What Do Virtual "Tells" Tell? Placing Cybersociety Research Into a Hierarchy of Social Explanation

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Abstract

Like archaeological Tells, large mounds resulting from the accumulation of human settlement debris, the remains of virtual communities can inform researchers about phenomena operating at many levels. However, for excavations to be effective they need to be conducted within the framework of a scientific research program.

The theory of interactive communication in cyber places developed here distinguishes between the social relationships that emerge from interactive group computer-mediated communication, and the cyber places where such communication occurs. It also links the density and form of cyber material to communication technology types. In so doing, it identifies four distinct levels of analysis. These are: i) individual behavior or social theory; ii) spatial and temporal patterning of artifacts in cyberspace; iii) technology and the parameters of human interaction; and iv) cyber-ecology or online behavior and resource supply. The recognition of four distinct levels of analysis allows for the production of a hierarchy of social explanation for cybersociety.

To date the majority of research into online behavior has focused on the level of social theory. However, a balanced understanding of all levels of the hierarchy is preferable. The theory outlined is also linked to a research program into the material aspects of computer-mediated communication. Research into this under represented level should inform e-commerce strategists as well as those interested in usability as a group level concept.

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1.0 Introduction

In this paper, we offer a structured approach to understanding the use of collaborative technologies. To date, theories of collaborative technology use have generally operated at the level of social theory where meaning or intent is of the utmost importance. Explanations have ranged from those focused on the small-scale and short time spans of personal psychology, (e.g. email flaming [24]), to those focused on larger-scale issues such as the relationship between communication technologies and society [41].

Because it is important to match theory to the scale of the phenomena being addressed, this paper develops a hierarchy of social explanation for cybersociety. The term cybersociety refers collectively to the new forms of social interactions and the complex social systems, such as virtual communities, that have emerged from the wide-scale use of computer mediated communication (CMC) technologies [21]. We equate the study of the relationship between collaborative technology used to create cyberspace and cybersociety, with the study of conventional societies by their cultural artifacts through archaeology. This is done, because it is argued that it is important to explore collaborative technologies at the level where material aspects of computer-mediated communication, such as text length, and text density, relate to online behavior. By focusing on the material aspects, analysis can occur where social meaning has only indirect relevance. This in turn makes it possible to provide explanations that go beyond the specifics of current responses to new communication technologies.

2.0 Archaeology and Theorizing about Technology and Cybersociety

Scientists frequently seek to understand new phenomena by using analogies [15,48], thereby mobilizing an existing body of knowledge to help explain new phenomena and new situations. A relevant example of the application of analogy is Shannon's mathematical theory of communication [44] in which laws of physics were equated with the statistical properties of information. The Internet ignites many metaphors [36], many of which are suggestive of a connection between material aspects and social change. For example, the growth of the Internet has been compared to the growth of the United States interstate highway system [21,49], hence the notion of the "information super-highway." However, metaphors that are unrelated to a discipline and a methodology do not immediately suggest how to proceed with systematic research.

Archaeology is the study of humanity's past by the analysis of the material remains of cultures. The last two hundred years has seen archaeology mature into science [9]. The result of this change has been a radical shift in Western culture's understanding of both human history and humanity's relationship with the environment [40]. Archaeologists have developed sophisticated classification methods to describe artifacts and other finds. Such methods combined with the time scale provided by an archaeological perspective allow for the study of the process of cultural change. The archaeological record is in fact an essential context for understanding humanity. This is because no other cultural milieu provides the time perspective and the range of comparative cases necessary for the recognition of the immense, slow consequences of community behavior [11].

We chose archaeology as an analogous field for a number of reasons. First, archaeologists focus on cultural artifacts, and we are interested in focusing on the artifacts of computer-mediated communication. Examples of such artifacts are listserv postings, web site structures, number of spams, Usenet content, user logs etc. Second, because of the vast difference between duration of social action and material remains, archeology has had to deal directly with the problem of explanatory scale when examining the relationship between artifacts and society. An understanding of how to deal with this issue is of crucial importance to the construction of valid theories of online behavior. By examining explanatory scale, archaeological theory has been able to produce explanations of the connection between technology and society without recourse to simple determinism. Finally, although social theory dominates archaeology, a significant body of relevant theory exists regarding phenomena that operate across a range of levels.

