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Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations

Donna L. Hoffman
hoffman@colette.ogsm.vanderbilt.edu

Thomas P. Novak
novak@moe.ogsm.vanderbilt.edu

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Abstract

This paper addresses the role of marketing in hypermedia computer-mediated environments (CMEs). Our approach considers hypermedia CMEs to be large-scale (i.e. national or global) networked environments, of which the World Wide Web on the Internet is the first and current global implementation. We introduce marketers to this revolutionary new medium, and propose two structural models of consumer behavior in a CME. Then we examine the set of consequent testable research propositions and marketing implications that flow from the models.

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1) Introduction

Firms communicate with their customers through various media. Traditionally, these media follow a passive one-to-many communication model whereby a firm reaches many current and potential customers, segmented or not, through marketing efforts that allow only limited forms of feedback on the part of the customer.

For several years now, a revolution has been developing that is dramatically altering this traditional view of advertising and communication media. This revolution is the Internet, the massive global network of interconnected packet-switched computer networks, and as a new marketing medium, has the potential to radically change the way firms do business with their customers.

The Internet operationalizes a model of distributed computing that facilitates interactive multimedia many-to-many communication. As such, the Internet supports discussion groups (e.g. USENET news and moderated and unmoderated mailing lists), multi-player games and communications systems (e.g. MUDs, irc, chat, MUSEs), file transfer, electronic mail, and global information access and retrieval systems (e.g. archie, gopher, and the World Wide Web). The business implications of this model "[where] the engine of democratization sitting on so many desktops is already out of control, is already creating new players in a new game" (Carroll 1994), will be played out in as yet unknown ways for years to come.

This paper is concerned with the marketing implications of commercializing *hypermedia computer-mediated environments* (CMEs), of which the World Wide Web (Berners-Lee et. al. 1992, 1993) on the Internet is the first and current networked global implementation. While we provide a formal definition subsequently, at this point we informally define a hypermedia CME as a distributed computer network used to access and provide hypermedia content (i.e., multimedia content connected across the network with hypertext links). Though other CMEs are relevant to marketers, including private bulletin board systems (Bunch 1994); public conferencing systems such as the WELL (Figallo 1993; Rheingold 1992, 1993) and ECHO; and commercial online services such as America On-Line, Prodigy, and CompuServe, we restrict our current focus to marketing activities in hypermedia CMEs accessible via the "Web" on the Internet. The Internet is an important focus for marketers because consumers and firms are conducting business on the Internet in proportions that dwarf the commercial provider base of the other CMEs combined. There are over 21,700 commercial Internet addressess (Verity and Hof 1994), and an increasing percentage of these commercial addresses are providing Web services. As of December 28, 1994, 1465 firms were listed in Open Market's (1994) directory of "Commercial Services on the Net," and there were 6370 entries in the "Business/Corporations" directory of the Yahoo Guide to WWW (Filo and Yang 1994).

The central thesis driving this research is that hypermedia CMEs, such as but not limited to the World Wide Web on the Internet, require the development and application of new marketing concepts and models. This is because hypermedia CMEs possess unique characteristics, including machine-interactivity, telepresence, hypermedia, and network navigation, which distinguish them from traditional media and some interactive multimedia, on which conventional concepts and models are based.

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The World Wide Web

The World Wide Web is a concrete example of a hypermedia CME. The Web, also referred to as WWW or W3, is an Internet-based global information initiative begun by Tim Berners-Lee at the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland. First proposed in 1989 and released to the Internet community in 1991, the Web represents the "universe of network-accessible information, an embodiment of human knowledge" in hypertext and multimedia form (Berners-Lee, Cailliau, Groff, and Pollermann 1992; Berners-Lee, Cailliau, Pellow, and Secret 1993).

In other words, the World Wide Web is the first example of a hypermedia CME with a body of software, and a set of protocols and conventions that make it possible for people on the Internet to search, retrieve, browse, and add information to the environment at will. From a marketing perspective, recent developments toward a de facto standard in enabling software, including HTML, the Hypertext Markup Language and the set of NCSA Mosaic, Netscape, and other Web clients (browsers) and servers, provide for the first time a uniform platform-independent hypermedia interface between consumers and firms.

The World Wide Web consists of locations or "sites" which providers (e.g. firms) erect on servers and users (e.g. consumers) visit. In the Web, consumer-oriented network navigation consists of visiting a series of "Web Sites" in order to search for information and/or advertising about products, browse content (possibly advertiser supported), or place an order for a product.

Figures 1a and 1b show examples of CommerceNet, a site dedicated to promoting electronic commerce on the Internet. CommerceNet represents a hypermedia computer-mediated interface for dozens of firms wishing to do business on the Internet and is just one of hundreds

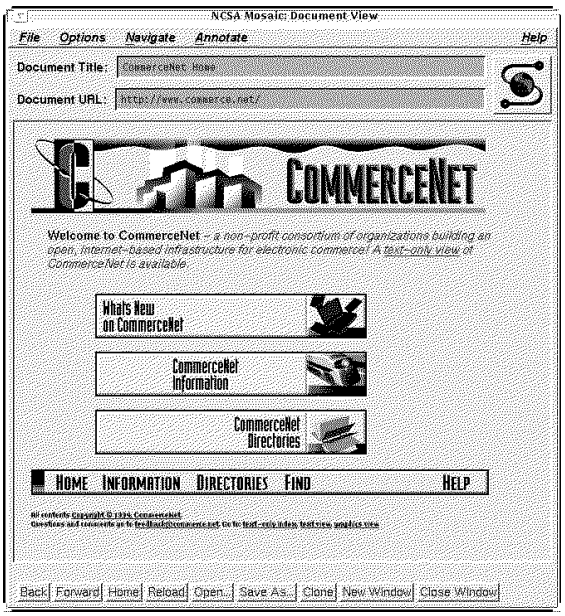

Figure 1a - CommerceNet

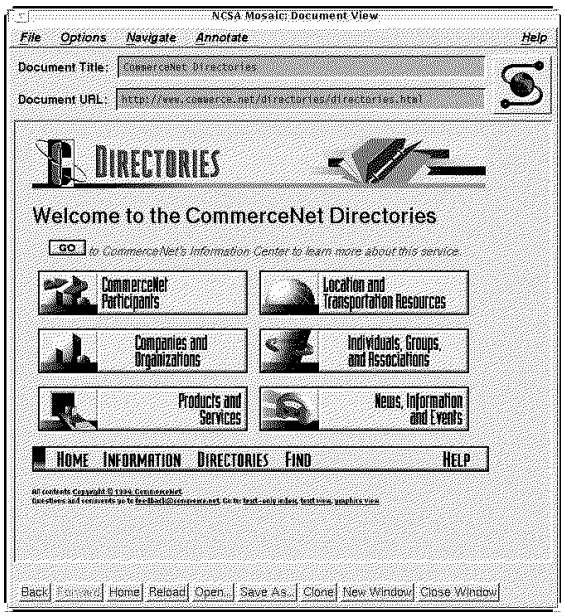

Figure 1b - CommerceNet

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of such diverse efforts to bring users and providers together in a virtual marketplace. The site, like all others, is accessible through client software called a Web browser available on Macintosh, Windows, and UNIX platforms, and a (preferably) high-speed Internet connection.

Consumers visit CommerceNet (or any other site) by entering its Web address directly in the browser or clicking on a hypertext link leading to it from some other site. Once there, consumers navigate through the site using a series of point-and-click motions with a mouse or entering textual information into pop-up windows and "fill-out-forms" via keyboard strokes. Figure 1a contains what is referred to as the "Home Page," the virtual front door of a Web site. From here, a user chooses where to go next. In the case of CommerceNet, this involves choices among content informing the consumer of "What's New" on the site, providing background "Information" on CommerceNet, or listing the CommerceNet "Directory" of sponsors and members. Figure 1b shows the page accessed when the user chooses (clicks on) "CommerceNet Directories." This page itself offers a nonlinear menu of choices to the user. And so the navigation process continues, terminated only when the user "jumps" to another off-site hypertext link within the Web, or exits the Web navigation experience entirely.

All home pages look different, uniquely reflecting the firms they represent. Figures 1c and 1d show sample pages from the Internet Shopping Network, a wholly owned subsidiary of the Home Shopping Network. Though traditional marketing approaches can be utilized to get

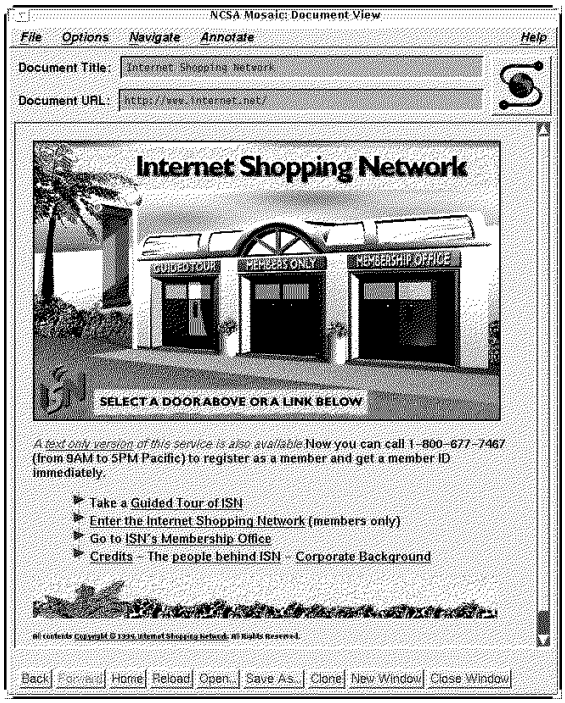

Figure 1c - Internet Shopping Network

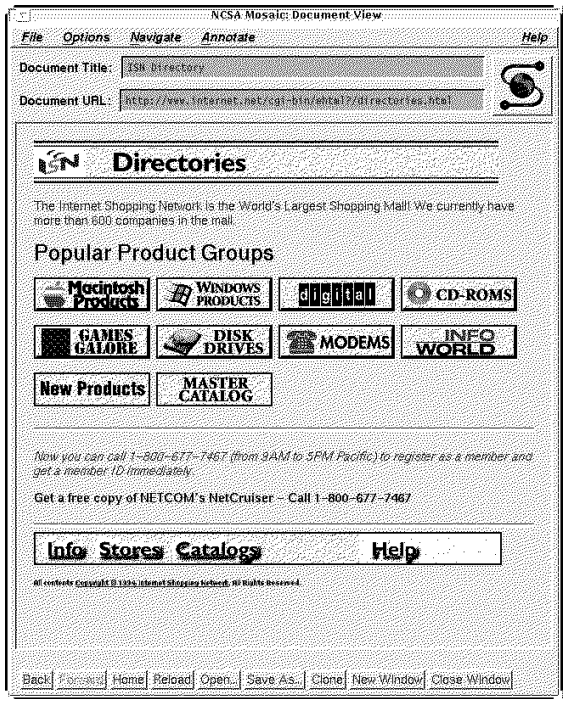

Figure 1d - Internet Shopping Network

consumers to visit such a site once (the trial problem), virtually nothing is known about how to develop virtual storefronts to maximize profit impact. For example, how does a firm maintain consumer attention, move consumers to the purchase decision, and secure repeat visits? While

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the data to address these issues are readily available[1], there is little in the way of a framework to guide the analysis.

