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ARTICLE

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# Interactivity: a concept explication

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### Abstract

The use of interactivity as a variable in empirical investigations has dramatically increased with the emergence of new communication channels such as the world wide web. Though many scholars have employed the concept in analyses, theoretical and operational definitions are exceedingly scattered and incoherent. Accordingly, the purpose of this project is to engender a detailed explication of interactivity that could bring some consensus to how the concept should be theoretically and operationally defined. Following Chaffee's (1991) framework for concept explication, we generate new theoretical and operational definitions that may be central to future work in this area. In particular, we suggest that interactivity is both a media and psychological factor that varies across communication technologies, communication contexts, and people's perceptions.

### Key words

communication technologies • computer mediated  
communication • interactivity • new media

## INTRODUCTION

With the ongoing influx of new communication technologies, many traditional concepts in mass communication are being redefined, reworked, and reinvented. Indeed, McQuail (1994) and Williams et al. (1988) argue that the 'convergence' of new technologies is skewing the boundaries involved in traditional mass communication theories. For example, many

scholars have highlighted the confusion embedded in theoretical discussions surrounding the concept of interactivity and the subsequent problems it raises in research (e.g. Heeter, 1989; McMillan, 2000; Newhagen et al. 1995; Steuer, 1992). Such questions ask, among other things, whether interactivity is a characteristic of the context in which messages are exchanged; is it strictly dependent upon the technology used in communication interactions; or is it a perception in users' minds? As such, it would be valuable to explicate the concept in an attempt to contribute to the term's theoretical foundation, which has lagged far behind the proliferation of empirical work that zeros in on it. Consequently, in this analysis, Chaffee's (1991) framework for concept explication is employed to carefully dissect this variable.

Typically, a concept explication is part of a larger empirical study, but in some instances, it is an entire project in itself – especially when conceptions are hotly contested, as has been the case with interactivity (e.g. Hoffman and Novak, 1996; Pavlik, 1998). More than anything else, explication is about theorizing. Chaffee states that 'without explication, our words are nothing more than words, and our data add nothing to them. Theory, or more exactly, theorizing, consists of an interplay among ideas, evidence, and inference' (1991: 14). Accordingly, the following steps were executed to complete this project:

- (1) provide a general background of interactivity;
- (2) survey relevant literature on the concept;
- (3) identify the concept's central operational properties;
- (4) locate present definitions of the concept;
- (5) evaluate and modify those definitions;
- (6) propose a conceptual definition;
- (7) propose an operational definition; and
- (8) discuss the implications on future research of the arrived-at definition.<sup>1</sup>

## **GENERAL BACKGROUND**

When initially thinking about interactivity, one must first pinpoint some basic assumptions that researchers connect with the term. Generally, we will find that interactivity is associated with new communication technologies (e.g. DeFleur and Ball-Rokeach, 1989), especially the internet and world wide web (e.g. Lanham, 1993; Stromer-Galley, 2000). In some arenas, the level of interactivity varies across media, usually anchored in its ability to facilitate interactions similar to interpersonal communication (Walther and Burgoon, 1992; Williams et al., 1988). However, the standard for what makes one medium more interactive than another is quite ambiguous. In the empirical literature, interactivity has been employed as both an assumed

independent variable to describe a medium (e.g. Kayany et al., 1996) and as a dependent variable gauging people's perceptions (e.g. Wu, 1999). A major limitation with some experimental inquiries is that a condition is often called 'interactive' without considering multiple levels of the variable, let alone defining its meaning.

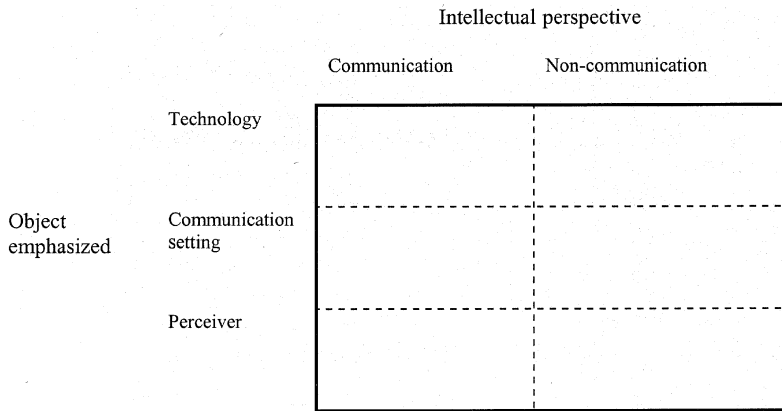
At first glance, one could submit that there should be no alarm at the lack of theoretical consensus regarding the concept. As long as we all accept that the term implies some degree of receiver feedback and is usually linked to new technologies, why should there be a problem? The dilemma is that, while these basic tenets are frequently agreed upon, the components and features that comprise the various definitions can lead to great discrepancies in scholarly output. For example, Newhagen et al. (1995) assert that interactivity levels rise and fall within a medium dependent upon people's perceptions, while Schneiderman (1987) suggests that interactivity levels only fluctuate by altering technological properties. Further, variables that are highly associated with interactivity, such as social presence and feedback, are shaped by how it is conceptualized by scholars.

As a consequence, the paucity of theoretical consensus can have dramatically different implications in more practical and operational terrains. For example, Bretz (1983) reports that interactivity is related to an interdependence of messages, while Steuer (1992) understands it as more technologically determined. Consequently, these two interpretations would obviously create differing opinions on computer design recommendations, with the former stressing message content and the latter emphasizing technological structure. Before seeking to formally define interactivity, the next step in the explication process is to survey the concept's literature in an attempt to synthesize its fragmented meanings.

## LITERATURE REVIEW

Any literature review of interactivity is cumbersome because of the vast implicit and explicit definitions prepared by researchers from many different academic and professional perspectives. Consequently, it is important to narrow our focus and keep the analysis manageable given the extensive discussion surrounding the topic. Specifically, while our emphasis is on communication, interactivity conceptions have been informed by both communication and non-communication perspectives, especially from the fields of psychology, sociology, and computer science/design. To help sharpen the current analysis' focus, this explication is principally rooted in *explicit* definitions of interactivity rather than implied or tacit conceptions, though these are considered when relevant. As with any literature review, this is a selected set of readings and by no means exhaustive.

Due to the diverse literature on the concept, it is apparent that some organizational device would be indispensable in discerning its various



• Figure 1 Interactivity definitions

meanings. Two dimensions emerge in scholarly work that could be used to arrange definitions: the object emphasized by scholars, and the intellectual perspective from which the definition originates. Of course, the categories within the two dimensions do overlap, yet still allow for concise classification of the literature. Figure 1 is presented above for the reader’s reference throughout the remainder of this article.

