely, its complexity. Although many papers can be found in the area of e-commerce, few papers study the relationship between WIR and WCR and their effect in e-commerce. The present paper extends our knowledge on the topic by studying the effect of both WIR and WCR on user experience.

3. HYPOTHESES

Media richness theory explains the importance of the fit between the characteristics of a communication medium and a given task. Fundamentally, it argues that individuals prefer a medium that matches the complexity of the task (i.e., rich media for complex tasks, lean media for simple tasks), and that using the appropriate medium improves performance. When the channel is inappropriate to the complexity of the task, messages are likely to be misinterpreted or misunderstood (Trevino et al., 1990; Trevino et al., 1987), leading participants to engage in compensating activities in order to clarify messages content, and creating

[2] Others have attempted to adapt media richness theory to new media by adding a broader set of antecedents have been added to the theory: situational influence (Rice, 1992; Trevino et al., 1990; Trevino et al., 1987), social influence (Fulk, 1993; Rice, 1993; Schmitz and Fulk, 1991), social presence (Straub and Karahanna, 1998), individual differences (Lee, 1994; Ngwengama and Lee, 1997), characteristics motivating communication behavior (Fulk and Boyd, 1991; Rice, 1992), personal experience leading to expansion of channel richness (Carlson and Zmud, 1999), and relational development over time (Burke and Chidambaram, 1999; Walther, 1992, 1994).

communication inefficiencies such as delays and redundancies and reducing learning and satisfaction (McGrath and Hollingshead, 1993). Similarly, the appropriate degree of web site richness is likely to depend on the complexity of the products sold on a given web site (or web page).

Applied to an e-business context, this suggests that when individuals buy complex products (and therefore perform relatively complex tasks), richer web sites are likely to be preferred and more effective than lean web sites. When buying a complex product, customers use a complex, non-linear, and iterative decision process; hence the task to be performed is relatively complex (Kleperer, 1987; Shugan, 1980). And when facing these tasks, people perform better when using rich media (D'Ambra and Rice, 1994; Hollingshead et al., 1993; Hunter and Allen, 1992; Rice, 1992; Rice and Shook, 1990a; Straub and Karahanna, 1998; Trevino et al., 2000; Webster and Trevino, 1995). We suggest that learning about a complex product will be higher when the richness of information is high. Complex products such as computers are made of numerous components and parts, offer multiple attributes, and perform diverse functions, all of which interact in a non-simple way (Cooper, Sinha, and Sullivan, 1992). Effective communication about such products often requires the transmission of social and interpersonal information (e.g., reference group opinion, individuals' credibility, expertise, status) along with technical information about the product itself. In fact, research on pragmatic social inferences indicates that consumers often use social information accompanying product information in making decisions about complex products (Grunfeld and Wyer, 1992; Hilton, 1995; Schwarz, 1994). They often make sense of this complexity by relying on personal, intuitional, and improvisational information, which tends to be complex and equivocal because there exist no established coding schemes to interpret it. The cognitive efforts and the process required to understand a product and to accumulate sufficient knowledge necessary for an effective assessment of its use are higher for complex products than for simple ones (Farrell and Shapiro, 1988; Klemperer, 1987; Shugan, 1980). Therefore, our first hypothesis is as follows:

Hypothesis 1: For complex products, learning about a product will be higher when WIR is high than when WIR is low.

Further, we suggest that satisfaction of individuals browsing for complex products will be highest with WCR is high. When browsing for complex products, consumers often need to create or find decision processes outside of the realm of existing procedures or routines that they have used before, and to do so, they need to rely on judgment, creativity, and intuition (Rice, 1992). The low predictability of these decision processes and their iterative nature make it difficult to specify in advance the information and the decision process that will be used. Consequently, the process of understanding a product will be more efficient and satisfaction will be higher

when made via a rich web site that that allows rapid feedback and the transmission of multiple cues (Kim, 1988). Leaner web sites do not satisfy these task requirements. They oversimplify complex topics and information and do not enable the communication of sufficient information to facilitate understanding of complex concepts and products (Jiang and Benbasat, 2007). Thus, our second hypothesis for complex products is as follows:

Hypothesis 2: For complex products, browsing satisfaction will be higher when WCR is high than when WCR is low.

The literature on media richness, especially the one focusing on new electronic media (e.g., Blano et al., 2010; Dennis and al., 2007; Jahng et al. (2007); Jiang and Benbasat, 2007), suggests that the two types of richness will interact in such a way that learning and satisfaction will be highest when both types of richness are high. That is, each type of richness will reinforce the effect of the other type of richness.

Hypothesis 3: For complex products, browsing satisfaction and learning about the product will be highest when both WIR and WCR are high.

Although media richness theory argues for symmetry of effects for simple tasks, the expected relationship between web richness and communication effectiveness for simple products is much less clear.