Goals and Organization of the Paper

The increasing popularity of the Web as a business vehicle in general, and an advertising medium in particular, is due to its current size and future growth prospects (see Appendix), its attractive demographics (e.g. Ogilvy & Mather Direct's (1994) "Techno-Savvy Consumer"), its ability to facilitate the global sharing of information and resources, and its potential to provide an efficient channel for advertising, marketing, and even direct distribution of certain goods and information services. For example, Verity and Hof (1994) have suggested that it may be nearly one fourth less costly to perform direct marketing through the Internet than through conventional channels. Along with the suspected increases in efficiency, the anecdotal evidence mounts that marketing on the net may also be more *effective* than marketing through traditional media. For example, by one estimate, marketing on the Web results in "10 times as many units [sold] with 1/10 the advertising budget" (Potter 1994).

Despite the massive amount of attention given to the Internet in the popular press (see, for example, Markoff (1993a; 1993b) and any of the 1526 references to the Internet in *ABI Inform* through August 1994), and the belief in many business circles that the Web represents a phenomenal marketing opportunity, to date virtually no scholarly effort has been undertaken by marketing academics to understand hypermedia CMEs, both as media for marketing communications *and* as markets in and of themselves.

Yet, without a theoretical framework to examine the issues, we are likely to make little progress in exploiting the potential of this unique environment. At the least, the current void in theory is likely to hamper seriously the efforts of marketers who wish to understand the hypermedia CME, from either the scholarly or practical perspective. Further, if marketers do not understand the medium, they cannot possibly develop and market offerings efficiently and effectively to customers, let alone satisfy customer needs.

Note that in this paper we do not provide an exhaustive review of the extant marketing and consumer behavior literature as it relates to new media environments. Indeed, although there have been recent scholarly efforts detailing the impact of new information technologies on marketing (notably compiled recently in Blattberg, Glazer, and Little 1994), there is a dearth of research on the impact that hypermedia CMEs such as the World Wide Web hold for marketing theory and practice. Instead, we draw from the relevant literatures in psychology, communications, organizational behavior, and computer science, with our efforts concentrated on developing a solid conceptual foundation for understanding the role of marketing in hypermedia computer-mediated environments.

Therefore, the goals of this paper are to: 1) introduce marketers to this revolutionary new medium; 2) propose two structural models of consumer behavior in a hypermedia CME and examine the set of consequent testable research propositions that flow from the framework; 3)

[1] For example, Internet Shopping Network's Web server generates a "log file" which provides a detailed record of every action taken by every visitor to the ISN Web site. This behavioral data can be linked to names of registered users, generating event history data containing richly detailed search and purchase histories for individual consumers.

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outline the key research issues necessary to stimulate critical inquiry in this emerging area, and 4) argue that marketing in a hypermedia CME requires an evolution in the marketing concept.

To that end, the paper is organized as follows. First, we construct a definition of hypermedia computer-mediated environments in which we introduce the concepts of computer-mediation, machine-interactivity, telepresence, hypermedia, and network navigation. Then, we summarize a model of intent to use a hypermedia CME, which relies on the construct of perceived behavioral control. This is followed by a process model of network navigation within the environment, based on the concept of flow (Csikszentmihalyi 1977; 1990). These two structural models provide the conceptual foundations for understanding the role of marketing in hypermedia CMEs. This leads us to examine how marketing activities have become transformed in this new media environment and propose that this transformation requires an evolution of the marketing concept. From this we argue that marketers need to construct new paradigms for marketing in which the marketing function is reconstructed to facilitate electronic commerce. Finally, we summarize the paper and offer our conclusions about the importance of this emerging area of inquiry to both marketing scholars and practitioners. An Appendix presents a brief history of the Internet and comments on its size, growth and user characteristics.

2) Hypermedia Computer-Mediated Environments

New and Old Media

Studying media characteristics provides a context for comparing the marketing implications for different media types, including traditional media and "new media" (Valacich, Paranka, George, and Nunamaker 1993; Rice 1984;Williams, Strover, and Grant 1994). Traditional media include both mass media (e.g. television, radio, newspaper, magazines, and direct mail), and personal communications (e.g. word-of-mouth). New media encompass interactive media like videotex, interactive CD-ROM, online services, and hypermedia CMEs, as well as emerging so-called "interactive multimedia" like pay-per-view (PPV), video-on-demand (VOD), and "500-channel" interactive TV (ITV). Note, however, that interactive multimedia tend to mirror traditional media, because they are based upon a one-to-many model in which the marketer directs and adapts content for the consumer.

Relative to traditional media, new media as a group tend to afford greater consumer control and nonlinear access to more differentiated content (Perse and Courtright 1993; Williams, Rice, and Rogers 1988). Media typologies have been developed to enhance our understanding of these issues. These typologies reveal that media can differ along several dimensions, for example, channel characteristics (Reardon & Rogers 1988; Rogers 1986); media richness (Dennis and Valacich 1994; Rice 1993; Valacich, Paranka, George and Nunamaker 1993); and uses and gratifications (Perse and Courtright 1993).

However, such typologies render little insight into the nature of hypermedia CMEs because these new environments were not in existence at the time these typologies were constructed. Although the typologies cited include the computer as a communications medium, it is defined narrowly in terms of email, bulletin boards, and computer conferencing. Thus, and without exception, all of these analyses are based on a dated and highly limited concept of computer communication which obscures the uniqueness inherent in new computer media like hypermedia CMEs.

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For example, consider the media characteristic of social presence, defined as the perceived personalness of a medium (Short, Williams, and Christie 1975). Perse and Courtright (1993) find that "computer" media tend to be low in social presence, compared to other media, because email and bulletin boards do not satisfy personal needs as well as other media. Yet, it is likely that hypermedia CMEs, owing to telepresence and interactivity, are actually higher in social presence than other media. Thus, failing to take into account the unique characteristics of hypermedia CMEs may lead to an incomplete and potentially misleading analysis.

Therefore, we begin our theoretical development by introducing a definition of a hypermedia computer-mediated environment that is based on concepts singularly relevant to this medium, including *machine-interactivity*, *telepresence*, *hypermedia*, and *network navigation*. This definition will play an important role in the models we present subsequently. We begin by considering a series of three communication models.

Model 1: Mass Media

Figure 2 presents a simplified model which underlies many models of mass communication (e.g. Lasswell 1948; Katz and Lazarsfeld 1955). The primary feature of Figure 2 is a one-to-many communications process, whereby the firm (F) transmits content through a medium to consumers (C). Depending upon the medium (i.e. broadcast, print, billboards), either static (i.e. text, image and graphics) and/or dynamic (i.e., audio, full-motion video and animation) content (see Bornman and von Solms 1993) can be incorporated. No interaction between consumers and firms is present in this model. Virtually all contemporary models of mass media effects are based on this traditional model of the communication process (e.g., see Kotler 1994, chapter 22).

To simplify presentation, we present only the major structural features of the communication process: 1) consumers (typically content receivers), 2) firms (typically content providers), 3) content, and 4) medium. We do not consider, but recognize as important for future research, issues such as noise (Shannon and Weaver 1949), source/transmitter and receiver/destination distinctions (DeFleur 1970), multi-step flow patterns involving opinion leaders and receivers (Katz and Lazarsfeld 1955, Robinson 1976), uses and gratifications (Rosengren 1974; Palmgreen & Raybern 1985) and media effects (e.g. Bryant and Zillman 1994).

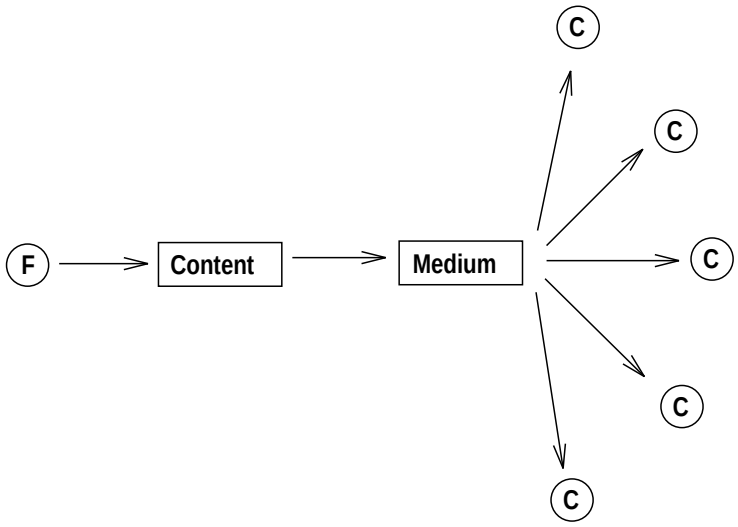

Figure 2 - Traditional One-To-Many Marketing Communications Model for Mass Media

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Model 2: Interpersonal and Computer-Mediated Communications

Figure 3, based upon traditional models of communication from sender to receiver, presents a simplified model of interpersonal communication. The solid and dashed lines indicate communication flows through a medium for two distinct individuals. This model incorporates a feedback view of interactivity, consistent with Rafaeli's (1988) definition of interaction 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." While Figure 3 is shown here for one-to-one communication between two consumers, the model can easily be extended to represent many-to-many interpersonal communication (i.e. teleconference, face- to-face group meetings, or on-line "chat rooms"). Again, many combinations of content and media are possible (e.g., audio + telephone; text + regular mail; text + email; text + computer "talk program"; text + fax; audio and video +teleconference; multi-sensory + face-to-face). Note that unmediated face-to-face interpersonal communication is special case of Figure 3. From a marketing perspective, the model in Figure 3 is implicit in developments of word-of-mouth-communication models (e.g., see Wilson 1991).

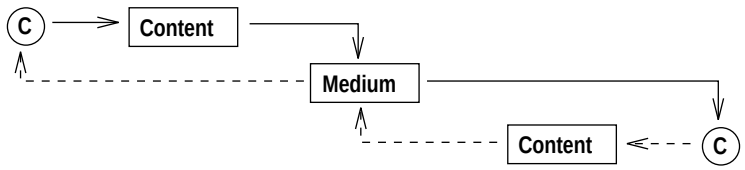

Figure 3 - Model of Marketing Communications for Interpersonal and Computer-Mediated Communication

Person-Interactivity. Interactivity is the key feature distinguishing Figure 3 from Figure 2. This "person-interactivity" is *through* a medium (or unmediated, in the case of face-to-face communication). In this view of interactivity, media are "important only as a conduit, as a means of connecting sender and receiver, and are only interesting to the extent that they contribute to or otherwise interfere with the transmission of messages from sender to receiver" (Steuer 1992). The implicit assumption is that the characteristics of the medium allow only limited aspects of the content to be communicated. For example, non-verbal cues are eliminated in text-based computer conferencing systems, and visual cues are eliminated by the telephone.

