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An Analysis of Interaction IN
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FORUM TALK:
AN ANALYSIS OF INTERACTION IN TELECOMPUTING SYSTEMS

By

Steven Joseph Dick

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirement
for the degree of

DOCTOR OF PHILOSOPHY

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College of Communication Arts and Sciences

1993

ABSTRACT

FORUM TALK:
AN ANALYSIS OF INTERACTION IN
TELECOMPUTING SYSTEMS

By

Steven Joseph Dick

Telecomputing forums have gone beyond the stage of a simple technical possibility and become an important part of many telecomputing systems. But the creation of a forum does not automatically create interaction. Since few of us are happy talking to ourselves, a successful forum must engage participants that are willing to contribute ideas and information on trust that others will do the same.

In this study, 10,847 messages were collected from three general interest forums on a midsized national information utility. The goal was to look for differences between forum leader and non-leader message sources and in quantity and quality of messages across a cyclical pattern of forum activity identified through previous research based on quantity of activity. The study creates a model of cyclical forum activity, called "resonance," based on prior collective action and critical mass research.

Analysis was done in two stages. First, a descriptive analysis provided a baseline description of activity. Second, a content analysis looked for differences in quality, classifying messages as directly

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addressing users by name, including non-verbal communication, reacting to prior content, asking a question, relating to the announced topic, containing positive or negative comments, and disagreeing. Chi-squares and Cramer Vs tested relationships between past activity and quality measures in a two by five contingency table (leaders/nonleaders by life cycle).

The descriptive analysis found an activity level that was highly skewed. The great bulk of weekly measures had no activity in many of the qualitative categories. This non-normal distribution limits the range of appropriate statistical analyses and thus has important implications for future studies. Most messages were on topic (94%). Few contained personal remarks (7% positive, 2% negative) or direct disagreements (7%). Using the name of another user (44%) was common, as was non-verbal communication (39%).

The content analysis revealed some effects of both life cycle and participant class on qualitative aspects of forum interaction. Forum leaders sent 55% of all messages and were more likely to add messages when the forum was at its highest level of activity ("super-resonance"). Non-leaders participated more as a topic was beginning to gain momentum. Non-leaders were more likely to give opinions and ask questions.

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For the Foundations:

Albert and Irene Dick

Pop and Lorena Jahn

ACKNOWLEDGMENTS

Anyone that reads a dissertation must know that it is not a just another book. This study marks the end of the biggest challenge of my life. Looking back over the last six years, I feel a little guilty about putting only my name on the cover. So many people helped with this process that it is hard to know where to begin.

I feel privileged to have been a part of the Mass Media Ph.D. program at Michigan State University (MSU). I enjoyed an environment that could not help but produce personal growth. At MSU, my life was guided both personally and academically by Thomas Muth — a friend and mentor. As much as anyone, he gave me the means to finish this project.

One guide was not enough for me. I needed more help. As head of my committee, Carrie Heeter of MSU's Comm Tech Lab provided hours of assistance on this project and on preliminary studies. She was my main supporter and most valuable critic. Her input gave this project its life and rigor.

The statistical analysis in this project cost many late nights. It would not be where it is without the help of one more person. Stephen Lacy had to endure many wrong turns and extend my education in statistical analysis. By stepping into the process near the end, Dr. Lacy had to work extra hard to understand the

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Finally, Lucinda Davenport was a patient counselor and supporter. She provided an important alternative point of view and the objective criticism needed to improve this project.

Many other people at Michigan State were there to field ideas and aggravation in the early versions of this project — most importantly Joseph Straubhaar, Rosemarie Alexander.

From an operational standpoint, I must thank a great group of coders — Adam Brochert, Steve Wamsley and Jason Spencer. They worked hard and did an excellent job.

Financial support for most of this project came from the Department of Telecommunication at MSU under the direction of Barry Litman and Bradley Greenberg. Also, it is necessary to thank Dale Gadd and Millard Jones of McNeese State University for their support during the last few months of the writing process. It is always a good sign when a new employer can invest in such an effort.

Finally, any graduate program is as difficult on the family as it is on the student. Special awards should be given to my family for their support through the years. My parents Thomas and JoAnn Dick endured many years where I was just too busy for a normal life while supporting me with many small loans. My dear wife, Hsiu-Yueh Hsu, had to live in the austerity of a graduate student while taking on extra work for herself such as hand holding, housecleaning, and keyboarding. Without these people this work could never have been started.

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CHAPTER ONE
INTRODUCTION

What if you gave a party and no one comes? Telecomputing[1] system operators (sysops) must face this question on a daily basis. A communication system can not be effective unless there is someone with whom to communicate. The success of any system is therefor dependent on sysop's ability to collect a willing group to exchange communication. The challenge faced by the sysop is the creation of an electronic environment that encourages such an exchange.

The sysops' challenge becomes most immediately visible in the telecomputing forum[2]. Forums are computer communication systems that allow time-shifted (asynchronous) conversations. These conversations require that participants leave a message hoping that others will reward their effort with an answer. In the forum, a group of individuals must make their commitment to such an exchange independently with the risk that others may to participate elsewhere (or not at all). In such a situation, their time (money) and effort will be wasted.

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[1]Telecomputing is any synergistic combination of computers, telephony and mass media technology. It results in a wide variety of products and will be discussed in more detain in the next chapter.

[2]Hereafter refereed to as simply a "forum" unless otherwise noted.

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While it is reasonable to believe that a certain amount of activity is necessary, the question remains, the question must be "How does activity affect interaction?" Logically, too little activity would cause people to look elsewhere. Too much activity, or the wrong type of activity, may be just as problematic. For example, a person wishing a conversation may avoid an empty room, a room full of children, and a raucous bar in favor of some other place. The forum manager must create an area where current messages will hopefully inspire future messages. If successful, the number of participants[3] grows, and forum continues as a potentially valuable communication center.[4] If not, messages go unanswered, participants feel unrewarded and participants eventually look elsewhere.

It has been suggested by earlier researchers (Allen, 1988; Hiltz, 1984; Markus, 1990; Rice, Grant, Schmitz, & Torobin, 1990) that some minimum amount of activity will make a critical difference in the success or failure of any communication media. The analogy is then drawn between this minimum amount of activity needed for a communication medium to succeed and the minimum amount of nuclear fuel necessary for a chain reaction — called a critical mass. The goals of this dissertation are to study the rise and fall of forum interaction and to develop the concept of critical mass into something

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[3]Herein, "participants' reefers to only those that actually send messages on the forum as opposed to "visitors" that read messages but do not send any. The word "users" will be a general class of both participants and visitors.

[4]The value of the forum may be either social (exchange of ideas), professional (exchange of information and business contacts), or economic (the sale of telecomputing time and resale of forum transcripts).

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more useful to forum management. Specifically, this study will do three things:

- Characterize and describe forum activity in its own terms.
- Describe qualitative differences in forum activity.
- Develop a greater understanding of the growth process in activity.

This study takes advantage of a unique opportunity. It has become possible to study independently established forums[5] in enough quantity for better generalizability. Until recently, it has been impractical to collect more than anecdotal information on forum activity. The results of this study can be applied to at least two general areas of research — telecomputing and sociology.

Importance to Telecomputing

The telecomputing forum is a successful product for an increasingly important industry. Reliable prediction of forum traffic is the first step in establishing professional forum management. In order to understand the unique environment of telecomputing, you must first understand the factors that motivate both participants and managers. By creating a set of reasonable expectations, we will be creating forums that better serve the needs of both their participants and their providers.

Inaccessible systems and the lack of experienced users have forced researchers to create their own telecomputing services, stocked with their own people, and with their own definitions of

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[5]Rather than forums established by the researcher or new systems that are not fully mature.

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success. Results were measured against these assumed definitions of anticipated use. The results of these projects were not only dependent on the success of the technology but also on the researchers' ability to manage that technology (Lea, 1991). This project intends to look at telecomputing from another perspective. By allowing an active system to set its own definitions of success, success (or failure) is measured within a more realistic frame (Briggs, 1988).

In addition, it is time that we looked seriously at the qualitative aspect of forum interaction. Previous studies have looked at qualitative aspect of telecomputing interaction (Anderson & Walther, 1992; Chesebro & Bonsall, 1989; Lazowski & Andersen, 1990; Rice & Gail, 1987) but these studies have either been mainly theoretical or suffered from the same effects of pre-conceived notions. While it is not believed that the results for this study can be generalized to all forums, it is hoped that this dissertation can move the study of forum activity into a more realistic frame.

Importance to Sociology

The communication theories that describe the adoption and success of a new medium are built on the sociology theories that describe the process by which people come together for a common goal. The classic studies (discussed in Chapter Three) try to predict the developments of riots (Granovetter, 1978; McPhail & Wohlstein, 1983) or civic organizations (Tillock & Morrison, 1979). While these examples may seem quite distant from telecomputing forums (and each other), the same forces are acting on potential participants.

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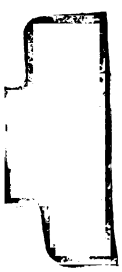
- Participation requires cost or risk.
- Non-participation will not require cost.
- A common good may be produced without participation.
- The common good is available to all, even those that did not participate in its creation.

In riots, civic organizations, and forums, people must choose to invest in a common good. If successful, everyone will able to benefit from their effort. If not successful, only those that invested effort (or money) will lose. From the standpoint of a potential participant's decision, the difference between a riot and a few malcontents in a crowd is similar to the difference between successful and unsuccessful forums.

Forum represents both a communication medium and a collection of individual that must make a joint investment for a common good. The forum participant must do more than adopt the medium. They must also invest in a project that is only successful if others act in a similar way (i.e., send messages back).

The development of collective action theory has been extensively developed but has suffered in field trials due to the inability to accurately record growth. Forums not only facilitate conversation, they also record it. By using transcripts of forum conversation, complete, long-term records can be studied. Also, most collective action research limits itself to the startup period of an event and to only one event at a time. Forums offer the researcher more choices. First, the computer's ability to store messages creates an accurate record of the entire collective action — from creation to degeneration. Second, users have more than a binary choice to participate or not



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Through a return to communication's roots in sociology, mass communication research can come full circle. To accommodate the needs of the media, mass communication research has moved from point-to-point communication to point-to-multipoint communication models. Telecomputing requires that we reconsider the original point-to-point models in order to accommodate the possibility of a multipoint-to-multipoint communication model (McQuail, 1987; Reardon & Rogers, 1988; Rogers, 1986).

Organization of this Study

The content of this dissertation must cross the line between technology and sociology. Depending on the background of the reader, a more detailed explanation is needed in at least one of these areas. There are two main areas of prior literature that must be discussed — telecomputing and collective action. Chapter Two will discuss telecomputing technology and prior telecomputing studies. Chapter Three will review critical mass and collective action theories. These two areas were merged in a prior study with the same data set. This prior study set an important variable to be used here — the point of critical mass. The earlier study will be presented in Chapter Four. As a result of the findings in the prior study, a new model is create and proposed in Chapter Five.

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The goal of this dissertation is primarily descriptive — to understand what is taking place in a new medium. A description can be either qualitative or quantitative, but most powerfully both. The general plan for this study will be discussed in Chapter Six. Chapter Seven will contain the results of the study followed by a discussion in Chapter Eight.

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CHAPTER TWO
TELECOMPUTING TECHNOLOGY

It is easy to look at an individual technology as a nearly random occurrence — brought on by the inspiration of its developers. In doing this, the larger picture is dismissed. Although this study concentrates on one form of telecomputing, the forum is *only* one application in a group of technologies brought on by the convergence of three established industries. Telecomputing is the synergistic convergence of computers, telephony and mass media technologies. The combination of these technologies has created more than new services; it has created a new medium for communication and a new environment for business. As such, not one but many new products and services have developed.

Although the forum is an important product, no telecomputing system offers only forums.[6] The following section describes telecomputing products and services[7] in relationship to one another. The intent of this first sub-section is to give the reader a sense of the what telecomputing could be. After that there will be a more in-depth discussion of the forum.

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[6]If nothing else, telecomputing systems offer private electronic mail.

[7]Although telecomputing can result in both products and services — depending on your definition— the use of both terms is rather redundant. For this study, the term "product" will be used as generic for both.

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World of Telecomputing

The combined advantages of the three parent technologies create an extremely flexible variety of products. First, the telephone network gives users the ability to bridge space by providing nearly unlimited access. Users can replace transportation (travel to see one another) with telecommunication (visit via telephone). But the telephone network is structured to favor point-to-point interpersonal communication. It lacks a strong ability to provide real point-to-multipoint communication (Lazer, Elton, Hohnson, & al., 1983).

Second, computers offer users the ability to manage, manipulate and produce information. The system works for users by bridging intelligence. The user is able to access the intelligence of the programmer through the computer (i.e., ability to file, sort, etc.). The computer has traditionally been a more isolated tool with a limited audience for each product. Until computers are connected to a network, their ability to distribute information is limited to disk.

Although mass media provide neither the interactivity nor the installed intelligence of the other parent industries, they can provide what the media do best. Not only do mass media provide information and entertainment, but — due to their traditional reliance on advertising — they have a unique ability to identify markets.[8] In this way, the media provide bridges between groups of people — information producers and consumers.

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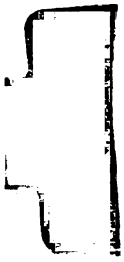
[8]Unlike most other industries, the mass media must not only sell its own products (programs, stories, ect.) but, in order to sell advertising, must find buyers for the products of other people.



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Product Classification

A synergistic combination is accomplished when the ability of one technology supplants an original limitation of another. This result in not a single product but rather, like kaleidoscopic images, a group of loosely related products spread across three dimensions: social presence, distribution and intelligence.

Social Presence

Short, Williams and Christie (Short, Williams, & Christie, 1976) conceptualized communication media as falling along a continuum of "social presence." Social presence is defined as the degree to which the medium facilitates the awareness of the other person and interpersonal relationships during the interaction. Under their theory of social presence, face-to-face communication would have the greatest presence, followed by teleconferencing, then written communication (among others).

Telecomputing can extend many levels of social presence from simple access to remote computers (e.g., providing access to a database of citations) with little or no social presence to online chats with more social presence.[9] The amount of social presence is effectively the level of interaction *with another person* allowed by the system. For example, individual computer games have become very popular but usually only one person can play at a time (or at least take turns playing). Telecomputing enhances gaming by allowing people to do more than to sit in a single location and race or

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[9]The "online chat" creates a direct connection between telecomputing users for real-time conversations.

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battle each other (or the computer). In games such as GEnie's *Federation II*, a true cyberspace is created. These games provide an alternative universe for users to interact and explore together or in competition. Users are no longer limited to assigned adversaries and structured duties. The character encountered in these games is not computer generated but another user with all of the possibilities of such a relationship. The computer game is was a tool for entertainment but the cyberspace game is a medium of communication.

Distribution

The traditional model of communication implies a rather simple relationship of communication from sender through a medium to receiver. Mass communication is accomplished when there are multiple receivers to a single message. The result is a rather simplistic understanding of information distribution with two possible choices — point-to-point and point-to-multipoint communication. Telecomputing creates practical alternatives to traditional communication distribution including multipoint-to-point and multipoint-to-multipoint (Rogers, 1986). Multipoint-to-point communication takes place as one receiver is the target of communication from many senders.

For example, telecomputing facilitates the growing trend towards reverse advertising — where consumers communicate their desires to a product manufacture. The goal of reverse advertising is to solicit opinions from customers and to manage the complaints, comments and input of users. The bulk of the communication comes from many

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Multipoint-to-multipoint communication takes place as work groups and online forums communicate in a open electronic space. Teleconferencing systems and telephone chat lines are examples of multipoint-to-multipoint communication. With such services, the intent is to share information. Telecomputing provides a common electronic space. The major flow of the communication is neither from any definable point nor to any definable point. Rather, the flow of the communication is from participants to the group. It is impractical to think of these distribution systems as either point-to-point or point-to-multipoint communication because the participants' expectation of the message is not the same. The level of distribution is therefore defined by the number of possible participants for a medium not just the number of receivers.

Intelligence

The amount of installed intelligence gives the system the ability to modify, create or add value to a product. For example, database services add intelligence to the original paper volumes by allowing automated searching of information. Clipping services[10] and expert systems[11] are an additional advancement over database services with even more installed intelligence. The installed intelligence

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[10]"Clipping services" automatically scan incoming files from news or other information services and forward files to users which meet a search criteria set by the users.

[11]"Expert systems" are programs that attempt to endow computers with the ability to imitate the thought processes of humans or act as an intelligent assistant, providing advice and making judgments in a specialized area of expertise (Rosenberg, 1987, p.221).

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allows users to "bridge intelligence" by giving the user access to the programmers ability. As the systems advance, they take more work away from the users and must get more intelligent to accomplish their tasks. Intelligence adds value to the relatively unintelligent distribution systems of the telephone and mass media.[12]

Mapping Products [13]

Telecomputing has resulted in many new products. If each product were plotted along the dimensions described above, the result would be a true (three dimensional) world of products. It is inevitable that this "world of products" will come about but, to date, telecomputing rarely makes use of intelligence needed to add value and capabilities. Though computers are low-cost facilitators for many telecomputing products, it is not yet possible to distribute more intelligent services such as virtual reality,[14] hypermedia[15] and artificial intelligence[16] For now, the two-axis model, in Figure 1, provides a good description of current products.

The horizontal axis accounts for the level of distribution and the vertical axis the level of social presence. In point-to-point

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[12]See discussion below of value-added services.

[13]Even though telecomputing creates services (e.g., electronic mail) as well as products (e.g., online newspapers), the term "product" will be used to refer to both.

[14]"Virtual reality" is a functional simulation of a environment (real or computer-generated) which allows users to enter and interact with that environment without physically traveling to it.

[15]"Hypermedia" is a general class of programs or instruction sets which allows users to access multichannel information in a non-linear manner.

[16]"Artificial intelligence" is the capability of a device to perform functions that are normally associated with human intelligence, such as reasoning, learning and learning (Rosenberg, 1987). Note that artificial intelligence technology is often necessary in "expert systems" but is not necessarily used in expert systems.

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telecomputing, the service acts very much like a common carrier by delivering little more than a simple channel of communication such as electronic mail or and interactive link to another computer. At the other extreme are mass delivery services such as online publications and electronic auditoriums.[17] In the midrange of this continuum, telecomputing functions as an enhanced communication or distribution channel for a product with a limited audience.

The vertical axis charts telecomputing's social presence. At one extreme (high social presence), there are "live' services such as teleconferencing and online chatting. At the other extreme (low social presence), telecomputing provides a means to access remote systems such as banking, information retrieval or mainframe computer services. At the midrange, telecomputing allows time-shifting or asynchronous communication. The vertical axis therefore becomes a continuum from no access with another person to direct (real-time) interaction.

[17]The "Electronic Auditorium" is similar to a teleconference but enforces a virtual stage where certain participants are allowed to talk freely while others must ask permission to talk or send questions/comments through a moderator.