A number of researchers hold that archaeology is a branch of anthropology [1]. Many authors suggest that we use anthropological methods to guide the study of online behavior [51]. Paccagnella [34] for example, examines how to proceed with ethnographic cyber-anthropology. Howard Rheingold states the case most eloquently [39]:

> “Watching a particular virtual community change over a period of time has something of the intellectual thrill of do-it-yourself anthropology and some of the garden-variety voyeurism of eavesdropping on an endless amateur soap opera where there is no boundary separating the audience from the cast”

For our purposes, what is important here is that a strong case can be made for the cross-fertilization from anthropology to the study of CMC. Anthropologists deal with issues of direct relevance to cybersociety researchers. For example, when addressing the issue of impact of the move to virtual “places” it is only natural for Turkle [51] to refer to the anthropologist Ray Oldenberg’s book “The Great Good Place” which deals with community gathering places and one’s sense of belonging. The problem is that anthropology has been narrowly construed in terms of a standard defined by the content and treatment of ethnographic experience. Archaeologists do not research communities and cultures directly. Instead, they examine the remains of human habitation. As a result, despite the fact that archaeology is dominated by theories that focus on active social aspects, other approaches and levels of analysis flourish. Other levels include those based on the recognition of the long-term, large-scale role of material as a regulator, and restrictive influence on the management of community life [11].

Others, too, take an historical and cross-cultural approach to communication technologies by calling attention to the potential effects of media, as distinct from the content they convey. The best known and most controversial of these medium theorists are Harold Adams Innis and his student Herbert Marshall McLuhan, although many others have followed in their footsteps [32]. These theorists first suggested that media help mold social environments, thus linking media to social structures. This led McLuhan [31] to coin the term “the global village” and Meyrowitz [32] to write about the “hunters and gatherers of the information age.” Not surprisingly, the field of anthropology also influenced them. Their work suggests that comparative analysis will yield valuable information about media from a longer-term larger-scale perspective. However, as Meyrowitz [32] notes, medium theorists have failed to provide a theory to guide research into the relationship between communication mediums and social structures that is not dependent on social context. Further, their work was often obscure or, like most anthropologists, focused on issues that operate at the level of social theory. In other words, medium theorists have a problem with explanatory scale, again suggesting that there is value in examining archaeological theorizing.

Just as the use of metaphors does not immediately suggest how to proceed with systematic research, the potential value of the use of archaeology as an analogous discipline is limited if a connection is not made directly to an applicable theory and methodology. The archaeologist Roland Fletcher [11] provides a theory and a model of the impact of material on human settlements. The theory replaces technological determinism with the notion of bounded hierarchies and an analysis of material behavior. His model shows how the material components of settlements play a substantial and essential role in many large-scale transformations of human community life. Material becomes recognizable as an actor without intent, whose operations occur at a scale beyond the limited perceptions of daily community life. Using Fletcher’s methodology, cybersociety can also be examined one step removed from social theory, where human intent is not of particular importance and larger-scale cultural changes are assessable.

3.0 Meaning, Artifacts, and a Hierarchy of Social Explanation for Cybersociety

In this section, we show how the bounded hierarchies approach leads to the replacement of technological determinism with notions of pre-requisites and constraints. This in turn allows us to examine how to produce a theory of cybersociety operating at the level of cyber-material using Fletcher's [11] approach.

3.1 Explanatory Hierarchies

We understand evolution by a hierarchical theory of selection. What happens at each level is not predetermined by a larger-scale context. Therefore, we need a proposition about indeterminacy to organize the relationship between successive levels.

Indeterminacy was proposed to replace the mechanistic and reductionist 'laws' that typified 19th century physics as a result of the rise of quantum mechanics [3]. Later, the advent of chaos theory reinforced the notion that the study of complex phenomena is possible without detailed knowledge of all the particular small-scale events [13]. Indeterminacy may or may not be the 'true' characteristic of the universe, life, or human behavior, but it is now the way in which physics, cosmology and biology attempt to comprehend reality [2]. Indeterminacy provides us with the freedom to explore the impact of factors that occur at one level of an explanatory scale without focusing on the complexity and details of factors that occur at a lower level. This is possible via the construction of hierarchies of explanation about operations that are of different magnitudes and produce observable effects and outcomes over different spans of time. The links between the levels result from the boundaries imposed by higher-scale phenomena on the range of actions that can occur at a lower level.