In computer-mediated communication, the medium is a computer, and interest lies in how the computer-based communications technology affects transmission of content and impacts task completion (e.g., Hiltz and Johnson 1990; Rice 1992; Dennis and Valachich 1994; Walther 1992). Marketing approaches such as relationship marketing (Christopher, Payne & Ballantyne 1991) and mass customization (Pine 1993) use *addressable media* (Blattberg & Deighton 1991; Deighton, Peppers and Rogers 1994) to facilitate interpersonal communication (Reardon & Rogers 1988). In this context, compared to the mass market approaches represented by Figure 2, the medium *contributes to* rather than *restricts* the transmission of content between the consumer and the firm.

Model 3: A New Model for Hypermedia CMEs

Figure 4 presents a many-to-many communication model for hypermedia CMEs. The content in Figure 4 is hypermedia (to be defined in the next section), and the medium is a

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distributed computer network. Figure 4 differs from Figure 3 in that interactivity can also be *with* the medium, in addition to *through* the medium. We define a hypermedia CME as:

> *a dynamic distributed network, potentially global in scope, together with associated hardware and software for accessing the network, which allows consumers and firms to 1) provide and interactively access hypermedia content (i.e. "machine interaction"), and 2) communicate through the medium (i.e. "person interaction").*

In order to discuss this model, we need to introduce several new concepts: machine-interaction (interactivity with the medium), telepresence, hypermedia, and network navigation. Taken together, these concepts distinguish hypermedia CMEs from both traditional and interactive multimedia, and must be understood by marketers if they are to realize commercial success in this medium.

Machine-Interactivity. Figure 4 is based upon a communication model outlined by Steuer (1992), and shown in Figure 5. This model contains an important addition to the models shown in Figure 2 and Figure 3. In Steuer's model of mediated communication, interactivity is "...the extent to which users can participate in modifying the form and content of a mediated environment in real time" (see also Laurel 1991; Rheingold 1991). The mediated model represented in Figure 5 suggests that the primary relationship is not between the sender and the receiver, but rather with the "mediated environment" with which they interact. Additionally, because of the interaction, the sender is also a receiver. In this view, information or content is not merely transmitted from a sender to a receiver, but rather "mediated environments are created and then experienced." (Steuer 1992). Thus, this "machine-interactivity" is *interaction with* the environment (medium), rather than *interaction through* the environment (medium).

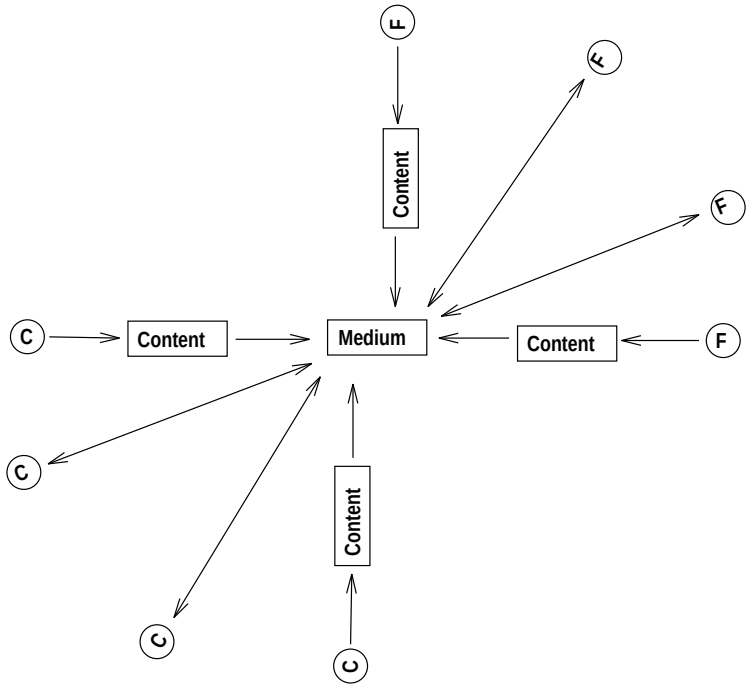

Figure 4 - New Model of Marketing Communications in a Hypermedia Computer-Mediated Environment

In a similar vein, Rogers (1986) characterizes interactivity as "...the capability of new communication systems...to "talk back" to the user, almost like an individual participating in a conversation." This extended view of the computer as a "participant," with the ability to evaluate the user's actions and respond accordingly, is consistent with the concept of interactive marketing (Blattberg and Deighton 1991; Deighton, Peppers and Rogers 1994; File, Judd and Prince 1992; File and Prince 1993). In interactive marketing, "the marketer's message can be modified to take account of what the

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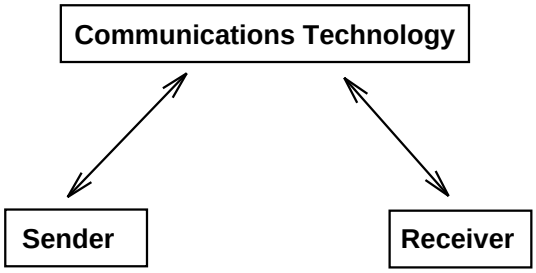
customer has said or done at an earlier point in the relationship" (Deighton, Peppers, and Rogers 1994).

Thus, Figure 4 shows the range of communication relationships possible in a hypermedia CME. Consumers can interact with the medium (e.g., "surf the Web" using a browsing program such as Mosaic), as can firms (e.g. business-to-business marketing as in CommerceNet). In addition, firms can provide content to the medium (e.g., a firm establishes a corporate Web server). Finally - perhaps the most radical departure from traditional marketing environments -consumers can provide product-related content to the medium. For example, individual consumers have established Web pages for automobiles (e.g. the Ford Probe, Porsche, car audio, and solar cars), toys (e.g. Lego and Barbie Dolls), and television shows (e.g. Jeopardy, The X-Files, Married With Children, and Northern Exposure).



(after Steuer 1992 and Krueger 1991)

Figure 5 - Mediated Communication

Further, note that Figures 2 and 3 are contained within Figure 4. Thus, a hypermedia CME can also used be used for computer-mediated communication among consumers and/or firms (*through* the medium), and also potentially for one-to-many mass communication, although applications of the latter have met with considerable consumer resistance (e.g., Godwin 1994b).

Telepresence. Steuer calls his model a "telepresence view" of mediated communication, where *presence* is "the natural perception of an environment" and *telepresence* is "the mediated perception of an environment" (Steuer 1992). Following Steuer, when interacting with a computer-mediated environment, the consumer perceives two environments: 1) the physical environment in which he or she is present, and 2) the environment defined by the hypermedia CME. The *strength* of the experience of telepresence is a function of the extent to which one feels present in the hypermedia CME, rather than in one's immediate physical environment.

Note that telepresence applies to interactivity with a medium, rather than interactivity through a medium. For interactivity through a medium, the parallel construct is the *transparency* of a medium (Rafaeli 1985) which is a function of how *vivid* the medium is (Steuer 1992). Thus, transparency increases the realism of interpersonal communication, while telepresence increases the realism of the "virtual reality" created by the medium.

Hypertext, Multimedia, and Hypermedia. Nearly fifty years ago, Busch (1945) proposed a hypertext-like system called "Memex," which would consist of "...a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility." Nelson (1967) discussed hypertext in terms of a network of paths and associations, with an emphasis upon approximating the way the human brain connects information. Bornman & von Solms (1993) provide a current definition: "Hypertext suggests the concept of non-sequential writing of information that allows

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the user to connect information together by means of different paths or links. The information in a hypertext system is in the form of nodes and links."

Multimedia (Hugo 1991; Newton 1991; Bornman & von Solms 1993) uses a computer to integrate and provide interactive access to both static (i.e. text, image and graphics) and dynamic (i.e., audio, full-motion video and animation) content. As discussed by Tomek et al. (1991), *hypermedia* combines the node-and-link access of hypertext with multimedia content to create an environment that is at once more than the simple additive combination of the components:

> "Hypermedia is a philosophy of representation and access of information. Its conceptual basis is the model of the information space as a graph whose nodes store information, and whose arcs represent semantic relationships...The information stored in a true hypermedia system should encompass all media that current computers can process, including text, graphics, animation, digitized pictures, and sound."

Hypermedia thus combines the elements of radio (audio), television (moving images), newspaper and magazines (text), and the computer (video display terminal) with hypertext links to form the basis for a unique computer-mediated environment. Gygi (1990) provides more extensive definitions of hypertext and hypermedia.

Network navigation. Network navigation is *the process of self-directed movement through a hypermedia CME*. This nonlinear search and retrieval process provides both essentially unlimited freedom of choice and greater control for the consumer, and may be contrasted with the restrictive navigation options available in traditional media such as television or print. Further, network navigation permits much greater freedom of choice than centrally-controlled interactive multimedia systems, such as video-on-demand and home-shopping applications of so-called "Interactive Television," and the menu-based information-acceleration approach of Hauser, Urban & Weinberg (1993). Network navigation in a hypermedia CME may also be contrasted with hierarchical, "menu-based" navigation systems such as gopher (Anklesaria, et.al. 1993), which although networked, offer less control to the consumer.

We now propose a two-part structural model that provides a framework for understanding the role of marketing in commercialized hypermedia computer-mediated environments. Our model has two main components: (1) a familiar planned behavior model, and (2) a new process model of network navigation within a hypermedia CME. These components are discussed in the next two sections.

3) A Model of Intent to Use a Hypermedia CME

Planned Behavior Model

We use the well-known planned behavior model of the attitude/behavior relationship (see Ajzen 1988; 1991) to facilitate our understanding of the salient determinants of consumers' *intentions to use a hypermedia CME.* This familiar model provides direction on developing marketing strategies that impact usage behavior and thereby influence consumer adoption of hypermedia CMEs. This is particularly important for the Web. As Cerf (1993) has pointed out, the Internet on which the Web resides, has reached critical mass as a communication medium.

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But has it reached critical mass as a *commercial medium*? In order for the Web to be successful as a commercial environment, it must reach a "critical mass" of individuals willing to engage in its activities, (Oliver, Marwell, and Teixeira 1985) after which point, adoption "explodes" (see Bayus 1993, and Urban, Weinberg and Hauser 1994 for a discussion of issues related to modeling the diffusion of discontinuous innovations).

Markus (1987) points out that for interactive communication technologies, such an event is all or none: thus, if critical mass is achieved, then "everyone" will eventually be using the Web for commercial purposes. However, if the Web fails to reach a critical mass, then early commercial adopters will cease using the technology because of the lack of reciprocity. Eventually, no one will be conducting business on the Web.

Currently, the primary barrier to critical mass is "ease of access." Access is a multidimensional issue which includes high speed access (the "bandwidth" problem), the ease of finding a service provider, and the continuing diffusion of the computer hardware / software / modem bundle into the home. Until bandwidth is widely and inexpensively available above speeds of 56k (e.g. ISDN lines), the Web is not likely to be a viable medium for commercial activity. The secondary barrier to critical mass is "ease of use," which includes "user-friendliness" of the software, ease of software installation, and related factors. Both primary and secondary barriers invoke issues of "perceived behavioral control," which we discuss below.