Media richness theory suggests that simple information is best communicated through lean media and simple tasks (those for which there exist predetermined and well-known procedures and routines) are most effectively performed through lean media. In addition, the literature on information overload and on cognition suggests that individuals minimize the mental and cognitive efforts needed in a decision making process like understanding the nature of products and their usage (Bettman et al., 1990; Crever et al., 1990; Jacoby, 1984; Keller and Staelin, 1987; Todd and Benbasat, 1992). Further, media richness suggests that using rich web sites for simple products (and therefore for accomplishing relatively simple buying tasks such as purchasing a CD or a book) is likely to reduce communications effectiveness because they provide a variety of potentially conflicting excess cues, which can distract the receiver's attention from the simple message and foster unnecessary cognitive stimulation (Bettman, Johnson, and Payne, 1990; Edwards, 2001; Jacoby, 1984; Keller and Staelin, 1987; Paulus and Dzindolet, 1993; Todd and Benbasat, 1985).

However, the empirical evidence indicates that "excess richness" does not seem to be detrimental to performance for simple tasks in electronic communications (Fann and Smeltzer, 1989; Jones et al., 1988-89; Markus, 1994; McCleod and Jones, 1987; Rice et al., 1989; Rice and Shook, 1990b). Consequently, it is difficult to make theoretically and empirically based arguments that simple products require leaner web sites or that too much WIR or WCR will be negatively affect learning and satisfaction. Thus, our hypothesis for simple products is as follows:

Hypothesis 4: For simple products, learning about a product and browsing satisfaction will not be affected by WCR and WIR.

4. RESEARCH METHOD

In this section, we empirically test the hypotheses proposed in Section 3.

4.1. Constructs and Measurement

This study focuses on five main constructs: WCR, WIR, product complexity, learning about a product, and browsing satisfaction. *WCR* refers to the characteristic of the communication channel and its capacity to transmit complex information. It is composed of multiplicity of cues (the number of ways in which information can be communicated on the web site), immediacy of feedback (the extent to which the web site enables buyers to receive rapid feedback on the communication they initiated or enables rapid interactions between buyers and the web site), language variety (the range of meanings that can be conveyed with language symbols used on a web site), personal focus (the degree to which people feel that a web site fit and is tailored to individual frames of reference, needs, and the current situation of the user).

WIR is the richness of the informational content of a web page. WIR is composed of three main factors. First is the quality of the information provided on the web site. Better quality of information is likely to lead to better learning (Katerrattanakul and Siau, 1999; Seddon, 1997). The second element is the degree to which the information provided helps in comparing equivalent products and of different models of a product. Determining what products best fit with one's needs is a complex process, which is facilitated when consumers have sufficient information to compare different models of a product and the products of different companies based on objective criteria (e.g., comparing different models of personal computers sold by IBM and comparing one model of an IBM computer to a similar model of another manufacturer). The final component of WIR is the degree to which the web site provides information drawn from comments of user groups or through on-line help that helps the consumer to understand, evaluate, and choose a model or product that best fit with their needs and requirements.

Product complexity is defined as the extent to which a product is made of large number of parts that interact in non-simple ways. In addition, product complexity is related to the interactions between product variety and rapid changes in product configuration. Highly complex products like computers, cars, copiers and cameras have a variety of models that are modified and updated over time. These products, in general, have a large number of components that are assembled through a multi-stage process (Hill, Smith, and Mann, 1987).

Learning about a product refers to the amount of new information that was provided to individuals and how much they feel they have learned about

the product by browsing the web site. *Browsing satisfaction* is the individual's perception that the web site meets or exceeds their expectations (Oliver, 1993). In the present context, satisfaction means the degree to which individuals are pleased with their browsing of the web sites and hoe motivated they are to visit the site again in the future.

All the five constructs are measured on a Likert scale, with 5 representing the highest value and 1 the lowest value. The questionnaire items measuring each construct are presented in Appendix A, along with the reliability results of both the pretest and the study. The questionnaire was pretested with 49 individuals[5] in the following way. Participants were asked to visit a web site of their choice and to browse the site long enough to become familiar with its content and with the way it is structure before answering the questionnaire. Participants spent an average of 30 minutes on the site they visited before filling the questionnaire. Participation was rewarded through either credit applied to their course homework or a monetary reward of 20$. Each concept (see bolded titles in Appendix A) in the questionnaire underwent a confirmatory factor analysis with a Varimax rotation approach, which confirmed the initial structure presented earlier. All scales yielded acceptable reliability for a pretest (see Appendix A).