External boundary conditions or parameters, such as the net balance between energy input and output in resource supply, limit the degree to which the characteristics of the next step down in a hierarchy can persist. Within the boundaries that form a particular hierarchy of explanation, forms taken by the system under study can vary enormously because they are not determined at that level. Therefore, it will not be possible to determine from a higher level in the hierarchy the forms that will occur at a lower level of analysis. From the vantage point of a particular level in the hierarchy, lower level events are indeterminate.

3.2 Explanatory Hierarchies and the Rejection of Technological Determinism

Deterministic and teleological theories conceive of a certain set of long-term outcomes as inevitable. They propose that a particular technology will automatically lead to a particular set of social outcomes. The adoption of a hierarchical approach with indeterminacy between levels leads to the rejection of technological determinism and teleology. This is because the scale at which technology operates is different to that of social outcomes. Instead, the emphasis is on technologies as constrainers or enablers of a range of behaviors. The hierarchical approach is prescriptive, but not necessarily predictive. For example, the creation and use of the telephone may well be a prerequisite for high-rise living, but does not prescribe the creation of such structures. The idea of technology as enablers is not new to media research. As early as the 1950s, Innis [16] argued that cultures with portable information storage (e.g. writing on papyrus or clay) could produce empires although they do not necessarily do so.

We can also reject technological determinism and teleological explanations for empirical and theoretical reasons that do not relate to the bounded hierarchy approach. Empirical reasons for rejecting simple technological determinism come from many quarters including archaeology and history [43]. Theoretical grounds for rejecting teleology included the fact that such theories are self-referential (rely on circular reasoning) and are therefore not scientific explanations. Further, their self-referential nature means that they are likely to result in non-progressive research programs [23]. Another reason for rejecting technological determinism is the fact that a complete correspondence does not exist between the material and social aspects of community life. Therefore, the relationship cannot be deterministic.

The notion that technological advances automatically lead to positive social change is common in the fields of Information Systems and CMC in particular. Ein-Dor and Segev [8] noted that "virtually all developmental IS explanations" were teleological and Markus [29] that a similar situation existed in relation to theories of collaborative technology use. For example, the media richness theory of Daft et al. [5] can be considered teleological, as the theory holds that humans as rational actors inevitably use the most efficient medium for a particular level of task ambiguity. Despite the problems with technological determinism, determinist theories are often proposed because of the desire to explain the relationship between technology and social structures. Researchers exploring virtual-communities, for quite understandable reasons, want to suggest straightforward relationships between CMC-technologies and human behavior. However, a simple deterministic relationship between technology and social outcomes does not exist. This is because social outcomes are determined at the level of social context [47], not at the level of technology. Examples include: group norms and social learning [42]; social identity [25]; the make up of the community of users [22]; and work group cohesiveness [12]. Therefore, the particular way in which a technology is used, is not determined by the technology itself, but rather is dependent on its social context. Consequently, it will not be possible to accurately predict the form that online behavior will take without a detailed understanding of its social context. Therefore, without a hierarchy of social explanation, we cannot effectively relate technology to social structures.

4.0 Modeling the Impact of Material on Cybersociety

While researchers into cybersociety have examined a wide variety of questions operating at various scales, few have successfully explored the link between technology and online behavior. Instead, theories of collaborative technology use have generally operated at the level of social theory where meaning or intent is of the utmost importance. In this section, we outline a model of virtual-public or virtual-settlement growth that links technology to online behavior using an analogist approach to Fletcher [11]. The model of virtual-public growth produced allows us to place much of the work to-date on cybersociety within a hierarchy of social explanation.