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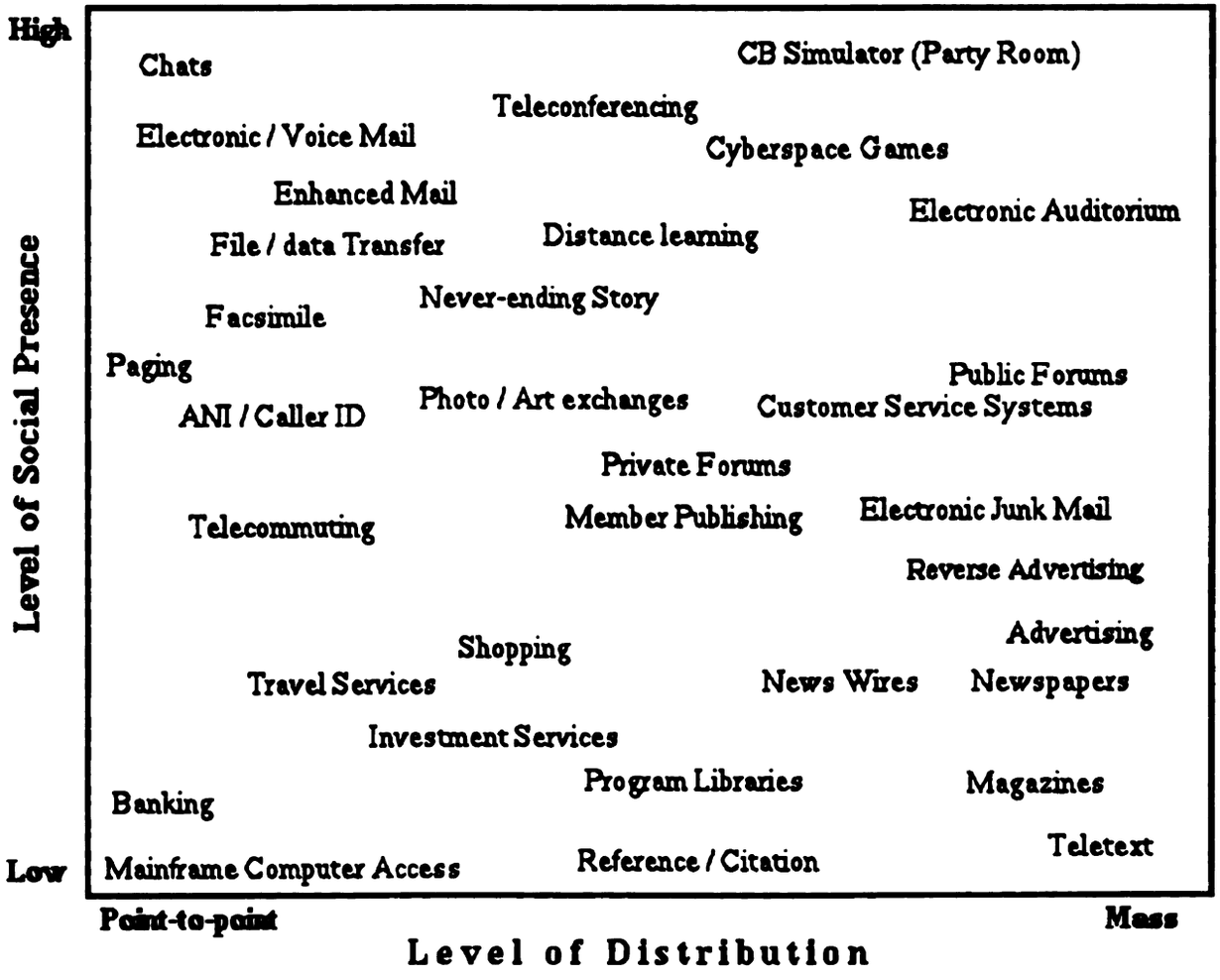
FIGURE 1
WORLD OF TELECOMPUTING PRODUCTS[18]



[18]Figure One is intended to show a snapshot of current telecomputing products. Please read the next sub-section for a discussion of individual products.

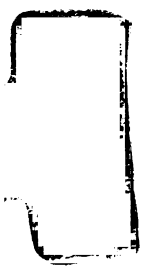
The World of Products

By now, it should come as no surprise that there is no "typical" telecomputing product. Products have evolved through the efforts of many people working independently. The result is the myriad of products that are continually changing. What follows is a discussion of the current products pictured in Figure 1. Since telecomputing is continually changing, any description may be quickly out of date. This section is intended to illustrate the diversity of products. It is not intended to act as a definitive categorization and definition of products.

The first temptation is to classify products by their parent industries. For certain products such a classification system makes sense but the synergistic convergence of the technologies has moved most products far from their parent industries. Although there are many other possible categories for products (all of which would be somewhat inaccurate), the products pictured in Figure 1 will be discussed as five basic categories: 1.) Real-time products; 2.) Data-transfer; 3.) Computer products; 4.) Online publications; and 5.) Time-shifted interaction.

Real-time Products

Real-time products provide just what the name implies -- real-time or live communication including: online chats; teleconferencing; distance learning; electronic auditoriums; cyberspace games; and CB simulators. The technology for these services is basically the same. The main differences are the number of participants and the resulting structure of the interaction.



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Chat lines allow conversation between two or more people — usually text-only.[19] Close cousins to the online chat are data teleconferences and CB simulators (sometimes called party rooms). The teleconference has a planned, stated, discussion topic or reason for being (Lazer, 1983). CB Simulators, the name coined from citizen band radio, are completely open, free-form discussion areas where any number of people can participate. In both cases, multiple people can interact at once but the structure of the conversation is slightly altered by their different purposes.

Very similar to teleconferencing are electronic auditoriums and distant learning systems. The simple link is enhanced with system software[20] that enforces additional structure to the conversation by creating different classes of users with differing freedom to send messages.[21] Distant learning systems allow for education through telecomputing and therefor becomes a highly structured teleconference. A popular use for the electronic auditorium is the "game show." Game show participants will assemble at a pre-arranged time for a contest of some sort (e.g., trivia contest, bad joke contest, etc.). In both cases, there are identified discussion leaders and audience members.

The most advanced real-time technology is the cyberspace game. Not only must there be a link between individuals but the host

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[19]America Online currently allows a limited amount of sound to be transmitted. A main use for the chat is for the sysop to talk directly to visitors.

[20]The telecomputing host software will simply not accept messages from unauthorized users or transmit the messages to a moderator only.

[21]Often sysops will move a popular teleconference from a normal meeting room to an electronic auditorium. This is either done for by host software (as described above) or enforce rules of behavior on participants.

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software must function as an extended-time game. The games may last anywhere from several hours to several months. Also, there is a near necessity that most cyberspace games comprise several rooms so that interaction with the entire group is not necessary. The exploring nature of these games provides close interaction with many people but not all at once.

Data Transfer

Probably the technology most identified as telecomputing are those where data is managed or transmitted including: electronic mail; voice mail; enhanced mail; file/data transfer; facsimile; paging; and ANI/caller ID. The popularity of these products is understandable since they are basically delivery services with clear analogies outside telecomputing.

Electronic/voice mail, file/data transfer, paging and facsimile are the simplest of these products. The computer must simply forward the message to the correct person and possibly store it until they can receive it. The level of social presence on these products is relatively high because the receiver usually knows the sender.[22] As systems advance, social presence may be better felt to a greater extent by other products (e.g., video mail) and these products will not have the same high level on the continuum.

Enhanced electronic mail provides an additional service over normal electronic mail. Frequently, the recipient of the enhanced mail is not a subscriber to electronic mail system. Enhanced mail

[22]See also electronic junk mail.

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may deliver the message to a post office close to the recipient. It may customize artwork or other information for the recipient (such as a Valentines' Day message) or based on the sender (and current needs of the sender). It has also been used effectively to facilitate political support for telecomputing information utilities. The enhanced mail system took user's messages, determined the correct congressional representative or senator, and mailed the user's sentiments to that person (or people).

ANI[23]/caller ID is the most unusual of the data delivery services because it does not deliver an isolated message. ANI/caller ID allows the receiver to know something about the person calling,[24] via a normal voice phone call, before the call is answered. As such, it acts only in conjunction with another message.

Participation in telecomputing necessarily reveals valuable information about users. For example, the person that spends times in a genealogy forum may be interested in purchasing genealogy products and information. Participation in any kind of forum suggests a person's economic status because they are able to buy the necessary equipment. Armed with this kind of information, electronic junk mail is growing. The junk mail can be sent to a large group of people yet still be personalized.

Forums are frequently used to facilitate contact between businesses and clients. Customer services systems not only allow

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[23]Automatic Number Identification

[24]Caller ID systems usually only display the phone number of the person calling but systems can (and ANI frequently does) display the name or other identifying information.

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communication among product users but will also take orders, track billing and distribute sales information to clients. These systems can become a source for reverse advertising. Users discuss problems with products and desires for new products. The manager of the customer service system gains valuable knowledge through clients' discussion. The system can also automatically track clients' orders to suggest future needs or alternatives for the client.

Computer Products

A great deal of work can be accomplished via telecomputing without direct interaction with another person. For example, when a person accesses a mainframe computer, human interaction is not necessary — sometimes not even desirable. The same is true for reference/citation databases and online banking. In this way, telecomputing is supplying access to computers with special ability and/or information rather than access to other people.

Telecommuting allows users to work (at least partially) at home rather than commuting to the office. As such, it is likely to require a mixture of products including file/data transfer, electronic mail, access to remote computers, and voice telephony. The main purpose, at least for now, have been to allow users to receive raw data at home and send completed work back to the office.

Three products, which are very similar, require a mixture of advertising, information distribution and data processing: 1.) online shopping; 2.) travel services; and 3.) investment services. In all three cases, service providers are attempting to sell products and services to people in the comfort of their home.

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Online Publications

For the most part, this category contains telecomputing extensions of the mass media. Online advertising, program (software) libraries,[25] magazines, news wires, and newspapers often simply redistribute products published in their traditional counterparts. Advertising products can take advantage of telecomputing's two-way link by allowing consumers the immediate opportunity to respond. Magazines and newspapers may accept letters to the editor through online services. Pure online publications (those with no traditional mass media counterpart) are going in popularity as well.

Teletext is left in the lower corner of Figure 1 because of the nature of its delivery system. By definition, teletext systems are broadcast to receivers through television signals. While this method of distribution makes them one of them one of the most widely available, interaction is not possible because the broadcast signal is strictly one-way. Therefore, social presence must be less than other services.

For people who desire more than simply being a part of a forum, users may choose to create and distribute their own publications online. Denise Caruso is an excellent example of member publishing with her weekly column and forum on America Online. For those with a more artistic flair, many telecomputing services offer the opportunity to exchange artwork or digitized photographs.

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[25]Software libraries are included in this group because it is assumed that they replace a similar bookstore style delivery of software.

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Time-Shifted Interaction

Time-shifted interaction is a general class of products that allow users to interact without the necessity of being present at the same time. These products — including public/private forums, never-ending stories, photo/art exchanges, member publishing, customer service systems, electronic junk mail, and reverse advertising — open the possibility of publishing to everyone. They allow users to exchange messages, ideas, art and expression with groups that would not be practical otherwise.

Any discussion of time-shifted interaction must start with the forum — one of the most universal telecomputing products. The purpose of the forum is to create a low cost communication center for people of similar interests. Users participate in time-shifted discussion groups or send large files and messages through forum libraries. The result is an organization that is half-way between a publication and a club. Sysops must garner the support of volunteers[26] in order to create an ongoing message exchange. This frequently means creating or editing discussion areas and finding new information for discussion. The next section will describe forums in more detail

Writers' forums have come up with an interesting variation on the typical forum conversation in the never-ending story. Participants take turns at writing a small section of a story and then read how others build on their work. While this may not produce great literature, it apparently makes for an interesting and active forum.

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[26]In commercial services, "volunteers" must actually pay for participation.

The Forum's Place in the World

The forum, as a type of time-shifted interaction, places itself squarely in the middle of the world of products. As such, it is easy for most sysops to offer forums as an extra service — the technology required is not far from what they are already doing. As an ongoing discussion, forums encourage users to return often and hopefully develop emotional ties to the system. In addition, there is an emotional satisfaction associated with the sysop knowing the people served. Often, forums are the main reason for the creation of a telecomputing system. As a result, forums have become a popular choice for both telecomputing sysops and users.

A Technology Primer

The first step in using a forum is creating a communication link between two computers. The model for this link is similar to the basic model for communication.[27] One computer must transmit a message over some medium to another computer. For purposes of clarity, the telecomputing service is the "host" computer and the user is the "remote" computer. Today, the medium is usually a standard telephone line — although cable television lines, optic fibers, radio waves and other computer networks (LANs) are also in use. Since they are the most common, the remainder of this section will concentrate on forums accessible through standard telephone lines.

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[27]The simplest model, Sender -> Medium -> Receiver, works well here.

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Remote Computer

The remote or user's computer must have two things — a telecommunication program and a modem. The telecommunication program tells the computer how to connect and communicate with the host computer. The modem acts as a translator between signals within a computer and those that can be transmitted over a standard telephone line.

Communication between computers of all types is easy through the use of a good telecommunication program. There are two types of telecommunication programs — general use and system-specific. The general use telecommunication program allows the user to access most systems with ease. It is designed to be as versatile as possible by allowing the user's computer to adapt to the needs of a variety of systems.[28] The system-specific telecommunication program is written for a specific telecomputing service. In general, these programs are easier to use and provide a more pleasant look (interface) to the user. As the name implies, they are designed to be used on only one telecomputing system and are given (or sold) to the user when service is started.

The signals used to communicate within the computer can not be transmitted over telephone lines. A modem, the name short for modulator/demodulator, translates the digital computer signal into and from an analog signal used in telephone networks. The primary measure of a modem is the speed at which it can transmit the analog

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[28]Some telecomputing systems require the use of different languages or codes for communication.

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signal — measured in baud. The early 1980's, saw the general use of 300 baud modems. By late in that century, 1200 baud modems became more normal. Today, faster modems are typically 2400 and 9600 baud. There is a near perfect relationship between these numbers and the rate at which data can be transferred (i.e., a 2400 baud modem is twice as fast as a 1200). The telephone link may cause a problem for faster modems. The greater the speed of the modem, the more likely there are to be errors in transmission. While automatic error checking can catch most problems, the modem will automatically request that problem data be resent. Resending data slows down transmission. If problems continue, software (or the user) can direct the modem to slow transmission. You gain accuracy but you lose the advantage of the faster modem.

The Host Computer

The person wishing to participate in a forum has three choices — BBS, information utilities or listservers. First, Bulletin Board Systems (BBS) provide a service generally limited in scope (in number of users and/or services available[29]) but an inexpensive local (or special interest) communication center. Today, any area probably supports about as many BBSs as they do radio stations. In addition, regional or national BBS are available for those with a special interest. For example, the Federal Communication Commission supports Statelink for those interested in its regulation.

Second, information utilities are national or regional subscription-

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[29] For more information on other services available via telecomputing (Dick & Alexander, 1990).

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based services with larger audiences and more ability (i.e., products and services). They provide users with the ability to contact a more specialized group of people. For example, instead of a health forum on the local BBS, the information utility may have a diabetes interest group. The national service is augmented by networks of low-cost long-distance telephone lines called packetnets. Packetnets allow the user to call a local telephone number and connect to the national service. Packetnets combine the signals from many computers to share a telephone line and its cost.

The third choice is the result of cooperation between telecomputing systems. Listservers use the basic technology of electronic mail to create the forum environment. Rather than messages being stored in one location and users electronically traveling to that location, listservers are basically mailing lists. The participant wishing to participate in the forum mails a message to the listserve and the listserve mails the message to everyone on the mailing list.[30] Listservers have become popular because they do not rely on all participants being on a single system. Instead, participants need only be on a shared network.

The Forum's Environment

The forum's environment is analogous to a well-organized physical (traditional) bulletin board.[31] Users are invited to "post" messages while the host computer keeps the messages organized by

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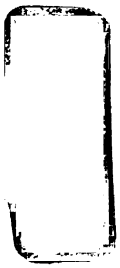
[30]Some listservers collect a group of messages before sending them out.

[31] Bulletin board is an early name for the forum. To avoid confusion with BBS, the term forum or special interest group (SIG) has been adopted by most systems and users.



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topic and time. Users may leave messages on either a new or existing topic of conversation. Sysops moderate the discussion by soliciting opinions, negotiating disputes and creating, ending or dividing topics of conversation.

The forum offers the advantage of asynchronous communication — users need not be present at the same time. Most BBS and information utilities contain multiple forums generally defined by subject. The forums are then divided into sub-areas or categories and sometimes further divided into topic areas. Finally, the messages are grouped together with the earlier messages on the same topic. These groups of messages, called strings (of messages),[32] can then be read as a unit (See Figure 2). For example, an information utility may contain forums on Germany, music and military affairs. Separate discussion areas (categories) within the military forum might include the Gulf War, veterans' issues and weapons systems. When entering the weapon systems category, the user may find active topics such as the latest model of tank or the Patriot missile. Strings, found within a discussion area, may be as short as a single question, and answer, or as in-depth as a lengthy interchange involving several people.