As the analysis unfolds, the table cells will begin to be filled in with various authors in the hope of locating common threads and subtle differences across the literature. Before continuing, it would be helpful to explain the rationale behind the two dimensions selected for organizing the literature. The choice of the intellectual perspective dimension was rather uncomplicated. Due to the concept’s interdisciplinary nature, it is advantageous to recognize the originating field of the different definitions. For purposes of brevity, the literature was divided into communication and non-communication perspectives, yet both categories could certainly be further segmented.

In contrast to the first dimension, the object-emphasized dimension is not as straightforward, but is a natural outcropping of the literature. Several scholars underscore these various objects in their work, but few have ever unified them into a single theoretical framework. For example, McMillan writes that ‘while some scholars see interactivity as a function of the medium itself, others argue that interactivity resides in the perceptions of those who participate in the communication’ (2000: 71). Moreover, Stromer-Galley (2000) distinguishes between ‘human’ and ‘media’ interactivity. Finally, Massey and Levy (1999) identify differences between ‘content’ and ‘interpersonal’ interactivity. Collectively, most of the literature touches on at least one of the three object domains. Even when considering elaborate, multifaceted views of the concept (e.g. Heeter, 1989), the object-

emphasized categories can still be used to group many of the various dimensions pinpointed in such definitions (to be discussed below). While not perfect, this categorization scheme is believed to capture the preponderance of prior conceptual and empirical work, and is therefore useful as an organizational tool in this capacity.

### Communication definitions

Any discussion of interactivity inevitably draws from its roots in Cybernetic theory, as outlined by Wiener (1948). As a basic communication model, the chief difference between Cybernetic theory and the classic Shannon and Weaver (1949) model is its emphasis on *feedback*. This ability for message receivers to respond to message senders has developed into a core component of many interactivity conceptions. Under this framework, interactivity is an attribute of the channel through which communication occurs. Communication is seen as a dynamic, interdependent process between senders and receivers. Like much of the communication work giving attention to interactivity, the Cybernetic position belongs in the middle cell of our first column in Figure 1.

As the rise of new media grew – such as the personal computer, videotext, cellular phones, etc. – more conceptual deliberation of interactivity was needed and was subsequently forged in the 1980s. During this period, Rafaeli declared that interactivity is

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. (1988: 111)

In a similar vein, Williams et al. stated that interactivity is ‘the degree to which participants in a communication process have control over, and can exchange roles in, their mutual discourse’ (1988: 10). Here, we see a shift away from an emphasis on channels and more towards the interconnected relationships among exchanged messages (also referred to as *third-order dependency*). A third-order dependent message interaction in a computer chatroom might read like the following:

User 1: Five minutes ago, you said that you wanted to go to the movies tonight, why have you changed your mind?

User 2: I didn’t change my mind. Two minutes ago, I thought you said you wanted to go to the movies tomorrow?

From this dialogue, we notice that both participants refer to prior transmissions, prompting a third-order dependency. Consequently, while this definition clusters into the communication setting’s category, the object of

focus, in this perspective, has transferred from channel to message relationship. As Rafaeli and Sudweeks (1997) put it,

interactivity is not a characteristic of the medium. It is a process-related construct about communication. It is the extent to which messages in a sequence relate to each other, and especially the extent to which later messages recount the relatedness of earlier messages. (1997, online)

Several academic and professional applications of interactivity have stemmed from this belief. If a system permits third-order dependency among participants, it is deemed interactive. In empirical terms, scholars in this tradition examine the content of interactive media and associate it with psychological and behavioral variables (e.g. Rafaeli, 1986; Rafaeli and Larose, 1993; Rafaeli et al., 1994).

Of course, this approach is restricted because it does not highlight the elements of interactivity that other communication researchers find compelling – specifically, technological and individual factors. More current work bridging communication and computer science has pushed scholars to consider technological structure and audience idiosyncrasies when commenting on interactivity and related concepts (e.g. Nass, Lombard et al, 1995; Nass, Moon et al., 1995; Reeves and Nass, 1996). Viewed as a multidimensional construct, Steuer furnishes a detailed account of interactivity, which he contends is ‘the extent to which users can participate in modifying the form and content of a mediated environment in real-time’ (1992: 84). Admittedly, his conception is technologically based and is governed by the speed, range, and mapping capabilities of a medium, although the user possesses ultimate control.<sup>2</sup> One can surmise that increases in any one of these factors raises the level of interactivity for a given medium.

However, there may be a point of diminishing returns when too much of one of these factors may actually make an experience less interactive. Aldersey-Williams states that ‘IDEO found that most people only use a few functions offered by state-of-the-art television, and that they tend not to readjust the controls once they have set them’ (1996: 35). In this situation, excessive *range* overburdens the user. A similar technologically-driven communication definition is given by Jensen (1998), who submits that interactivity is ‘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). His definition is further separated into transmissional, consultational, conversational, and registrational interactivity. The potential quantification of interactivity levels, as generated by these authors, is of great benefit for scholars attempting to generate operational definitions. However, of concern is their definitions’ inattention to aspects of other prominent interactivity conceptions, such as third-order dependency.

Durlak (1987) expresses a slightly different technological viewpoint by producing a typology for interactive media. Variables implicated with interactivity become equated with the physical components of interactive systems themselves. For example, *hardware* encompasses ‘sensory richness’, ‘spatial management’, and ‘responsiveness’. Here, the composition of technology becomes the litmus test in order to recognize interactivity. Returning to Figure 1, we deduce that Steuer, Durlak, and Jensen are best grouped in the upper left cell, but please note their differing views reflect that these classifications leave room for multiple interpretations within each perspective.

While most implied and explicit definitions of interactivity in communication concentrate on the technological and communication context aspects of the concept, other studies see it as a perception. Newhagen et al. (1995) adopt interactivity as a psychological variable in a content analysis of NBC news viewer email to gauge perceptions of interactivity. More recently, Wu (1999) noted that perceptions of interactivity have an impact on people’s attitudes towards websites. Unlike other definitions, here interactivity is comprehended as a variable that can dwell within individuals’ minds. This perceiver-based outlook introduces a new path for researchers to explore, complementing prior conceptions that emphasized other attributes.

Up to this point, the communication definitions that were multidimensional underscored components of interactivity that dealt with *one* of the ‘objects’ presented in our organizational scheme. This article now turns to those touching on multiple objects. Based on Heeter’s (1989) conceptualization of interactivity, a series of communication studies – primarily examining the world wide web – appropriate a multifaceted view of interactivity that touches on two or all three of the objects emphasized in this study’s typology. As a consequence, it is important to note that our categories are not mutually exclusive, but rather continuous. Further, authors are not just bound to single categories.