4.1 Fletcher's interaction-communication stress model of settlement growth (1995)

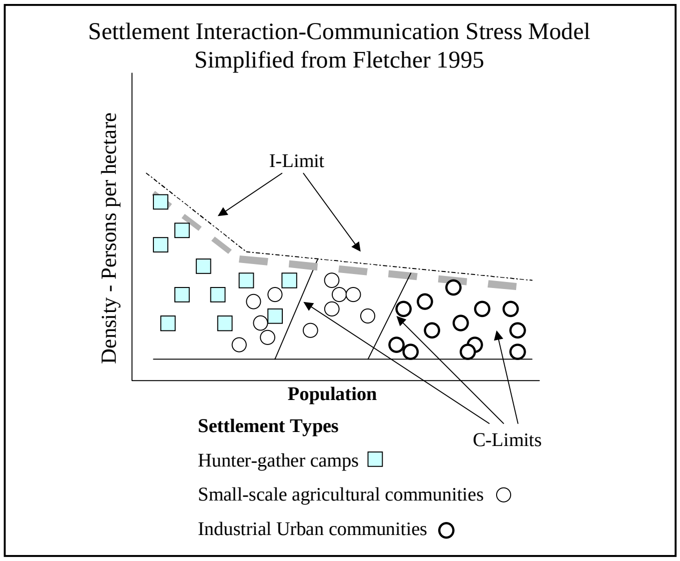
The impact of the relationship between material and interpersonal behavior is termed material behavior by Fletcher [11]. The effects of material behavior on the viability and growth of a community may be both advantageous and disadvantageous. This is because material acts as a non-verbal message-system, which manages human interaction, by providing rules that offer some degree of predictability. Clay tablets with script written on them assist signal transmissions: they carry information and help reduce the amount of required interpersonal interaction. Effective transfer of information is linked to the underlying rule structure of the interaction in question. At the same time, a society dependent on clay tablets for communication may be constrained by a technology that is not easily reproduced and requires physical presence for message transfer. In Fletcher uses the term 'interaction' in its broadest sense to cover all media and channels of interaction. The actors need not intend to interact and affect each other. Fletcher argues that the starting point for modeling the impact of technology on social structures is to recognize the degree to which material entities can effectively control or aid social life, which in turn is defined by the finite capacity of humans to process information. Humans can effectively undertake only a limited number of cognitive tasks during a given period [37]. Therefore, the amount of physical interaction and group communication that we can manage is finite. Such constraints are inherent to any biological mechanism for processing information [7].

The existence of human cognitive processing limits leads Fletcher to a number of further propositions. First, he argues that cognitive processing limits will restrict the range of situations in which a community can interact and communicate adequately. Secondly, he postulates that the range of sustainable communication situations will relate to the society's cultural assemblages. Thirdly, Fletcher suggests that it is possible to identify a set of cultural assemblages that are roughly related to the boundaries to settlement size and density. Finally, by examining the impact that technology has on community life, Fletcher offers a strategy by which we can come to a better understanding of the processes involved in settlement growth.

Based on the above logic, Fletcher [11] mapped various settlement types over the last fifteen thousand years by geographic size and population. What he discovered was a relationship between the upper boundaries of a ratio of community size to density, and a society's available technology.

Diagram 1 below provides a simplified graphical illustration of the results of mapping this relationship. It summarizes the proposed behavioral constraints on the growth of various types of human settlements. The boundaries represent zones rather than rigid, deterministic, instantaneous halt lines. They are indicators of an uncertain range of likelihood within which the behavioral limitations become severe. The I-Limit in the diagram refers to the interaction limits which individuals can cope with and which place a limit on the maximum density of a settlement. For example, hunter-gatherer communities are able to support a higher level of average residential density than industrial urban communities, although their populations are much smaller. The recognition of this relationship has a significant and important impact on our understanding of the growth of human settlement size and population. The C-Limits represent the constraints imposed on population expansion by the maximum extent to which a given assemblage of communication technologies can function adequately. Thus, for example, city populations were able to dramatically increase because of the industrial revolution. Fletcher's approach provides a modeling technique to explore the boundaries of what we label elsewhere as virtual-settlements or virtual publics [17,18,19].

Diagram 1.



To understand the relationship between the material and active components of behavior in the non-virtual world requires attention to at least three different scales of analysis. First, attention must be paid to the small-scale spatial and temporal patterning of social life, that is, who uses what technologies and when. Secondly, it is important to take account of the range of behaviors within which a community with a particular cultural assemblage can operate. Thirdly, the large-scale constraints to resource supply are of significance. A similar hierarchy can also be constructed for understanding the relationship between cyber-material and online behavior, where limitations and possible forms of group interaction are mediated by technology.

