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ARTICLE

A four-part model of cyber-interactivity

Some cyber-places are more interactive than others

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Abstract

Existing communication models and definitions of interactivity provide both background and structure for a new model of cyber-interactivity that is introduced and explored in this article. Two primary dimensions, direction of communication and level of receiver control over the communication process, provide the primary framework for this new model of computer-mediated cyber-interactivity. A study designed to explore the applicability of this model analyzed 108 health-related websites using both perception-based and feature-based measures of these two dimensions. No significant correlation was found between the perception-based and feature-based models. The perception-based model was a better predictor of attitude toward the website and perceived relevance of the subject of the website than the feature-based model. However, the feature-based model may hold greater promise as a tool for website developers who seek to incorporate appropriate levels of interactivity in their websites.

Key words

communication models • interactivity • new media

Much of the literature on computer-mediated communication assumes that it is interactive. But more work is needed in defining the concept of interactivity. One frequently cited definition comes from Rafaeli (1988: 11), who defined interactivity as: 'An expression of the extent that, in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions.' Rafaeli has conducted a number of studies (see for example, Rafaeli, 1990; Rafaeli and Sudweeks, 1997) in which he examined interactivity as a process-related variable based on relatedness of sequential messages.

This article explores the concept of interactivity by going beyond the single dimension suggested by Rafaeli. Several authors have suggested that interactivity may be a multi-dimensional construct (see, for example, Durlak, 1987; Ha and James, 1998; Heeter, 1989; Jensen, 1998; Massey and Levy, 1999; McMillan, 1998). But no literature identified to date has presented a model based on two dimensions that define a four-part typology of interactivity. As illustrated in the following review of the literature, such models have been useful in describing and prescribing other communication phenomena. This article develops such a four-part typology of cyber-interactivity.

William Gibson (1984) coined the term 'cyberspace' to refer to a data-based environment. The 'cyber' prefix has since come to be associated with many different forms of computer-mediated communication and experience. The early work on interactivity by researchers such as Rafaeli and Heeter was conducted prior to the widespread adoption of cyber-technologies such as the internet and the world wide web. Although these particular technologies will probably be eclipsed by future technologies, they do represent a major leap into cyberspace and they have popularized the concept of interactivity. Now it is time for researchers to examine how cyber-interactivity can be understood within the context of existing theory, and within new theories, that help to explain why some cyber-places seem to be more interactive than others.

LITERATURE REVIEW

Four different perspectives are useful in examining interactive communication: mass communication, organizational communication, individual communicators and media features. Additionally, it is important to explore potential effects of interactivity.

A mass communication model

Many communication students have been introduced to the Bordewijk and van Kaam (1986) four-part typology of information traffic through McQuail's (1994) mass communication theory textbook. The key element of the

Control of time and choice of subject	**Control of information source**	
	Central	*Individual*
Individual	Consultation	Conversation
Central	Allocution	Registration

• Figure 1 A typology of information traffic adapted from McQuail

Bordewijk and van Kaam typology is control. One dimension of the model is defined by control of information source, and the other by control of time and choice of subject. For both of these variables, Bordewijk and van Kaam suggested that control may reside either in a central source or with the individual. The resulting four-part typology is illustrated in Figure 1.

'Allocution' refers to situations in which information is simultaneously distributed from a center to many peripheral receivers. The pattern applies to many mass media as well as to other communication forms such as lectures or concerts. Allocution is typically one-way communication with very little feedback opportunity.

'Consultation' occurs when an individual looks for information at a central information store. In the context of computer-mediated communication (CMC) this may include databases, CD-rom, etc.

'Registration' is, in essence, the reverse of consultation. The organization at the center receives information from a participant at the periphery. This applies when central records are kept of individuals in a system and it also applies to surveillance systems. The accumulation of information at a center often takes place without reference to, or knowledge of, the individual. Many communication technologies make registration more feasible. The use of 'cookies' to track and customize content for visitors to websites is one example of the registration potential of CMC.