In an effort to summarize much of the early literature, Heeter (1989) supplies a six-dimensional definition of interactivity, which includes the following:

- (1) complexity of choice available;
- (2) effort that users must exert;
- (3) responsiveness to the user;
- (4) monitoring of information use (when a system can track users for example);
- (5) ease of adding information; and
- (6) facilitation of interpersonal communication.

Though not exact, many of these variables can be classified as employing the proposed organizational framework. For example, complexity of choice available, monitoring of information use, ease of adding information, and facilitation of interpersonal communication are all related to internal characteristics of the communication technology itself. The responsiveness dimension, which is anchored in Rafaeli's view of interactivity as feedback, is the 'degree to which a communication exchange resembles human discourse' (1985; cited in: Heeter, 1989: 223), and is therefore connected to communication settings. Absent is a direct linkage to human perceptions, yet the effort dimension is certainly perceiver-based. Reflecting further overlap in our classification scheme, system responsiveness, ease of adding information, and facilitation of interpersonal communication are variables that could also be studied from a perceiver standpoint.

Many communication investigations, building on conceptualizations similar to Heeter's, also contain components that are tied to more than one of the aforementioned objects (e.g. Goertz, 1995; Ha and James, 1998; Kenney et al., 2000; Massey and Levy, 1999). For example, Ha and James argue that interactivity is the 'the extent to which the communicator and the audience respond to, or are willing to facilitate each other's communication needs' (1998: 462), consisting of the following variables: playfulness, choice, connectedness, information collection, and reciprocal communication.<sup>3</sup> Within the present framework, choice could be seen as a dimension dealing with technology, while connectedness, as they conceptually define it, would probably be more perceiver-based. However, they operationalize it in terms of the presence of hyperlinks on webpages. Such differences reflect the murkiness of the literature. Downes and McMillan (2000) provide a five-dimensional definition of interactivity comprised of:

- (1) direction of communication;
- (2) timing flexibility;
- (3) sense of place;
- (4) level of control;
- (5) responsiveness and the perceived purpose of communication.<sup>4</sup>

As a whole, such definitions primarily focus on computer-mediated communication.

Downes and McMillan's (2000) identification of timing flexibility as a key dimension warrants further discussion. Traditionally, the real-time speed ideal has been included or implied in many interactivity conceptions, making it difficult to reconcile with communication experiences such as email, newsgroups, etc. – which most people deem 'interactive' despite their delayed response times. Additional scholarly attention has suggested that it is

the *flexibility* of message timing that makes interactive media more appealing (e.g. Finn, 1998; McMillan, 2000; Rheingold, 1993). Accordingly, timing flexibility should be more thoroughly considered as an important facet of interactivity. However, it is critical to distinguish between speed and timing flexibility, with the former representing the rate at which information flows through a system, while the latter refers to the degree to which users can control that rate. Despite this distinction, real time remains central in many conceptualizations of interactivity (e.g. Lombard and Ditton, 1997; Zeltzer, 1992).

While the prior multifaceted definitions are beneficial for covering several aspects of the construct, we must be careful that they do not become so highly intricate that they cannot be applied to real world settings (for discussion, see Jensen, 1998). As a consequence, the concise framework offered in this project affords some parsimony to many of the varying dimensions of the concept found in the literature.

### Non-communication definitions

Although communication theorists perhaps afford the most systematic overview of interactivity, this explication project would be incomplete without acknowledging the contributions made by other intellectual discourses. It is well documented that psychology plays an integral role in interactive media design (Aldersey-Williams, 1996). As one might imagine, psychological work on interactivity prefers the individual to be its object of focus. Leary poses an intriguing analogy comparing the evolution of *interactivity* to the development of the *interpersonal* in psychology: ‘Both concepts are related to very wide and deep and irrevocable changes in the way people relate to the world’ (1990: 230). In fact, Leary predicts that the success of an interactive medium hinges on its ability to resemble the interpersonal. This conclusion parallels those drawn by many communication scholars, who have long asserted that face-to-face communication is a standard for judging interactive experiences (see Bretz, 1983; Heeter, 1989; Williams et al., 1988). From a sociological perspective, DeFleur and Ball-Rokeach similarly contend that ‘interactivity generally refers to the processes of communication that take on some of the characteristics of interpersonal communication’ (1989: 341).

Importantly, the face-to-face standard is problematic because most interactive experiences are associated with *technologically-mediated* environments, rather than the unmediated environments of face-to-face communication. To address this problem, we believe it is essential to employ the broader term of ‘interpersonal communication’ – which can occur in both technologically-mediated and unmediated contexts – rather than employing face-to-face communication to avoid such concerns. There is some research that criticizes the use of interpersonal communication as a

standard in mediated communication experiences (Schudson, 1978), yet the consistency of such a pattern in interactivity literature has been ubiquitous for many years.

While never proffering any formal definition of interactivity, Turkle (1984) further develops the notion of it as an interpersonal, humanistic variable. Her ethnographic work suggests that human beings ascribe some very human characteristics to interactive systems (e.g. a computer is 'alive', and can even 'cheat' according to children). Despite writing from a communication point of view, in a similar vein, Jensen offers an insightful interdisciplinary comparison between the notions of 'human interaction' in sociology and 'media interaction' (which he sees as closely intertwined to the evolution of interactivity) in communication studies, when remarking that

in communication studies, it [interaction] refers, among other things, to the relationship between text and the reader, but also to reciprocal human actions and communication associated with the use of media as well as (para-social) interaction via a medium. (1998: 190)

When taken to its logical conclusion, this hints that to some extent interactivity is associated with the ability of individuals to experience different media as if they were engaging with other human beings. Accordingly, the simulation of interpersonal communication in an interactive environment is not just confined to human-to-human communication, but includes human-to-machine communication as well. Ultimately, any evaluation of interactivity from such approaches does not lie just within the technology, but in perceptions of users themselves. This has noteworthy ramifications for scholars who judge a medium as interactive on the sole basis of technological criteria. Obviously, this work is best placed in the lowest cell of the non-communication column in Figure 1.

Much of the work in the communication technology category is derived from the computer science/design literature. Generally, one would surmise that the object of interest in such perspectives is communication technology. That is, the users of interactive media are, at best, mechanisms initiating interactive communication experiences, but not central figures in the concept's definition. For example, in professional circles, interactive media are often thought of as 'mechanisms for delivering image, text and sound data in which the user interacts with the database' (Hutheeing, 1993: 244). Further, Dyson (1993) infers that most computer professionals understand interactivity in terms of converging technology. In brief, observers from this outlook see the capacity of media systems to convey and receive information in multimedia formats as a chief feature of the concept (Sims, 1995).