4.2 Modeling the Impact of Cyber-Material

Two things are required to construct a model of the impact of cyber-material using the methodology described above. First, significant parallels must exist between the virtual places that support cybersociety and conventional human settlements. Secondly, cognitive processing limits must affect the social structures formed using cyber-places, just as they do in "real" places.

4.2.1 Parallels between Virtual Places and Conventional Settlements. Papers that deal with virtual community often discuss their "inhabitants" [34], what "takes place" within them, and "where" we can "find" the virtual community under study [45]. This is because, "computer-mediated communication is, in essence, socially produced space" [21,p.17]. A number of authors have also noted the connection between common-virtual public space and virtual community. Fernback and Thompson [10] define virtual communities as "social relationships forged in cyberspace through repeated contact within a specified boundary or place (e.g. a chat channel) that is symbolically delineated by topic of interest". Therefore, according to Fernback and Thompson, a virtual community needs a virtual-space. At the same time, they note that a virtual community is not equivalent to its cyberspace. The aim here is not to join the debate about the extent to which they are "real" communities, but rather, to note the existence of socially constructed spaces where interaction occurs at various levels.

The social interactions, which form the basis of cybersociety, occur via a variety of public settings and private communication channels. These public cyber-places we have termed 'virtual publics' [18,19]. More formally, virtual publics are symbolically delineated computer mediated spaces, whose existence is relatively transparent and open, that allow groups of individuals to attend and contribute to a similar set of computer-mediated interpersonal interactions. This definition distinguishes virtual publics from private computer-mediated spaces. For example, a password protected corporate employees-only discussion board is not a virtual public. The public probably would not know about its existence nor would they be able to use it. This distinction is important when we construct a model of the impact on online discourse of various technologies. People and organizations build a variety of open and closed virtual spaces. Not all virtual publics will have associated virtual communities, therefore the term virtual settlement has been adopted as a label for those virtual publics whose users constitute the population of a virtual community [17].

Many parallels exist between the concept of interactivity and the broader term 'interaction' used by Fletcher to discuss constraints to conventional settlements. While it may be true that the channels of interaction in cyberspace are generally narrow in scope, they are still the ties that bind users together [52]. Like conventional communities, actors in cyberspace need not intend to interact and affect each other. Their intentions do not concern this inquiry. Visual and auditory signals have an impact whether or not we want to notice them. However, unlike conventional communities in cyberspace, we can track a larger proportion of public interactions and categorize their nature. The messages that form the basis of online interaction via virtual publics can be classified as broadcast, two-way, reactive, or interactive. Fully interactive communication requires that later messages in any sequence take into account not just the messages that preceded them, but also the manner in which previous messages were reactive [35]. Interactivity is not a characteristic of the medium per se. It is the extent to which messages in a sequence relate to each other, and especially the extent to which later messages recount the relatedness of earlier messages. The literature regarding virtual communities is insistent that interactive communication is a necessary part of virtual community life. This is because true conversations require interactive-communication [35,54,14].

Like conventional settlements that have residents, an active virtual public will have a user-population. The term ‘virtual public user-population’ refers to the individuals who engage in a virtual public’s symbolically delineated space [17]. Lurkers are members of a virtual public’s user-population who do not engage in public discourse. Contributors are members of a user-population who over a period engage in public discourse.

Another parallel that should be noted is related to the action of material in both virtual and conventional human interactions. In both situations, material acts as a non-verbal message-system that manages human interaction by rules that provide some degree of predictability. The notion of rule structures being linked to information transfer is well known to CMC researchers. Since the early seventies, it has been known that it is possible to find an empirical relationship between linguistic measures, such as the number of words per message per sentence etc., and performance in a CMC context [4]. Rules of course can breakdown. For example, while messages posted to an email list form the basis of group dialogue, a significant number of spams could lead to discourse disintegration. Therefore, the degree to which users can effectively process virtual public messages has consequences for the size, viability and duration of discourse.