The theory of planned behavior in Figure 6 (Azjen 1988, 1991; Ajzen and Driver 1992; Doll and Ajzen 1992; Madden, Ellen and Ajzen 1992) is an extension of the well-known theory of reasoned action (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975), which hypothesizes that attitudes and norms predict behavioral intentions. The extended theory of planned behavior is useful for predicting behaviors which are not under complete volitional control. Similar to the original model, the theory of planned behavior posits that the conceptually independent determinants of attitudes toward the behavior, subjective norms with respect to the behavior, and a new component, *perceived control over the behavior*, affects behavioral intentions (BI), as well as directly affecting behavior. In other words, in this new formulation, usage of a

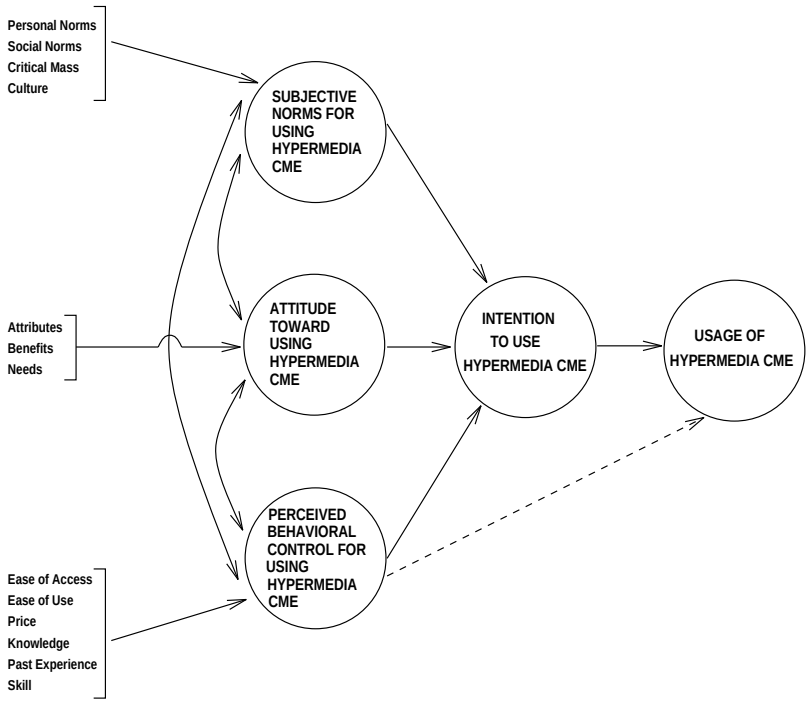

Figure 6 - Planned Behavior Model for Intentions to Use a Hypermedia CME

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hypermedia CME depends jointly on motivation (intentions) and ability (behavioral control). The model can be expressed in terms of expectancy-value models (Ajzen 1991) as shown in Table 1.

Table 1 - Expectancy-Value Formulation of Planned Behavior Model

BI =f(A, SN, PBC), where:

$A = \Sigma_{i=1,I}(b^{A}_{i}e_{i})$, where:

A =	attitude toward using CME
b^{A}_{i} =	*I* behavioral beliefs associated with using a CME
e_i =	importance weights for behavioral beliefs

$SN = \Sigma_{j=1,J}(b^{SN}_{j}m_{j})$, where:

SN =	subjective norm
b^{SN}_{j} =	*J* normative beliefs that constitute the underlying determinants of subjective norms for using a CME
m_j =	motivations to comply with normative beliefs

$PBC = \Sigma_{k=1,K}(b^{PBC}_{k}p_{k})$, where:

PBC =	perceived behavioral control
b^{PBC}_{k}=	*K* control beliefs reflecting the presence or absence of requisite resources and opportunities
p_k =	perceptions that a particular control belief will facilitate or inhibit CME use

Perceived Behavioral Control. The primary outcome variable in this model is the consumer's intentions to use the hypermedia CME. In the traditional attitude/behavior formulation, intentions capture motivational factors that influence behavior, for example, the amount of effort the consumer is willing to exert in order to use a computer-mediated environment. The stronger the intention, the more likely usage. However, behavioral intentions only lead to usage if such usage is under volitional control, i.e. if the consumer can decide at will to engage in using the Web or not. To the extent that using a CME depends on nonmotivational factors like "requisite opportunities and resources" (e.g. computer skills and Internet access), the traditional formulation will not accurately predict intentions and subsequent Web usage.

The control beliefs provide the basis for perceptions of behavioral control and, in our development, are derived from ease of access (e.g. speed of connection, reliability of connection, availability of access), ease of use (e.g. point-and-click Web browsers,), price (e.g. the particular pricing model used by the hypermedia CME), knowledge, past experience with CMEs, and skill using CMEs (see Figure 6).

Thus, perceived behavioral control is defined as the perceived ease or difficulty of using the Web and depends on the opportunities and resources available to the consumer for such usage. It can also be interpreted as a confidence construct. Perceived behavioral control, (cf. Bandura's 1977; 1982 earlier notion of "perceived self-efficacy") is an important determinant of

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Web usage because we believe that such behavior is strongly influenced by consumers' confidence in their ability to achieve it. Note, however, that opportunities and resources available represent consumers' *real* control over CME usage; given the required opportunities and resources, along with intentions, we expect consumers to realize this usage. Yet, theoretically, and not surprisingly, a consumer's *perception* of behavioral control over Web use and its impact on intentions and actions is more important than real control (Ajzen 1988).

Implications

Implications for Adoption and Diffusion of CMEs. As noted by Howard (1989, chapter 4), consumers confronted with a new product category will be very unclear as to the appropriate components of the expectancy-value models in expression (1). Thus, the consumer who has little experience with a CME will not know which benefits are important (e_i's), let alone whether a CME possesses these benefits (b^A_i's). Even experienced users of the Internet/Web will not necessarily be aware of the *commercial benefits*. Further, while subjective norms regulate behavior among experienced Internet users (e.g., Reid 1991; Strangelove 1994), the understanding of normative beliefs (b^{SN}_j's) and the motivation to comply with these beliefs (m_j's) are presumably very weak for the vast majority of Web users with respect to Internet-based shopping behavior.

In this extensive problem solving situation, the only way that consumers will learn which benefits are important, and that subjective norms will develop, is through direct experience with the CME. Thus, the role of perceived behavior control is absolutely critical in ensuring that barriers to obtaining this experience are minimized. For commercial usage of a CME, we propose the following:

P1: *Attitudes will be the dominant influence upon behavioral intention for early adopters pioneering commercial use of a CME. Once a commercial CME has been established, perceived behavioral control will then become the dominant influence on adoption for additional users. Over time, as critical mass builds, subjective norms will become the dominant influence in attracting additional users.*

For example, most early adopters of Web-based shopping environments will be current Web users. Thus, perceived behavioral control or subjective norms are unlikely to be barriers to commercial usage for these users; however, current users still need to form an understanding of the benefits of commercial use. As users adopt the Web as a commercial environment, a clear benefit structure will begin to evolve. This evolving benefit structure is a "consumption externality" (Biddle 1991; Schickele 1993) or spillover effect, which affects subsequent adopters. Subsequent adopters will understand and desire these benefits, but will need to overcome access issues involving perceived behavioral control, since these later adopters will be less technologically savvy. The Web environment will evolve and simplified interfaces will be developed to accommodate these users (witness Microsoft's imminent entry into the on-line service market, and the likelihood that Microsoft and other on-line service providers will shortly be providing simplified Web access to their subscribers). Even later adopters will have these simplified interfaces already at their disposal, and their decision to adopt will largely come from the pressure of subjective norms.

Implications for Usage of CMEs. The inevitable adoption-driven evolution in the Web is ignored by many who predict that the television, not the computer, will be the "dominant 'on-ramp' to the [information] superhighway" (McCracken, quoted in 11/20/94 Edupage) due to the

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"convenience and familiarity of cable TV". The relative merits and likelihood of an Internet vs. "Interactive-Television" based view of the information highway have been widely debated (e.g., Hoffman and Novak 1994a; Press 1993; National Academy of Sciences 1994, chapter one). However, the point that television is in some way "simpler" than the computer ignores the inevitable evolution and convergence of the two mediums, and is a false issue.

We do not mean to imply that perceived behavioral control is only important for the adoption decision, and once the early adopters have "signed on," perceived behavioral control ceases to be important for this segment. Consider an example with existing media. Perse and Courtright (1993), in explaining network television's declining share as a function of the communication needs it satisfies, observe that VCRs, cable, and movies are perceived as functional alternatives to television, with VCRs and cable better than TV at satisfying consumer's communication needs. Perse and Courtright go on to speculate that this increased satisfaction derives from the "greater choice and control" these newer mass media channels offer to consumers. For hypermedia CMEs we propose:

P2: *Properties inherent to hypermedia CMEs - specifically interactivity and network navigation - will increase perceived behavioral control, and consequently intentions to use these media, once the initial adoption decision has been made.*

4) A Process Model of Network Navigation Within a Hypermedia CME

The Flow Construct

Although consumer researchers have explored the role of play in the consumption experience (e.g. Holbrook, Chestnut, Oliva, and Greenleaf 1984**)**, we believe the concept of play, or *flow* in a hypermedia CME, holds wider applicability, underlying virtually every aspect of the consumer's interaction with the firm and its offerings. In other disciplines, researchers have suggested that flow is a useful construct for describing our interactions with computers (Csikszentmihalyi 1990; Ghani 1991; Trevino and Webster 1992; Webster, Trevino, and Ryan 1993). We now extend this idea and propose that:

P3: *Flow is the central construct for understanding network navigation within a hypermedia CME, including movement through hypermedia links, time spent in a CME, range of hypermedia documents examined, and attention paid to hypermedia documents. Flow is measurable and exists on a continuum.*

Brigish (1993), as quoted in Hawkins (1994**),** provides a list of characteristics which lead to successful electronic marketing: easy to use, fun to use, fast, personalizable, comprehensive, highly visual, browsable. This list bears resemblance to the process of *flow* (Csikszentmihalyi 1977; Gnani et. al. 1991; Trevino & Webster 1992) described by Webster, Trevino, and Ryan (1993): "...a multidimensional construct characterized by the four dimensions ... control, attention focus, curiosity, and intrinsic interest."

Flow has been characterized as a "peculiar dynamic state - the holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi 1977, p36). Flow involves a merging of actions and awareness, with concentration so intense there is little attention left over to consider anything else. A consumer's action in the flow state is experienced "as a unified

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flowing from one moment to the next, in which he is in control of his actions, and in which there is little distinction between self and environment, between stimulus and response, or between past, present, and future" (Csikszentmihalyi 1977, p 36). Self-consciousness disappears, the consumer's sense of time becomes distorted, and the resulting state of mind is extremely gratifying.