Notwithstanding an emphasis on technology, surprisingly what we find, at least in the more academically-based literature, is an evened approach that is equally concerned with medium structure and human characteristics. Schneiderman (1987), who does not explicitly define interactivity, suggests a checklist to estimate the success of an interactive system. He balances technological criteria (system functionality and reliability) with user criteria (time to learn, speed, rate of user error, etc.). His accentuation on speed is especially enlightening because it illustrates the tendency toward perceiver-determined representations. Heckel recommends that interactive software designers ‘learn to think like a communicator and to practice an artistic craft as well as an engineering one’ (1984: xii). Even Laurel (1991), whose early work (1986a, 1986b) argued that interactivity consists of frequency, range, and significance (similar to Steuer’s [1992] technology-driven definition), gives way to a more perceiver-based position when writing that interactivity occurs when ‘you either feel yourself to be participating in the ongoing action of the representation or you don’t’ (1992: 20–1).

In a broad sense, interactivity definitions from a computer science/design viewpoint have gradually become more user-based. Naimark (1990) urges that we differentiate between *realness* and *interactivity*. The former refers to the competency of technology to blur the boundaries between physical and mediated reality. The latter refers to the aptitude of users to modify, interact, and respond to media which, in turn, transform the mediated environment being experienced. Nevertheless, as demonstrated by Laurel (1991), the blurring of such boundaries is a critical part of other observers’ interactivity definitions. Murray, when discussing the notion of ‘cyberdramas’, captures the idea of realness when concluding that ‘at that point, when the medium itself melts away into transparency, we will be lost in the make-believe and care only about the story’ (1997: 272). Elsewhere, she reflects a focus on both the user and communication context when stating that it is the ‘procedural’ and ‘participatory’ environments created by new media that make them interactive.<sup>5</sup> Norman’s (1988) theme of mapping as a vital factor in interactivity confirms the human-centered orientation evident in contemporary design literature. By combining the cogent aspects of interactivity discussions from the fields of communication, sociology, psychology, and computer/science design, we may be able to identify the true nature of the concept.

## Summary

Before proceeding any further, it is essential that we reformulate Figure 1 to organize many of the authors in the literature review visually. In addition, certain attributes salient to authors are also listed. Figure 2 is presented below as a reference for the remainder of this project.

		Intellectual perspective	
		Communication	Non-communication
Object emphasized	Technology	Steuer (Mapping) Durlak (Sensory-richness) Jensen (System ability to facilitate user influence) Heeter (Complexity of choice) Ha and James (Choice) Downes and McMillan (Timing flexibility)	Schneiderman (System functionality) Hutheesing (Message delivery) Sims (Multimedia capabilities)
	Communication setting	Wiener (Cybernetic theory) Williams et al. (Mutual discourse) Bretz (3rd-order dependency) Rafacli (3rd-order dependency) Heeter (Responsiveness)	Murray (Procedural and participatory environments)
	Perceiver	Newhagen et al. (Perceived interactivity) Wu (Perceived interactivity) Ha and James (Connectedness) Downes and McMillan (Perceived purpose of communication)	Leary (Simulation of interpersonal) Schneiderman (Learning speed) Murray (Perception of mediated reality)

• Figure 2 Interactivity definitions

### EMPIRICAL DESCRIPTION

Based on the literature review, it is clear that operational definitions of interactivity revolve around measuring specific dimensions or subconcepts of the term. Though some agreement has been discovered on certain subvariables, formal operational definitions are equivocal. Yet by collectively scrutinizing those studies that discuss interactivity operationally, some of its common operational properties may be isolated.

In a very general sense, interactivity is used as a descriptive characteristic of new media (e.g. DeFleur and Ball-Rokeach, 1989). Many authors center on feedback as the key signal of the concept (e.g. Rafaeli, 1988). Thus, if participants can engage in message transactions that are comparable to interpersonal communication, those experiences are labeled interactive (e.g. Kayany et al., 1996). However, two-way communication is not the only type of experience related to interactivity, for many scholars highlight one-to-many and many-to-many communication experiences as well – provided that some degree of feedback is involved (e.g. Hoffinan and Novak, 1996; Rust and Oliver, 1994). It is also important to note that the communication flow can be both linear and non-linear (Goertz, 1995; Stromer-Galley, 2000). Of course, one-way communication is typically deemed low in interactivity.

In studies of web communication, the number of hyperlinks on webpages and sites has been used to operationalize interactivity (e.g. Sundar et al., 1998). From a multidimensional perspective, Kenney et al. (2000) assessed

complexity of choice by looking at alternatives for speed and language. Likewise, Ha and James (1998) measured choice in terms of options for color, speed, language, etc.; playfulness by the number of 'curiosity arousal devices and games'; connectedness with hyperlinks; information collection with registration prompts at websites; and reciprocal communication through mechanisms such as email, telephone numbers, etc. McMillan (2000) ascertained time flexibility by whether websites allowed users to submit updates at their convenience.

As mentioned earlier, Newhagen et al. (1995) was one of the first studies to operationalize interactivity as a perception of the individual. Specifically, email messages addressing large audiences indicated *low* levels of perceived interactivity, while those targeting interpersonal audiences were perceived to be *highly* interactive. Wu (1999) gauged perceived interactivity by asking website visitors questions that grouped into two major factor loadings: (1) how responsive a website was to their input; and (2) how easy the site was to navigate. Steuer (1992) does not perform an empirical analysis but advocates that interactivity should be operationalized in terms of a medium's speed, range, and mapping abilities.

While studies operationally defining interactivity are scattered, we still may be able to glean some basic operational properties from the literature. As disclosed in Newhagen et al. (1995) and in related definitions, interactivity is a variable that fluctuates across individuals and media (e.g. computers are more interactive than newspapers). Interactivity levels are fairly stable across time in media technologies, but can vary substantially within individuals' perceptions. Steuer (1992) hints that interactivity levels should correlate with telepresence (the degree to which users feel that mediated environments take precedence over physical environments). This is similar to discussions of 'place', 'connectedness', and 'realness' mentioned by other scholars (e.g. Ha and James, 1998; McMillan, 2000; Murray, 1997; Naimark, 1990; Walther and Burgoon, 1992). Finally, based on the arguments of Bretz (1983), Rafaeli and Sudweeks (1997) and others, one can assume that the ability to induce feedback is a major prerequisite to calling a medium or communication experience interactive. Again, feedback should not be limited to two-way communication, but multiway communication as well.

## DEFINITION

Overall, considerable debate exists about how to properly conceptualize or operationalize the term (e.g. Heeter, 2000; Kayany et al., 1996; Norman, 1988). On a simple everyday level, interactivity deals with the ability of systems to simulate interpersonal communication, although the features and components of it change with authors. To review, the following are some of the explicit definitions encountered in the literature search.

Interactivity is '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, 1988: 111).

Williams et al. say 'the degree to which participants in a communication process have control over, and can exchange roles in, their mutual discourse is called interactivity' (1988: 10).