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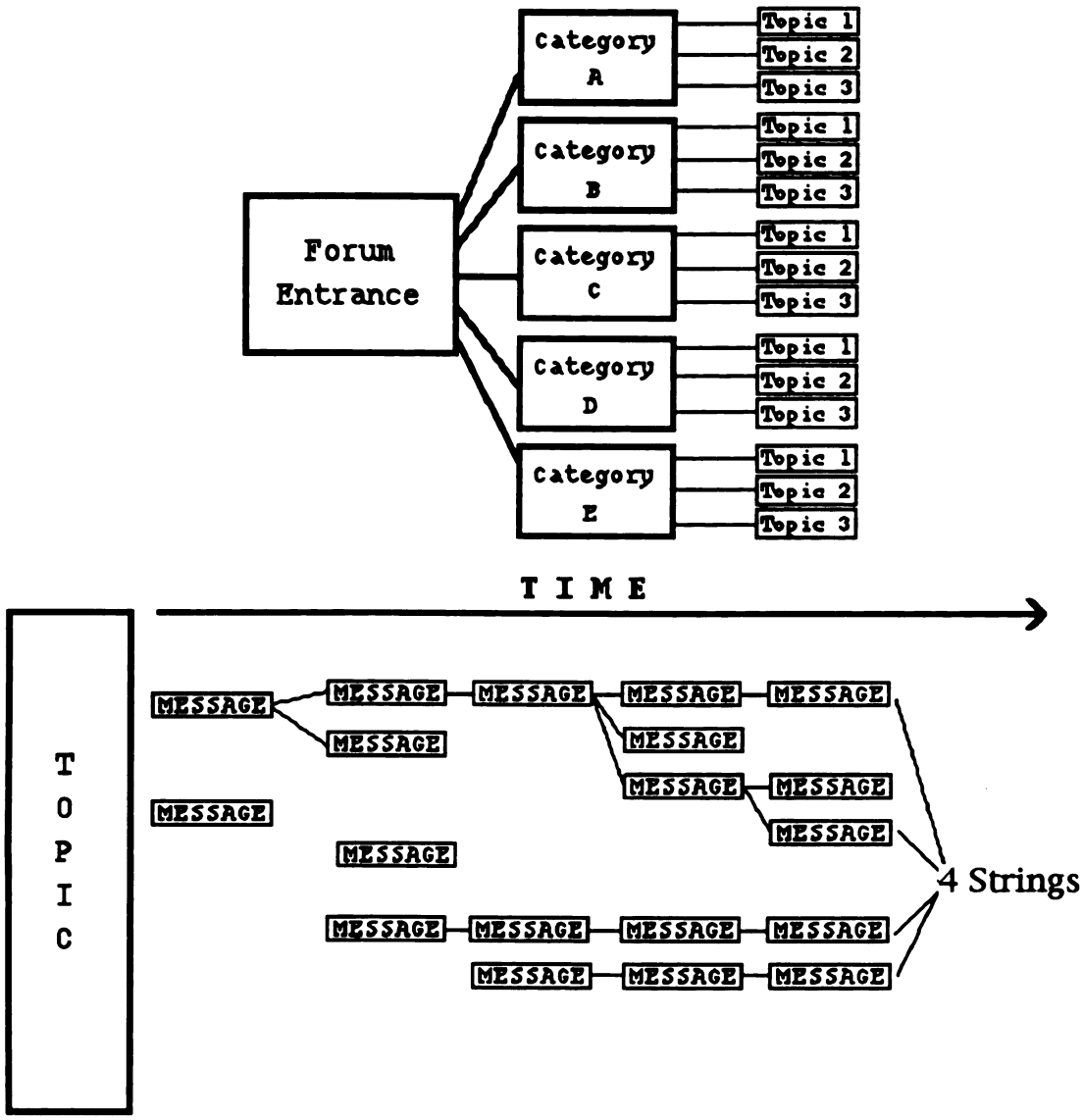
[32] On some systems, threads are called "strings."

FIGURE 2

A TYPICAL FORUM LAYOUT



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[33]SAPs are ar
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Forum communication seems more like verbal conversation than that which is generally found in print. Online comments take on a quality that seems less formal, more spontaneous and interactive than those seen in letters, memos or publications. For example, Figure 3 was found on CompuServe's Broadcast Professional's forum about second audio program channels (SAP[33]). The "conversation" lasted six days (2/24/90 to 3/1/90) but, with some alterations, it could sound "live." Online messages frequently seem as if they are occurring in the middle of a party or classroom. The exchanges lack real direction and often each user simply reacts to previous messages.

[33]SAPs are an extra audio channel (beyond the stereo signal) on an FM or television audio signal.

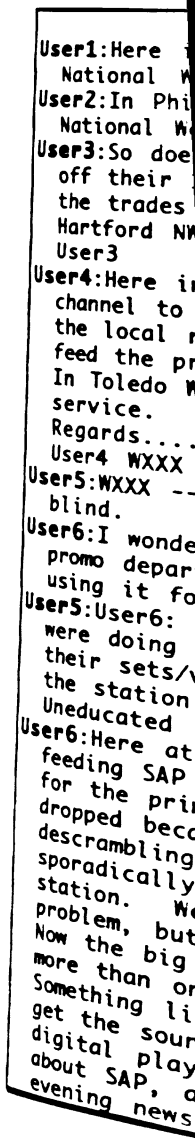

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FIGURE 3[34]

EXAMPLE OF ONLINE "CONVERSATION"

[Personal information omitted]

User1:Here in Atlanta, WXXX-TV uses their SAP channel to broadcast the National Weather Service.

User2:In Philly, WXXX-TV uses SAP for broadcasting weather from the National Weather Service. It comes in handy! --User2

User3:So does WXXX (XXX) in Milwaukee. Gee, the NWS might as well shut off their 162.xxx MHz transmitters & just use SAPs! I read in some of the trades where a FM station in Connecticut has been relaying Hartford NWS on their MAIN carrier while preparing a format change... User3

User4:Here in Detroit WXXY-TV Ch2 (XXX affliate) is using their SAP channel to do a "closed circuit" feed of their daily news promos for the local radio spots. About 3pm weekdays the SAP lights up and they feed the promo repeatedly for a half hour or so then dump the SAP. In Toledo WXXZ-TV Ch-- is using SAP for a reading for the blind service.
Regards....
User4 WXXX Detroit

User5:WXXX -- in Miami (XXX secondary) uses SAP for reading for the blind.

User6:I wonder if anyone is using SAP for promotion. O.K., I know promo departments are strapped for time, but I wonder if anybody's using it for program listing or the like.

User5:User6: possibly...that sounds familiar....I thought some folks were doing that....problem is lots of people get cornfused and leave their sets/vcrs on SAP and wonder why they get the wrong stuff (if the station has SAP)
Uneducated users...User5

User6:Here at WXXX-TV we had a continuoudsly repeating cart deck feeding SAP back in 1985 for about six months. The copy was a promo for the prime time lineup and an occationalspecial. The SAP was dropped because an intermod product from it interfered with the descrambling circuits of certain cable company's boxes, and would sporadically tell the boxes to "unscramble" our (non-scrambled) station. We worked with the cable company to enentually solve the problem, but the promo carts never returned.
Now the big challenge with SAP is educating the viewers. I've taken more than one call berating us for "screwing up" their sound. Something like "you have no business being on TV if you can't even get the sound to match the picture!" We may be trying a multiple-cut digital playback unit which rotates an "educational" announcement about SAP, a forecast, and an evening lineup. We may also distribute evening news promos to radio stations, ...

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[34] The messages represented in this Figure were taken from a normal time-shifted forum string. This was not a live teleconference. Header information (e.g., sender's name, message number, subject, time, date, ect.) was omitted to reduce space requirements. Information that identifies the participants or their companies was omitted as well.

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The forum gives its participants a very narrow sensory window. Users are deprived of not only images and sounds, but also other identifying factors such as location from which the message was sent, demographic, and socioeconomic status indicators of the sender.[35] Although forums strip messages down to the participant's actual words,[36] this lack of contextual information can help to build an environment conducive to information exchange. Forum participants are equal in status and less constrained by group pressure than face-to-face interactions (Lazowski & Andersen, 1990; Lea & Spears, 1991). The narrow window created by the forum works in two ways. Not only does it hide information about the users, it also hides information from users. Unfortunately, a forum participant will have very little indication who, if anyone, is currently visiting the forum. Some people will choose to visit without participating in the discussion. Since most forums poorly communicate the presence of visitors, an active area may *seem* inactive if it lacks discussion participants.

Potential for the Future

Despite the problems, the convenience of asynchronous communication combined with the low cost computer link creates a communication center which has previously been impractical, and offers new dynamics for human communication.

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[35] Unless the user volunteers this information through online comments or an online directory service, this information can be hidden.

[36] Shorthand has been developed to replace nonverbal behavior. These symbols are normally used to prevent messages from being misinterpreted. For example, a joke may be followed by a wink ;) or a smile :) to make it seem friendly rather than insulting (viewed sideways).

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Market analysis

Access to the needed equipment and ability (desire) to use telecomputing limits access. In surveys of active systems, both Dick (1985), Garramone (1986) and Lansing (1992) (Dick, 1986; Garramone, Harris, & Anderson, 1986)found that the ninety-five percent of the respondents were male, that the mean age was about 33.5 (Garramone 33.7, Lansing - median 30-39) and that users possessed a higher than average education level (Dick - 72 percent bachelor's degree, Garramone - median education 15.69 years, Lansing, 40% some college).[37] In addition, Lansing found that seventy-six percent of BBS users were white.

Despite early failures in the mid 1980s,[38] the market is growing — especially the business market (Bowen, 1992; Han, 1992; Herbst, 1991). High speed modem, advanced packetswitching networks and local area networks are almost universally on the increase. As for non-commercial market, the greatest efforts seems to come from a grass-roots effort. Wood (Wood, 1990) claims that there are sixteen-thousand public BBS in the United States (although 84,000 more belong to the business market). Lansing (1992) indicates that at least one non-commercial network, has grown considerably internationally. In education, Internet/Bitnet access is widespread in forty-seven countries and available in many more.[39] There is little reason why this market can not grow into a profitable industry. Jennewein (1989) (Jennewein, 1989) maintained that there is an

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[37]See also (Collins-Jarvis, 1992) and (Bates & Lansing, 1992)

[38]Such as Knight-Ridder's Viewtron and Time-Mirror's Gateway services.

[39]According to an Internet information sheet distibuted online.

untapped market for the delivery of information to an audience of fifty to fifty-thousand in the first twenty-four hours. Dick (Dick, 1992b ; Dick & Alexander, 1990) described the current BBS market as being similar to the early days of radio. There is a mixture of commercial and non-commercial services with a great variation is service types and financial support structures.

Social Effects

The development of new communication technologies has done more than simply create new media, it has created new challenges for researchers and society. It is generally agreed among researchers that the new media will lead to a more demassified society — one in which there will be a growing dependence on media products designed for a smaller audience (Aumente, 1989; Rogers, 1990; Williams, 1988). What Rogers (Rogers, 1986; Rogers, 1990) described as an increase in interactivity, asynchronicity and de-massification now challenges our current models of communication (Cathcart & Gumpert, 1983; Cutler, 1992; McQuail, 1987; Mundorf, Dholakia, & Dholakia, 1992). Our models need to be redefined in order to be sensitive to the more interactive environment of the media (Reardon & Rogers, 1988).

These challenges have resulted in new opportunities for researchers willing to try new methods (Briggs, 1988; Lea, 1991; Rice & Barnett, 1986). The research advantage of telecomputing is an increased passive record keeping that allows more detailed information about participants.[40]

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The question the becomes, "How do you model the new communication media?" Is it interpersonal, mass communication or something else? In separate articles Fulk, Ball-Rokeach and Walther (Ball-Rokeach & Reardon, 1988; Fulk, Schmitz, & Schwarz, 1991; Walther, 1992a; Walther, 1992b) agreed that new models are needed for the environment. Models must account for motivations of users and the richness of the media.[41]

Problems with Forums

But forums do have a few problems. First, forums tend to be labor intensive for the sysop(s). Messages must be read on a regular basis to answer questions and filter-out problematic material. Otherwise, conversations can die for lack of a good question; stray well off topic; include inappropriate language; or even include material causes legal problems for the sysop (e.g., libel, or stolen credit card numbers, Carroll, 1991).[42] While individual sysops must determine for themselves the type of environment they wish to foster, the maintenance of that environment takes time.

Second, forums take computer space and time as well. Due to the asynchronicity of the media, messages are often kept for an extended period of time. Weeks, even months, may go by without a response to a relatively active topic. In addition, due to the relatively free-wheeling nature of conversation, just about any topic may become

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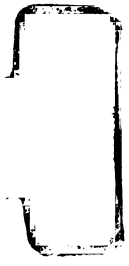
increased risk of privacy invasions.

[41]See Social Presence subsection above

[42]While sysops' level of responsibility for the illegal or tortuous acts of users is not yet known, most sysops prefer to avoid these situations.



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interesting at any time. Considering the cost of storage media (for areas with no messages), it is often cheaper to keep inactive areas than it is to throw them away. Users may take up computer time by composing messages while online. The telecomputing system must then devote computer resources and the telephone connection during the relatively slow processes of writing.[43] These problems force the telecomputing system to invest in larger storage capacity and more phone lines that might otherwise be necessary.

Finally, as the most visible means for users to perceive system activity, inactive or ineffective forums reflect on the telecomputing system itself. Whatever prestige is gained by system activity is gained through the forums. Often, the only real means of seeing other users is in the forums.[44] Like the restaurant parking lot with too few cars, the inactive forum area can impact on the success of the entire system by giving the impression of inactivity.

Previous Studies in Forums [45]

The attractiveness of telecomputing for research proposes has resulted in an enormous variety of previous studies. Many of these studies considered telecomputing affects on purposive or task oriented behavior. For the most part these studies took a traditional laboratory approach. A contingency table of communication media

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[43]Newer systems often encourage users to write responses off-line through per-minute charges, time-limits or new software that makes it easy to respond to messages while not connected to the telecomputing service.

[44]While most systems keep and publish a user list, these lists are usually over-populated with inactive or one-time users. In addition, on any decent system, the user list should be too large to bother reading.

[45]See also the critical mass studies discussed in the next chapter.

versus problem type was compared to evaluate the possible use of the technology in the business environment.[46] To summarize the results of these studies indicated an equivalent quality of decisions, with a more even participation, but a longer decision process. For the most part these studies looked at real-time interaction versus various telecomputing systems.

The effect of the technology became clearer with time-shifted interaction studies. In particular, the emotional aspect of the communications (Anderson & Walther, 1992). were shown to develop as system culture or community also develops (Kiesler, Jane, & McGuire, 1984; Phillips, 1983). The majority of these studies considers the effects of the anonymity allowed by the communication. Some researchers believed that anonymity allows for more equal communication (Lazowski & Andersen, 1990; Lea & Spears, 1991; Rice & Gail, 1987), but others support the idea that there is still a significant effect of personal power which could be detrimental (Collins-Jarvis, 1992; Hiemstra, 1982; Selfe & Meyer, 1991).

The final conclusion of these studies must be that there are different groups (or classes of users) within the online community. Just as in the rest of society, different people are affected differently by the communication environment.

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[46]There are too many of these studies to list but the best include: (Hiltz, 1988; Hiltz, Johnson, & Turnoff, 1986; Steinfield & Dick, 1989; Steinfield, 1986)

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Summary

Telecomputing involves the use of quickly evolving technologies. While it is not necessary for the reader to understand the technology, it is often helpful to anticipate changes. It is really only necessary for this study to understand that forums are a text-based time-shifted communication media. Forum allow convenient, low-cost, long-distance interactions. Naturally, forums create a unique environment for communication with possible effects on the interpersonal interaction. For the purposes of this study, the relationship between forum participants will be considered equivalent to groups with similar emotional ties. For the most part, this means that the forum is a group of non-family, non-peers and non-colleagues. While such a group may seem rather rare, such a description would fit many public organizations such as interest groups (e.g., PTA, Cancer Society), self-help groups (e.g., Alcoholics Anonymous, singles clubs) and professional societies. The next chapter will look at the development of such groups in light of the individual decisions that are necessary for their formation.

CHAPTER THREE
CRITICAL MASS AND COLLECTIVE ACTION

The theoretical foundations for this study are rooted two different areas. First, the growth of individual forums are logically tied to the growth of communication services as a whole. Second, the forum is a group effort. As a group effort, sociology theories of group formation become important. This chapter will survey these two areas to put the current study in context.

Critical Mass Analogy

Critical mass is not a single theory as much as it is a general concept upon which theoretical models have been built. The original analogy generally refers to the term's proper use in physics — the minimum amount of nuclear fuel necessary for a chain reaction to take place (Barnhart & Stein, 1970). In practical use, "critical mass" can be defined as the minimum amount of some resource (e.g., money, people, teachers, etc.) needed before another condition or product explodes into existence. For example, Summit (Summit & Firschein, 1976) felt that online database searchers needed some critical mass of searches each month to maintain their skills and Hiltz (Hiltz, 1984) suggested that there was a critical mass of participants needed for the success of a forum. These examples are not true applications of theory but rather an effective use of the analogy.

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During the 1970's and 80's the critical mass analogy was tied to theoretical foundations laid much earlier. Critical mass did not become one unified theory but rather a group of theories across several disciplines including, economics, sociology and biology and education.[47] Practical applications of critical mass as a theory in communications and sociology have adopted two main points-of-view. The macro view is an outgrowth of Rogers' *Diffusion of Innovations* (Rogers, 1962). It tends to look at the adoption of technologies as a whole. On the other hand, the micro view has developed from Olson's *The Logic of Collective Action* (Olson Jr., 1965) concentrates on individual decisions to join collective actions or groups. Since the two views share a common research and theoretical basis, the resulting discourse is more of a continuum between the two views rather than two opposing camps.

100th Monkey Theory

As early as 1952, Japanese zoologist sparked interest in what seemed to be an example of critical mass (Kawai, 1965)[48]. The research involved the particular pattern of novel behavior adoption in a troop of monkeys. It was first noticed when one young monkey started washing her food before eating it. The habit spread slowly at first, then explosively until almost every member of the troop adopted the behavior. Although there were only sixty-five monkeys in the original troop, Watson (Watson, 1979) used it as a basis for

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[47] Compare (Allen, 1988; Johnson & Feinberg, 1990; Oberschall, 1980; Summit & Firschein, 1976)

[48] Previous reports written in Japanese.

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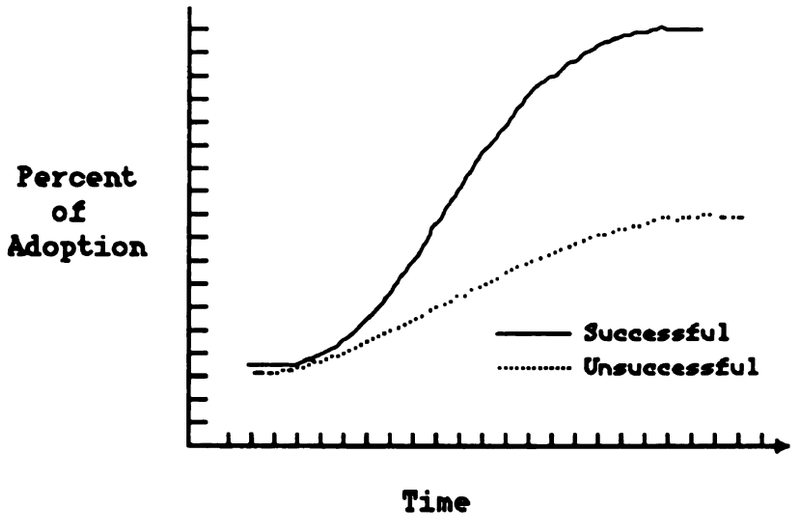
what became known as the "hundredth monkey phenomena." The concept was simple, at the exact time that the n-th monkey adopted the behavior, the troop and maybe even the species as a whole would immediately adopt the behavior as normal. The hundredth monkey phenomena seemed to rely more on magic than on theory.[49] The cause-effect relationship between critical mass and universal adoption is poorly developed. Despite its fascinating beginning, this line of critical mass can be quickly discarded.

Critical Mass Theory

For a communication technology, the ultimate definition of success would be universal adoption (Allen, 1988) but how does that adoption occur? While the 100th monkey theorists left this question poorly answered, others worked to map the adoption process. Rogers (Rogers, 1983) proposed a "diffusion of innovation" model with an emphasis on describing the difference between the first adopters of an innovation and those that adopt later (See Figure 4). The underlying assumption was that certain people were more inclined or better able to adopt a technology first. Note that this assumption implied heterogeneous adopters (or adopters with heterogeneous needs, desires, or ability). Heterogeneity among participants will be an important factor in collective action theories discussed later.