The application of information theory to interpersonal communication supports the view that for discourse to be sustained by a virtual public it must contain non-verbal rules that provide some degree of predictability to its CMC [50]. This is because the transfer of information is linked to the underlying rule structure of the interaction. A number of studies into virtual settlements suggest that virtual-communities often follow rules that provide some degree of predictability to their CMC messages. For example, McLaughlin et al. [30] noted the commonplace phenomena of Usenet standards of conduct. Two conclusions can be drawn from this. First, we can surmise that the variability that can be sustained within a virtual community will relate to the message code system used by that community. Therefore, the impact of a message can be considered independently of its maker's intent. Secondly, that technology can also constrain the shape of virtual public discourse because of the way in which it can affect information transfer.

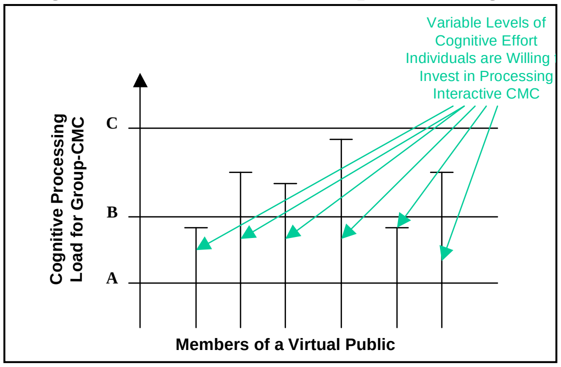
4.2.2 Cognitive Processing Limits, Computer-Mediated Discourse and Technology. Fletcher’s model of conventional settlements outlined above links individual cognitive processing limits to the boundaries of group structures supported by particular classes of technology. Similarly, a link exists between cognitive processing limits and virtual publics discourse boundaries. Nearly all users of the Internet have at times experienced “information overload”. The question, then, is what is the aggregate expression of individual discomfort or overload? Is the message processing power of a group increased with the addition of extra individuals?

The inability of members of a virtual public to effectively process certain message patterns will result in limitations to the possible forms of sustainable group-CMC. That is, beyond a particular communication processing-load, the behavioral stress zones encountered will make group communication unsustainable. Communication load is the processing effort required to deal-with a set of communications. Users of virtual publics have two options regarding information overload. The first option is simply to end participation (possibly unavailable in closed corporate systems). The second option is to change communicative behavior so that it becomes manageable. It is argued here that, from a systemic exploration of the communication patterns of many large-scale virtual publics, it should be possible to identify the stress zones caused by cognitive processing limits.

Communication-processing load relates to a number of message system characteristics. Users generally have to make more of an effort to reply coherently to a thread [26] than to a single message. Higher message interactivity correlates with higher communication-processing load. Similarly, a dense pattern of messages (high frequency of postings) will require quicker and more sustained processing by group members. Therefore, message density will also covary with communication-processing load. It is also likely that an increase in ‘interactional coherence’, not compensated for by a useable persistent record, will also increase communication-processing load [14]. For example, disrupted turn adjacency (reversed sequencing or lags) may require increased user effort to track sequential exchanges. Of course, it is possible to alleviate some of the problems of information overload by the use of software.

Diagram 2 illustrates how individual cognitive processing limits are linked to group communication. Three cognitive processing loads for group-CMC, A, B and C are displayed. At different cognitive loads, different individuals are willing or able to process group messages. The cognitive processing abilities of groups are not simply the sum of its individual’s cognitive processing capacities. Consequently, certain patterns of interactive group-CMC cannot be sustained if the required processing effort (communication load) is higher than the maximum amount individuals can or are prepared to invest.

Diagram 2. Individual & Group Processing Limits



Only a handful of authors have noted the impact of information overload on group communication (see [18] for a review), and no attempt has been made to systematically identify group-CMC patterns that produce information overload. This is probably due to the lack of a theoretical approach or methodology for exploring the problem. It is also probably because the focus of research in the area has been on the behavior of individuals in closed systems (e.g. laboratory experiments or corporate groupware) rather than on the behavior of open systems, i.e. virtual publics.