DeFleur and Ball-Rokeach argue that 'interactivity generally refers to the processes of communication that take on some of the characteristics of interpersonal communication' (1989: 341).

Steuer reports it as 'the extent to which users can participate in modifying the form and content of a mediated environment in real-time' (1992: 84).

Ha and James contend that it is 'the extent to which the communicator and the audience respond to, or are willing to facilitate each other's communications needs' (1998: 461).

Jensen argues that it is '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' (1998: 201).

Based on scholarly work from the aforementioned intellectual discourses, we can begin to compile a list of the various elements and meanings encompassing interactivity. Some consensus can be reached concerning the chief ingredients of an interactive experience. Two-way or multiway communication should exist, usually through a mediated channel. The roles of message sender and receiver should be interchangeable among participants. In addition, some third-order dependency among participants is usually necessary. For the most part, communicators can be human or machine, often contingent upon whether they can function as both senders and receivers. Individuals should be able to manipulate the content, form, and pace of a mediated environment in some way. Users should be able to perceive differences in levels of interactive experiences.

### Problems with definitions

While some common ground among authors can be observed from these shared definitional threads, problems frequently arise when scholars accentuate one of these features over another. For example, much of the communication literature is preoccupied with factors related to communication context, such as message relationships and channels (e.g. Rafaeli, 1988). Meanwhile, Steuer (1992) delimits interactivity as a property of technology itself, consisting of speed, mapping, and range. Though speed and range seem consistent with basic views of interactivity, mapping is probably more topic specific for computer software.

A major problem linked to the concept of speed is that, it too, is weakly explicated. For example, a distinction should be made between *objective*

standards of speed and *perceptions* of speed. This is a crucial distinction, because people's interpretations of an interactive experience will not necessarily conform to objective operational measures linked to that experience. Thus, communicating on the internet with a 28,800bps modem by today's standards might be perceived as slow, but just a few years ago, this seemed brisk. The point here is that objective standards of speed (e.g. 28,800bps) might not change, but users' perceptions of them do. Furthermore, scholars have pointed out that interactive experiences do not always have to be 'fast' or in 'real time', as seen in the example of email (e.g. Finn, 1998). Accordingly, we should separate these two qualities of speed in our consideration of interactivity, along with the distinction between speed and timing flexibility outlined earlier.

Besides speed, other problems also surface with the definitions reviewed in this study. In contrast to some of the more technologically-based work (e.g. Durlak, 1987), for example, the original Cybernetic model seems appropriate for specific media (e.g. telephone) because of its emphasis on feedback. However, it is surely antiquated for many of today's complex media technologies (e.g. virtual reality). Authors, including Heckel (1984), Laurel (1991), and Schneiderman (1987) define interactivity in close relation to the user. In particular, Leary (1990) sees interactivity as the capacity for a system to mimic interpersonal communication. Newhagen et al. (1995) and Wu (1999) take this a step further by displaying interactivity as a possible perception of individual users.

Others maintain that a system may not be interactive if all its members cannot cognitively process the messages transmitted, raising questions about machine-to-machine communication (for discussion, see Williams et al., 1988). The notion of real time is also problematic because it suggests that instantaneous feedback is required for an interactive experience. The shift in the literature to discuss 'flexibility' has helped to address such issues. Indeed, many forms of communication with new media, which most researchers would concur are interactive, have delays in response times (e.g. email may be returned after one week, yet is still considered interactive by most). However, as remarked above, many explications still indicate that real time is integral to interactive experiences (e.g. Lombard and Snyder-Duch, 2001; Steuer, 1992). Finally, the face-to-face standard is difficult to accord with the possibility of communicating one-to-many and many-to-many, as might be the case with email and the world wide web. Therefore, while some common discussion exists regarding certain attributes of the construct, our challenge remains to assimilate the plethora of scattered conceptions in the literature into a more cohesive theoretical framework.

Whenever attempting to conceptually define abstract terms, it is often helpful to link their theoretical meanings with some lower order concepts (Chaffee, 1991). Perhaps the most concrete term embracing interactivity is

technology. In recent years, interactivity has become more and more allied to the personal computer. We are told continuously that the internet is interactive, and widespread dissemination of interactive videophones is in the near future. Generally, any new communication technology will be dubbed interactive if it allows some degree of user response. Traditional media (e.g. television, radio, and newspapers) rank low because their capacity for feedback is limited. Among the various new media, interactivity is highly connected to the following: computers, cellular communications, digital communications, video-conferencing, software, virtual reality, the world wide web, etc.

Since the end-goal of an explication project is to operationally define a concept (Chaffee, 1991), it is vital that we tentatively sketch out some basic empirical rules for observing interactivity.<sup>6</sup> First, there must be at least two participants (human or non-human) for interactive communication to transpire. Further, some technology allowing for mediated information exchanges between users through a channel must also be present (e.g. telephone or computer chatroom). Finally, the possibility for users to modify the mediated environment must exist. Once these conditions have been met, interactive communication can be detected.

One key to noticing interactivity on an individual level lies in the researcher's competency to recognize simultaneous comprehension and responses to communication transmissions by participants. Normally, evidence for this would consist of direct observations, questionnaires, and content analyses. Psychological scales, such as those formed in Newhagen et al. (1995) and Wu (1999), could be employed to approximate perceptions of interactivity by users. In addition, questionnaires monitoring typical interpersonal communication variables could function as indicators of perceived interactivity, i.e. higher scores on such variables would signify higher perceptions of interactivity. To ascertain interactivity levels of a particular medium, researchers could devise a scale based on predetermined criteria. Specifically, the number of possible actions available to users (range) by a media system could be one indicator of interactivity for a specific medium. To gauge interactivity levels of a communication context, one could calculate the frequency of messages that refer to earlier exchanges (third-order dependency). These measures could then be scaled and statistically tested to calculate perceived and actual interactivity scores. Against this backdrop, we could then make comparisons across media and individuals more precisely than previously imagined. This would be a powerful tool for both professionals and academics alike.

## REVIEW OF DEFINITIONS

As argued earlier, little consensus has been reached concerning interactivity. Thus far, the concept has been identified, the literature surveyed, and the

scattered definitions reviewed. It is now necessary to converge on some basic properties of the numerous definitions. To begin, interactivity should be categorized as a relational variable (Rafaeli and Sudweeks, 1997). On an individual level, it resides in the minds of media users as perceptions (Newhagen et al., 1995). As a quality of media, it can be seen in the form, content, and structure of technology and their relation to the user (e.g. Steuer, 1992). Typically, interactivity is examined within a dyadic communication context between humans and machines, or humans and humans via machines (Rice, 1984). It is difficult to isolate from variables such as social presence, transparency, and user friendliness (Durlak, 1987). Other connected factors are feedback, speed (perceived and real), and timing flexibility (e.g. Bretz, 1983; McMillan, 2000).