We define flow in a hypermedia CME as *"the process of optimal experience" (Csikszentmihalyi 1977,1982; Csikszentmihalyi & LeFevre 1989) achieved when a sufficiently motivated user perceives a balance between his or her skills and the challenges of the interaction, together with focused attention*. Flow activities in the Web, for example, network navigation, facilitate concentration and involvement because they are distinct from the so-called "paramount reality" of everyday existence (Csikszentmihalyi 1990, p. 72). Network navigation makes optimal experience easier to achieve, because it has rules that require the learning of skills, developing goals, providing feedback, and making control possible (Csikszentmihalyi 1977). The rule-bound, goal-directed action system in a hypermedia CME provides clear cues as to how well the consumer is performing.

Flow formalizes and extends a sense of playfulness (Csikszentmihalyi 1975; Bowman 1982; Csikszentmihalyi & LeFevre 1989; Day 1981; Ellis 1973; Miller 1973), incorporating the extent to which, in the hypermedia environment, consumers: 1) perceive a sense of *control* over their interactions in the environment, 2) focus their *attention* on the interaction, and 3) find it *cognitively enjoying* (Webster, Trevino, and Ryan 1993). When in the flow state, irrelevant thoughts and perceptions are screened out and the consumer's attention is focused entirely on the interaction.

The Process Model

Figure 7 presents a dynamic process model of network navigation in the hypermedia CME. For expository purposes, we diagram only the most important links. The model in Figure 7 does not show the complex set of feedback loops and pathways, nor the fully dynamic nature of the process. It represents a general process model of behavior in this environment. At this juncture in the development of the Web, it is premature to advance hypotheses or draw conclusions regarding the factors influencing, for example, site selection, correlates of successful Web sites, or even what consumers want in the way of Web-based electronic commerce.

A consumer enters the hypermedia CME and engages in network navigation. There are several points of Exit from the environment, as well as opportunities to continue navigation. Flow is the "glue" holding the consumer in the hypermedia CME. In order to understand the flow process, we must consider the characteristics that are relevant to the network navigation process. As depicted in Figure 7, we see that control, content, and motivational characteristics lead to four factors which directly determine the flow state. We state this as a research proposition:

P4*:* *Flow is a function of control, content, and motivational characteristics that define four direct determinants of the flow state: 1) perceived congruence of skills and challenges, 2) focused attention, 3) interactivity, and 4) telepresence.*

Determinants 1) and 2) are necessary conditions for flow; determinants 3 and 4 will enhance flow.

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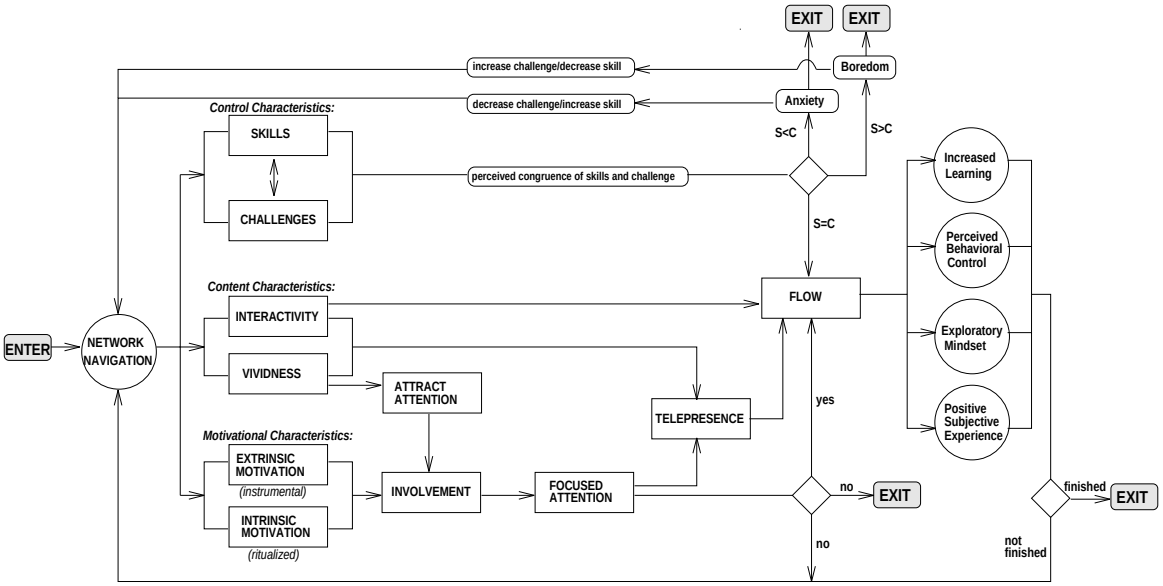

Figure 7 - A Model of Network Navigation in a Hypermedia CME

Perceived Congruence of Skills and Challenges. Consider the first necessary condition (prerequisite) for flow to occur. Only when consumers' perceive that the hypermedia CME contains high enough opportunities for action (or challenges), which are matched with their own capacities for action (or skills), will flow potentially occur. This congruence between the *control characteristics* of the consumer's skills and the challenges of network navigation enables the consumer in flow to feel "in control of his actions and of the environment. He has no active awareness of control but is simply not worried by the possibility of lack of control" (Csikszentmihalyi 1977, p. 44). In such cases, consumers have a sense that their skills are adequate to cope with the challenges presented by navigating the environment. When flow occurs, the moment itself is enjoyed and consumers' capabilities are stretched with the likelihood of learning new skills and increasing self-esteem and personal complexity. However, as shown in Figure 7, if network navigation does not provide for this, then consumers will become either bored (skills exceed challenges) or anxious (challenges exceed skills) and either exit the CME, or select a more or less challenging activity within the CME[2].

One characteristic of activities conducive in general to the development of flow is that the activity has a "theoretically unreachable ceiling" (Csikszentmihalyi 1977, p 52), allowing either

[2]Unfortunately, Csikszentmihalyi has not been consistent in his interpretation of the congruence or lack of congruence of skills and challenges, and provides no explanation for his inconsistencies. In Csikszentmihalyi (1977, p. 49), "flow" is defined as congruence of skills and challenges, regardless of the level of skills and challenges. When challenges are greater than skills the individual experiences "worry," while when skills are greater than challenges the individual experiences "boredom." However, when the incongruence in both the worry and boredom conditions becomes too large, "anxiety" results. In Csikszentmihalyi and LeFevre (1989), "flow" is defined as challenges and skills greater than the respondent's average, while "apathy" is challenge and skills less than average. "Anxiety" is greater challenges than skills, and "boredom" is greater skills than challenges. Finally, in Csikszentmihalyi (1990 p. 74), "anxiety" is defined, as in Csikszentmihalyi (1977), as congruence of skills and challenges, while "boredom" and "anxiety" are defined as in Csikszentmihalyi and LeFevre (1989). We use this last set of definitions, as they are the most logical and consistent with our own development of the flow construct in the hypermedia CME.

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an "indefinite increase in the development of skills or in the ability to organize experience." Athletic, musical, or artistic activities, for example, all allow indefinite increases in the development of skills. On the other hand, skills needed to navigate a CME will likely plateau. However, network navigation in a CME such as the Web has a theoretically unreachable ceiling in the sense that it is impossible for a consumer to organize and investigate all information currently present on the Web, let alone the additional new information added on an ongoing basis.

Focused Attention. The presence of focused attention is also necessary to experience flow. Csikszentmihalyi (1977, p 40) characterizes flow as "a centering of attention on a limited stimulus field." Webster, Trevino and Ryan (1993) note that the computer screen functions as the limited stimulus field, and that computer users report being "mesmerized" during their computer interactions (Webster 1989).

Figure 7 indicates the role of vividness, a *content characteristic*, in attracting attention. Vividness, the "representational richness" of the hypermedia CME (Steuer 1992), may be increased by the structural characteristics of breadth and depth. Breadth refers to the number of sensory dimensions presented and is closely related to concurrency (Valacich et. al 1993) and media richness (Daft and Lengel 1986; Daft, Lengel and Trevino 1987; Daft and Wiginton 1979). Depth defines the resolution or the quality of the presentation (Steuer 1992) and is highly correlated with media bandwidth. In the hypermedia CME, both breadth and depth are high.

The content characteristic of interactivity also contributes to the flow state. The performance characteristics of ease of use, mapping, speed, and range increase interactivity. A consumer's evaluation of ease of use and mapping (naturalness of how human actions are connected to actions in the hypermedia CME) are subjective and based on perception. The speed of a CME depends on a number of factors including the type of Internet connection and the hardware. Typically, the range or number of possibilities for action in a hypermedia CME is high.

Motivational characteristics consist of both extrinsic and intrinsic motivation (Csikszentmihalyi 1977, chapter 1; Davis, Bagozzi, and Warshaw 1992). Extrinsic motivation, or positive reinforcement (e.g. financial reward), creates situational self-relevance (Celsi and Olson 1988; Bloch and Richins 1983), while intrinsic motivation, or "autotelic activities" (Csikszentmihalyi 1977, chapter 2), creates intrinsic self-relevance. Davis, Bagozzi and Warshaw (1991), in summarizing the motivational literature, note that extrinsic motivation applies to activities performed because they are *instrumental* to achieving a valued outcome, while intrinsic motivation applies to activities performed "for no apparent reinforcement other than the process of performing the activity." Situational and intrinsic self-relevance combine to form felt involvement which affects attention and comprehension effort (Celsi and Olson 1988). In the context of human-computer interactions, Webster, Trevino and Ryan (1993) found significant positive correlations between factors for intrinsic interest/curiosity and focused attention.

Together with intrinsic and extrinsic *motivational characteristics*, this attention leads to involvement. In turn, involvement contributes to the focused attention (Zaichkowsky 1986) which is a prerequisite for flow. Vividness is a stimulus determinant of attention, while the motivational characteristics are personal determinants of attention (Engel, Blackwell and Miniard 1993, pp 397-399).

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Interactivity and Telepresence. The last two determinants - high levels of interactivity and telepresence - are hypothesized to increase the subjective intensity of the consumer's flow state. As noted earlier, telepresence (Steuer 1992) is the mediated perception of an environment, where "presence" is the natural perception of the immediate physical environment. A strong sense of telepresence is induced by vividness and interactivity (Sheridan 1992), as well as focused attention. As noted in Figure 5, the telepresence view of communication differs from the traditional view, which positions the medium only as a connection between sender and receiver. In that model, the medium is only of interest in terms of how it affects message transmission. In the telepresence view, the consumer is both a sender and a receiver who interacts with a mediated environment. The number of consumers present in the CME can also affect the perception of telepresence (Steuer 1992).

Telepresence and interactivity are important because they can increase the flow experience. Alone, however, interactivity and telepresence are not sufficient to produce a flow state. While the user of a hypermedia CME will always experience some level of telepresence and interactivity, higher levels can "boost" flow. However, feedback loops must be considered as well. When telepresence is too high (e.g, when the medium is too "hot"), then challenges may become greater than skills and flow cannot be achieved (Lang 1992; McLuhan 1964; Steuer 1992).

Ritualized and Instrumental Orientations. Flow can occur along the continuum from high skills / high challenges to low skills / low challenges. Csikszentmihalyi (1977, p. 54) considers the "experience of pleasure to be one of low complexity, since it does not require the use of complex skills." Congruent high complexity tasks also consist of flow activities, but require greater cognitive / physical effort.