'Conversation' occurs when individuals interact directly with each other, bypassing central controls or intermediaries. Individuals choose their communication partners as well as the time, place and topic of communication. Massey and Levy (1999) categorize this conversational-style interactivity as 'interpersonal interactivity' to differentiate it from what they categorize as 'content interactivity'; the degree to which content creators empower consumers over content.

Jensen (1998) used the Bordewijk and van Kaam (1986) typology as the basis for his exploration of interactivity in computer-mediated environments.

He defined interactivity as: 'A measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication' (p. 201). In this context, he suggested that interactivity can be subdivided using the same basic concepts introduced in Figure 1.

'Transmissional' (or 'allocutional') interactivity is a measure of a medium's potential to allow the user to choose from a continuous stream of information in a one-way media system. 'Consultational' interactivity is a measure of a medium's potential to allow the user to choose, by request, from an existing selection of pre-produced information in a two-way media system. 'Registrational' interactivity is a measure of a medium's potential to register information from, and thereby also adapt and/or respond to, a given user's explicit choice of communication method. 'Conversational' interactivity is a measure of a medium's potential to allow the user to produce and input his/her own information in a two-way media system.

Fidler (1997) theorized that the new cyber-media are merely one more phase in the evolution of media, or what he calls 'mediamorphosis'. He identified three 'domains' of communication: 'broadcast', 'document', and 'interpersonal'. He suggested that technology enables individuals to experience the interpersonal domain in new ways. However, he argued that much of the future of CMC would continue to draw on the broadcast and document domains. He suggested that these forms are likely to resemble allocution, consultation, and registration, while conversation will remain a separate form in the interpersonal domain.

An organizational communication model

Both Fidler (1997) and Jensen (1998) emphasized two-way communication in their discussions of evolving computer-mediated, interactive media. A well-known organizational communication model further explores the concept of communication direction. Grunig and Grunig (1989) identified a four-part model of public relations practice. As illustrated in Figure 2, direction of communication and goals of communication are the two key variables in that model.

Unlike the Bordewijk and van Kaam (1986) typology, which grows out of the mass communication tradition, the Grunig and Grunig (1989) typology grows from the organizational communication tradition. The Grunigs suggested that organizations can be most effective when they establish a dialogue with their publics. They identified social science research as the primary tool for developing this dialogue. However, the advent of tools such as email and the world wide web suggest new ways in which organizations may establish two-way communication with their publics.

In the 'Press Agentry' type, the organization tries to persuade key publics using techniques typical of allocution. In the 'Public Information' type, the organization sees the primary purpose of public relations as information

Goals of Communication	Direction of Communication: *One-way*	*Two-way*
Symmetric	Public information	Two-way symmetric
Asymmetric	Press agency	Two-way asymmetric

• Figure 2 Four models of public relations adapted from Grunig and Grunig

dissemination. The individual's use of this information may often resemble consultation. As organizations move to adopt more two-way communication, they sometimes seek information from their publics that will allow the organization to persuade more effectively. This 'Two-Way Asymmetric' type, sometimes referred to as scientific persuasion, may often utilize techniques typical of registration as identified in Figure 1. But, to achieve the Grunigs' ideal of 'Two-Way Symmetric' communication, organizations often have to develop a more conversational approach to communicating with their publics.

The Grunig and Grunig (1989) model has served as the basis for a large body of public relations literature that is both normative and prescriptive. Organizational factors such as regulatory threats, scale of operations and the position of communicators within the power structure of organizations have been used to identify the models that organizations use and/or should use (for an in-depth application of these models, see Grunig and Dozier, 1992).