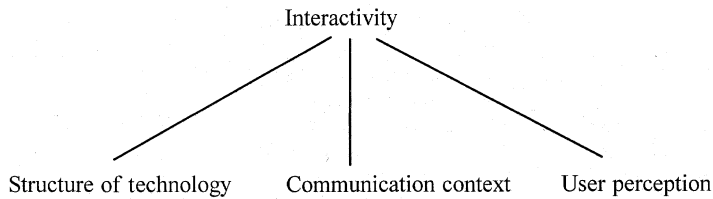
Many definitions of interactivity are either tacit or assumed. Researchers often make broad assumptions about interactivity and simply merge them into positivist work as a two-level, nominal independent variable. Moreover, many of the explicit definitions lack a parsimonious framework to be useful (for discussion, see Jensen, 1998) or are limited to particular media, but significant progress has been made (e.g. Downes and McMillan, 2000; Newhagen et al. 1995; Steuer 1992). Few would dispute that the concept 'really' exists, yet how one would isolate and order it is certainly subject to debate. Currently, the best approach for appraising operational measures is to sift through the studies operationalizing the concept (as done in the present analysis) and explore empirical literature covering related concepts such as social presence. Walther et al. (1994) encapsulate previous work on some germane variables.

The academic usage of 'interactivity' is marginally inconsistent at best. Many fundamental differences (e.g. channel vs. technological attributes) lead to incongruity in implied and explicit theoretical definitions. However, there is some common understanding as to which related variables belong together. For instance, Steuer (1992) and Durlak (1987) both believe that social presence is a crucial factor. Murray (1997) and Ha and James (1998) suggest that increasing user awareness of mediated environments over physical environments is paramount. In fact, meanings are not so scattered that intellectual dialogue is impossible. Reconsideration of interactivity by researchers can elicit a more holistic awareness of the concept.

## DEFINITION MODIFICATION

As we continue through the explication process, we may want to contemplate modification of extant interactivity definitions. So far, it has been demonstrated that interactivity definitions have multiple roots, which have all made valuable improvements in the evolution of the concept. Rather than alter any of the contributions made by other researchers or highlight only one area of the different conceptions, it is instead imperative

that interactivity conceptions are merged into a hybrid definition. A succinct interpretation encompassing the central aspects of the previously reviewed definitions is more appropriate. The goal here is to eliminate non-essential components of the different views and blend the fundamental ones into a comprehensive vision of interactivity. Consequently, we endeavor to formulate a definition of interactivity that includes the following as major dimensions: (1) the structure of a medium (Steuer, 1992); (2) the context of communication settings (Rafaeli, 1988); and (3) the perceptions of users (Wu, 1999). Hence, the final definition will hopefully allow interactivity to be accepted as both a media and psychological variable by scholars. Visually, the definition outlined above might look like this.



• Figure 3 Conceptualization of interactivity

### TENTATIVE DEFINITION

As asserted throughout this article, interactivity definitions have stressed three principal domains: technological properties, communication context, and user perceptions. The problem has been that researchers have not tied these three aspects together into an inclusive definition. This is what we will attempt to accomplish now.

### Definition

Interactivity can be defined as the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many), both synchronously and asynchronously, and participate in reciprocal message exchanges (third-order dependency). With regard to human users, it additionally refers to their ability to *perceive* the experience as a simulation of interpersonal communication and increase their awareness of telepresence.

### Clarification

To clarify a few points about the terms consolidated into this definition, by communication technology we allude to anything from a telephone to a computer system. Further, a mediated environment can be anything from a telephone wire to virtual reality. Communication, in this context, can range from simple information transfer to sophisticated movements in video games or through the world wide web, thereby encompassing linear and non-linear

communication paths. Participant relationships would normally be human-to-machine or human-to-human via machine, but could be machine-to-machine in some cases. As mentioned earlier, including machine-to-machine communication in interactivity definitions is provocative (e.g. Williams et al., 1988), yet it does possess many of the key features of the concept, including two-way/multiway message transmissions through mediated environments and the interchangeability of roles as senders and receivers. Further, the fact that so many conceptions of interactivity are closely tied to technology makes incorporating machine-to-machine exchanges natural.

Third-order dependent message transmissions are applied in the tradition of Rafaeli (1986) and Bretz (1983). Telepresence is elucidated as the ability of a medium to form an environment that, in the minds of communication participants, takes precedence over actual physical environments (Steuer, 1992). This parallels the emphasis put on 'place' or 'connectedness' by other scholars (e.g. Ha and James, 1998). The first segment of the definition is designed to cover the technological structure and communication settings aspects of interactivity, while the latter part integrates user perceptions.

Interactivity, in this light, contains the major components of previous explications, but demarcates certain boundaries that must be adhered to in order for a medium or communication experience to be regarded as interactive. For example, it includes all types of technology, but clearly differentiates between technologically-mediated and unmediated communication. Therefore, a conversation over the phone is interactive, while a dialogue in person is not (though technological *simulation* of interpersonal communication is central). Our definition's exclusion of 'pure' interpersonal communication is debatable; however, as stated above, the concept is so closely tied to technology (from a communication perspective at least) that there should be a distinction between mediated and unmediated experiences.<sup>7</sup> Moreover, Jensen (1998) articulates the importance of distinguishing between 'human interaction' (in sociological circles) and 'media interaction' (in communication circles), with the latter typically involving technologically-mediated experiences and the former typically occurring without technology. Because interactivity is more heavily anchored in the notion of media interaction (Jensen, 1998), mediated communication via technology is a central attribute of our definition.

The definition's inclusion of both synchronous and asynchronous communication captures the idea of timing flexibility because communication technology providing both options are thought to be truly interactive, yet the growing importance of real time is also acknowledged. The vague use of 'mediated environment' is somewhat limiting, but is purposeful because we are aiming to accommodate all two-way and multiway communication performed with or through media technologies. This could range from

conversations through a CB radio to live chats on the internet. Of course, some mediated environments are more interactive than others, dependent upon factors such as the choice of actions provided to participants and the ease with which participants can direct and adjust the constructed mediated environment. (This will be detailed more in the operational definition stage of the explication process). Finally, in this view perceptions are limited to humans because researchers claim that the simulation of interpersonal communication and increased telepresence are variables pertinent only to human communication, not machine-to-machine exchanges (e.g. Keltner, 1973). The first portion of the offered definition adequately accounts for machine-to-machine communication, while human perceptions are integrated into the second part.