In the communications literature, a distinction has been made between instrumental and ritualistic orientations to media (Rubin 1984; Rubin and Perse 1987). Ritualized orientations focus "more on the medium, rather than on particular content," are "associated with diffuse motives (e.g., pass time, habit, relaxation)," and are a "less intentional and nonselective orientation, a time-filling activity" (Rubin and Perse 1987). In contrast, instrumental orientations are "more intentional and selective," reflecting "purposive exposure to specific content." The distinction between instrumental and ritualized orientations bears considerable resemblance to the classification of expected benefits in the marketing literature into utilitarian and hedonic / experiential benefits (e.g., Havlena and Holbrook 1986; Srinivasan 1987), which as we noted earlier are, respectively, extrinsically and intrinsically motivated. Therefore, we propose:

P5: *High challenge/high skill flow corresponds to an extrinsically motivated instrumental orientation (i.e., goal-oriented, purposeful). Low challenge/low skill flow corresponds to an intrinsically motivated ritualized orientation (i.e., hedonic, pass the time).*

For example, the corporate buyer using CommerceNet to close a deal for computer components will experience a high-challenge, extrinsically motivated instrumental flow state. On the other hand, "netsurfers" exploring the Web in their daily quest for the latest interesting sites will experience a low-challenge, intrinsically motivated ritualized flow state.

Further, we anticipate that early interactions in the hypermedia CME are characterized by a "time-passing," ritualistic quality. Over time, ritualistic use evolves into instrumental use as consumers become bored after they accumulate experience navigating within the medium. This experience is likely to be accompanied by an increase in skills the consumer develops to

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meet the challenges presented by the environment. In other words, learning occurs and consumers begin to seek higher challenges. Thus, an instrumentalized orientation is likely to dominate a consumer's later interactions in the environment, although both orientations may be present at different points in time, depending on consumer characteristics. Thus:

P6: *The ritualized orientation will dominate a user's early interactions; over time this will evolve into an instrumental orientation, or both will be present.*

Last, both instrumental and ritualized orientations leading to flow states in a CME are accompanied by high levels of involvement, although the object of involvement will differ according the proposition:

P7: *Involvement in an instrumental orientation is with the achievement of a goal in the CME, while involvement in a ritualized orientation is with the CME medium and process.*

Consequences of Flow

We propose that there will be a number of positive consequences of flow in a CME. Specifically, consumers who experience the flow state in a hypermedia CME will achieve increased learning, increased perceived behavioral control, increased exploratory and participatory behavior, and positive subjective experiences. Support for these positive consequences are detailed below. We conclude this section with a brief discussion of potentially negative consequences of flow.

Increased learning. Playfulness (Miller 1973) and flow (Ghani 1991; Webster, Trevino and Ryan 1993) have been found to relate to learning. In addition, as noted earlier, early ritualized use (i.e., "net-surfing") of a CME will facilitate learning needed to progress to instrumental usage (i.e., purposive search behavior to identify on-line vendors selling products or services desired by the consumer). Flow is positively correlated with perceived communication quantity and effectiveness. Webster, et.al. (1993) suggest that since consumers develop and apply their abilities through exploratory behaviors that characterize flow interactions, learning is a reasonable outcome of the flow state.

P8: *Consumers in the flow state will be more likely to retain more of what they perceive.*

Van Dijk (1993), following Bruner and Olsen (1973), cites three modes of learning: *enactive* (learning by direct action), *iconic* (learning by the observation of visual models), and *symbolic* (learning by symbolic systems). Van Dijk concludes that while new media offer all three modes of learning, they predominantly offer iconic and symbolic modes, and that since enactive learning is "the base of human experience" (Bruner and Olsen 1973), new media "could lead to an impoverishment of it in the long run." However, in the new medium defined by the hypermedia CME, we believe that machine-interactivity enables enactive learning, thus facilitating rather than hindering the learning process.

Increased Exploratory Behavior. Webster, et. al. (1993) showed that flow is correlated positively with perceptions of software flexibility and modifiability, and experimentation. Katz (1987) and Ghani (1991) also found that higher levels of playfulness or flow in human-computer interactions correlated with higher experimentation. This argues for a flexible hypermedia environment that encourages exploratory behavior on the part of consumers. Since flow is also

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positively correlated with expectations of future computer interactions and the actual use of technology, CMEs that facilitate flow are likely to reap the rewards of increased repeat visits and longer times at each visit.

A "playful" hypermedia CME makes it more likely that consumers will be more exploratory. In general, then, we propose that:

P9: *Consumers in the flow state in a hypermedia CME will exhibit more exploratory behaviors, leading to longer time spent at the site and increased repeat visits.*

Increased perceived behavioral control. Because the hypermedia CME is, first and foremost, an interactive environment, it affords the foundation for consumer control that is impossible in traditional, passive media. This sense of control manifests itself through interactivity, as the consumer perceives the ability to adjust the CME and observe the results of those adjustments are based on his or her input. Control comes from both the consumer's perception of their ability to adjust the CME, plus their perception of how the CME responds to their input. As discussed earlier with respect to Figure 4, this adjustment takes the form of network navigation. The consumer has the ability to navigate anywhere within the medium that is the CME network. Further, Figure 4 shows that another aspect of consumer control is that in a hypermedia CME such as the Web, consumers can directly and actively add content to the medium.

P10: *The more opportunities there are for the consumer to control the activities and perceive the results of those activities in the hypermedia CME while in the flow state, the greater the perceived behavioral control will be.*

Positive subjective experiences. Webster, Trevino and Ryan (1993) note that research has suggested that "higher playfulness results in immediate subjective experiences such as positive mood and satisfaction" (Csikszentmihalyi 1977; Levy 1983; McGrath & Kelly 1986; Sandelands, Ashford and Dutton 1983). Previous research on human-computer interactions (Sandelands and Buckner 1989; Starbuck and Webster 1991) has shown that higher degrees of pleasure and involvement during computer interactions lead to concurrent subjective perceptions of positive affect and satisfaction. A study conducted by Gardner, Dukes and Discenza (1993) showed that the more people use computers, the more their self-confidence with respect to computers increases. This in turn causes more favorable attitudes toward computers. Csikszentmihalyi (1977 p. 36) notes that "people seek flow experience primarily for itself," thus flow itself serves as a positive reinforcer which increases the probability of future usage of a hypermedia CME.

P11: *Consumers in the flow state in a hypermedia CME will exhibit positive subjective experiences, due to the reinforcing nature of flow itself.*

Together, positive subjective experiences and the increased perceived behavioral control resulting from flow will feed back into the planned behavior model in Figure 6, increasing the probability that the CME will be used in the future. Webster, Trevino and Ryan (1993) found flow to be positively correlated with expectations of future voluntary computer interactions.

The positive subjective experience of flow has also been linked to a distortion in time perception (Csikszentmihalyi 1977), where the consumer is unaware of the passage of time.

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Hauser, Urban Weinberg (1993) provide a model of how in the presence of time pressure, the allocation of search time to negative information sources increases, while in the absence of time pressure, the allocation of search time to positive information sources increases (see also Svenson and Edland 1987; Wright 1974; Kanouse and Hanson 1972). Thus,

P12: *To the extent that the consumer being in the flow state reduces time pressure and increases time spent at the site, it will contribute to relatively greater time allocation to searching positive information sources.*

Given the tendency of computer-mediated environments to encourage negative word-of-mouth, actions that marketers can take to facilitate positive search behavior become paticularly important.

Negative consequences of flow. There are some potentially negative consequences of flow that must be considered. Since flow can be its own reward, consumers may explore a CME for its own sake, rather than purposively search for specific information. Thus, too much flow may distract the consumer from purchase-related activities. As noted by Webster, Trevino and Ryan (1993), playfulness may produce longer time to task completion (Bateson 1955; Miller 1973; Sandelands 1988); at an extreme, "playful computer systems may be so enjoyable that employees neglect other tasks." However, if one marketing objective of a hypermedia CME is to encourage the consumer to spend time at the site, examining product-related information for example, then this is not necessarily a problem. Flow has also been linked to over-involvement (Csikszentmihalyi 1977), leading to mental and physical fatigue. A related source of cognitive fatigue stems from the overwhelming complexity inherent in global hypermedia content (Gygi 1990).

5) A New Paradigm For Electronic Commerce

Now that we have examined consumer behavior in a hypermedia CME, we turn to a discussion of how conventional marketing activities have become *transformed* due to the radically different media environment represented by the hypermedia CME and assert that these changes portend an evolution in the marketing concept. We argue that a new paradigm for marketing is required in which the marketing function is *reconstructed* to facilitate electronic commerce.

The Transformation of Marketing Activities

As we have argued, the hypermedia CME represents a fundamentally different environment for marketing activities than traditional media and interactive multimedia. In many cases, the differences are so great that conventional marketing activities have become *transformed* and cannot be implemented in their present form. Therefore, these marketing activities must be reconstructed in forms more appropriate for the new medium.

This process of transformation and reconstruction of marketing and communication activities in information-intensive environments has been noted by numerous researchers (e.g., Glazer 1991; Reid 1991; Blattberg, Glazer and Little 1994; Stewart and Ward 1994; Rust and Oliver 1994a, 1994b; Venkatesh, Sherry, & Firat 1993; van Raaij 1993), For example, in order to maintain a virtual community on the Internet, Reid (1991) has argued that users have had to

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deconstruct and reconstruct the nonverbal communication that exists in interpersonal communication by typing their feelings out in ascii and constructing a notational system to convey emotion (e.g. emoticons such as "smileys," as discussed in Reid 1991). In addition, the online medium transforms the individual's identity, resulting in a relative anonymity of users in these environments. In a marketing context, this hinders personal selling at the same time that it encourages negative word-of-mouth activity (i.e. "flaming"). However, personal selling is simultaneously facilitated by the enabling of consumer addressability (e.g. Blattberg & Deighton 1991).

Most important from a marketing perspective, however, is the manner in which the hypermedia CME transforms the marketing function. For example, the many-to-many communication model turns traditional principles of mass media advertising (based on the one-to-many model of Figure 2) inside out, rendering application of advertising approaches which assume a passive, captive consumer impossible. Thus, marketers must reconstruct advertising models for the interactive, many-to-many medium depicted in Figure 4, in which consumers actively choose whether or not to approach firms through their Web sites, and exercise unprecedented control over the management of the content they interact with.

The Evolution of the Marketing Concept

Market orientation operationalizes the marketing concept and refers to the "organization wide generation of market intelligence pertaining to current and future customer needs," along with the dissemination and responsiveness of the organization to such (Kohli and Jaworski, 1990). Kohli and Jaworski (1990) suggest that a market orientation will be more related to business performance under conditions of intense competition and unstable market preferences. Since these conditions, along with technological uncertainty, face and will continue to face firms developing new offerings in hypermedia CMEs for years to come, and since a market orientation can represent a significant competitive advantage for a firm in such cases, it follows that firms interested in marketing in a hypermedia CME adopt a market orientation.