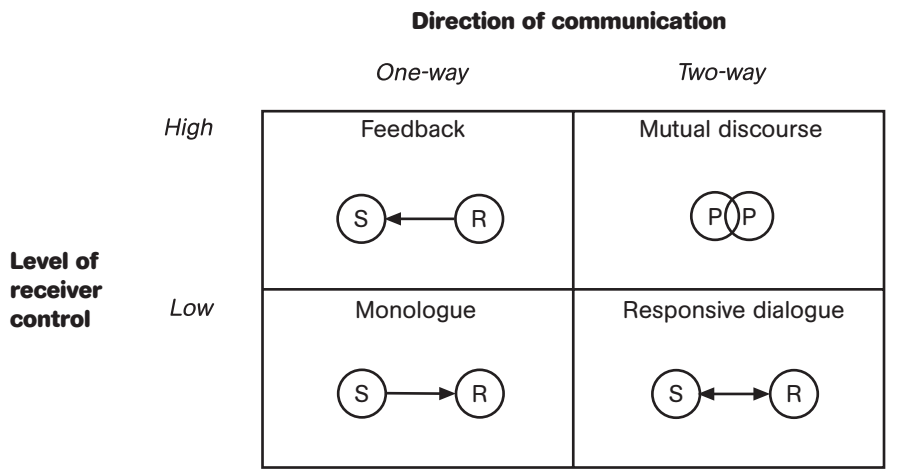
A new model from the individual perspective

Morrison (1998) suggested that failure to view evolving media from the user's perspective may be a blind spot in the study of interactivity. Newhagen (1998) noted that traditional concepts of 'audience' become virtually irrelevant in the context of the internet. Rather, the individual user comes forward to a conceptual center stage. While theoretical perspectives arising from the mass media and organizational communication traditions may provide a useful framework for understanding the basic nature of interactive communication, it is the uses that individuals make of evolving media that may better explain the interactive process. Williams, Strover and Grant (1994) suggested that although media technologies change rapidly, understanding individuals' uses of those media is a key step in the theory-building process. Wu (1999) focused on the need to study interactivity from the perspective of those who use interactive media. Johnson (1998) also argued that a user-centered approach is critical for effective design of human-computer interfaces.

McMillan and Downes (2000) conducted interviews with individuals who teach, research and create content in the evolving environment of CMC. From those interviews, they identified two primary dimensions that seem to form the basis for perceptions of interactivity: direction of communication, and control over the communication process. Direction of communication was central to the Grunig and Grunig (1989) model, while control was central to the Bordewijk and van Kaam (1986) model. These two concepts have also been explored in the literature on interactivity. Within the CMC tradition, a fundamental assumption is that two-way communication flows back and forth among communication participants (see, for example, Bretz, 1983; Duncan Jr., 1989; Durlak, 1987; Garramone et al., 1986; Kirsh, 1997; Pavlik, 1998; Rice, 1984; Rogers, 1995). Scholars have also suggested that receiver control is a key dimension of computer-based information systems (see, for example, Chesebro, 1985; D'Ambra and Rice, 1994; Finn, 1998; Guedj et al., 1980; Kayany et al., 1996; Trevino et al., 1990; Zack, 1993).

These two key dimensions can be used to form a four-part model of cyber-interactivity that both builds on, and expands, the models reviewed earlier. Figure 3 presents such a model. In Figure 3, control is illustrated with circles indicating individuals' role in communication. Direction of communication is illustrated with arrows or overlapping circles.

'Monologue', with primarily one-way communication and relatively little receiver control over the communication process, resembles both allocution and press agentry. Senders create and disseminate content to attract an audience, promote a product or service, build a brand, or perform some other persuasive communication function. Most corporate websites provide an example of monologue.



S = sender, R = receiver, P = participant (sender/receiver roles are interchangeable)

• Figure 3 A four-part model of cyber-interactivity

'Feedback' is still primarily one-way communication, but it allows receivers to have limited participation in the communication process. Feedback tools such as email links allow the receiver to communicate with the sender. However, in this model, the sender and receiver roles are still very distinct. Even though the receiver may communicate with the sender, there is no guarantee that the sender will respond to the feedback that has been received. In some ways, feedback resembles both consultation and public information. The receiver can consult with the provider of information in terms over which the receiver has some control. In other words, there may be some symmetry in the communication goals.

'Responsive Dialogue' enables two-way communication, but the sender retains primary control over communication. This type strongly resembles the two-way asymmetric model. It may also use techniques typical of the registration model for monitoring the communication process. Responsive dialogue may take place in environments such as e-commerce in which the sender makes goods and services available, the receiver selects and orders desired goods/services, and the sender acknowledges receipt of the order. Online customer support websites, and websites that solicit volunteer participation in non-profit organizations, may also utilize responsive dialogue.