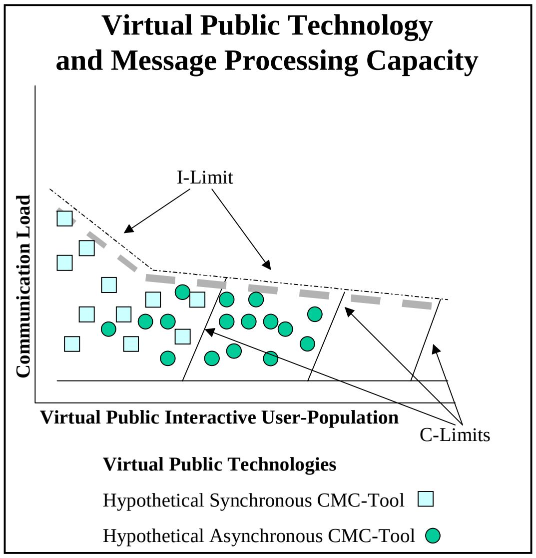
4.2.3 A Model of the Relationship between Technology and Online Behavior. We can now extract building blocks for modeling the relationship between communication technology and online behavior. We know that there is a limit to the physical density of conventional settlements, due to human interaction limits. Similarly, there are also limits to the processing by user populations of the interactive messages posted to virtual publics. Further, we also know that increasing the population of a settlement will relate to increases in settlement density or size. Similarly, an increase in the number of active users of a virtual public will relate to its communication load and or message posting density. Finally, we know that different technologies structure communication and interaction differently, resulting in a link between technology type and social structures. From these points, it is possible to construct a hypothetical model of virtual public technology and message processing capacity based on Fletcher's approach.

In Diagram 3, a number of hypothetical virtual publics are plotted. The plots show that the user-population's size and communication-processing load of virtual public's CMC can vary widely. It also shows how different technologies have different boundaries for sustainable group-CMC. For example, a relatively synchronous CMC-technology such as Internet Relay Chat (IRC) may be able to reach a higher communication load than an email list because of the speed at which users in a channel window can reply to the comments of other users. However, IRC channels may not be able to reach the same user-population as a function of message density as an email list. This is because email list subscribers can store messages and take time to structure responses.

Diagram 3 also suggests that the stress zones caused by overloaded interactive communication can be identified empirically by mapping active participation in different virtual places. This in turn will enable a model of the relationship between CMC-technologies and communication load. Like Fletcher's model of conventional settlements, it is likely that I-limits and C-limits exist. The I-limits or zones, here representing the maximum sustainable communication load of a class of virtual publics. The C-limits representing the durability and storability of messages used to communicate via a virtual public.

The model outlined is a type of coordination theory [27] as it examines the inter-linked dependencies between activities. Further, it is possible to consider discourse via virtual publics to be the output of a complex social system [18,19], with the notion of indeterminate hierarchies of explanation used here to understand the coordination of dependencies between levels.

Diagram 3.



4.3 Placing Cyber-Material Research in a Hierarchy of Social Explanation.

In this subsection, we use the model described above to build a hierarchy of social explanation linking cybersociety to cyberspace. The model in Diagram 3 suggests attention to at least four different scales of analysis. First, the small-scale spatial and temporal patterning of cybersociety is represented by the positions on the model of the various hypothetical virtual publics. Second, the longer-term behavioral parameters of human interaction, or the range of behaviors within which discourse using a particular technology can operate, is represented on the diagram by the positioning of the I-Limits and C-Limits. Third, the large-scale constraints to resource supply, or cyber-ecology, is represented by the existence of the diagram itself, and by the types, and numbers of virtual publics that can potentially be displayed. The model does not preclude different virtual publics using equivalent technologies, from having different communication loads. Nor does it say anything about the content of virtual public discourse within the boundaries imposed by technology, or who will use one virtual public or another. This constitutes a fourth lower level of analysis (social theory). The recognition of four distinct levels of analysis allows us to produce a hierarchy of social explanation for cybersociety.

4.3.1 Individual Behavior - Social Theory. As we noted in the discussion of analogies from anthropology, online behavior is well suited to analysis at the level of social theory. Reasons, meaning and intent operate at this level of the hierarchy. The theories do not hinge on the technology per se, rather on the social context of technology use. Remember that technology does not determine online behavior; it merely enables or constrains it. Therefore, theorizing at this level cannot result in models that accurately predict technology use without significant linkage to the specific social context under question.