4.2. Description of Data and Data Collection

Two hundred and seven individuals (105 men, 102 women) participated in the study. Participants, averaging 30 years old, were professionals (53%), managers (10%), and graduate and undergraduate students majoring in management or computer science (37%). They had used the Internet on a regular basis for an average of 33 months, made 3 purchases over the internet in the last 12 months, and were accessing the Internet on average 12 times per week for a total of 14 hours per week.

We selected 22 companies from Information Week's list of e-business 100 companies that sold either complex (Personal computer, Laser printer) or simple products (CD, Polar jacket). Two main criteria were used to choose the company. First, the Internet represented an important channel for the company to communicate information about its products. All companies in the e-business 100 are characterized as being aggressive in using the Internet and their respective web sites to handle sales transactions and provide customer service. Based on Information Week, on average, the companies derived about half their annual revenue from e-business transactions, although that figure may be skewed somewhat by the fact that one-quarter of the companies get all

[5] Pre-test participants (42% were male) had an average age of 32 years old and were graduate and undergraduate students majoring in management or in computer science (33%), professionals (40%), and managers (27%). They were experienced in using the Internet: they had used the Internet on a regular basis for an average of 28 months, made 6 purchases in the last 12 months, and were accessing the Internet on average 14 times per week for a total of 12 hours per week.

their revenues from e-business. Second, the companies needed to sell products that we had categorized as simple and complex. To assure this, each researcher browsed the companies' web site to determine the appropriate specific page to include in the study.

Two complex products (Personal computer, Laser printer) and two simple products (CD, Polar Jacket) were selected to manipulate product complexity. In addition, as a manipulation check, we measured *perceived product complexity* using a 5 item Likert scale (see Appendix A) that assessed the respondents' perception of the number of components, the complexity of the technology embedded in the products, and the number of functions the product can perform. The data indicates that our manipulation of product complexity was successful. The average perceived complexity for simple products was 3.019 (standard deviation, 0.942) while the average perceived complexity for complex products was 3.587 (standard deviation, .829), with an F of 21.000 ($p < .000$).

Eight companies selling simple products and 14 selling complex products were chosen for the study.[1] Each participant was randomly assigned to a specific page of a web site. Before answering the questionnaire relating to a specific web site, the participants were asked to browse the web site for a minimum of 15 minutes so that they become familiar with the page's structure and content. Respondents spent an average of 31 minutes on the site before answering the questionnaire. Each scale underwent a second factor and reliability analyses, which, as indicated in Appendix A, yielded higher scores than those obtained in the pre-test and are all acceptable given the exploratory nature of this study.

5. RESULTS

We present the results of the statistical analyses conducted to test the hypotheses of this study. We first present the descriptive statistics of the key constructs. Then, to examine the respective importance of WCR and WIR and to explore their interactive effects, we test their effects on learning and satisfaction for simple and complex products.

Table 3 presents the descriptive statistics (mean, standard deviation, correlations) of web information richness (WIR), web channel richness (WCR), perceived product complexity (PC), learning, and satisfaction. The descriptive statistics were derived from an overall sample (N = 207 responses) that was also divided into two smaller samples with one containing complex products (i.e., personal computers and laser printers) (N = 115), and the other containing simple products (i.e., CD and polar jackets) (N = 92).

[1] The companies for simple products are: Amazon, Barnes and Noble, Buy, CDNOW, Landsend, LLBean, Outpost, REI, ValueAmerica. The companies for complex products were: Apple, Beyond, Buy, CC-inc, Compaq, Dell, Egghead, Gateway, HP, IBM, Intel, PCConnection, Sun, Warehouse. The addresses of the specific pages are available upon request.

Overall Sample (n= 207)	Mean	Std. Dev.	WIR	WCR	LEARNING	SATISFACTION	PC
WIR	3.5178	.6503	1.000	.565**	.643**	.661**	.162**
WCR	2.9983	.4746		1.000	.458**	.684**	.000
LEARNING	3.6290	.9782			1.000	.549**	.284**
SATISFAC	3.3481	1.1954				1.000	.008
PC	3.4397	.9207					1.000
Complex products (n=115)	Mean	Std. Dev.	WIR	WCR	LEARNING	SATISFACTION	PC
WIR	3.4444	.6704	1.000	.590**	.639**	.625**	.268**
WCR	2.9534	.5004		1.000	.420**	.685**	-.008
LEARNING	3.6013	.9535			1.000	.472**	.262**
SATISFAC	3.0632	1.1728				1.000	.059
PC	3.7219	.7929					1.000
Simple products (n=92)	Mean	Std. Dev.	WIR	WCR	LEARNING	SATISFACTION	PC
WIR	3.6360	.6014	1.000	.488**	.660**	.713**	.200*
WCR	3.0707	.4224		1.000	.531**	.686**	.149
LEARNING	3.6737	1.0205			1.000	.720**	.404**
SATISFAC	3.8070	1.0889				1.000	.273**
PC	2.9853	.9341					1.000

** P<0.01, *P<0.05, 2 tailed significant

Table 3 Descriptive Statistics and Pearson Correlation.