'Mutual Discourse' enables two-way communication and gives receivers a great deal of control over the communication experience. This strongly resembles the conversation and two-way symmetric models. The sender and receiver roles become virtually indistinguishable in environments such as chat rooms, bulletin boards, etc. A key to mutual discourse is that all participants have the opportunity to send and receive messages.

Media features

Each of the above models addresses communication and interactivity from the perspective of key dimensions: control of information source, control of time and choice of subject in the Bordewijk and van Kaam (1986) model; direction and goals of communication in the Grunig and Grunig (1989) model; and direction and control of communication in the new model of cyber-interactivity. Another body of literature addresses the concept of interactivity from the perspective of media features. Researchers in this tradition define interactivity based on how many, and what types of features allow for interactive communication.

Much of this feature-based research grows out of Heeter's (1989) conceptual definition of interactivity. She suggested that interactivity resided in the processes, or features, of a communication medium. Massey and Levy (1999) operationalized Heeter's conceptual definition, and examined websites for interactivity based on the presence of functional features such as email links, feedback forms and chatrooms. McMillan (1998) also used

Heeter's conceptual definition of interactivity to identify features of websites that may be considered interactive. Her feature list also included many of those identified by Massey and Levy, as well as bulletin boards, search engines, forms for registration and online ordering. Ha and James (1998) identified additional interactive features including curiosity-arousal devices, games, user choice and surveys.

Generally, the researchers who coded these features operated under the assumption that the more of these features were found in web-based communication, the more interactive the communication at that website was likely to be. However, it is also possible to divide these features into those that are used primarily to facilitate two-way communication and those that are designed to enhance the receiver's control over communication. These two dimensions can be used to conceptualize the model in Figure 3 from a feature-based, rather than a perception-based, perspective. Rather than considering interactive features as having a cumulative effect on interactivity, the model can help researchers identify different forms of interactivity based on the balance of features that facilitate two-way communication and/or receiver control of communication. The first research question explores the relationship between this feature-based approach to interactivity and the perceptual approach suggested earlier:

> RQ1. How similar are models of cyber-interactivity defined by perceptions of the two key dimensions of interactivity (direction and control) and those defined by features that facilitate direction and control of communication?

Effects of interactivity

For many communication scholars and practitioners, exploring the concept of interactivity from both user- and feature-based perspectives is considered a preliminary step to understanding the effects of interactivity. Researchers have begun to explore the relationships between interactivity and factors such as attitude toward the website (McMillan, 2000a; Oginanova, 1998; Wu, 1999). Additionally, exploratory research (McMillan, 2000a) has suggested that there may be some relationship between interactivity and the perceived relevance of the topic of a website. And, among communication scholars and practitioners, there is a widespread hope that increased interactivity will lead to increased likelihood of behaviors such as returning to a website, referring others to the website and purchasing from a website (Bezjian-Avery et al., 1998; Cooley, 1999; Rodgers and Thorson, 2000; Singh and Dalal, 1999; Sundar et al., 1998).

However, while the literature has begun to explore the effects of interactivity, much of that literature has failed to distinguish between perception-based and feature-based models of interactivity when examining potential effects. The second research question explores potential effects of

interactivity based both on perceived interactivity and interactive features of websites:

> RQ2. What relationships exist between both perception-based and feature-based models of cyber-interactivity and:
>
> (1) attitude toward the website;
> (2) relevance of website topic; and
> (3) behavioral intentions?

METHOD

This article reports an exploratory study that is designed to evaluate the model of cyber-interactivity introduced in Figure 3, and to address the two primary research questions posed above. Examination of 108 health-related websites was central to this study. These websites provide an interesting venue for analysis of websites for three reasons. First, health-related topics have played a central role in media development (see, for example, Barnouw, 1966; Jones, 1996). Second, health-related websites have long been one of the fastest growth areas on the world wide web (Fisher, 1996). Third, health-related websites are used heavily (Pingree et al., 1996). These websites were part of a larger sample of websites randomly selected from the Yahoo directory of health-related websites in January 1997 (McMillan, 1998). The websites analyzed in the current study were still operating three years later in January 2000. Thus, an additional strength of using these particular websites is that they have survived a turbulent growth period in the history of the world wide web (McMillan, 2000b). All of the websites were downloaded and saved for analysis in January 2000.