4.3.2 Spatial and Temporal Patterning of Artifacts in Cyberspace. Archaeologists map stone-tool dispersal in order to understand the range of cultural formations with which a particular technology is associated. Similarly to understand the relationship between CMC-tools and online behavior, we need knowledge of the range of ways in which the technology in question is used.

Only a small number of researchers have examined cyber-artifacts at this level of analysis. ProjectH was one such effort [37]. ProjectH was a collaborative content analysis of a wide sample of communicative activity taken from the Usenet, Bitnet and Compuserve discussion groups. At the time of the study, 1992-1994, these discussion groups represented the vast majority of publicly accessible cyberspaces. Whittaker, et al. [53] examined what they called the “dynamics of mass interaction” by examining millions of Usenet messages. Smith [45] in a similar vein measured what he referred to as the social structure of the Usenet, by mapping the overall activity of users of the Usenet. Research examining the spatial patterning of cyber-artifacts does not necessarily have to be conducted on the large-scale of the studies discussed above. Herring [14] in her examination of interactional coherence, by focusing on mapping the flow and structure of CMC, is also working at this level of analysis.

4.3.3 Technology and the Parameters of Human Interaction. Little work has been conducted into the longer-term behavioral parameters of online human interaction, or the range of behaviors within which discourse using a particular technology can operate [18]. Further, most of the relevant work is theoretical [18]. To help rectify this imbalance, the authors are currently undertaking empirical research into the communication boundaries of email lists and Usenet newsgroups [20]. It should also be noted that effective production of empirically based models at this level requires the production and analysis of a significant amount of data regarding the patterning of cyber-artifacts (as described in section 4.3.2 above).

4.3.4 Online Behavior and Resource Supply (Cyber-Ecology). Theories operating at this level examine the ecology of cybersociety rather than the direct impact of the technology on online behavior. For example, the expansion of any online social interaction by the inclusion of new actors relates to resource-supply (the potential supply of new users). An example of a theory that links to the ecology of cybersociety is Markus' [28] critical mass theory. It focuses on explaining the percentage of a real-community that has adopted a particular telecommunication innovation. Markus' emphasis is not on the structure or uses of interactive media, but who will adopt such media. Many other theories exist that examine phenomena operating at this scale.

5. Conclusions and Implications.

The theory presented in this paper for the study of the interrelationship between cybersociety and cyberspace can be considered a scientific research program in the full Lakatosian sense [23]. The research program's hard-core, is the outlined relationship between technology and cybersociety. The positive heuristic, or rough guidelines as to how research should proceed, is to increase the focus on large-scale field-research into communication via virtual publics. This should better balance the amount of empirical and theoretical research conducted at the four levels of the hierarchy of social explanation outlined.

The theory outlined has a number of significant implications. First, the approach suggests that in relation to technology use, inconsistencies between laboratory and field studies are to be expected. This is because in regards to individual technology use, context is king. Social context in the field is extremely difficult to measure or adequately comprehend, making it difficult to validate laboratory findings in the field. Recognition of this fact by Group Support Systems theorist [5,38] could resolve a number of philosophical dilemmas.

Second, focusing on the construction of deterministic models of technology outcomes will not necessarily help us understand what features of collaborative technologies are useful as has been argued elsewhere [38]. Instead, the hierarchical approach suggests that researchers should aim to construct models based on prerequisites or critical success factors.

Third, researchers need to match their research question to an appropriate level of analysis. Failure to do so will result in effectual theorizing. This is the case with much of the current work linking virtual communities to e-commerce [19].

Fourth, as the active population of any individual virtual public is limited by cognitive processing constraints, those wishing to build virtual metropolises for e-commerce will have to devise methods to segment and relate discourse spaces [19]. In turn, measures of virtual public 'crowding' [19] based on empirical field-research will help refine such segmentation strategies.

Fifth, the field-research promoted by the research program should provide human computer interaction researchers with data for examining usability as a group level concept [20].

Finally, the theory and research program is of significance to communication theory in general. This is because it links communicative behavior and social structure to technology without resorting to technological determinism.

6. References

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