[49]For a detailed criticism of the hundredth monkey phenomena see [O'Hara, 1985 #156].

FIGURE 4[50]
DIFFUSION THEORY



The problem with diffusion of innovations is the basic assumption of sequential decision making. Under Rogers' model, each person makes a permanent choice to adopt or not adopt. The possibility of someone recanting their adoption is not fully considered. Under Rogers' model, the difference between a successful and unsuccessful innovation would be indicated by the speed of its universal adoption.

Markus (Markus, 1987; Markus, 1990) modifies Rogers diffusion curve to allow for the possibility that non-adopters could affect adopters. Under this model, current adopters will not continue to use an innovation if others do not also adopt. After a certain period of time, if the medium is not adopted by a certain percentage of the community (i.e., country, firm, or profession), then the current users will revert to another technology. The difference between a successful and unsuccessful technology is one with a very high percentage of eventual adopters versus one with almost none (See Figure 5).

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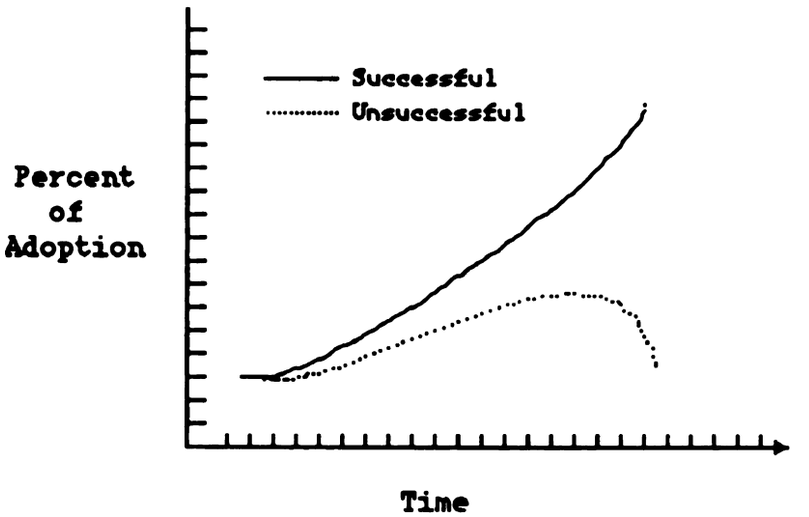
[50]Compare Rogers (Rogers, 1983, p.11) to Markus (Markus, 1990, P.198).

FIGURE 5
MARKUS MODIFICATION TO THE DIFFUSION CURVE



Source: Markus, 1990, p.199

The next step is to determine characteristics of the technology that affect the likelihood of adoption. A key consideration is the cost of adoption — primarily to the first investors. The first investors in a technology must adopt quickly, lest critical mass not be attained.[51] To describe the relationship between individual contribution and benefits, Oliver (Oliver, Marwell, & Texeira, 1985) proposed various possible production functions. The premise was that relationship between cost and benefits changed as the diffusion process occurred. The production function concept was accepted by others with some alterations. Oliver discussed "a return on participants' investment." Markus (1990) saw benefits as "the likelihood of a general acceptance of the technology." Finally Granovetter (Granovetter, 1978) saw number of rioters (safety in numbers) as a benefit necessary to entice more rioting.

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[51]This time-limit on critical mass will become an important criticism of the model in Chapter Five.

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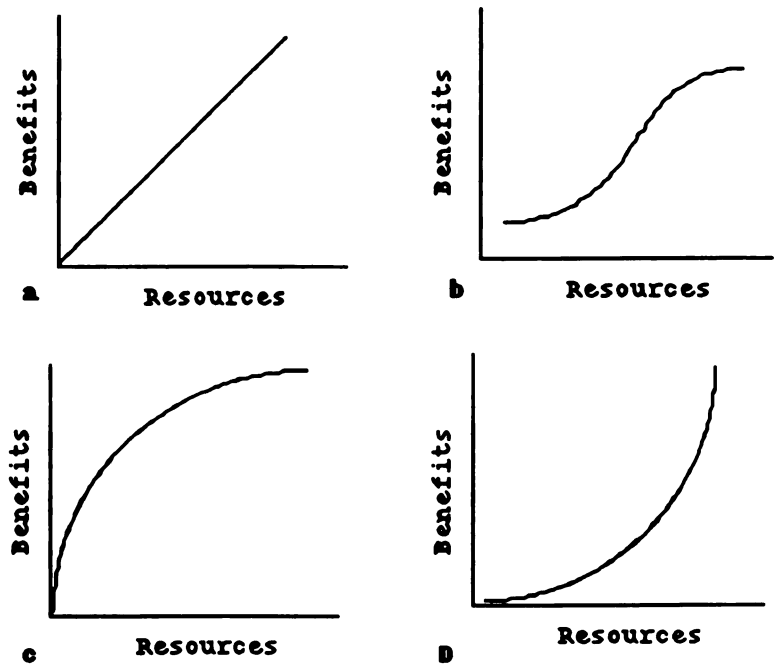
If each person's contribution creates the same amount of benefits, then the production function is a straight line (see Figure 6-a). The return on each unit of invested resources is one unit of benefit. A more common economic assumption would be a production function represented by the curve in Figure 6-b (Oliver, et al., 1985). The third-order or S-shaped curve suggests that the first units of resources contribute very little to desired benefits. After contributed resources reach some amount, the increase in benefits begins to outweigh the increase in contributed resources. Finally, after a second amount is reached, the return on invested resources begins to diminish.

FIGURE 6
POSSIBLE PRODUCTION FUNCTIONS
FOR CREATING BENEFITS FROM RESOURCES



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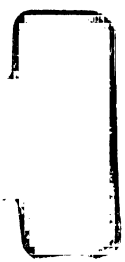
The application of the macro view of critical mass to communication media involves determining the production function of a potential new medium and attempting to lower the cost to first adopters (Allen, 1988; Markus, 1990). The two extremes are the decelerating (Figure 6-c) and accelerating (Figure 6-d) production functions. The more a first adopter must contribute to insure the acceptance of the medium, the better the production function can be represented by a decelerating curve. The decelerating production function does not mean that the medium will necessarily fail but that the medium must be supported by some group — business, government, technocrats, etc. The recommendation from these studies was to find a way to support a technology until it has achieved the critical mass necessary for public acceptance (Allen, 1988; Hiltz, 1984; Markus, 1990; Williams & Chen, 1987).

Collective Action

Success as measured by the number of participants is reasonable in communication industries as a whole that stand to benefit from universal access. There are clear advantages to for some service providers to achieve universal access (Allen, 1988; Mendelson, 1987), but individual forums do not enjoy the same advantages from unlimited size. A conversation among ten individuals may be enjoyable but one among one-hundred can be overwhelming. The quest for universal access must be replaced by a concern for what motivates individual participation. By putting the focus on individual's motivations, critical mass can be applied to more situations.



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To understand the micro view if critical mass, it is necessary to understand the more comprehensive study of collective action. Collective action involves situations where a group of previously unorganized individuals must work together to achieve some mutually desirable goal. A popular example is where a group of residents must work together to prevent the closing of a nearby school (Marwell & Oliver, 1984). Oberschall (Oberschall, 1980), Granovetter (Granovetter, 1978), Johnson (Johnson & Feinberg, 1990) theorized about decisions on whether or not to join a riot. Others have concentrated on the decision to join a national movement or political campaign (Marwell, Oliver, & Prahl, 1988; McCarthy & Zald, 1973; Tillock & Morrison, 1979).

There is a long held view among some sociologist and economists that people of common interest will naturally work together to advance their common interest (Olson Jr., 1965). Collective action theorists question this assumption. For example, suppose a local radio station has a disk-jockey who, though popular with children, has offended parents. A local minister, wishing to be known for an anti-indecency stance, begins a movement to have the DJ fired. The more people that join the minister's protests, the more likely she is to be successful. Assuming that the true majority of the community's parents oppose the DJ and that this opposition would be enough for the station manager to fire the offensive DJ, it would be in the parents' interest to join forces and rid their community of the DJ. Participation will carry some costs such as time, money and risk to reputation. Parents must decide if the potential benefit is worth their invested cost. Some will realize that the DJ may be fired even

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without their effort so they can enjoy the benefit at no cost. For the parents' effort to be successful, enough people must either give up the opportunity to enjoy the benefits free of charge or perceive a secondary value or benefit from the effort (as did the minister).[52] The evolution of group behavior despite the temptation to withhold participation is basis of research in collective action research.

Collective action theorists assume that these potential groups are made up of people who have different levels of the desire to participate (Marwell & Oliver, 1984; Oberschall, 1980) and elect to participate either through rational decisions (Hartman & Johnson, 1990; Johnson & Feinberg, 1990; Markus, 1990; Oliver, et al., 1985) or based on learned behavior (Macy, 1990). Decisions to participate are based on a combination of perceived cost, anticipated value and personal interest. Perceived cost would include any real cost or subjective risk associated with the collective action. Anticipate value is the product of the probability that a benefit will be produced, times the value of the produced benefit. Finally, personal interest plays a natural role in the participation decision and justifies behavior that would otherwise be unlikely. Thus, an equation can be created to predict behavior. The individual will participate if the value of the good (V) times the probability that the good will be created (P) plus personal interest (I) minus cost (C)[53] is greater than zero.

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[52]Community members may find many other benefits from participation such as status concerns, interaction or an unusual high perceived risk from the DJ.

[53]For purposes of simplicity, costs include both real (sunk, marginal) and opportunity costs. Since the service studied charged on a per minute basis, marginal and opportunity costs increased at a similar rate. A later study may look at the effect of the different types of costs.

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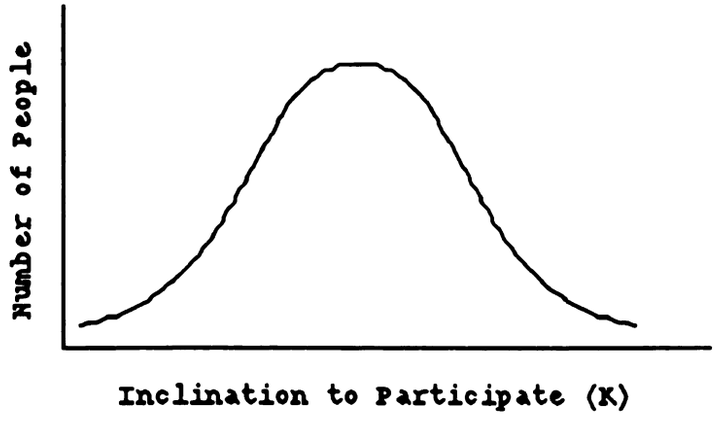
$VP + I - C > 0$ Participation

$VP + I - C < 0$ No Participation

The equation defines a critical mass necessary for an individual's participation in a collective action. If you assumed that everyone possesses their own combination of the elements in the equation, the equation defines an individual's inclination to participate ($VP + I - C = K$). There would be some members with a positive K and some with a high negative K but most members of the group would fall somewhere in the middle (Oberschall, 1980), (See Figure 7). Since the actions of others modify the values in the equation, K can change over time.

FIGURE 7
FREQUENCY DISTRIBUTIONS OF
INCLINATION TO PARTICIPATE (K)



Modifying one of Oberschall's (Oberschall, 1980) examples,[54] those with a high positive K would be the first to participate in a forum. The participation of even one individual raised the probability of

[54]The original example used people's decision to join a riot.

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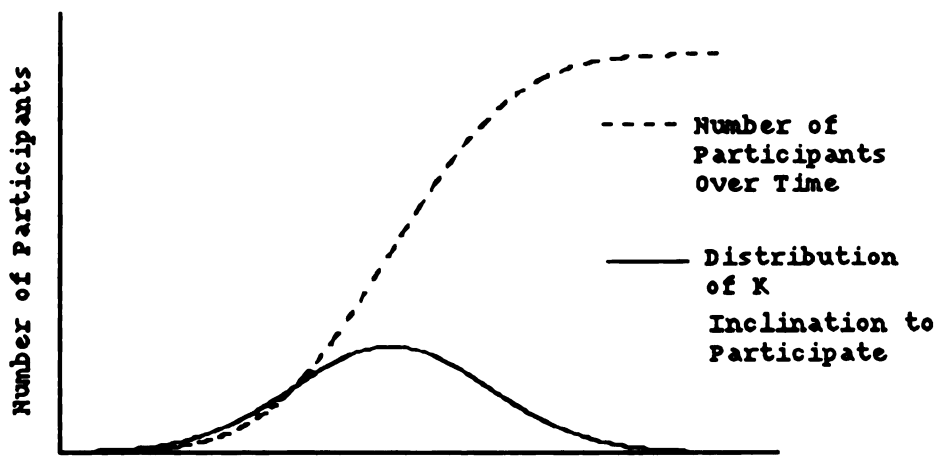
benefits so each person's inclination to participate (K) increases.[55] Hopefully, others would choose to participate based on the now higher probability of success. Again, the value of K is raised for everyone and more people choose to participate. If this trend continues, participants join the collective action as their individual critical mass thresholds are reached. If K is distributed normally in a population, a running total of participants results in a third-order or s-shaped curve (See Figure 8), (Granovetter, 1978). An active forum results from the independent decisions of heterogeneous individuals.

FIGURE 8
NUMBER OF PARTICIPATION AS A FUNCTION OF INCLINATION TO PARTICIPATE



Oberschall further postulates that the forum may not become active if only one person is missing as a possible forum participant. Let's assume that the group is affected only by the number of previous participants. Now suppose one member of the group (Jim)

[55]Note: This assumption requires that potential participants are, in fact, aware of the increase in activity.

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needs no one else to participate before he starts. Jim has a critical mass equal to zero. If the group has other members — Jane with a critical mass of one, John with a critical mass of two, Jerry with a critical mass of three and so forth — the forum may grow as discussed above. Jim will start followed by Jane, John and Jerry. But if Jane is missing, the nearly identical group will not be able start an acceptable conversation area. Jim will offer a comment but the others will not join the conversation since their personal critical mass is not achieved.

To sum, potential participants are looking for an acceptable place to participate. Each person individually defines what is acceptable through a combination of personal interest, costs and perceived benefits. As each person chooses to invest, the probability of success is increased for everyone.

Bringing it Together

What is still needed is a link between the micro and macro views. The two views share a concern for a return on the participants' investment. By combining the changing marginal cost and benefits of the macro view's production function with the participants' sensitivity to those changes, what we see is a more dynamic product life cycle than a simple explosion into existence.

Oliver (Oliver, et al., 1985) uses the production function to describe a saturation point for participation in collective actions. Assuming a decelerating demand curve — either a true decelerating curve (as in Figure 6-c) or the decelerating portion of an S-curve (as in Figure 6-b) — potential participants realize that they will not make

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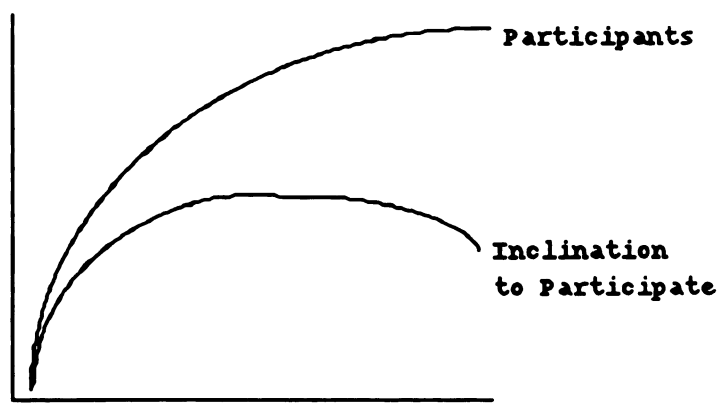
a significant contribution to a collective action. Their motivation to participate will decline (See Figure 9). For example, as a political campaign is successful in creating a bandwagon effect, voter turnout may be reduced in what seems like an assured election. In the same way, as a forum's discussion gets redundant even interested members may not participate because they have nothing new to say. The inclination to participate (K) is reduced not by the anticipated quantity of benefits but by its quality.

FIGURE 9
INCLINATION TO PARTICIPATE
BASED ON PREVIOUS PARTICIPANTS



So far, collective actions have been discussed as individual events but the success or failure of one collective action can affect similar events that come later (Oberschall, 1980). For example, as one nation in Eastern Europe gains its independence, the probability of success for similar events will increase. As the probability of success rises, critical mass for potential participants drops. While it should not directly affect the macro level critical mass, it should make critical

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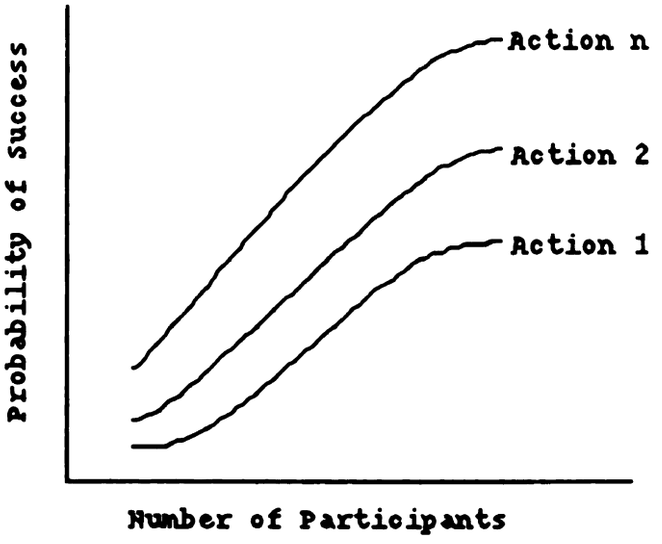
mass easier to attain (See Figure 10) because each person's inclination to participate is increased.

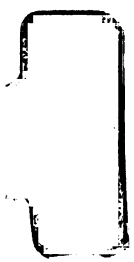
FIGURE 10
SUCCESS AS A NUMBER OF PARTICIPANTS
AND EARLIER SUCCESSES



Source: Oberschall, 1980, P. 53

Assuming that there is a "critical mass" effect and that users have a choice of forums, it is reasonable to believe that potential participant will be choosing between forums that either have or have not attained critical mass. Although the effect will be mediated by first time visitors (unaware of the forum's relative inactivity[56]), it is reasonable to believe that there will be a qualitative difference between those that participate in a forum before it has attained critical mass and those that choose a more developed area. McCarthy (McCarthy & Zald, 1973), in discussing the relationship between national organizations and local affiliates, felt that such organizations

[56]First time visitors are usually shown all previous messages.



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had permanent and transitory members who performed different functions. The permanent members are those that create critical mass and the transitory are those that pay most of the cost of the collective action.[57] In this way, permanent members keep the organization going between major actions (e.g., demonstrations, parties) and transitory members paid the cost (i.e., money or risk) of these major events.