Table 3 indicates that WIR and WCR were positively correlated with both learning (.643, $p < .01$; .458, $p < .01$, respectively) and satisfaction (.661, $p < .01$; .684, $p < .01$, respectively) for the overall sample. WIR and WCR were also correlated with learning (.639, $p < .01$; .420, $p < .01$, respectively) and with satisfaction (.625, $p < .01$; .685, $p < .01$, respectively) for the complex products. Similarly, WIR and WCR were correlated with learning (.660, $p < .01$; .531, $p < .01$, respectively) and with satisfaction (.713, $p < .01$; .686, $p < .01$, respectively) for simple products.

To examine these results more closely, we analyzed the relative importance of WCR and WIR for complex products. We divided the 115 respondents into 4 groups at the medians of WCR and WIR (1: Low WCR and low WIR, 2: Low WCR and high WIR; 3: High WCR and low WIR; and 4 High WCR and high WIR).

The Anova test results presented in Table 4 indicate that the differences in the means of learning and satisfaction were statistically significant ($F = 22.437$, $p < .001$; $F = 33.875$, $p < .001$, respectively).

Table 5 presents the results for the Post Hoc tests of differences in the means of learning and satisfaction between any two groups for complex products. The results indicate that learning about complex products was mostly influenced by WIR. For instance, the mean of learning was not significantly different between groups with similar WIR and different WCR (group 1 vs. group 3; group 2 vs. group 4, not significant). However, learning

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Satisfaction	1.00	41	2.1951	.71910	.11230	1.9681	2.4221	1.00	3.29
	2.00	15	2.8952	.61910	.15985	2.5524	3.2381	2.00	4.00
	3.00	17	3.0924	.67563	.16387	2.7451	3.4398	2.14	4.14
	4.00	42	3.8299	.81989	.12651	3.5744	4.0854	1.57	5.00
	Total	115	3.0161	1.01170	.09434	2.8293	3.2030	1.00	5.00
Learning	1.00	41	3.0610	.79996	.12493	2.8085	3.3135	1.00	5.00
	2.00	15	4.2333	.65101	.16809	3.8728	4.5938	2.50	5.00
	3.00	17	3.1765	.61087	.14816	2.8624	3.4906	2.50	4.00
	4.00	42	4.1310	.63495	.09798	3.9331	4.3288	3.00	5.00
	Total	115	3.6217	.87256	.08137	3.4606	3.7829	1.00	5.00

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Satisfaction	Between Groups	55.770	3	18.590	33.875	.000
	Within Groups	60.914	111	.549		
	Total	116.684	114			
Learning	Between Groups	32.764	3	10.921	22.437	.000
	Within Groups	54.031	111	.487		
	Total	86.796	114			

Sample split based on the median of Web Information Richness and Web Channel Richness
1 Low WCR & Low WIR
2 Low WCR & High WIR
3 High WCR & Low WIR
4 High WCR & High WIR

Table 4 Anova — Web Information Richness and Web Channel Richness (Complex Products).

when WIR was high was significantly higher than learning when WIR was low, notwithstanding the level of WCR (2 > 1, 4 > 3, p < .000 each). Hence, hypothesis 1 is supported. The interaction effect of WIR and WCR on learning partially supported hypothesis 3. Learning when both WIR and WCR were high was higher than when both WIR and WCR were low (4 > 1, p. < .000), however, the results for other situations were mixed (4 > 3, p < .000; 4 vs. 2, ns).

Two observations can be made based on the results of Table 5 concerning satisfaction when browsing for complex products. First, as hypothesized, browsing satisfaction was higher when WCR was high than when WCR was low (satisfaction of group 3 > satisfaction of group 1, p > .001), thus supporting hypothesis 2. Second, browsing satisfaction was also influenced by a combination of WCR and WIR. Satisfaction level was lowest when both WCR and WIR were low (group 1 < group 2, p < .024; group 1 < group 3, p < .001; group 1 < group 4, p < .000). On the contrary, satisfaction was highest when both WCR and WIR