Two forms of analysis were used to examine the research questions. First, 31 undergraduates were assigned to review approximately 10 of the selected websites. These students are referred to as untrained codes because they were given no instructions other than to 'surf' the website for about 10 minutes. Following that review, they were asked to rate the websites based on their perceptions of the two key dimensions of interactivity as identified in Figure 3. The wording of those two items appears in Table 1. Both items were coded on a seven-point scale for which 1 = strongly disagree, and 7 = strongly agree. Overall average scores for both dimensions are also shown in Table 1.

Three separate untrained coders rated each website on these two dimensions of interactivity. Ideally, an average of these three ratings could be

• Table 1 Coder perception of interactivity (scale = 1–7/negative–positive)

Identifier	Mean/SD	Description
Direction	(4.07/1.72)	This site facilitates two-way communication.
Control	(4.96/1.76)	I feel that I have a great deal of control over my visiting experience at this site.

used to develop scales for direction and control of communication. However, analysis of the three ratings revealed very low reliability scores (alpha of .22 for direction and .27 for control). Thus, creating a mean from these three separate ratings could confuse findings by creating means that hide differences in rating of websites. The differences in ratings among these untrained coders tends to suggest that perceptions of direction and control of communication may be highly personalized, and may be influenced by other factors such as overall attitude toward the website and perceived relevance of the website. Given the exploratory nature of this study, the decision was made to examine only one of these untrained coder's ratings of interactivity for each website. This single coder's rating can then be compared with the same coder's attitude toward the website and perceptions of the relevance of the website. The selection of one of the three coders was made arbitrarily.

These same 31 untrained coders were also asked to complete scales measuring their attitude toward the website, the relevance of the website topic, and their behavioral intentions related to the website. These scales grew out of earlier research that has adapted standard advertising measures of attitude, relevance and behavior to the world wide web (see, for example, McMillan, 2000a; Oginanova, 1998). The items used in these scales are reported in Tables 2, 3 and 4. These tables also show overall averages of student ratings using these scales.

The second primary form of analysis was identification of interactive features of websites. Four trained coders used the downloaded websites to

• Table 2 Measures of attitude to the website

Semantic differential item		Mean/SD (7-point scale)
Bad	Good	4.62/1.64
Unpleasant	Pleasant	4.43/1.52
Irritating	Not irritating	4.68/1.64
Boring	Interesting	4.03/1.83
Dislike	Like	4.17/1.87
Combined scale (alpha = .92)		4.38/1.50

• Table 3 Measures of relevance

Semantic differential item		Mean/SD (7-point scale)
Unimportant	Important	4.27/2.06
Not relevant to me	Relevant to me	2.65/1.77
Insignificant	Significant	3.71/1.93
Combined scale (alpha = .82)		3.54/1.67

• Table 4 Measures of behavior intentions

How likely would you be to . . .	Mean/SD (7-point scale)
Return to this site	1.97/1.58
Tell someone else about this site	2.31/1.81
Send email to this site	1.57/1.17
Bookmark this site	1.55/1.27
Post a message about this site on a list or newsgroup that deals with a related subject	1.63/1.39
Purchase from this site	1.43/1.06
Combined scale (alpha = .93)	1.77/1.22

search for and code the presence of website features. Coding time depended on the complexity of the website, but the trained coders reported spending an average of 20–30 minutes reviewing each website.

The primary task of this second analysis was identifying and coding website features that had been defined as interactive in the literature (Ha and James, 1998; McMillan, 1998; Massey and Levy, 1999). These features are identified in Table 5.