Summary

In this chapter, the focus has been on the process by which group actions occur. In particular, the concentration has been on the motivations of potential participants. A number of theoretical models have been reviewed to create a unified set of assumptions. Put simply, 1.) heterogeneous potential participants, 2.) choose to risk (or not risk) time, money or effort, 3.) depending on their inclination to participate. Inclination to participate is 4.) determined by the person's perception of potential rewards and costs. The perception of costs and rewards is determined by 5.) the person's interest, and 6.) their perceived likelihood that others will participate. Finally, 7.) since some people will choose to participate earlier than others, 8.) potential participants decisions are open for review and change as others act (or fail to act).

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[57]The permanence of the "critical mass" group is not assumed by this research and will not be tested in this study.

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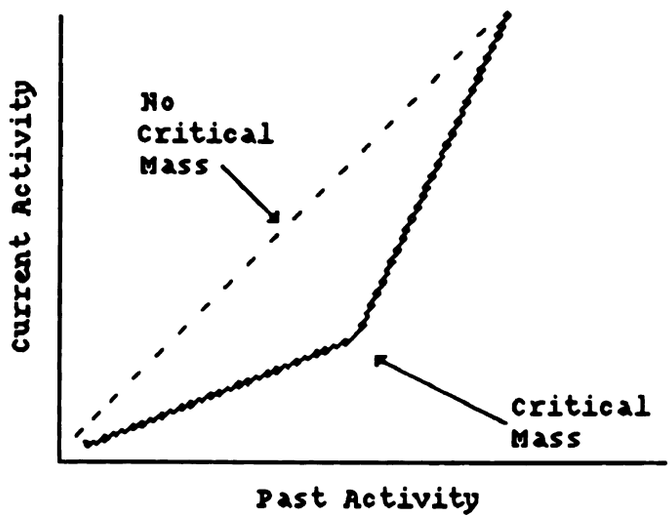
CHAPTER FOUR
THE PRELIMINARY STUDY

The preliminary study looked at the forum activity of a mid-sized national information utility (Dick, 1992a). Forum activity was measured as the number of messages and the number of participants per week. The goal of this study was two-fold. First, get some sense of the volume of forum activity. Second, test to see if a point of critical mass can be supported by this data.

Critical mass suggests a relationship between past and current activity. A time-series regression analysis was used to reveal one of three reasonable regression equations. First, forum activity may be completely random with no definable relationship so no regression line. Second, future activity may simply react to past activity — resulting in a linear regression equation. Although a relationship between past and current activity is necessary, it is not sufficient to support the foundations of critical mass. Third, if critical mass can be supported, the best-fitting regression equation must indicate a sudden change in the relationship between past and current activity This change in the relationship would result in a significant shift in linear slopes (See Figure 11).

FIGURE 11
POSSIBLE FORUM GROWTH CURVES



If the strict assumptions of critical mass are correct, forum activity should follow a fairly simple pattern — slow activity, a surge, long-lasting success or no surge followed by failure. But too much activity can overwhelm users resulting in an increased cost of participation and a reduced inclination to participate (K in previous chapter's equations). As K is reduced, so is forum activity. Critical mass may be matched by the equally important critical saturation. Forum activity should achieve its best sustained level of activity in a "golden median" between critical mass and critical saturation (See Figure 12). The preliminary study operated from two basic hypotheses.

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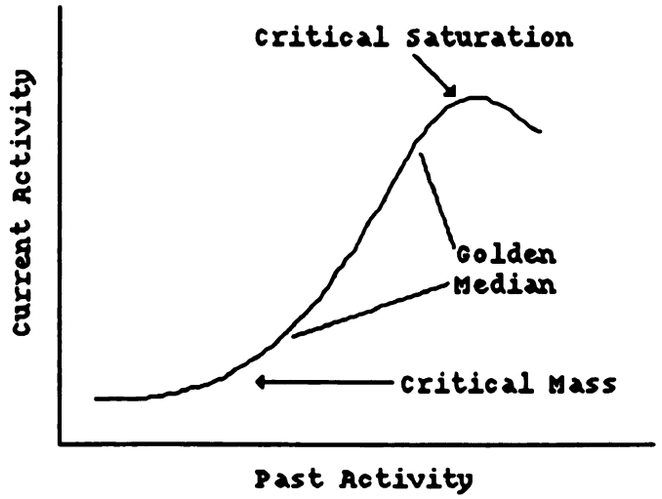
H1:Exceeding some minimum amount of forum activity will result in a significant increase in future activity

H2:Exceeding some maximum amount of forum activity will result in a significant decrease in future activity

FIGURE 12
PROPOSED RELATIONSHIP
BETWEEN PAST AND CURRENT FORUM ACTIVITY



The Data

This study was designed to look at the behavior of established forums. The first step was to choose acceptable forums for study. The criteria for selection were as follows:

- **National:** To overcome regional differences in users.
- **General interest:** To draw the widest possible audience.
- **Advanced host software:** To most closely emulate future, not past, telecomputing technology.
- **Popular:** A service which has earned a reputation for success and quality.

GEnie[58] Information Services was chosen as the test site. Since its inception in 1985, GEnie has established a base of experienced users

[58]GEnie is a registered trade mark of General Electric Information Services.

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through national advertising and a favorable pricing structure. GEnie is one of the fastest growing home telecomputing service. In 1987, it enjoyed a 130% increase in subscribers, as compared to 12% to 27% increase for similar services (Dick, 1992a). It is now the third largest telecomputing service in the nation with approximately 180,000 subscribers — a 486% increase since the beginning of 1987 (Cousins, 1980). On October 5, 1990, the thirty-three forums offered by GEnie Basic Services contained 473 categories, 7601 topics and more than 221,000 messages.

GEnie forums are more carefully managed than on most systems. In general, there are more topics than on competitive systems. Conversation areas generally have a more defined topic (e.g., Mozart rather than classical composers) so there are fewer strings.[59] Topics are more likely to be inactive but easier to follow with fewer digressions. When the sysop initiates a new forum, many categories and topics are already present. Participants may start new topics but sysops, at their discretion, may move messages to combine, split or end topics.

GEnie's basic services contain general interest forums ranging from professional forums on law and home offices to pure entertainment areas such as entertainment gossip and pets. Forums were chosen for this study based on their age and general level of activity. It was also important that the selected forums, as a group, represented diverse interests so that they would attract as many

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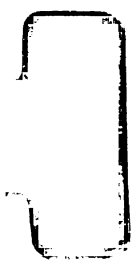
[59]See "The Telecomputing Forum" in the preious chapter for an explanation of strings and topics.



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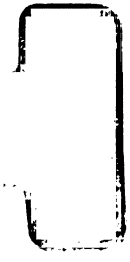
potential participants as possible. Based on these criteria, the following forums were selected.

> **Law:** An old GEnie forum with a clientele of mainly professional lawyers and law students. Topics in the law forum tend to contain relatively few messages on a broad range of subjects. The first available message was from April 15, 1987, and there were 6125 messages, 444 topics and 17 categories.
>
> **Religion:** This forum tends to specialize in controversial subjects. Participants seem to be a mix of resolute professionals and others of strong opinions. This forum has strings with the most and longest messages. The first available message was from April 6, 1988, and there were 8626 messages, 260 topics and 14 categories.
>
> **Aviation:** Aviation covers a surprising range of topics and people. Participants include professional, semi-professional, amateur and even arcade pilots. Topics are equally diverse. The first available message was from March 16, 1989, and there were 6833 messages, 216 topics and 22 categories.

The forums above contained 21,584 messages, 920 topics in 53 categories. Messages were available over a forty-two month period from April 1987 to September 1990.

Once forums were selected, the next step was to determine the measurement. Activity can be studied in two ways — by the number of messages or participants. The number of messages implies the total amount of invested information or effort by current participants. On the other hand, the number of participants is a measure of the people that have participated and thereby some measure of information diversity. A combination of the two may cause the loss of valuable information. Since it is not clear which measure is more appropriate, both measures were used.

On GEnie, the category is the individual discussion area. The users must actually select the category in the same way that television viewers select the channel. As a result, categories are in competition



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with one another for the users' online time so categories were considered separate subjects in this study. Early tests showed that participants participated once every 11.5 days. Since it is logical that users do not necessarily participate at every visit combined with the natural habit imposed by the seven day week, it was assumed that most active users were given the opportunity to participate once per week. The measures of activity are therefore messages-per-category-per-week and participants-per-category-per-week.

To reduce the sample to a reasonable size, it was determined that every second category would be considered. The first category usually contained forum information, announcements and help so this category was skipped. Starting at the second category, every second public[60] category was added, in its entirety to the sample. This generally meant that even number categories were included.

Methods

The simplest method to test the relationship between past and future activity is to relate the amount of activity last week with the amount of activity this week. The problem with this test is that it ignores a basic assumption of critical mass — users make participation decision based on their perception of activity. Just because we define activity in terms of weeks does not mean that users do as well. In a preliminary test, a step-wise regression was performed on a randomly selected category to determine the most effective time period.[61] From this test, a period of five weeks was

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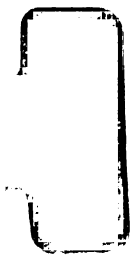
[60]Private categories were not open to the researcher an so were skipped.

[61]A step-wise regression looks for the best (most predictive) variable first.



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chosen as the optimum amount of prior activity.[62] While step-wise regressions are not conclusive and must rely on researcher interpretation (Gujarati, 1988), five weeks seemed sensible because it was approximately three times the average number of days between messages sent by participants. Using each of the five previous weeks as separate explanatory (independent) variables will make it practically impossible to test for critical mass. Each week may have its own level of critical mass. The final regression equation used the average activity from the last five weeks to predict the current week's activity.

We now have a measure of activity but what can we do with it? It is worthwhile to pause for a moment and consider what is happening. Users are coming to the category and reacting based on what they perceive. Users have a binary choice — participate or not. That choice is made at a specific point in time. While past activity is best measured through averages, user reactions take place at a single point in time. This study will therefore look at a current week's activity (number of participants[63] and number of messages) as predicted by average past activity.

So far the regression equation may be able to show that past activity affects future activity but that is neither surprising nor

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It then looks for the second best and continues until more variables do not significantly contribute to the equation or variables run out. The explanatory variables in this case were prior week's activity and their lagged values.

[62]A later study may look more closely at the effect of distributed lags.

[63]From this point on "users" are defined as the number of people sending messages.

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necessarily supportive of critical mass. For critical mass to be supported, there must be a significant change in the slope of the regression line. To determine if such a change existed, it is necessary to perform a piecewise regression. A piecewise regression introduces a dummy variable (D_i) into the normal linear regression.

In this case, the dummy variable indicates the presence or absence of a critical break point in activity (either critical mass or saturation). While the normal regression equation would be:

$$Y_i = a_1 + b_i X_i + m_i$$

where Y_i = current activity
X_i = Average activity for five previous weeks
a_1 = Y intercept for the line
b_i = Slope of line
m_i = Disturbance term

The piecewise regression adds an extra term that effectively splits the sample into two segments — above and below the critical break point.

$$Y_i = a_1 + b_1 X_i + b_2 (X_i - X^*) D_i + m_i$$

where X^* = Threshold value
$D_i = 1$ if $X_i > X^*$
$D_i = 0$ if $X_i < X^*$

If the value of X_i is less than the break point, then the third element of the equation $b_2(X_i - X^*)D_i$ is equal to zero because D_i is equal to zero. If the value of X_i is greater than the break point then the third element becomes a positive number and causes the slope the shift. Thus, b_1 gives the slope of the regression line in segment one and $b_1 + b_2$ gives the slope of the regression line in segment two (See Figure 13). A test of the hypothesis that there is no break

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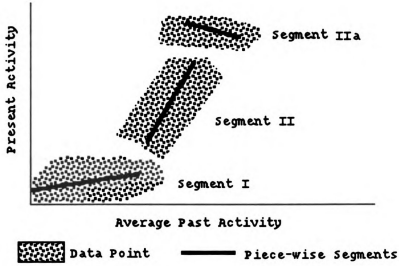
in the regression line at the threshold value X* can be conducted easily by noting the statistical significance of the estimated differential slope (coefficient of b_2). When the critical break point is significant, a is the Y-intercept for segment one. The Y-intercept for segment two is calculated as $-b_2X^*$.

FIGURE 13
PIECEWISE REGRESSION LINES



The investigation of critical mass involves the creation and testing of several regression equations. The goal was to find the regression equations that produced the best representation of relationships between past and current activity. As a guide, a single variable linear regression was performed followed by piecewise regressions for each potential critical point. The best regression equation was chosen based on maximizing both R^2 and the significance of the critical break point. In order for an equation to be considered as indicating critical break point, the piecewise R^2 had to be greater

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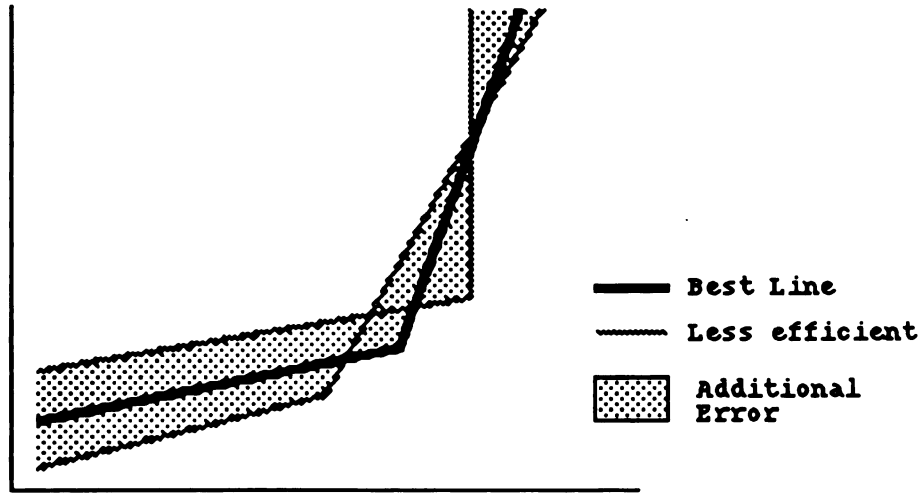
than the R^2 of the linear equation and the t-statistic for the coefficient of the breakpoint had to be significant. As the piecewise regression equation accurately approached a critical break point, R^2 should increase and then decrease as the critical break point is exceeded by the regression equations (See Figure 14).

FIGURE 14
MAXIMIZING PIECEWISE REGRESSION



Since the first five weeks of the forum category would not have an average past activity, they were dropped from consideration. In the regression analysis five weeks of missing data were inserted between categories so that forum categories would not affect one another in the analysis. In a strict sense this is not a time series analysis because it does not take advantage of any corrections for time. The test was a normal linear regression where past activity was compared to future activity with one exception. Although tests for serial correlation (the tendency for the error term in one data point to affect the next error term) were inconclusive, there was

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strong reason to believe that autocorrelation would be present. First our model assumed a serial effect and second by using averages for forum activity, autocorrelation should be suspected.

The normal linear regression procedure was replaced with the Hildreth-Lu grid search procedure (AR1). The AR1 procedure corrects for first-order serially correlated errors (Doan, 1981; Gujarati, 1988) by determining the proportion of prior values' effects on current value. This proportion is expressed as rho (r). Basically, r is multiplied the previous value and subtracted from the current values of the equation. The resulting equation is:

$$(Y_i - rY_{t-1}) = a_1(1-r) + b_1(X_i - rb_1X_{t-1}) + b_2((X_i - X^*)D_i) - r(X_{t-1} - X^*)D_i))$$

Graphs of the predicted regression lines were produced for the sake of clarity but actual predicted values must include r. While the correction would be necessary for exact prediction of future values, this preliminary study was in interested the shift itself. Graphical presentations of the data were created with Cricket Graph by Cricket Software. Due to a technical limitation imposed by the software, the number of data point had to be reduced to below 2700. A systematic sample[64] reduced the data set for all graphs but statistics and regression analysis was performed with the full data set.

[64]A start point of 9 was selected as a start point. That week was dropped from the data set followed by every 19th week in the data set.

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TABLE 1
BASIC FORUM TRAFFIC STATISTICS

	Messages per week	Participants per week
Mean	4.46	2.02
Standard Deviation	9.22	2.77
Maximum for a week	100	17
Skewness	3.89	1.73
Kurtosis	19.9	3.6

Results

Forum activity can be quickly summarized in Table 1. The statistics above were strongly affected by the lack of activity. Forty-four percent of the sample weeks showed no category activity at all. By excluding inactive weeks, mean messages jumped to 8.4 and mean participants increased to 3.8. Forum activity can be understood more clearly through a frequency distribution. In Figures 15 and 16, the imbalance of activity is evident. In a large part of the sample there is little or no activity but there is also a great deal of activity in some weeks. Since the telecomputing forum does not have the same limitation on space as other media,[65] failed forum areas to do not carry the same cost as failed programming in other media.

[65]For example, there are only so many hours that can be broadcast by a television station. Even cable television and print media should suffer from greater costs for expanded capacity. See Kang, Miller, & Pick, 1986; Mendelson, 1987.