Multiple Comparisons

Dependent Variable		(I) WIR-WCR for complex products	(J) WIR-WCR for complex products	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Satisfaction	Scheffé	1.00	2.00	-.7001	.22354	.024	-1.2832	-.1170
			3.00	-.8973	.21370	.001	-1.4547	-.3399
			4.00	-1.6348	.16264	.000	-2.0590	-1.2106
		2.00	1.00	.7001	.22354	.024	.1170	1.2832
			3.00	-.1972	.26242	.904	-.8817	.4873
			4.00	-.9347	.22283	.001	-1.5159	-.3535
		3.00	1.00	.8973	.21370	.001	.3399	1.4547
			2.00	.1972	.26242	.904	-.4873	.8817
			4.00	-.7375	.21295	.010	-1.2930	-.1820
		4.00	1.00	1.6348	.16264	.000	1.2106	2.0590
			2.00	.9347	.22283	.001	.3535	1.5159
			3.00	.7375	.21295	.010	.1820	1.2930
Learning	Scheffé	1.00	2.00	-1.1724	.21053	.000	-1.7215	-.6232
			3.00	-.1155	.20126	.954	-.6405	.4095
			4.00	-1.0700	.15317	.000	-1.4695	-.6704
		2.00	1.00	1.1724	.21053	.000	.6232	1.7215
			3.00	1.0569	.24715	.001	.4122	1.7015
			4.00	.1024	.20986	.971	-.4450	.6498
		3.00	1.00	.1155	.20126	.954	-.4095	.6405
			2.00	-1.0569	.24715	.001	-1.7015	-.4122
			4.00	-.9545	.20056	.000	-1.4776	-.4313
		4.00	1.00	1.0700	.15317	.000	.6704	1.4695
			2.00	.1024	.20986	.971	-.6498	.4450
			3.00	.9545	.20056	.000	.4313	1.4776

Sample split based on the median of WIR and WCR
1 Low WCR & Low WIR
2 Low WCR & High WIR
3 High WCR & Low WIR
4 High WCR & High WIR

Table 5 Post Hoc Tests — Web Information Richness and Web Channel Richness (Complex products).

were high (4 > 1, p < .000; 4 > 2, p < .001; 4 > 3, p < .010), thus providing support for hypothesis 3.

Similar analyses were conducted for simple products and are presented in Tables 6 and 7. To analyze the relative importance of WCR and WIR for simple products, we divided the 92 respondents into 4 groups at the medians of WCR and WIR (1: Low WCR and low WIR, 2: Low WCR and high WIR; 3: High WCR and low WIR; and 4 High WCR and high WIR). Table 6 indicates that the interaction between WIR and WCR was significant for both learning and satisfaction (F = 23.714, p < .001; F = 39.664, p < .001, respectively).

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Satisfaction	1.00	26	2.5165	.94422	.18518	2.1351	2.8979	1.00	4.86
	2.00	15	4.2381	.59066	.15251	3.9110	4.5652	3.29	5.00
	3.00	21	3.4683	.51680	.11278	3.2330	3.7035	2.57	4.29
	4.00	30	4.3667	.52076	.09508	4.1722	4.5611	2.86	5.00
	Total	92	3.6178	1.02163	.10651	3.4062	3.8293	1.00	5.00
Learning	1.00	26	2.7500	.82765	.16231	2.4157	3.0843	1.00	4.00
	2.00	15	4.2000	1.11484	.28785	3.5826	4.8174	1.50	5.00
	3.00	21	3.4048	.73517	.16043	3.0701	3.7394	2.00	5.00
	4.00	30	4.4000	.54772	.10000	4.1955	4.6045	3.00	5.00
	Total	92	3.6739	1.03625	.10804	3.4593	3.8885	1.00	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Satisfaction	Between Groups	54.601	3	18.200	39.664	.000
	Within Groups	40.379	88	.459		
	Total	94.980	91			
Learning	Between Groups	43.683	3	14.561	23.714	.000
	Within Groups	54.035	88	.614		
	Total	97.717	91			

Sample split based on the median of Web Information Richness and Web Media Richness
1 Low WCR & Low WIR
2 Low WCR & High WIR
3 High WCR & Low WIR
4 High WCR & High WIR

Table 6 Anova — Web Information Richness and Web Channel Richness (Simple products, N=92).

Table 7 presents the results of the Post Hoc analyses for the interaction between WIR and WCR for web sites selling simple products. Two observations can be made. First, WIR and WCR had significant effects on browsing satisfaction and learning about a product (hypothesis 4 not supported). The lowest levels of satisfaction and learning were found for web pages with low WIR and low WCR ($1 < 2$, $1 < 3$, $1 < 4$, all $p < .050$). Second, WIR had a significant effect on both learning and satisfaction ($1 < 2$, $3 < 4$, all $p < .001$). However, the differences in the means of both learning and satisfaction between groups with low and high WCR were not statistically significant (2 vs. 4, not significant for both learning and satisfaction).