To observe interactivity as it has been outlined above, a three-stage inspection procedure is required. First, we are interested in looking at the attributes of the communication medium being used during an interactive experience. Within this context, objective criteria will be formulated to produce an interactivity score for a medium, e.g. what is the range of choices a system provides participants? Next, we will want to scrutinize the environment in which the communication is occurring. This can be achieved by content analysis to establish the degree of third-order dependency among communication exchanges. Finally, we will probe individuals' perceptions of such interactions and devise perceived interactivity scores. One strategy for accomplishing this is through questionnaires. The value of such an observation plan is that it employs multiple indicators to detect the construct. Thus, the units of analyses are as follows: individual medium, single communication experiences (comprised of sets of message transmissions based on exchanges with communication technologies), and user perceptions.

Because of the different measures needed to observe interactivity as completely as it is proposed here, data conversions are necessary but not too difficult. To complete this, we must consider each step of the detection process separately. First, when measuring technological interactiveness, we could create an index to produce a 'technology interactivity score'. In a basic investigation, this might be accomplished by including the number of actions that are allowed by a medium. In the second stage of the inspection process, traditional operational procedures for third-order dependencies could be utilized as a basis for a 'communication context interactivity score', i.e., tallying the amount of overall communication transmissions that allude to prior message transmissions (Rafaeli, 1988). Finally, a composite scale of interpersonal communication measures might be adapted to produce a 'perceived interactivity score'. Depending upon the intentions of the study, scholars may choose just one of these measures in their inquiries or perform more complex statistical tests to create an 'overall interactivity score'. By

gauging interactivity in this manner, we can make comparisons across media, communication exchanges, individuals, and overall interactive experiences. At this point, specific operational procedures will be supplied to explain how this might manifest in an empirical investigation.

## OPERATIONAL DEFINITION

In this section, an example of how the current definition might be applied is presented. As a preface, the example is *simplistic* by design for ease of illustration. Certainly, it would be optimistic that all the aspects of interactivity covered could be easily measured quantitatively, as the example proposes. I am by no means asserting that all applications of the offered definition would be this smooth, but believe this can be a good starting point for future research to build on.

That said, for the purposes of this explication project, let us suppose that a set of researchers are interested in ascertaining the *total* degree of interactivity for some new computer communications system software. It will also be assumed that the scholars have the means to perform an experiment, which would be a desirable method for evaluating the system. The first step they must take is to define a population and draw a sample. A sample of 30 users to test the system might suffice to represent their chosen overall population, especially if it is in an organizational setting. As the sampling procedure is created, the researchers must also generate operational measures to make their observations.

Forming operational measures is one of the more challenging phases in carrying out an empirical study because the items need to be discernible enough to be measured, yet also need to encompass the actual concept that the researchers are attempting to quantify. Hence, a major consideration revolves around the reliability and validity of measures. By applying multiple indicators (as intended here), our empiricists should dramatically strengthen reliability (Chaffee, 1991). The researchers should also aim to improve validity by matching the operational definition with the conceptual definition granted earlier. To list the appropriate observations in the inspection process, data would be collected by scrutinizing attributes of the software program, the content of communication transmissions, and user perceptions.

The first operational measures will examine the medium's structure, i.e., the computer system. Steuer (1992) and Durlak (1987) afford some logical measures of interactive technology: speed, range, and mapping. Of these, speed and range appear to be most appropriate because mapping is more applicable for virtual reality or video games. Downes and McMillan's (2000) dimension of timing flexibility is also appropriate for studying communications software. Our researchers could operationalize speed (objective) as an average between the amount of time it takes for the

software to transmit information from one participant to another or the whole group *and* the amount of time responses take to be communicated (feedback).<sup>8</sup> Timing flexibility could be operationalized as whether the system would allow participants to communicate in real time and/or in delayed fashion. A system allowing for both would rate higher than one only providing one option. Range could be computed as the number of actions that the system offers to the user. For example, can subjects only communicate with one person at a time or many simultaneously? Can individuals reply to information while receiving it? Each of these possible actions are counted toward a mapping score. Obviously, there would be some overlap between the timing flexibility and mapping scores, since the timing options would be among the actions available to users.

Expanding on Durlak's (1987) ideas, scholars might approximate technological complexity as the amount of devices employed by the system to activate the five senses (sensory complexity). For example, written text would activate visual senses, while use of sound would activate acoustic senses. This is instrumental for comparing different media because it acknowledges that, for example, video streaming on the web is more technologically complex than telephone discussions. Another advantage of this operational definition is that it is broad enough to include nearly all interactive communication experiences, yet it is not too simplistic to assess such factors as graphics quality. It furnishes a criterion that is based on objective properties of the system, not subjective perceptions of the user. Higher levels on any of these measures would signify higher levels of 'technological interactiveness'.

The second set of operational measures concentrates on the environment in which interactive communication takes place. For this, researchers could have two measures: one of third-order dependency and one of social presence. Third-order dependency would be quantified in the content analysis as the percentage of overall messages that refer to prior message transmissions. Subjective judgements of coders would probably be sufficient to assess which messages allude to prior exchanges and which ones do not. Social presence, which in this context is delimited as the ability of users to convey their presence in communication transmissions, might be operationalized as the percentage of messages when subjects explicitly refer to themselves (e.g. 'I, me, my', etc.). Although this measure lacks validity, it is extremely reliable and clearly represents a demonstration of communicating social presence. Higher percentages on both indicators would signal higher 'context interactivity' levels.

Finally, the third set of measures entails perceived levels of interactivity. As mentioned earlier, this could be detected by questionnaires once the experiment has concluded. When investigating participant perceptions, the researchers could judge how well a communication experience simulated

interpersonal communication. Some of the most paramount variables in interpersonal communication are proximity, sensory activation, and speed (Bretz, 1983; Chesebro and Bonsall, 1989; Meyers and Meyers, 1976). Therefore, the questionnaire could gauge these and other related variables, such as telepresence, to compute a perceived interactivity score.

Our hypothetical scholars could then form Likert scales for each of these indicators. Thus, they might be operationalized as follows:

- (1) proximity would be the degree to which a respondent feels he/she is 'near' other subjects when engaging with the system from 'very far' to 'very close';
- (2) sensory activation would be operationalized by asking the respondent to rate which senses (sight, hearing, touch, etc.) were heightened during the experiment from 'not at all' to 'very much';
- (3) perceived speed would be operationalized as how fast users thought the system allowed participants to react to one another's transmissions from 'vary fast' to 'very slow'; and
- (4) telepresence would be operationalized as the accuracy with which users could describe the physical environment of the laboratory – presumably the less accurate, the higher the sense of telepresence, because the mediated environment would take precedence over physical surroundings.