FIGURE 15
FREQUENCY DISTRIBUTION OF MESSAGES PER WEEK

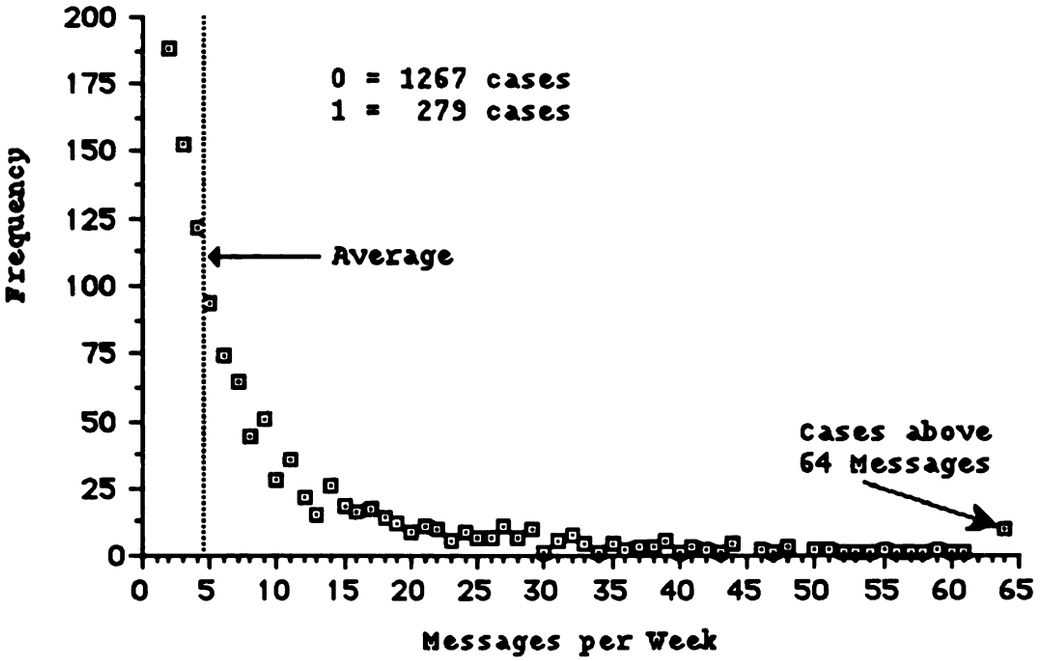
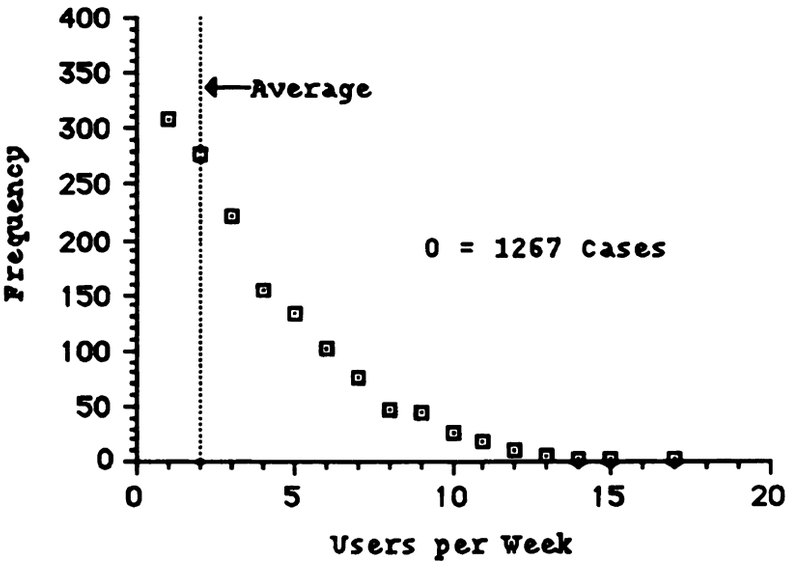


FIGURE 16
FREQUENCY DISTRIBUTION OF PARTICIPANTS PER WEEK



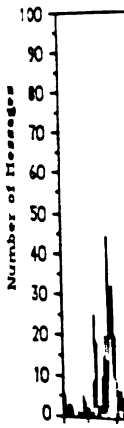


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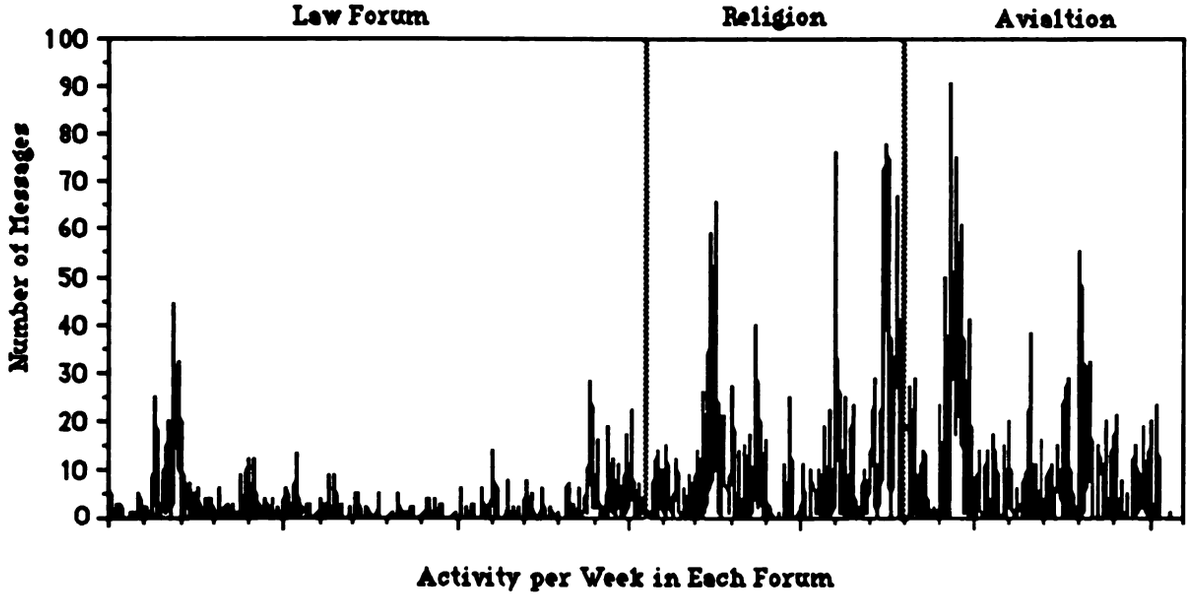
FIGURE 17
NUMBER OF MESSAGES OVER TIME (WEEKS)



Current theory might lead one to predict two things about forum activity. First, there are smooth growth curves to forum activity. Second, the time element for the success of such collective efforts is limited.[66] Figures 17 and 18 help to demonstrate that neither of these prediction were true for these forums. Figure 17 demonstrates the much more erratic nature to forum activity. There were frequent surges and lulls in the number of messages sent.[67]

In Figure 18 the critical mass assumption of a critical time element is called into question for forum activity. The cumulative frequency of messages in each category was plotted over time.[68] Active categories are characterized by upward sloping lines. The

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[66]Critical mass theory suggest that if forums do not become successful in a limited amount of time, they never will.

[67]The number of users-per-week displayed the same erratic pattern.

[68]The category is an individual discussion area for the forum. Categories, not forums, were specifically studied (see data section above)

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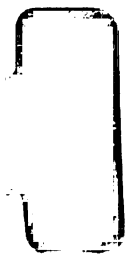

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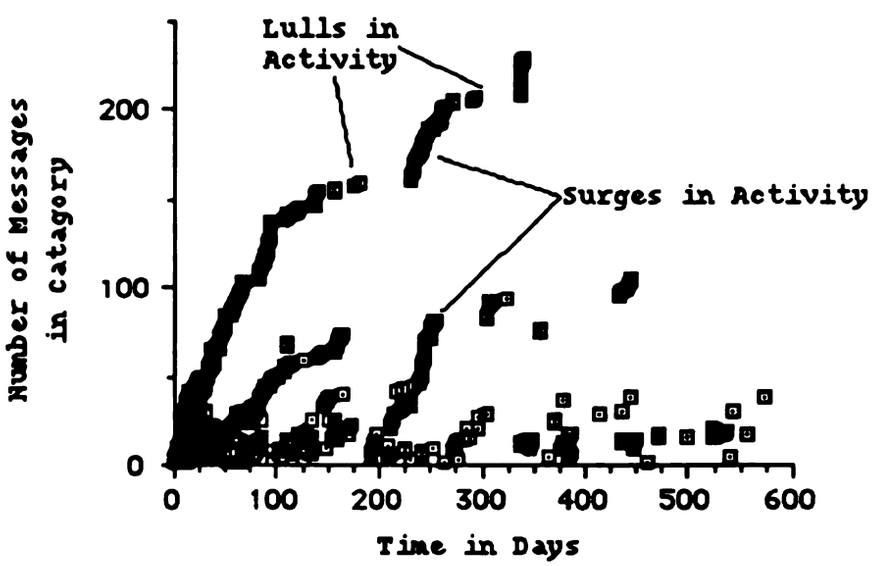
faster messages are contributed, the more vertical the line. As activity slows, the resulting line becomes more horizontal. While it was clear that many topics achieved a surge of activity fairly quickly, at least one topic was inactive for over 200 days. The most active topic suffered several lulls well after it had been established.

FIGURE 18
CUMULATIVE MESSAGES OVER TIME



In preparation for the regression analysis, Figure 19 illustrates the relationship between past activity and current activity. Rather than discussing all regression equations, the discussion below concentrates on the linear regression equations and selected piecewise equations. The piecewise equations were selected based on a maximized R^2, a clear trend to maximize R^2, and the significance of the break point coefficient. In all cases, adjusted R^2 and the significance of the critical break point coefficient maximized on the same equations.

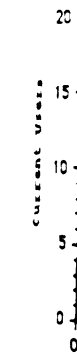

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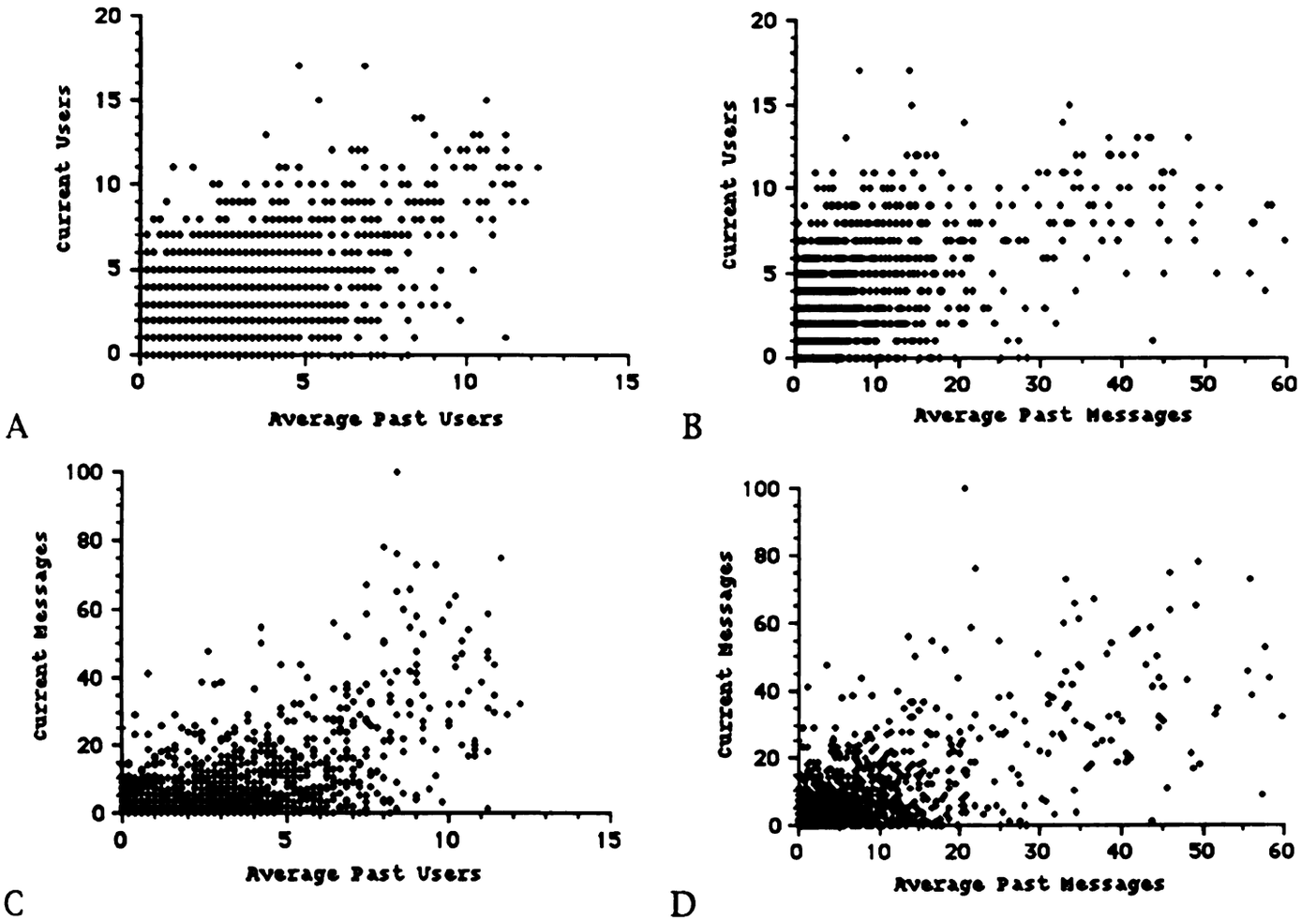
FIGURE 19
AVERAGE PAST ACTIVITY
COMPARED TO CURRENT ACTIVITY



When using the number of average past participants as an explanatory variable, the traditional view of critical mass was supported. As the average number of past participants reached a critical level, there was a significant upward shift in the slope of the regression lines predicting current activity. The shift was most dramatic for past participants predicting current messages in Figure 20. The slope of the linear regression line was 2.08 while the piecewise regression produced a slope of 1.52 for segment 1 and 5.14

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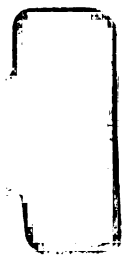
for segment 2. When average past participants to predicted the current participants, evidence of critical mass was not as dramatic but still present (See Figure 20). The slope of segment one (0.71) was almost identical to the linear regression (0.74) but the slope of segment two shifted to 0.94.

When the explanatory variable was the average number of past messages, there was evidence of critical break points but not necessarily as predicted. Past message activity displayed a damping effect on current activity rather than an encouraging one. In the relationship between past messages and current participants, two acceptable (significant) critical breaks were found. The first appeared at a critical mass of five. In this case, there was a significant shift in the slope of the regression line but the shift was to a gentler slope — not a steeper slope as critical mass would suggest. The effect was almost opposite the equation above where past participants were regressed on current participants (see Figure 21). In Figure 21 the slope of the linear regression (0.18) was similar to segment two (0.14) of the piecewise regression. When previous weeks' messages averaged less than four per week, the slope of the regression was a much steeper 0.47.



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	Co
Linear	0.2
CM-6	0.8

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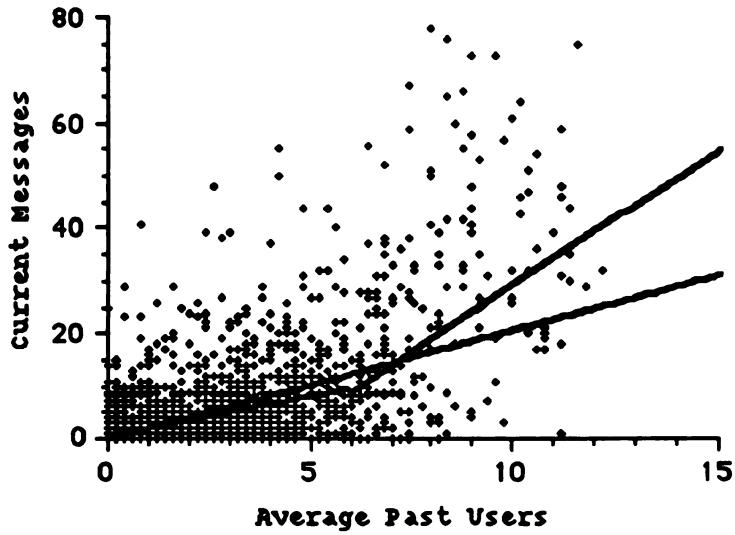
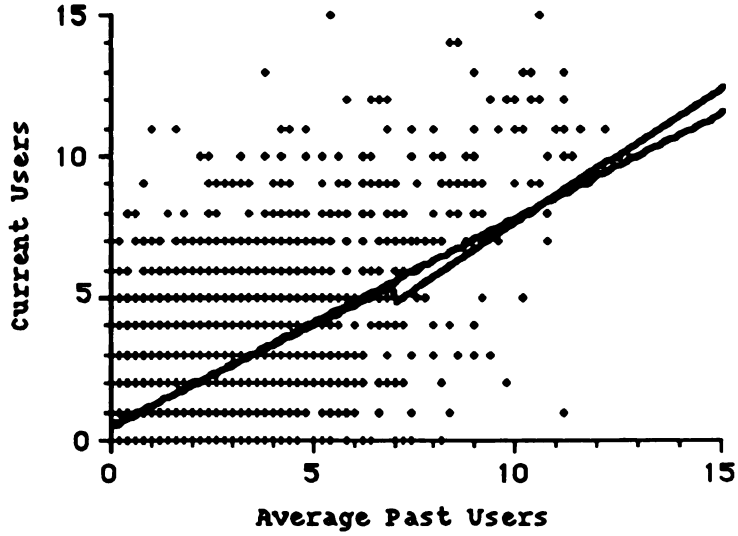
Linear	0.5
CM-7	0.5

FIGURE 20
AVERAGE PAST PARTICIPANTS TO CURRENT MESSAGES



	Const.	Beta1	Signf.	Beta2	Signf.	Rho	R^2
Linear	0.28	2.08	<0.001			0.48	0.5402
CM-6	0.88	1.52	<0.001	3.62	<0.001	0.42	0.5535

FIGURE 21
AVERAGE PAST PARTICIPANTS TO CURRENT PARTICIPANTS



	Const.	Beta1	Signf.	Beta2	Signf.	Rho	R^2
Linear	0.53	0.74	<0.001			0.33	0.5187
CM-7	0.58	0.71	<0.001	0.24	<0.01	0.33	0.5190

	Con
Linear	1.23
CM-5	0.66

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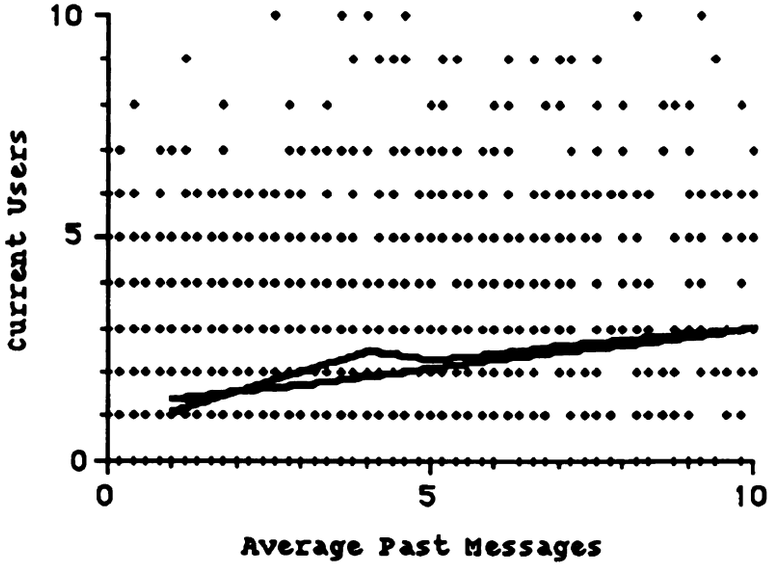
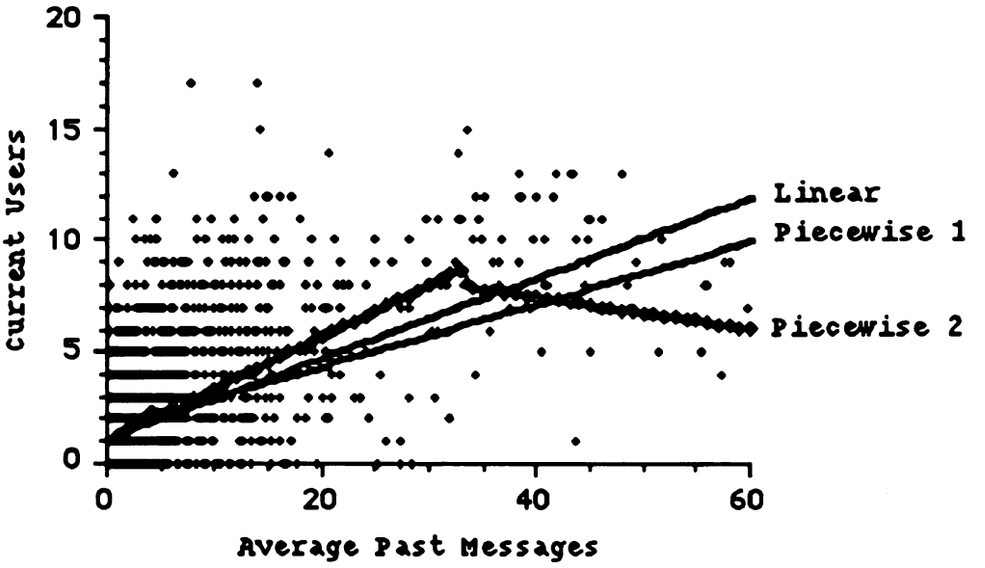
Linear	1.23
CM-5	0.66
CM-34	1.06