6. DISCUSSION

In an effort to provide some theoretical foundation to support web design this paper developed new constructs, called Web Channel

Multiple Comparisons

Dependent Variable		(I) WIR-WCR for simple products	(J) WIR-WCR for simple products	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Satisfaction	Scheffé	1.00	2.00	-1.7216	.21963	.000	-2.2968	-1.1464
			3.00	-.9518	.19874	.000	-1.4722	-.4313
			4.00	-1.8502	.18150	.000	-2.3255	-1.3749
		2.00	1.00	1.7216	.21963	.000	1.1464	2.2968
			3.00	.7698	.22900	.014	.1701	1.3696
			4.00	-.1286	.21421	.948	-.6895	.4324
		3.00	1.00	.9518	.19874	.000	.4313	1.4722
			2.00	-.7698	.22900	.014	-1.3696	-.1701
			4.00	-.8984	.19273	.000	-1.4031	-.3937
		4.00	1.00	1.8502	.18150	.000	1.3749	2.3255
			2.00	.1286	.21421	.948	-.4324	.6895
			3.00	.8984	.19273	.000	.3937	1.4031
Learning	Scheffé	1.00	2.00	-1.4500	.25407	.000	-2.1154	-.7846
			3.00	-.6548	.22990	.050	-1.2568	-.0527
			4.00	-1.6500	.20996	.000	-2.1999	-1.1001
		2.00	1.00	1.4500	.25407	.000	.7846	2.1154
			3.00	.7952	.26491	.035	.1015	1.4890
			4.00	-.2000	.24780	.884	-.8489	.4489
		3.00	1.00	.6548	.22990	.050	.0527	1.2568
			2.00	-.7952	.26491	.035	-1.4890	-.1015
			4.00	-.9952	.22295	.000	-1.5791	-.4114
		4.00	1.00	1.6500	.20996	.000	1.1001	2.1999
			2.00	.2000	.24780	.884	-.4489	.8489
			3.00	.9952	.22295	.000	.4114	1.5791

Sample split based on the median of Web Information Richness and Web Channel Richness
1 Low WCR & Low WIR
2 Low WCR & High WIR
3 High WCR & Low WIR
4 High WCR & High WIR

Table 7 Post Hoc Tests — Web Information Richness and Web Channel Richness (Simple products).

Richness (WCR) and Web Information Richness (WIR) and tested their relationships with browsing satisfaction and learning about a products. Based on the literature on media richness and on marketing, the complexity of the products sold on a web site was also taken into account. Our results converge with the empirical evidence on media richness theory concerning complex products. Our results indicate that for complex products, while browsing satisfaction was influenced by a combination of both WIR and WCR, learning about a product was mainly influenced by the richness of the informational content of web pages. Unexpectedly, relatively similar results were obtained for web sites selling simple products. The richness of the informational content of the web sites has a predominant effect on both learning and satisfaction, while the effect of WCR is more limited. Excess

richness does not impair satisfaction and learning as media richness theory stipulates. In fact, our results for simple products are consistent with some previous empirical evidence on electronic media and suggest that the symmetry argument of media richness theory, i.e., that using too much richness for simple task hinders performance, might not be valid (Hollingshead et al., 1993; Rice, 1992).

Taken together, our results indicate that one cannot go wrong by having as much richness on a web site as technically and economically feasible. Lack of richness can affect negatively learning and satisfaction of individuals browsing sites that sell simple products as well as sites that sell complex products. One plausible explanation of why our findings fail to support the symmetry argument of media richness for simple products is that our "manipulation" of product complexity may not have been strong enough. That is, the products did not differ sufficiently in complexity between the two groups and the variation within each group was insufficient to be able to detect the effects of the interaction between web richness and product complexity for simple products. We think, however, that this is unlikely to have occurred. First, to control for the fact that some companies (e.g, PC connection) sell both complex and simple products (e.g., computers and disk), we sent participants to a specific web site and to a specific page on that site rather than allowing them to browse web sites of their choice. This assured that the page the participants visited sold products that we classified as complex or simple. Discussion with participants when they handed in their questionnaires confirmed that they browsed the assigned pages. In addition, the data indicate that our manipulation of product complexity was effective. The difference in perceived complexity between simple products (mean = 2.985, scale ranging from 1 to 5) and complex products (mean = 3.722) was significant ($F = 21.000$, $p < .000$), indicating that the grouping of personal computer and laser printer into complex products and CD and polar jacket into simple products was adequate.

7. CONCLUSION AND FUTURE RESEARCH

As this is an exploratory study of new constructs, one important direction for future research is to further examine the notions of web information richness and web channel richness and how they interact with different consumer behavior factors such as intention to buy, time spent browsing, buying procedures, and repeated purchase. Also, research is needed to assess the effect of enlarging web richness by including sites using virtual reality and other advanced communications means. More work is needed to examine the micro-level cognitive process of individuals interacting with web sites of different richness and to determine precisely what factors (e.g., multiplicity of cues, feedback) affect learning and satisfaction and how they do so. This would help in providing precise theoretically based guidelines to web design. Research is also needed to determine the return on investment of

making a rich web site as opposed to a lean site in light of their effects on actual sales. Another potentially interesting research avenue is to study how individual differences might influence the relationship between web information richness fit, web media richness fit, learning, and satisfaction. For instance, experience of using a particular communication channel has been found to expand its richness (Carlson and Zmud, 1999). Participants in the present study were relatively experienced in using the Internet and our results indicates that experience in using the Internet was not correlated with perceived information richness, perceived media richness, satisfaction, and learning. However, it is possible that experience might be important when dealing with extremely complex products or when novices use the Internet. A final direction is to study the effects of web richness on different types of tasks such as gathering information on a product or company, buying a product or service, or investing money.