Table 5 also shows which of the features were identified by the coders as facilitating two-way communication, and which were identified as facilitating receiver control of communication. Using Holsti's (1969) formula, intercoder reliability of 96.1 percent was achieved for these

• Table 5 Interactive features

Feature (% of sites where found)		Description
Features that facilitate two-way communication (mean 1.5)		
Email	(89.7)	One of more hot links to an email address
Registration	(25.2)	Registration form
Survey	(21.5)	Survey and/or comment form
BBS	(15.9)	Bulletin board (for asynchronous communication)
Order	(15.0)	Order and/or purchase form
Chat	(10.3)	Chat room (for synchronous communication)
Features that facilitate receiver control of communication (mean 2.0)		
Search	(44.9)	Search engine
Choice	(25.2)	Viewer choice (e.g. view the site in one of multiple languages)
Curiosity	(24.3)	Curiosity devices (e.g. 'brain teasers' or question and answer formats)
Game	(.02)	Games
Links	(mean = 138)	Total links at site are equal to or greater than average for all sites
External	(mean = 71)	External links at site are equal to or greater than the average for all sites

measures. Discrepancies were due to omissions or oversights and were easily resolved.

FINDINGS

A brief review of descriptive findings will provide context for review of the research questions. First, both dimensions of perceived interactivity had means slightly above the mid-point on a seven-point scale (see Table 1). This might suggest that this sample of health-related websites is relatively interactive. However, by contrast, Table 5 shows that some interactive features were found at relatively few websites (e.g. chatrooms at only about 10% of websites). Furthermore, the average number of two-way communication features at these websites was only 1.5 (of a possible six); the average number of receiver-control features at these websites was only two (of a possible six). Thus, it would seem that the untrained coders rated these websites fairly high on key interactivity dimensions even though the websites have relatively few interactive features. Some other factors seem to be having an impact on perceived interactivity. Attitude toward the website might be such a factor. As illustrated in Table 2, the overall attitude toward these websites is also above the mid-point on the seven-point scale.

However, despite these high ratings, it should be noted that scores on measures of behavioral intention are very low (see Table 4). In fact, only the intention to tell someone about the website scored above two on a seven-point scale, thus moving it from the 'very unlikely' category to being simply 'unlikely'. These low scores on behavioral items might be related to the relatively low scores on measures of relevance. As shown in Table 3, the average score for relevance is slightly below the mid-point of this seven-item scale. Perhaps, if subject matter of the websites were of greater relevance to those who were rating the website, more individuals might indicate an intention to take action related to the website.

Research question 1 asked: 'How similar are models of cyber-interactivity defined by perceptions of the two key dimensions of interactivity (direction and control) and those defined by features that facilitate direction and control of communication?' To examine this question, the four-part model of cyber-interactivity (see Figure 3) was developed in two ways. First, the model was formed based on the two perception-based dimensions identified

• Table 6 Distribution based on perceived interactivity

Type	Number	(%)
Monologue	16	14.8
Feedback	25	23.1
Responsive dialogue	21	19.4
Mutual discourse	46	42.6
Total	108	

• Table 7 Distribution based on interactive features

Type	Number	(%)
Monologue	30	27.8
Feedback	24	22.2
Responsive dialogue	15	13.9
Mutual discourse	39	36.1
Total	108	

in Table 1. Scores less than the mean for direction of communication were coded as one-way communication; while scores equal to, or greater than, the mean were coded as two-way. Scores less than the mean for control were coded as low receiver control; while scores equal to, or greater than, the mean were coded as high control. Websites were coded as one of the four types of cyber-interactivity identified in Figure 3 based on the combination of those scores. Table 6 reports distribution of the studied websites among the four perception-based types.

The second method for forming the model of cyber-interactivity was based on interactive features of the website. Two new variables were calculated for each website. The first totaled all two-way communication features and the second totaled all receiver-control features (see Table 5 for details on features). Scores less than the mean for these two variables were coded as low two-way communication and receiver control; while those at, or above, the mean were scored as high on those two dimensions. Websites were coded as one of the four types of cyber-interactivity based on scores on these two dimensions. Table 7 reports distribution of the studied websites among the four feature-based types.

One might expect a cross tabulation of the perception-based and feature-based models of cyber-interactivity to reveal a strong relationship between perceptions and features. However, as illustrated in Table 8, no significant relationship was found between perception-based and feature-based models. The earlier discussion of discrepancies between the descriptive date found in Tables 1 and 5 may help to explain why no relationships were found between perception-based and feature-based models.