FIGURE 22
AVERAGE PAST MESSAGES TO CURRENT PARTICIPANTS



	Const.	Beta1	Signf.	Beta2	Signf.	Rho	R^2
Linear	1.23	0.18	<0.001			0.46	0.5025
CM=5	0.66	0.47	<0.001	-0.33	<0.001	0.38	0.5146

FIGURE 23
AVERAGE PAST MESSAGES TO CURRENT PARTICIPANTS



	Const.	Beta1	Signf.	Beta2	Signf.	Rho	R^2
Linear	1.23	0.18	<0.001			0.46	0.5025
CM=5	0.66	0.47	<0.001	-0.33	<0.001	0.38	0.5146
CM=34	1.06	0.23	<0.001	-0.30	<0.001	0.42	0.5102

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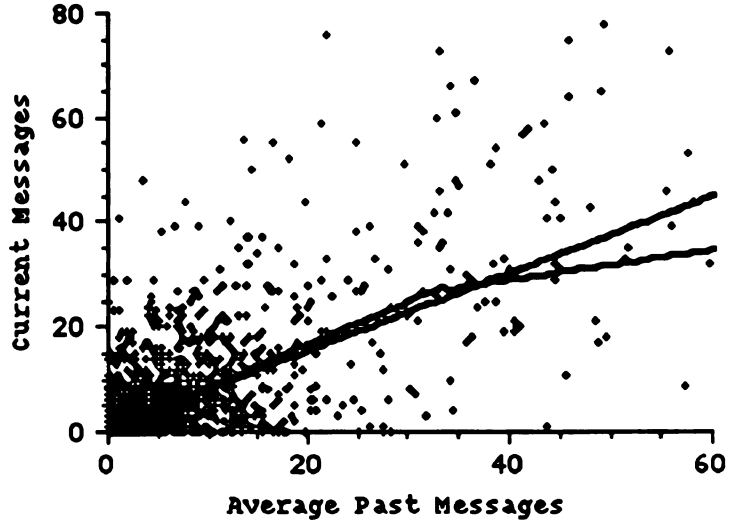
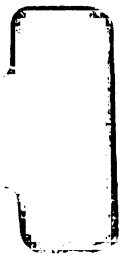
Linear	1.19
CM-34	0.96

Critical saturation was supported by the second significant piecewise regression. When average past messages exceeded thirty-four, the slope of the regression line predicting current messages shifted from 0.23 to -0.07 (See Figure 22). Critical saturation was supported to a lesser degree when past messages were used to predict current messages. In Figure 23 the linear regression line produced a slope of 0.73. The piecewise regression (at a critical point of thirty-four) indicated a gentling of the slope from 0.81 to 0.26. This was not a downturn but messages increased a slower pace.

FIGURE 24
AVERAGE PAST MESSAGES TO CURRENT PARTICIPANTS



	Const.	Beta1	Signf.	Beta2	Signf.	Rho	R^2
Linear	1.19	0.74	<0.001			0.36	0.5537
CM-34	0.96	0.81	<0.001	-0.53	<0.001	0.36	0.5566



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Discussion

The results of the regression equations consistently supported the existence of a critical break point but the increase in R^2 was often minimal. The lack of dramatic changes in R^2 may have been a result of the sample itself. The vast majority of data points were below the point of critical mass. The amount of data below critical mass may have simply overwhelmed points above critical mass. A later study may expand the data set and sample weeks to better balance high activity week with low activity weeks.

It is recognized that there is a valid concern that the effects shown by this study may be due to larger economic factors. The price of the service, competitive services or even the economic health of the nation may affect participation. To this end, Figures 24 and 25 were created. These figures show the relative random nature of activity over times. Although there are two clear surges in the number of messages per week, 1.) the surges are nearly two years apart, 2.) they represent changes in activity over a period of time longer than the sampling frame,[69] 3.) the surges are poorly represented by the number of participants per week and 4.) the two surges represented activity in the religion forum only.

[69]The independent variable represented activity over five weeks and the dependent variable one week.

FIGURE 25
MESSAGES PER WEEK

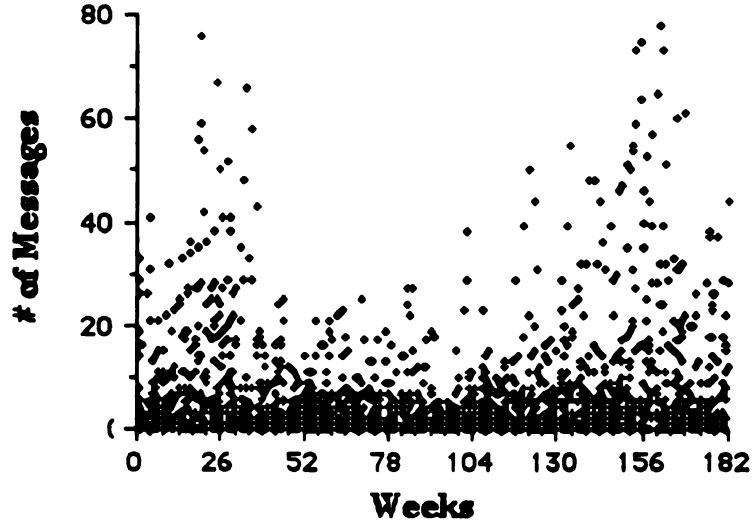
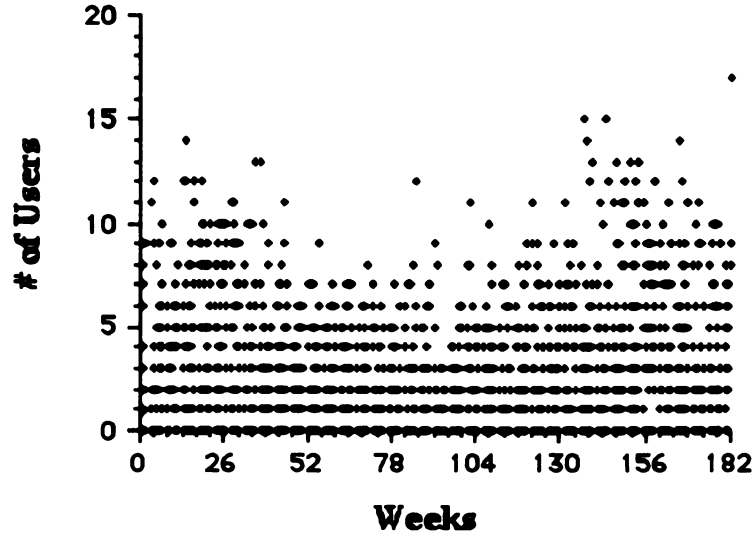


FIGURE 26
PARTICIPANTS PER WEEK



There was evidence of a golden median between critical mass and critical saturation but the results suggested a more complex relationship than anticipated. Participating users encouraged activity while too many messages from those participants tended to discourage activity. The golden median for these forums was between six participants and thirty-four messages per week.

Summary

There is little doubt that these forums displayed critical break points, but it is equally clear that the effect is neither as strong nor as lasting as previous literature has suggested. The results suggest something more was occurring than can be explained by the critical mass model. The variability of the data and the relative rarity of a forum enjoying critical mass,[70] suggest that critical mass is not an end but rather a stage in a larger life cycle. Collective actions, such as these forums, go through more than just critical mass. An alternative model is developed in the next chapter.

[70]Only 214 weeks out of 2866 achieved a critical mass as defined as an average of six users per week or more.

CHAPTER FIVE
THE RESONANCE MODEL

If the preliminary study is correct and critical break points occurred as demonstrated, then there is reason to question the assumption of critical mass. First, critical mass must be achieved within a limited period of time. Out of the twenty-two categories studied, eleven achieved critical mass at some point. Categories achieved critical mass at all ages from 7 to 170 weeks (mean=53 weeks, median=38 weeks).[71] Second, critical mass leads to permanent acceptance. Even though half the categories achieved critical mass, only 7.4% of the sampled weeks (214 out of 2866) enjoyed average activity above six participants-per-week. Critical mass was not sustained in almost any forum.

The preliminary study reveled a more complex relationship can be described by critical mass. In particular, there seems to be more stages than the simple presence or absence of some level of activity. While past activity was generally important in predicting future activity, forum "activity" was not a universal good. Since critical mass was designed to describe the growth of technologies as a whole, and not individual groups using the technology, it seems reasonable at this time to develop a new model for forum activity.

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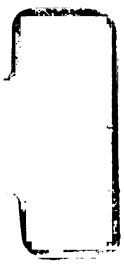
[71]Weeks are defined as weeks into the sample not the true age of the forum. It is possible that the forum categories were older.



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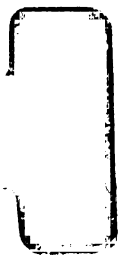
The Need for a New Model

Before starting on a new model it is reasonable to pause for a moment and discuss what is important. First, there are different stages in the growth of collective actions. Previous literature, particularly critical mass literature, suggest a binary choice (Granovetter, 1978; Hiltz, 1984; Johnson, 1990; Markus, 1990; Oliver, 1985). Intuitively, heterogeneity among participants should result in a build-up period to the success of any collective action similar to the diffusion model.

Second, it is reasonable to believe that the activity level can go too high and overcome the positive effects of critical mass. Thrasher (Thrasher, 1965), in a study of inner city gangs, found that there was at least a typical size to the gang. As the group gets too large, it loses its singularity of direction and thereby loses its appeal to many of its members. While it is possible to extend the analogy to include a point of saturation, the analogy loses much of its descriptive power.

Third, Marcus (Markus, 1990) maintained that a critical mass of participants must be achieved within some, yet undefined, limit of time. This assumption has been adopted by others and incorporated into the model (Allen, 1988; Rice, Grant, Schmitz, & Torobin, 1990; Rogers, 1989). While the critical time period was useful in describing the failure of certain communication technologies (e.g., eight-track audio), it did not do as well at describing some successful communication technologies (e.g., facsimile machines). While it is understandable that you must marshal some kind of simultaneous force, a strict critical time limit restricts the model's applicability.



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Forth, critical mass assumes permanent success once attained. While methods of communication (e.g., printing, broadcasting) may not ever go away, communication media can certainly enter phases so recessionary that they can no longer be defined as successful (e.g., Black and white television, writing in Latin). What is needed is a model that will allow for such periods of recession.

Finally, the assumed heterogeneity of the population is useful but incomplete. As McCarthy (McCarthy & Zald, 1973) suggested, there should be at least two classes of participants.[72] Even a passing view of the forum messages indicates that there are naturally some people that act as leaders. Forum leaders not only send more messages than other participants, it is reasonable to believe that these messages are qualitatively different from other participants.

Now that a list of needs has been developed, it is time to look for an appropriate model. The model must be one where a variety of forces come together to create or inhibit an output that changes both quantitatively and qualitatively. The idea of a critical break point has not been abandoned but there must be more flexibility in its potential effect(s). The model that was chosen will be discussed next.

Resonance

A more apt analogy for forum activity, and perhaps collective action as a whole, is that of resonance. Academic American Encyclopedia (Letcher, 1992)[73] describes resonance as:

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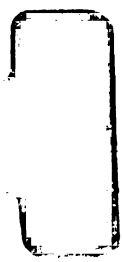
[72]McCarthy defined participant classes as permanent and transitory. Permanent members create the critical mass while transitory members pay most of the cost of a collective action.

[73]An online edition of *Grolier's Academic American Encyclopedia* .



> Resonance usually refers to the large absorption of energy and the resultant large amplitude of motion that occurs when a vibrating system is driven by an external force at its natural frequency of vibration. The principles of resonance are at work when a person pushes a child in a swing; the greatest effect will be achieved for the least effort if the force is applied at the natural frequency of the swing and in phase with the motion. ...

Resonance is a generalized concept used in many fields of study, including physics, electronics, quantum mechanics and chemistry. While individual readers may understand the term from the point of view of one discipline or another, for parsimony, it must be discussed in more generalized terms.[74] In general terms, resonance is used to describe many systems that are dependent on waves of energy.[75] In a practical application, resonance can be used to describe the relative ability of a musical instrument to produce sound. The instrument is a vibrating system and any such system would have at least one resonance frequency.[76] Energy is applied to the instrument through air movement or vibrating strings. When energy is applied at the proper frequency and time (in phase with the output), the greatest output is produced for the expended effort. To illustrate, input energy is held constant in Figure 27. At resonance, output velocity reaches a peak for a consistent effort.

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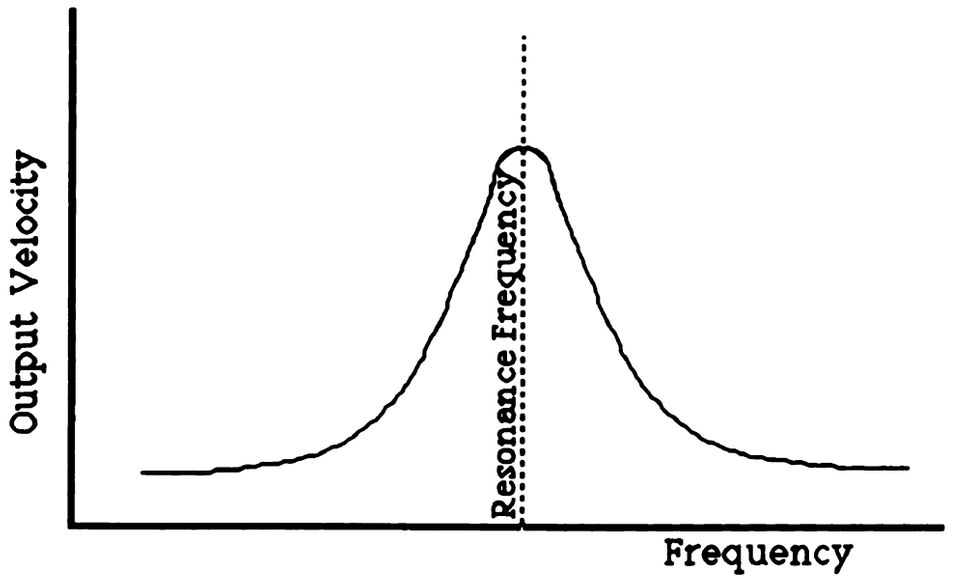
[74]Readers will hopefully see the parallel to their own favorite discipline.

[75]In some disciplines, such as electronics, these waves may be at such a high frequency that energy is viewed as continuous. It is, however, easier to understand the concept if waves of periodic energy are used.

[76]Additional resonance frequencies can be produced by changing the basic structure of the instrument — closing/opening the holes in a wind instrument — or by having a instrument consisting of parts with different resonance frequencies — such as string instruments. These additional resonance frequencies will be ignored in the present study but may be considered in later studies.

FIGURE 27
OUTPUT VELOCITY PRODUCED BY FREQUENCY



The resonance frequency is attenuated by two opposing forces — inertia and restoring force.[77] Inertia causes objects in motion to want to continue to be in motion.[78] Restoring force causes the object to want to return to its resting state. Using the swing in Figure 28, input energy drives the swing beyond its resting state. Inertia would cause the swing to continue away from its original position if it were not for the restoring force (i.e., gravity and a good sturdy rope). When the restoring force overcomes inertia, the swing moves back to its resting position but is carried by inertia beyond. In this way, the input energy activates a chain of forces — each reacting to one another.

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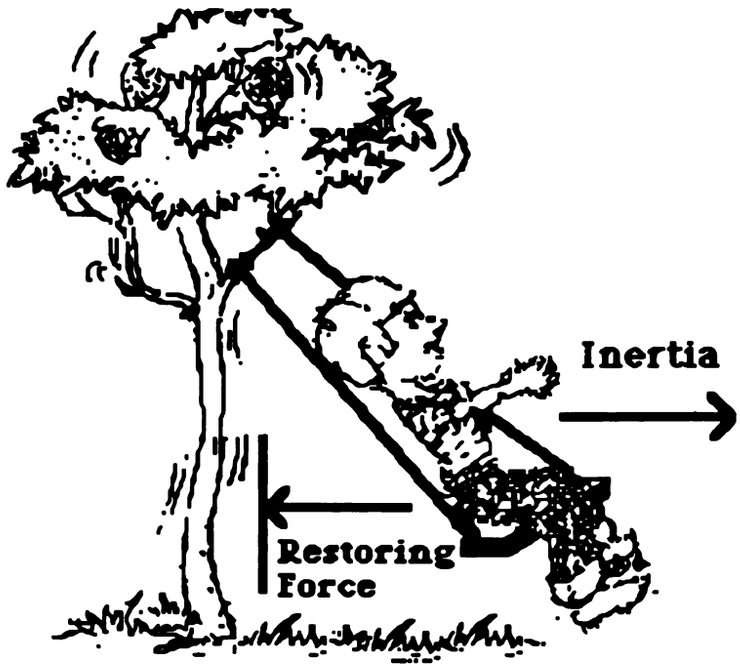
[77]Many disciplines refer to these two forces as reactance. Inertia is inductive reactance and restoring force is capacitive reactance. The effect is basically the same so the simpler, more descriptive term is used.

[78]Inertia would also cause objects as rest to want to stay at rest but this effect is more aptly described by restoring force next.

FIGURE 28
THE RELATIONSHIP BETWEEN
INERTIA AND RESTORING FORCE



The swing's resonance frequency is achieved when inertia is balanced by the restoring force. At resonance frequency, input energy only needs to overcome the mechanical friction of the system.[79] Below resonance frequency, input energy must overcome mechanical friction and the restoring force. Above resonance frequency, input energy must overcome mechanical friction and inertia.

To illustrate, unless you push the swing (add energy) it will stay at the resting position (straight down). As you start to swing, inertia does not help you a great deal. The swing will return to its resting

[79]Mechanical friction would include the energy needed to bend the swing's rope and shift weight to push the swing.