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APPENDIX A: THE QUESTIONNAIRE

WEB INFORMATION RICHNESS (Cronbach Alpha: .949, .922) # Quality of Information (Cronbach Alpha: .901, .887)

(Assess the information used to describe the products on this page: 1—Poor, 3—Average, 5—Excellent)

1. The level of detail of the information
2. Relevance of the information
3. Readability of the information
4. Understandability of the information
5. Up-to-date information
6. Quantity of the information
7. Accuracy of information
8. Reliability of information
9. Completeness of the information

Comparison of products/models (Cronbach Alpha: .786, .799)

Indicate whether you feel this page provides you with enough information to compare the different models and make a decision to buy a product from this company (1—Strongly disagree, 5—Strongly agree, 6—Not applicable)

1. Easily compare different models
2. Easily compare models of this company with models of other companies
3. Be sure I can choose the model that best fits my preferences and needs
4. Be sure I can choose the best model given a certain budget
5. Know exactly how much each model costs

Support in product assessment (Cronbach Alpha: .702, .709)

Indicate how much each of the following is used in the web page to help you understand the products (1—Not used at all, 3—Moderately used, 5—Used heavily)

1. Comments from user groups (or customers who have bought the same products)
2. Online needs assessment (helping to identify and clarify needs and proposing products)
3. Key word search (that helps to locate the products you need)
4. Personal-choice helper (that identifies the products that fit your preferences and decision criteria)
5. Frequently-asked-questions (FAQ)

WEB CHANNEL RICHNESS (Cronbach Alpha: .761, .705) Multiplicity Cues (Cronbach Alpha : .707, .722)

Indicate how much each of the following cues is used **to describe the products** sold on this page (1—Not used at all, 3—Moderately used, 5—Used heavily)

1. Tables
2. Links to external sites

3. Animation.
4. Pictures.
5. Graphics
6. Videos without sound
7. Video with wound
8. Verbal description of the products
9 Virtual reality with sound

Language Variety (Cronbach Alpha: .624, .720)

Indicate how much each of the following cues is used **to describe the products** sold on this page (1—Not used at all, 3—Moderately used, 5—Used heavily)

1. *Natural language* (using lay-person words to describe the products)
2. *Technical language* (describing the technical characteristics of the products)
3. *Scientific language* (information based on scientific studies)
4. *Mathematical language* (numeric expressions like formulas)
5. *Multiple languages* (e.g. English, French)

Immediacy of Feedback (Cronbach Alpha: .742, .769)

Assess your interaction with the web page using the following assertions (1—Strongly disagree, 5—Strongly agree)

1. When I first accessed the site, I waited a long time before the site got downloaded on my browser*
2. During my visit, the slowness of the site's response interrupted my communication process*
3. During my visit, I was able to interact freely with the site
4. During my visit, this site was very slow to provide the information I wanted*

Personal Focus (Cronbach Alpha: .853, .854)

Indicate your opinion regarding how well the web page fit your personal preferences (1—Strongly disagree, 5—Strongly agree)

1. This site fits the way I usually browse over the internet
2. I felt this site must have been designed for individuals like me
3. I thought this site was convoluted and difficult to navigate on*
4. This site had things where I expected to find them

SATISFACTION (Cronbach Alpha: .865, .919)

Indicate how satisfied you are with your visit on this page (1—Strongly disagree, 5—Strongly agree)

1. I will visit this site again
2. I will recommend this site to my friends
3. I felt satisfied when I ended my visit
4. I did not enjoy my interaction with this site*

PERCEIVED COMPLEXITY OF PRODUCTS (Cronbach Alpha: .892, .894)

Comparing to other products sold in the internet, indicate your perception of the complexity of the products sold by this company on the specific web page you visited (1—Very low, 3—Average, 5—Very high)

1. The number of components included in the products
2. The complexity of the technology embedded in the products
3. The number of different tasks that the products can perform
4. The degree of sophistication of the products
5. The overall complexity of the product

LEARNING (Cronbach Alpha: .767, .764)

Indicate how much this site helped you to better understand the products of this company: (1—strongly disagree, 5—Strongly agree)

1. This site provided me with new information on the products
2. I understand how the products work much better now than before I browsed this site.