Yet, surprisingly, as it is currently evolving, the consumer is not being included in the development of the so-called "Information Superhighway" (Dennis & Pease 1994). Instead, developments are being driven largely by what can be done technologically, rather than according to customer needs. But in order to adopt a market orientation, firms must understand their customers. Yet, very little in the way of consumer research is being conducted, perhaps because in information intensive environments, the marketing function is performed by other functional areas (Glazer 1991) that may not be as competent to perform the marketing function as marketers.

The technological and market turbulence of the hypermedia CME represents more than mere technological evolution. Thus, and consistent with the central thesis in this paper, we propose that successful marketing in a hypermedia CME requires an *evolution* in the marketing concept to what we call the "Hyper-Marketing Concept." We further propose that:

P13: *In the Hyper-Marketing Concept, the firm not only attempts to uncover and satisfy customer needs at a profit, but also engages in marketing activities that contribute positively to the development of the hypermedia CME itself, by developing new paradigms for electronic commerce.*

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Thus, the role of marketing moves from "merely" satisfying customer needs to include an altruistic, cooperative goal of facilitating the development of the market itself. This is consistent with a recent report by the National Academy of Sciences (U.S. Congress 1994): " In the new business environment, cooperation may prove more rewarding than competition, and information-sharing more fruitful than information control." Hoffman and Novak's (1994b) proposal to form a non-proprietary Internet Users Measurement Advisory Panel to assess the size and user characteristics of the Internet and disseminate the information widely is but one example of this idea.

Several propositions from Glazer (1991) regarding information intensive marketing environments also support the Hyper-Marketing Concept. Specifically, information leads to "issues of access sharing, and creating opportunities for use." Greater involvement in strategic alliances is proposed to lead to "extended cooperation framework." Further, in information-intensive environments such as the World Wide Web, attention will be focused less on competitive strategy and more on cooperative strategy.

Reconstructing Marketing for the New Media

To a large extent, the structures that have been reconstructed thus far to facilitate electronic commerce in the hypermedia CME are characteristic of a primitive, simple society, bound by "mechanical solidarity" (Durkheim 1933), with a common consciousness and internalized set of shared values. These shared (and often anti-commercial) values have risen largely from the original core group of Internet users, who are a relatively homogeneous group of students, academicians, and researchers. However, as the Internet evolves into a complex, heterogeneous virtual society, "organic solidarity" develops from an increasing interdependence between people pursuing different goals. This produces an increasing division of labor, which transforms existing paradigms and requires new rules of cooperation to emerge.

Therefore, marketers must focus on playing an active role in the construction of *new organic paradigms* for facilitating commerce in the emerging electronic society underlying the Web, rather than infiltrating the existing primitive mechanical structures (Hoffman and Novak 1994d). This means that the effective marketer on the Web will *not* be the one, for example, who posts "politically correct" advertisements on Usenet Newsgroups in order to avoid repressive negative word-of-mouth "flaming." Rather, the effective marketer will be actively constructing new models for marketing on the Web, based upon an increasingly diverse and complex virtual society. Such efforts will contribute to the establishment of organic solidarity within the heterogeneous market defined by segments of consumers and firms doing business in the hypermedia CME.

It is too soon to predict the form these efforts might take. Yet it seems clear that 1) steps to build the infrastructure for electronic commerce; 2) mechanisms that take advantage of the medium's unique features; and 3) attempts to develop stimulating and exciting content-rich sponsored environments, hold tremendous promise toward this goal.

Infrastructure for Electronic Commerce. In a recent report on Electronic Enterprises, the Office of Technology Assessment (U.S. Congress 1994) noted that "because exchange transactions will increasingly be carried out electronically and online, the network will in many instances serve as the market." While it has been said for traditional media that "the medium is the message" (McLuhan 1964), with a CME it is also true that *the medium is the market*. The

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establishment of broadly-based, horizontal commercial sites[3] support this observation and lead to our final proposition:

P14: *As media increase in their interactive and navigational capabilities, they move from serving as communication and marketing channels to serving as markets.*

Press (1993) speculates that the Internet as a marketplace has the potential to make markets more efficient. This is particularly so for a hypermedia CME because it offers not only the opportunity to provide full information to consumers about goods and services, but lends itself to rich detail and specificity regarding such information, especially compared to traditional media. There is also greater probability of a well-informed consumer, since the consumer has greater control over the search process. Such control is likely to facilitate a highly developed form of, for example, price comparison shopping. Thus, compared to conventional markets, the cost of information should be lower and the information quality should be higher (and closer to "perfect"), leading to a higher degree of market efficiency (Stigler 1961). Therefore, the market represented by a hypermedia CME also has the potential to be a more efficient market than conventional markets. (See, however, Schickele (1993) for an opposing view point.)

However, before this can occur, the infrastructure must be built. The current difficulty transmitting sensitive data (e.g. credit card numbers) securely over the Internet has transformed traditional payment processes. Until secure systems are widely implemented on the Web, the lack of such represents a significant barrier to adoption of the Web for commercial transactions. Thus, new systems must be developed to permit virtual transactions directly over the network. These may take the form of "digital cash" (e.g. Medvinsky and Neuman 1993; Rose 1994) or credit card number encryption, allowing commercial transactions to take place directly rather than through parallel traditional channels such as 1-800 telephone numbers.

Equally important will be online dynamic content directories both within a site and across the Web. With over 1.19 million Web documents indexed by the Lycos search engine[4] alone as of December 19, 1994, and the number growing at the rate of 5,000 new documents per day, efficient ways to help consumers sort and search through the myriad of offerings available will be critical. Research in consumer decision making suggests that, in the absence of heuristics, decision effectiveness degrades in the presence of too much information (Keller and Staelin 1987; Keller and Staelin 1989; Meyer and Johnson 1988). Thus, the challenge for marketers will be to develop, in conjunction with consumers, rule-based systems for the organization of content that exploit the principles of network navigation and facilitate flow.

[3]Examples include CommerceNet (URL:http://www./commerce.net/, GNN, the Global Network Navigator (URL:http://nearnet.gnn.com/gnn/GNNhome.html)), the Internet Shopping Network (URL:http://www.internet.net/), and the Internet Ad Emporium (URL:http://mmink.cts.com/mmink/mmi.html). The Uniform Resource Locator (URL) is a formalized information system for the location and access of resources on the Internet.

[4]Lycos (http://lycos.cs.cmu.edu/) is a sophisticated search engine that compiles a database of Web documents both on a regular basis and in real-time in response to specific user queries.

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A Unique Medium. Because the hypermedia CME increases the power of the consumer and decreases the power of the firm, compared to traditional channels of distribution[5], the consumer and the firm approach "symmetrical power" and the best communication efforts are likely to be "collaborative" rather than "autonomous" (Mohr & Nevin 1990). Glazer (1991) notes that in the presence of higher information intensity, channel power shifts in favor of consumers and a breakdown occurs in formal distinctions between producer and consumer. In the information intensive hypermedia CME, the firm is no longer broadcasting a single communication to many consumers, but in effect tailoring its communications according to consumers' varied interests and needs. This is implemented primarily through the unique process of network navigation in which the consumer chooses what information (if any) to receive from the firm. Thus, marketers must begin to examine the manner in which these more collaborative communication efforts should proceed.

These shifts in channel power hold important implications for consumer participation in the marketing process. For example, consumers may collaborate not only in idea generation and product design, but also in the marketing communication effort itself. This is because interactivity in the hypermedia CME gives consumers much greater control of the message. Such control may manifest itself in startlingly new ways: for example, it is feasible for consumers interested in purchasing big-ticket durables such as cars or appliances to broadcast their interest and solicit open bids from different firms (Cutler 1990). Similarly, Digital has enjoyed success with their innovative program of making the Alpha AXP computer systems available to potential customers for "test drive" over the Web (Jarvenpaa and Ives 1994).

Such activities are possible because the process of network navigation in hypermedia CME is characterized by open access to information. The original motivation for developing an "internetwork" of computers, on which the Web is based, was to enable geographically dispersed computers representing diverse platforms to link and communicate so they could economically share costly resources (Roberts 1988). The Internet thus developed in a rich and exciting atmosphere of intellectual curiosity fostered in an unconstrained and creative environment (Licklider 1988; Miya 1990).

The Question of Content. Marketers can utilize the opportunities for customer interaction inherent in the hypermedia CME in numerous ways, including 1) the design of new products; 2) the development of product and marketing strategy, and 3) the innovation of content. The evolution of content in a hypermedia CME is dependent upon not only the evolution of existing metaphors and communication codes from traditional media, but also new techniques and conventions inherent in the possibilities of the medium itself (Biocca 1992). One implication of this is that the content that will make hypermedia CMEs commercially successful has likely not been invented yet, and may require more than a simple continuous innovation of existing content (Grossman 1994).

As evidence that a discontinuous evolution in content will be required to fuel the growth of hypermedia CMEs, witness the difficulties experienced in applying traditional content to the alternative new interactive multimedia, such as pay-per-view, video-on-demand, and interactive

[5]See P. Chatterjee and A. Narasimhan (1994), "The Web as a Distribution Channel," (Owen Doctoral Seminar Paper, (http://colette.ogsm.vanderbilt.edu/seminar/patrali_anand_final/first.htm] for a discussion of the unique characteristics of the Web as a distribution channel, including 1) extremely low entry and exit barriers for firms; 2) increasing irrelevance of distribution intermediaries; and 3) the capabilities of CMEs to not only keep pace with market change, but accelerate it.

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TV. Few applications have yet to meet with consumer acceptance in test markets, and even fewer have come online in any significant way (Schwartz 1994; Markkoff 1994). To generate and evaluate "future content," the consumer must somehow be placed in a future frame-of-reference. Promising product development techniques include Information Acceleration (Urban, Weinberg & Hauser 1994; Hauser, Urban and Weinberg 1993), and virtual reality and role-playing "informances" approaches being developed at firms such as Interval Research Corporation (Kirkpatrick 1994).

We have proposed that flow will lead to increased quality time in the hypermedia CME. Thus, content developers should seek to facilitate the flow experience, as it has numerous positive consequences. One important consideration is whether and at what point in the process consumers are likely to become bored (e.g. when network navigation is not sufficiently challenging) or anxious (e.g. when network navigation is too difficult), increasingly the likelihood of "site jumping."

Note that because consumers vary in their ability to achieve flow, new bases for market segmentation will be needed for marketing in hypermedia CMEs. Scholars must determine the variables that relate to a consumer's propensity to enter the flow state. Such information can be used to develop marketing efforts designed to maximize the chances of the consumer entering the flow state. Since we believe that repeat purchasing behavior, that is, repeat visits to a hypermedia CME, will be increased if the environment facilitates the flow state, the marketing objective at trial will be to provide for these flow opportunities.