• Table 8 Cross-tabulation of models based on perceptions and features

	Perception based			
	Monologue	Feedback	Responsive dialogue	Mutual discourse
Feature based				
Monologue	4	5	5	16
Feedback	4	5	6	9
Responsive dialogue	0	4	1	10
Mutual discourse	8	11	9	11

$\chi^2 = 10.358$, $p > .05$

• Table 9 Analysis of variance for models and measures of attitude, relevance and action

	Attitude	Relevance	Behavior
Perception based			
Monologue	3.80	3.10	1.57
Feedback	3.88	3.88	1.39
Responsive dialogue	4.20	2.95	1.90
Mutual discourse	4.93	3.84	2.01
ANOVA	$F = 4.23$, $p < .01$	$F = 2.20$, $p < .05$	$F = .18$, $p > .05$
Feature based			
Monologue	4.27	3.20	1.65
Feedback	4.38	3.65	1.69
Responsive dialogue	4.90	4.33	2.00
Mutual discourse	4.27	3.52	1.85
ANOVA	$F = .70$, $p > .05$	$F = 1.56$, $p > .05$	$F = .36$, $p > .05$

The second research question asked: 'What relationships exist between both perception-based and feature-based models of cyber-interactivity and: (1) attitude toward the website; (2) relevance of website topic; and (3) behavioral intentions?' Table 9 addresses this question.

No significant relationships were found between the feature-based model and attitude, relevance or behavioral intentions. Nor was there any significant relationship between the perception-based model and behavioral intentions. However, significant relationships were found between the perception-based model and both attitude and relevance.

Attitude toward the website was most positive for mutual discourse websites and least positive for monologue. Thus, mutual discourse websites were not only perceived to be the most 'interactive', but also the most positively evaluated websites. This finding is consistent with the theory underlying the model presented in Figure 3.

The pattern of ratings for relevance was somewhat unexpected. The websites rated as most relevant were feedback websites, while responsive dialogue websites were least relevant. This might reflect the orientation of the coders. As young, healthy students they may have noted feedback features in the websites, but had little interest in initiating responsive dialogue with creators of websites that focused on topics such as illness and disease.

DISCUSSION

Earlier definitions of interactivity and models of communication provide insights into the emerging concept of cyber-interactivity, but the proposed model further explains the nature of cyber-interactivity in the context of CMC. This study has proposed a four-part model that holds promise for exploring cyber-interactivity both from the perspective of the perceptions of

those who use it as a tool for communication and from the perspective of website features.

The four-part model of cyber-interactivity has promise as a heuristic device to help website developers think about what they most want to provide in a website. In some cases the monologue type, with its relatively low scores on both direction and control of communication dimensions, might be the most appropriate way to communicate persuasive information. In other cases, developers may want to increase feedback opportunities by increasing the participants' level of control over the communication process.

If website developers want to develop responsive dialogue with website visitors, more mechanisms for two-way communication need to be added to the website and they must actively respond to messages from visitors. Finally, mutual discourse may often represent both the greatest technological challenge and the greatest potential threat for website developers. In these unfettered environments that allow a free-flow of two-way communication, all visitors to the website have the potential to participate in the website as both senders and receivers. This may be appropriate in some cases, but some organizations may wish to consider carefully if they are willing to invest in a level of interactivity that gives everyone everywhere the opportunity to contribute in a way that may either praise or condemn.

The model of cyber-interactivity also holds promise for theory development. It brings together concepts found in earlier models of mass communication and organizational communication, and it also integrates literature related to both perceived and functional interactivity.

Earlier development work on these models (McMillan, 1999) revealed that websites mix elements of multiple models. Further theoretical development could be done to explore how and why such mixing of models occurs. Future research might also examine why website developers choose to develop websites with varying levels of interactivity.

Future studies may also consider the possibility of teasing out other levels or types of interactivity. The model proposed in Figure 3 focuses on interactivity from the user-to-user perspective. This type of interactivity is consistent with the literature on CMC, in which the computer serves as a tool that enables interaction between individuals. However, other research traditions may suggest other forms of interactivity.