"#" First Cronbach Alpha was obtained in the pre-test of the questionnaire (N = 49) and the second was obtained in the study (N = 207)

"*" Indicates that the answers are reversed in calculation.

AUTEURS

Serge BAILE est Professeur à l'Université de Toulouse et Professeur associé à l'ESCT, en charge du Mastère Spécialisé-Management et Ingénierie des SI qu'il crée en 1981. Il est chercheur associé auprès du CRM-IAE Toulouse-ED Sciences de Gestion, et du CERGAM-IAE Aix en Provence, où il dirige plusieurs thèses. Ses recherches, publications et communications portent sur les SI décisionnels, inter organisationnels et intégrés, l'évaluation du succès des TI, ainsi que sur la planification stratégique des SI et la gouvernance TI. Ancien Vice-Président et Président de l'AIM, il est aussi membre fondateur de l'AIS, de l'AFIM, et IEMEDI, et membre d'INFORMS, de l'AIMS et de l'AGRH.

Adresse : IAE – Université de Toulouse 1 – Place Anatole France, 31042 Toulouse

Mail : serge.baile@univ-tlse1.fr

Johanna HABIB est Maître de conférences à l'Université de Nantes, IEMN-IAE. Ses recherches portent sur la gestion des connaissances, l'innovation et les organisations publiques, et combinent études de cas et simulation multi-agents. Dans ce cadre, elle s'intéresse plus particulièrement à la création de connaissances dans les processus d'innovation fondés sur les Technologies de l'Information et de la Communication dans le secteur de la santé.

Adresse : IEMN-IAE, Bâtiment Petit Port, Chemin de la Censive du Tertre, 44322 Nantes

Mail : johanna.habib@univ-nantes.fr

Shanling LI is a professor of operations management at Desautels Faculty of Management of McGill University. She received her M.S. from Georgia Institute of Technology and PhD from University of Texas at Austin in US. Her current research interests include risk management in supply chains, firm survivability and operations and marketing interface issues in e-commerce and health care.

Adresse : McGuill University, Desautel Faculty of Management, 1001 Sherbrooke West, Montréal, Canada H3A 1G5

Mail : shanling.li@mcgill.ca

Rim LOUATI est docteur en sciences de gestion. Elle a réalisé une thèse de doctorat en systèmes d'information, traitant de l'évaluation de la performance perçue de la fonction SI. Pour ses activités de recherche, elle s'intéresse à la gestion de la relation client, à la satisfaction de l'utilisateur final et aux impacts des TI sur les organisations. Elle occupe une fonction de Maître-Assistante à l'ISAAS, Université de Sfax (Tunisie).

Adresse : Institut Supérieur d'Administration des Affaires de Sfax – Université de Sfax

Mail : rlouati5@yahoo.fr

Caroline LANCELOT MILTGEN est maître de conférences en sciences de gestion dans le groupe de recherche Angevin en économie et management de Université d'Angers. Prix de thèse FNEGE AFM 2007 et mention spéciale du Prix de thèse « Informatique et Liberté » CNIL 2010 pour sa thèse sur les réactions des consommateurs face à la collecte de données personnelles. Responsable scientifique de deux contrats de recherche pour la Commission Européenne sur « vie privée et systèmes d'identification électronique » (2008) et « vie privée et management de données personnelles » (2010). Responsable d'un master en « Management et Sécurité des Systèmes d'information de Santé » (MSSIS).

Adresse : Université d'Angers, GRANEM, UFR Droit – Economie – Gestion

Mail : caroline.miltgen@univ-angers.fr

Alain PINSONNEAULT is a James McGill Professor and the Imasco Chair of information systems in the Desautels Faculty of management at McGill University. His current research interests include the organizational and individual impacts of information technology, user adaptation, ERP implementation, e-health, e-integration, group support systems, strategic alignment of IT, and the business value of IT. He has published papers in Management Science, MIS Quarterly, Information Systems Research, the Journal of MIS, Small Group

Research, Decision Support Systems, Organization Science, and the European Journal of Operational Research.

Adresse : McGuill University, Desautel Faculty of Management, 1001 Sherbrooke West, Montréal, Canada H3A 1G5

Mail : alain.pinsonneault@mcgill.ca

Daniel TOMIUK is an associate professor at the University of Quebec in Montreal. His research interests include resource-based theory, e-commerce, e-learning, and understanding how user characteristics and Web design factors influence usage of commercial Web sites. He has won several best paper awards at conferences including the American Conference on Information Systems (AMCIS) and has published in such journals as Information Systems Journal (ISJ) and Journal of Global Information Management (JGIM).

Adresse : Université du Québec à Montréal, École des Sciences de la Gestion, 315 Ste-Catherine est, Montréal, Canada, H2X 3X2

Mail : tomiuk.daniel@uqam.ca

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