Pricing strategy is relevant here. Commercial online service pricing models are largely based upon connect time and usage charges. Such schemes have the effect of discouraging usage and, increasingly, consumers are demanding flat-rate pricing schemes. In the short run, flat-rate systems encourage consumer experimentation and system use (National Academy of Sciences 1994, Chapter 5). Continued use feeds demand because, as the anecdotal record shows, usage tends to be "addicting." This suggests that pricing algorithms that encourage browsing in a hypermedia CME will encourage usage (Hawkins 1994). In the long-run, usage-based a pricing may be more appropriate as the hypermedia CME matures as a medium, becoming as ubiquitous as the telephone (National Academy of Sciences 1994, Chapter 5).

6) Summary and Conclusion

In this paper, we introduced marketers to the revolutionary new medium defined by hypermedia computer-mediated environments, of which the World Wide Web is the current networked global example. We argued that hypermedia CMEs provide greater consumer control and are more accessible, flexible, and sense stimulating than either traditional media or interactive multimedia, owing to the synergistic effects of their unique characteristics, including machine-interactivity, telepresence, hypermedia, and network navigation, and proposed that by their nature, such a media environment will require the development and application of new marketing concepts and models.

We developed two structural models that provide the conceptual foundations for understanding the role of marketing in this new medium: 1) a familiar model of intent to use the medium, based on Azjen's relatively new construct of perceived behavioral control, and 2) a new process model of network navigation within the medium, built upon an extended concept

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of flow. From the models, we derived a series of fourteen testable propositions that specify expected relationships and conceptual links among important marketing variables, and may form the basis of a rich and detailed research program.

Subsequent to model formulation and based on our central thesis, we examined how the new media environment defined by the hypermedia CME has transformed the marketing function, and suggested that this transformation requires an evolution of the marketing concept. We argued that marketers must reconstruct the marketing function to meet the challenges imposed by this new commercial environment and construct new marketing paradigms that will facilitate electronic commerce.

Marketing scholars and practitioners alike ignore these issues at their peril. We have argued that the traditional one-to-many model, with its attendant implications and consequences for marketing theory and practice, is simply not applicable in this new hypermedia environment.

The hypermedia CME as both medium and market is likely to be successful because it frees consumers from their traditionally passive role as receivers of marketing communications, gives them much greater control over the search for and acquisition of information relevant for consumer decision making, and allows them to become active participants in the marketing process. Firms reap the benefits of this innovation in interactivity by being closer to the customer than ever before.

In sum, the new medium-as-market represented by the hypermedia CME, of which the World Wide Web on the Internet currently stands as the preeminent prototype, offers a working example of a many-to-many communication model where the consumer is an active participant in an interactive exercise of multiple feedback loops and highly synchronous communication. As such, it offers dynamic potential for growth, development, and indeed, a virtual revolution (e.g., see Godwin 1994a) in both the way marketing academics and practitioners alike approach the problem of effective, consumer-oriented marketing in hypermedia computer-mediated environments.

Appendix

The Internet

Krol and Hoffman (1993) offer three definitions of the Internet: "1) a network of networks based on the TCP/IP[1] protocols; 2) a community of people who use and develop those networks; [and a] 3) a collection of resources that can be reached from those networks" and note that there is no agreed upon definition because the Internet is at once a set of common protocols, a physical collection of routers and circuits, distributed resources, and even a culture of connectivity and communication. All three definitions are mutually consistent and will be useful in subsequent theory development. In this Appendix, we present a brief history of the Internet and comment on its size, growth, and user characteristics.

[1]A protocol is a mutually agreed upon standard method of communication between parties (Krol and Hoffman 1993). It establishes a set of signals to open communication channels, permit data to pass through, then close the channels (Hauben 1993). The TCP/IP (Transmission Control Protocol/Internet Protocol) protocol suite is the system of protocols that interlink the packet networks on the Internet (Cerf 1993).

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Some History

A careful history of the Internet is difficult to construct. This is largely because many of the accounts are anecdotal or recorded only in the postings on the relevant USENET news groups. Hardy (1993) presents an uneven, but fascinating chronicle of Net history, including a discussion of Bitnet and USENET, the other store-and-forward networks that permitted asynchronous electronic conferencing. Compiled from numerous online sources, Zakon (1994) has constructed a timeline documenting approximate dates of pivotal events in the history of the Internet, including the first International connections to ARPANET - the predecessor of the Internet - (England and Norway in 1973), the year the number of Internet host computers exceeded 1000 (1984), and the year the Whitehouse came online (1993, with president@whitehouse.gov, vice-president@whitehouse.gov). In a somewhat more humorous vein, Treese (1993) has indexed numerous Internet facts, including the number of online coffeehouses in San Francisco, California (18), the date the first Stephen King short story was published on the Internet prior to appearing in print (September 19, 1993), the number of USENET news articles posted over a two week period in December 1993 (605,000) and the number of Internet host computers in October 1993 (2,056,000).

In the early 1960s, the Department of Defense, working under the Advanced Research Projects Agency (ARPA), had the need to provide the Pentagon with a military and command control communications system that would operate even in the event of a nuclear attack (Hauben 1993). The solution, based upon the principle of "redundancy of connectivity," was developed at the Rand Corporation by Paul Baran (Baran 1962). Baran designed a computer communications network with no hub, no central switching station, no governing authority, and with the critical assumption that links between any two points (cities) were completely unreliable. Messages were cut into strips and put into electronic envelopes called "packets." Each was addressed to the sender and showed the receiver. The packets were sent out to go their own ways to be reassembled at destination. If they got lost or damaged, they were simply sent again.

In January 1969, Bolt, Baranek, and Newman was awarded the contract to design and operationalize this "packet-switching" store-and-forward network[2] at four sites (Heart, McKenzie, McQuillian, and Walden 1978). By the early 70s, this network began appearing in university and government research laboratories and eventually became the technological underpinnings of the Internet. Publicly demonstrated as ARPANET in October 1972 at the First International Conference on Computer Communications in Washington, D.C. (Cerf 1989), the Internet, until just a few years ago, was a few thousand computer "nerds" and "techies."

In 1986, the United States Department of Defense-funded ARPANET was restructured by the National Science Foundation (NSF) as NSFNET to connect several hundred university and United States government mainframe computers for the exchange of email, information, and computing resources for scholarly research (Krol 1992; Krol and Hoffman 1993). These computers were connected through six supercomputer centers with 56,000 bit per second (56k bps) telephone lines[3]. By 1987, the NSF-commissioned NSFNET was so successful that the network

[2]Packet-switching is a method of fragmenting electronic messages into component parts called packets, routing them to their destinations, and then reassembling them upon arrival.

[3]At 56k bps, approximately two full pages of text per second can be transferred.

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was overloaded. Consequently, NSF awarded a contract to the partnership of Merit Network, Inc., the state of Michigan, IBM, and MCI to manage and upgrade the network (NSFNET 1992) to T1 links[4]. The faster backbone of 170 networks was operational in July 1988. Subsequently, traffic increased over 15% per month (NSFNET 1992) and NSF exercised its contractual option with the partnership to implement and deploy a much higher capacity national network. Advanced Network & Services, Inc. (ANS), a non-profit corporation of Merit, IBM, and MCI was created to carry out this option. By 1991, all NSFNET backbone sites were connected to the new ANS-provided T3 backbone[5]. The NSFNET supports access to scientific computing resources, data, and interpersonal electronic communication (Chinoy and Braun (1992) and serves as the national backbone for the United States component of the Internet.

By the late 1980's, the Internet consisted only of networks using the IP protocol, which included federal, regional, university, and some foreign networks. However, the managers of non-IP networks such as Bitnet and DECnet realized the advantages of connecting to the Internet and developed "gateways" primarily for the transfer of email between the Internet and these other networks (Krol and Hoffman 1993).

The Internet is technically managed and directed by a set of invited volunteers operating as the Internet Architecture Board (IAB) of the Internet Society (ISOC), conducting meetings through the Internet Engineering Task Force (IETF). Yet, in a very real sense, no one owns the Internet, since no single organization or individual controls its use or pays for it. Operating costs are shared by the primary users (universities, national laboratories, high technology companies, and foreign governments), in a cooperative arrangement, by paying connection fees to regional computer hubs, or to local access providers that tie into hubs of the system.

Size, Growth, and User Characteristics

The size, growth and demographics of the Internet make it an extremely attractive marketing opportunity. The Net is the world's fastest growing computer network. Recent measurements (Lottor 1994) put the number of host computers on the Internet at 3,864,000 as of October 1994. The number of hosts has been approximately doubling every year: October 1993 (2,056,000 hosts), October 1992 (1,136,000 hosts), October 1991 (617,000 hosts), October 1990 (313,000 hosts), October 1989 (159,000 hosts) (Merit Network Inc, 1994). Much of this recent growth is attributable to commercial and international host computers.

Analysis of packet traffic by port numbers shows that the Internet is growing not only in size but also in the diversity of applications. Computer scientists classify Internet applications into the following categories: 1) file exchange, including ftp; 2) email; 3) conventional interactive applications (telnet, finger); 4) name lookup, and 5) newer "high-end" interactive TCP/UDP[6] services (Claffy, Polyzos, Braun 1994) such as irc, talk, and X-windows. Since 1989, traditional Internet applications such as telnet and ftp have decreased, while real-time, continuous multimedia applications (i.e. audio and video), Internet resource services (gopher, WAIS, WWW,

[4]T1 circuits transmit data at the rate of 1.544 Mbps, which is the equivalent of 50 pages of text per second.

[5]T3 circuits transmit data at the rate of 44.736 Mbps.

[6]Most computing applications on the Internet are based on the Transmission Control Protocol (TCP) or the User Datagram Protocol (UDP).

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Mosaic), distributed electronic role-playing environments (MUDs), and remote graphical displays (X-windows) have increased dramatically (Claffy, Polyzos, and Braun 1994).

Assuming somewhere between 5-10 machines per host (Partridge 1994), we can estimate the total number of users on the Internet at somewhere around 25 million worldwide. However, as Hoffman and Novak (1994b, 1994c) point out, no one really knows exactly how many users there actually are on the Internet, as estimates range from 2.5 to 32 million users, depending upon assumptions.

Time series data on NSFNET packet and byte counts (in total and by port numbers) (Claffy, Polyzos, and Braun 1993), the number of host computers (in total and by domain) (Lottor 1994), and the estimates of reachable hosts (Lottor 1994) are available and continue to be regularly updated. However, these aggregate traffic statistics reveal nothing regarding the distribution of users of host computers, individual usage of multiple hosts, or extent of individual usage. Perhaps most important, we know virtually nothing about consumer characteristics, including demographics, psychographics, and user needs.

Though little hard data on users is available yet, the Internet appears to attract upscale, educated individuals with access to computers and modems. Pitkow and Recker (1994) report that a recent self-selected sample of nearly 2,000 World Wide Web users responding to a survey call posted to the highly technical USENET newsgroup comp.infosystems.www and the NCSA Mosaic What's New Page were virtually all male (95%), young (nearly 85% between the ages of 21 and 40) and professional or getting there (nearly 45% professional and another 22% graduate students and 14% undergraduates).

As the environment evolves and competition increases, accurate information on market potential and consumer needs will be critical. Studies that define and estimate segments of usage based on customer need will be very important.

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