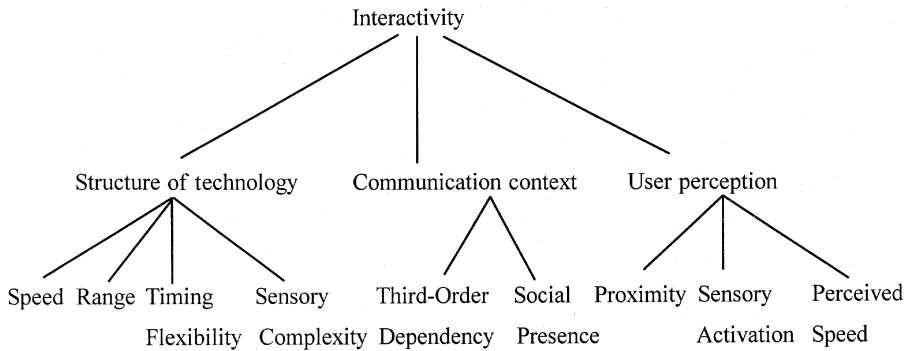
A composite scale of these measures would create a perceived interactivity score. The higher the score, the higher the level of 'perceived interactiveness'.

Once the data has been collected, it would be transformed, producing technological, communication context, and perceived interactivity scores. Subsequently, researchers could either combine it statistically to manufacture an overall interactivity score or simply use it individually to assess the system. As an overall score, the data would cover all three essential dimensions of the advanced interactivity definition. Individually, the data would magnify the component of interactivity in which the researchers were interested.

Empirically, the data would probably reveal that interactivity levels can vary across technology, communication settings, and individuals' perceptions. Technological interactivity is postulated to be more stable than the other types because medium qualities are usually consistent until innovations are made to systems. In contrast, context and perceived interactivity levels fluctuate more because they consist of communication content and participant perceptions respectively. Communication context levels are probably the most volatile since content is discursive, particularly in

interactive environments. User perceptions also fluctuate due to individual differences, inexperience in using computers, etc.

Before evaluating the operational definition, it would be wise to link the operational definitions with the conceptual definition established earlier. Visually, the manifestation might look something like this.



• Figure 4 Operationalization of interactivity

Throughout this explication, it has been substantiated that interactivity is operationally composed of three principal elements: properties of technology, attributes of communication contexts, and user perceptions. Each is equally important, and they combine to form the overarching concept known as interactivity. In contrast, interactivity can also be thought of along these three dimensions (that fuse together to form the broader concept) or simply be considered discretely. However, neglecting any facet of the operational definition does not capture the full view of the theoretical construct. It appears that our operational definition matches well with our conceptual definition of the term. Speed (objective), range, timing flexibility, and sensory activation are qualities associated with the structure of technology, and can be used to estimate high and low levels of technological interactivity. Third-order dependency and social presence are germane to the theoretical definition and describe characteristics of communication context appropriately. Finally, basic interpersonal communication measures and telepresence apply to the conceptual definition because all are correlated to the simulation of interpersonal communication.

On the whole, the operational definition offered not only describes the essence of the theoretical definition of interactivity, but may also help broaden the concept's boundaries. In comparison to previous versions, the interactivity definition provided above is expansive, permitting analyses across media and individuals. Interactivity is understood as both a media and psychological variable. In addition, interactivity is advanced here as a variable that can be examined along its individual dimensions or as a single,

composite variable. Thus, scholars can be as specific or general as needed in their inquiries.

## CONCLUSION

The convergence of new technologies blurs the boundaries between traditional and new media. For example, the internet is often seen as a hybrid system of television and text. Similar to this merging, interactivity conceptions need to be integrated into a hybrid definition. From this analysis, the significance of engendering conceptual and operational definitions that embrace interactivity as a media and psychological variable has been shown. To restate, interactivity can be defined as the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many) both synchronously and asynchronously and participate in reciprocal message exchanges (third-order dependency). With regard to human users, it additionally refers to the ability of users to *perceive* the experience to be a simulation of interpersonal communication and increase their awareness of telepresence.

Operationally, interactivity is established by three factors: technological structure of the media used (e.g. speed, range, timing flexibility, and sensory complexity), characteristics of communication settings (e.g. third-order dependency and social presence), and individuals' perceptions (e.g. proximity, perceived speed, sensory activation, and telepresence). Hence, definitions have been outlined that have blended the most important elements of prior conceptions into a concise framework. Inevitably, interactivity will remain a controversial concept in the literature, but it is hoped that this explication has granted a clearer picture of interactivity and how it might be studied in future investigations. As more new media proliferate, other concepts in mass communication will have to be adjusted and refined. The expansion of knowledge awaits.

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## Notes

- 1 It is important to recognize that these steps represent one method for explicating a concept and are by no means exhaustive. Chaffee further articulates this point by arguing that the steps outlined in his book 'can serve as a checklist for the researcher explicating a concept, but it is not a recipe that guarantees results' (1991: 14).
- 2 These three factors refer to 'the rate which input can be assimilated into the mediated environment'; 'the number of possibilities for action at any given time'; and 'the ability of a system to map its controls to changes in the mediated environment in a natural and predictable manner' (Steuer, 1992: 85–6) respectively.

- 3 Playfulness is the degree to which an interactive experience is entertaining. Choice deals with the amount of alternatives available to users in an interactive experience, similar to range. Connectedness is 'the feeling of being able to link to the outside world and to broaden one's experience easily' (Ha and James, 1998: 462). Information collection is similar to Heeter's (1989) monitoring of information use dimension. Finally, reciprocal communication mirrors the concept of feedback.
- 4 Direction of communication refers to the idea that 'two-way communication is more interactive than one-way communication' (McMillan, 2000: 71). Timing flexibility refers to the degree to which users have some control in the timing of messages. Place is similar to Ha and James' (1998) discussion of connectedness. Control is the extent to which users feel in command during interactive communication. Responsiveness entails the effort required by users to react in interactive experiences. Finally, perceived purpose of communication is the degree to which users 'feel that the goal of communication is more oriented to exchanging information than to attempting to persuade' (Downes and McMillan, 2000: 173).
- 5 'Procedural' simply means that the environments have rules, and 'participatory' means that the environments 'are responsive to user input' (Murray, 1997: 74).
- 6 Before continuing, two caveats must be mentioned. First, please note that the rules expressed are to be used for specific observation in an experimental environment. Other methods might require different sets of rules. Secondly, the rules created here are derived from combinations of theoretical and positivistic discussions.
- 7 This should by no means indicate that I completely reject interactivity's application in face-to-face communication, but rather feel such applications are rooted in a different interpretation of the concept than the one employed here – perhaps the concept of 'interaction' is more appropriate in that context. For my purposes though, it is the *simulation* of interpersonal communication that is crucial.
- 8 Channel traffic would inevitably play a role in this measure and might be considered a characteristic of communication context, but this hypothetical analysis presumes that the capacity to overcome channel traffic lies in the structure of technology and is thus a measure of the medium.

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