For example, the human–computer interface literature addresses interaction between the individual and the computer (see, for example, Aldersey-Williams, 1996; Johnson, 1998; Kay, 1990; Kirsh, 1997; Laurel, 1990; Lieb, 1998; Salzman and Rosenthal, 1994; Simms, 1997). In this type of interactivity, key dimensions might be the nature of the interface (either apparent or transparent to the user), and the center of control (either in the computer or the individual). Other research traditions focus on interactivity between the user and the text, or what Szuprowicz (1995) has called user-

to-documents interactivity (see, for example, Barak and Fisher, 1997; Bezjian-Avery et al., 1998; Blattberg and Deighton, 1991; Borden and Harvey, 1998; Chesebro and Bonsall, 1989; Fredin, 1997; Hunt, 2000; Iser, 1989; Landow, 1992; Mayburry, 2000; Murray, 1995, 1997; Rafaeli and LaRose, 1993; Steuer, 1992; Straubhaar and LaRose, 1996; Williams et al., 1988; Xie, 2000). In this type of interactivity, key dimensions might be the nature of the audience (either passive or active) and the level of control that audience members have over the content of the message.

Future studies should also address some of the perplexing findings of this exploratory study. For example, when three individuals reviewed the website with the same instructions, why were their ratings for the two key dimensions of interactivity so dissimilar? Would a larger pool of evaluators lead to a more reliable scale? Do coders need to be trained before they can evaluate direction and control of communication at websites? Why are the scores on dimensions of perceived interactivity higher than would be expected, based on the interactive features at the websites? Are additional scale items needed for developing better measures of perceived direction and control of communication? Why is there so little relationship between the perception-based and feature-based models of interactivity? Would changes in rating and scaling bring the perception-based and feature-based models closer together? Would differentiation between user-to-user, human-to-computer, and user-to-documents interactivity help to resolve differences in perception-based and feature-based interactivity?

Qualitative research may be needed to examine why some websites receive similar scores on the perception-based and feature-based dimensions of interactivity, while most websites do not. Future studies should also examine other types of websites. A better match between content of the websites and orientations of coders might lead to higher scores on measures of relevance as well as behavioral intentions. With more variance in these measures, more relationships might be found between models of cyber-interactivity and both website relevance and behavior related to the website.

It is not startling to find significant relationships between the perception-based model and measures of attitude and relevance. Attitude and relevance are also perceptually based, and are rated by the same coders who rated perceived direction and control of communication at the websites. However, the complete lack of significant relationships between the feature-based model and measures of attitude, relevance and action is somewhat unexpected. One might expect those websites with more features facilitating two-way communication and receiver control to be perceived more positively. But no support for such a relationship was found in this study. Relevance may be an independent factor that would not relate to the structure of the website. However, one might expect that websites with the potential for greater two-way communication (responsive dialogue and

mutual discourse) would facilitate more behaviors and thus lead to more behavioral intentions. In fact, the figures in Table 9 do follow this general pattern, but overall behavioral intentions are so few that no significance can be attributed to that pattern.

This study suggests that perception-based models are most appropriate for scholars who seek to find relationships between interactivity and other perceptually based factors, such as attitude toward a website and relevance of the topic of a website. However, this does not mean that the feature-based model should be abandoned. Researchers whose primary interest is in the structure and function of websites may find the feature-based model provides valuable insights that not only help to define the website, but also help to predict which type of website might be most effective. Future research should apply the kind of descriptive and prescriptive approaches that have been used with the Grunig and Grunig (1989) model. Just as that model has led to programs of excellence in public relations (e.g. Grunig and Dozier, 1992), so application of a feature-based model could lead to excellence in developing cyber-interactivity.

An exploratory study such as this one has value as it provides a framework for understanding a new technology in the context of existing theory. The early stages of developing a model will inevitably lead to questions and the need for further research. However, this study does make it clear that not all cyber-places are created equal; some are more interactive than others. And even when the technology that defines those cyber-places is the same (for example, the world wide web), the type of interactivity may be different. Key factors that define those differences in user-to-user cyber-interactivity are the direction of communication and the level of user control over the communication process.

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