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position and stay there. The restoring force (gravity) is greater than inertia. Your energy alone is moving the swing. As you swing higher, you move the swing to positions of greater and greater potential energy. The weight of your body at the high position has the stored energy of a dropping force. Your body moves the swing back down, past the resting position and to another high position. At the swing's ideal frequency, you only need to add enough energy to continue to shift your body and bend the ropes. If you were to continue to swing higher, your energy is wasted at the high point as the swing attempts to change directions. The swing will pause or bounce for a moment at the high point because the swing's inertia is trying to carry you beyond the end of the rope.

At resonance frequency, there is a qualitative change as well as a quantitative change. At resonance, overtones are produced. Overtones, or harmonic frequencies, are waves mathematically related to the original frequency. In a musical instrument, overtones make the entire tonal output more complex and thereby change to quality of that output.

The Resonance Model

Resonance assumes several elements left out of critical mass. First, there is an ideal range of frequencies for the forum's activity, not just a minimum. Second, a driving force (forum leaders) is as necessary as a mass of system participants. Third, there are both quantitative and qualitative differences as the system achieves resonance and passes through it. Finally, resonance moderates the

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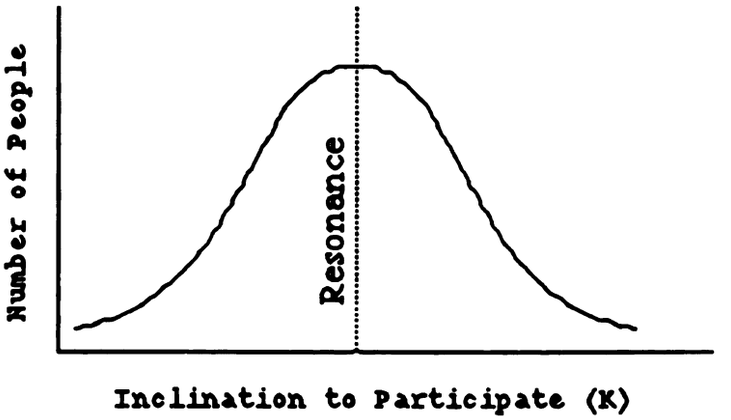
problematic time elements necessary to the critical mass model. Each of these changes will be discussed below.

What this means to the forum is:

- Forum leaders (external force) drive a previously non-involved group of individuals (the system).
- The group produces its maximum output at or near a certain frequency.
- If the driving force is removed or reduced, the group as a whole can lose its natural frequency and thereby the positive effects of resonance.
- The *quality* of the conversation is dependent on the *frequency* of the conversation (activity level).
- Even though a simultaneous force is necessary, this force can be achieved, lost, re achieved and even be too powerful. Forum leaders are in the position of tuning that force to the proper frequency.

Although the resonance model is used to replace critical mass, it augments the base established in collective action research. The model can be used to better describe the collective action process by dividing it into stages. Individual participation decisions still drive the growth of the collective action. Heterogeneity of participants is emphasized by the categorization of participants into separate classes. If you compare the proposed frequency distribution for the inclination to participate (K), resonance should be achieved at the top of the curve for the potential participants (see Figure 29).

FIGURE 29
FREQUENCY DISTRIBUTIONS OF
INCLINATION TO PARTICIPATE (K)



Resonance v. Critical Mass

In the preliminary study, two critical break points were described. First, critical mass was described as the point at which there was a dramatic increase in the amount of activity. Second, critical saturation was used to describe the point at which activity was so heavy that there was a dramatic decrease in activity. Resonance can be defined as the period of time between these two critical break points. In the resonance model, these two points become two parts of a single condition. Critical mass becomes the lowest possible frequency of resonance. Critical saturation then becomes the point where the frequency of activity becomes detrimental to future activity — going beyond resonance. While some simultaneous force is necessary, this force is not as dependent on a time period from an artificial starting point — such as the building of the swing. Resonance can be achieved as soon as the forces are marshaled. From this point on, the terms "critical mass"

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and "critical saturation" will not be used. The forum is either in a state of resonance or not.

The Driving Force

Forum leaders become the driving force, though not the only force in creating the successful collective action. Not only do they define the forum's environment, they supply the initial energy that activates the mass of potential participants. In this way they give the forum its direction and the mass of participants supplies a reactive energy that gives the forum its real activity. One of these two groups is not enough. The forum leaders reacting without the aid of the mass of the groups is similar to the musician attempting to perform without an instrument. The reverse might naturally be true except that leaders might naturally emerge from the mass.

For a forum to become active, it is necessary to have a group of willing participants. Sheer quantity of participants is necessary but not sufficient to start the active forum. Assuming that there is a normal distribution of K, the true success relies on the presence of those individuals with an unusually high K. A successful forum requires not just a number of people but the *actual people* willing to participate first. If even one of these people is missing, an otherwise active forum may languish. The group may be willing to participate, if only someone else would start. The leaders provide the that initial energy necessary to activate the resulting mass. In this way, the actions of others are, to a great extent, dependent on them.

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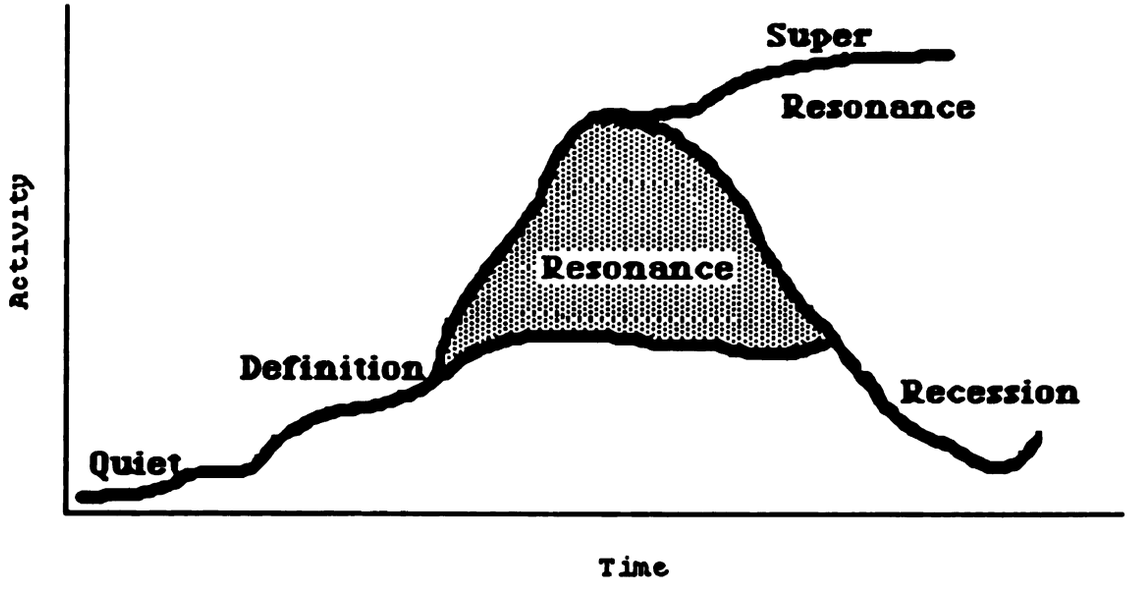
The Resonance Curve

In the resonance model, qualitative changes and quantitative changes happen together. The result is more of a life cycle model (see Figure 30) and can be broken up into several stages. Each stage will have its own unique characteristics and will be discussed below.

FIGURE 30
RESONANCE LIFE CYCLE



It should be noted however, that the model represent possible stages of the forum's life cycle *not necessary stages.* A forum may never leave the "quiet stage." The forum, in this model, must pass from quiet, to definition, to resonance but it may never achieve super-resonance. It is also possible that after recession, it can return to resonance.[80] To emphasize the optional nature of these stages, super-resonance will always be discussed after recession.

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[80]A later study may look at forums return to resonance after a recession.

Quiet

The quiet stage of the life cycle can be viewed in one of two ways. First, it could be at a time in the forum before the driving force is applied. Second, quiet areas could simply uninteresting topics.[81] Forum leaders do not often know what topics will be of interest to participants. Since resonance requires both leaders and a mass of participants, leaders do not wish to cut off an area that could be potentially active. These areas are trials that have not yet succeeded. Since it is often cheaper to keep inactive areas than it is to erase them,[82] most forums should be heavy with inactive areas.

Definition

At some point prior to resonance, the forum should define itself and its market. Like the swing that is trying to overcome the restoring force, the forum is trying to become something other than inactive. To accomplish this, the forum must establish a direction. The definition stage is one where activity and interest level interact. The forum can not be all things to all people any more than the swing can move in all directions at the same time.[83] The forum will become more interesting to some and less interesting to others. The activity level of past participant affects the qualitative interest level of the forum.

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[81]This study has not dealt with "interest level" to any great extent, but in the formula on page 43, it is acknowledged as a motivating factor in participants' decision. For the purposes of this study, it was assumed that any topic can be of interest to some group.

[82]Inactive areas require very little space or maintenance. Removing inactive areas may upset some potential participants so the tendency is to save them. The attitude is much like anyone who has several computer disks filled with old papers. It is easier to just let them go than to throw them away.

[83]Even a tire swing can not move up and down as well as left and right.

If you assume incoming messages are valuable, then a mass of messages should increase everyone's inclination to participate. But that assumption does not consider a basic premise of the collective action — heterogeneity among participants. If users are truly different, then the values of certain messages are equally different. Messages should cause an increase in the inclination to participate for some users while a decrease for others. As messages increase, a conversation becomes more specific in both topic and level (intellectual, maturity, etc.). The activity will cause the forum to be more interesting but to a smaller group of potential participants. In effect, the collective action is defining its market. This market definition is similar to an instrument being tuned to produce the strongest output (harmonic frequencies).

This portion of the life cycle is probably most like the original critical mass model. Each system user is making individual participation decisions based on what they believe to be the potential rewards. Loyalty to the group has not yet been established so the restoring force continues to have its greatest effect.

Resonance

During the time of resonance, forum managers have successfully excited the group into action. The leaders' participation may not decrease but it should become more enjoyable. The leaders may actually increase their activity (in relation to the rest of the group) at this point simply because it takes less effort and because their experience with the forum lets them know "where the action is." The friendship of the mass of participants should increase as well

because information is being exchanged freely and the participants are benefiting from the public good that has been created. At this point, loyalty should develop among participants. This loyalty allows the forum to continue even if there is a momentarily lose of resonance.

Recession

Oberschall (1980) suggested that the successful collective action could be reversed by the loss of a minor percentage of the group. For example, assume that summer starts and a forum leader leaves for other activities. Even if most participants are not affected by the change in season, all participants receive less interaction and the value of the forum drops. Since everyone's K-value is equally reduced, other current users withhold participation and the probability of reward diminishes further. An active forum dies due to the introduction of a variable that may not even be important to even a majority of the participants.

Recession is the point when the forum loses its resonance frequency and drops to a level of relative inactivity. Since forum leaders are the driving force, they should be the first to leave at times of recession. Recession may, in fact be caused by their driving force running out of energy. This may be due to a lose of interest in the current topic and a desire to move on to other areas. Using the swing analogy again, recession would occur when the child grows tired or bored and moves on to other toys.

The mass of participants may experience an entirely different effect at the time of recession. Loyalty has been created in the

group. Also, since leaders are most likely to be the first to send messages, the mass of participants is more likely to try to continue the topic (not yet bored). The energy originally invested by the leaders will remain for some time after resonance.

Oberschall's (Oberschall, 1980) suggestion that one collective action may affect another can be applied to the forum. The forum that has successfully attained resonance, may more easily attain it a second time because users are more assured of a valuable response. In this way, the forum suffering a lull may recover more quickly than those that had never attained resonance.

Super-resonance

Super-resonance occurs when activity exceeds resonance. At this point, management of the interaction should become more difficult because there is much more activity. Conversations should lose their focus and multiple (more) topics should be present. Like the swing that wants to fly off away from the tree, the forum flies away from its center of interest.

Super-resonance may not be enough to kill forum activity[84] but it may motivate participant to limit their contributions. Super-resonance may be caused by two separate effects. First, participants may simply be unwilling or unable to process too many messages at one time. Participants may find ways to limit their commitment to the group (e.g., put off responding for another time). Second, as Oliver (Oliver, 1984) suggested, the forum may reach a point where

[84]Due to the loyalty created in resonance.

participants feel they have little to add. In either case, forum activity should not be expected to exceed some maximum level — at least not for long.

This stage was intentionally discussed after recession to emphasize that it is an optional stage. Forum activity may simply stay in resonance until recession occurs. Also, super-resonance should not be assumed to be a stage before recession. It is not believed that super-resonance will necessarily cause an end to forum activity — only a downturn in activity.

Summary

This chapter has been devoted to the development of a new model for collective action. The model has been specifically discussed in terms of the way it may work in a telecomputing forum. To review, the essential elements of the model include:

- A heterogeneous group acting based on their own inclinations.
- Two specific classes of participants — leaders and non-leaders.
- A dynamic environment with life cycle stages of activity.
- Quantitative and qualitative changes in activity.

The next chapters will test the applicability of the model.

CHAPTER SIX
METHODOLOGY

Since the established model of resonance is both quantitative and qualitative in nature, the methodology must also be a mixture of both. The goal of this study was to look at the activity of established computer forums and describe that activity. While the preliminary study was primarily quantitative, this study will be primarily (although not completely) qualitative. If resonance is a reasonable model, qualitative differences should correspond to the quantitative ones found in the preliminary study. The primary goal of this study is to look for possible qualitative differences. As a result, this study will require a two-step process, discussed below.

Research Questions

How can "activity" be defined in an online forum?

Without definitive prior research, this study starts with no absolute definition a forum "activity." The first task must be to describe "activity." Activity can be studied in two ways — qualitatively and quantitatively. This portion of the study is essentially descriptive but lays the foundation for later questions.

Quantitatively, activity can be defined in two ways. First, the number of messages implies the amount of invested effort by current participants. On the other hand, the number of participants

is a measure of the people that have participated and thereby some measure of information diversity and total audience size. In the preliminary study, both were found to have effects, although different. In this study, the "active" versus "inactive" forum areas will be compared more closely.

Qualitatively, forum conversations can be described based on the ability to interconnect people, the exchange of views, and the expression of opinions. Before the properties on resonance can be tested, these important qualitative measures will have to be defined and described.

Does the resonance model reasonably describe forum activity?

The application of resonance to forum activity will be more complex than simply describing the amount or type of activity. The most important assumption of resonance is that there is a life cycle to activity. According to the theoretical basis outlined above, there should be quality changes that result from increases in forum activity. As a result, this part of the study will need to look for changes in the quality measures of the activity.

The Data

The sample set from the preliminary study was used again in this project with minor changes (discussed below). Although the sample was the same, many new variables were added and the old variables were used in a new way.

Changes in the Sample Set

The data set used for this study was essentially the same as in the original study (see Chapter Four). As the data set was being coded, minor changes became necessary. First, additional forum messages were found archived in the forum libraries.[85] Activity measures were coded for these messages[86] and the messages were added to the sample. Second, a coder failed to complete work on Religion Category Four. Recoding this category would have seriously delayed this study without any real hope of more reliable findings. As a result, this category was dropped from consideration. Third, Aviation Category Fourteen was found to be an archive of inactive topics. This did not seem to be an typical discussion area so it was dropped from the sample.

After the final sample was assembled for this data set, the regression analysis in the preliminary study was replicated. This time, the piecewise regression analysis indicated dramatic increase in the slope of the regression line at five participants-per-week rather than six. It also indicated a dramatic decrease in the slope of the regression line at ten participants-per-week in addition to thirty-four messages-per-week (found before). Since critical break points were viewed to be approximations rather than magic formulas, these findings were reasonably consistent with the preliminary study and will be used in this study.

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[85]Telecomputing forums often maintain separate libraries of files.

[86]Additional measures included new weeks of activity for the Religion and Aviation forums.

As with the preliminary study, forum activity was measured in the forum categories. The first four weeks of available[87] activity was dropped from consideration so that averages of past activity could be established. All activity after September 20, 1990 was dropped due to a major pricing change (starting October 1, 1990) that dramatically lowered the cost of participating in the forums. This editing left approximately 1997 acceptable weekly measures.

Independent Variables

The model of resonance has two basic contentions that were studied. First, all participants acted differently at different stages of the forum life cycle. Second, forum leaders act differently than forum followers. These two variables become the independent variables for this study.

Week Classifications

The major problem with quality measures is that the number of participants and the number of messages should change dramatically. It is not enough to say, for example, that the number of questions increase during resonance and super-resonance — all message increase after resonance. In this portion of the dissertation, the presence or absence of resonance became an independent variable. Weekly measures were divided into categories to correspond to those discussed in the resonance model — quiet, definition, resonance, recession, and super-resonance. Weekly

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[87]It was clear that some forum activity took place before the available messages. Where possible, archived messages were retrieved and restored to their original category.

measures were placed in one of five classes based on their activity level over a five week period — the current week and the four previous weeks.[88] Therefore, week classifications were based on the longer term past activity level presented to current system participants.

Resonance

Since resonance is the most critical period to this study, it was defined first. This study defined resonance weeks as those that had an average activity level between the critical break points. This meant that a week was defined as having resonance when average activity was above six participants and below ten participants or below thirty-four messages per week. In these weeks, the current users of the system were reacting to activity defined as being within resonance. Out of 1997 weekly measures accepted, 252 were defined as having achieved resonance.

Definition and Recession

Definition and recession weeks have activity levels *below* that of resonance. Definition weeks were defined as the five weekly measures immediately *prior to* any period of resonance (while activity was below that of resonance). Similarly, recession was defined as five weekly measures *after* activity dropped below that of resonance.

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[88]The preliminary study defined critical break points not on the basis of momentary surges (or drops) in activity but rather on sustained (average) activity.

In some cases, periods of resonance came too close together.[89] In these cases, it was possible for a week to fit the definition of both definition and recession. To avoid double counting these weekly measures, the first half were defined as recession and the second half defined as definition. In cases of an odd number of weekly measures, the middle week was defined as definition.[90] For example, if there were seven weeks where activity dropped below that of resonance, the first three weekly measures would be defined as recession and the remaining four weekly measures were defined as definition. In all, there were 161 weeks defined as definition and 144 weeks defined as recession.

Super-resonance

Super-resonance weeks attained an average activity level above that of resonance. Sixty weekly measures had average activity above either ten participants or thirty-four messages and were defined in this class. In these weeks, system participants were reacting to an activity level that was probably above ideal.

Quiet

Quiet weeks were simply all weeks that had not attained any other life cycle class. Put simply, these were weeks with low activity. While some quiet weeks were periods of poor activity, most weeks were simply failed areas that were not deleted by the sysop.

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[89]Recession (five weeks after resonance) plus a new definition stage (five week before a new resonance period) equals ten weeks.

[90]This choice was made because early tests suggested that overlaping weeks behaved more like definition than recession.

While this category had the least amount of activity, it accounted for the most weeks. There were 1380 weekly measures defined as quiet. In these weeks, system users were presented with system activity that was below ideal.

Sender Class

The division between forum leaders and other participants was an important part of the resonance model. A leader was defined as a person who had made a serious commitment to the collective action. The production of messages (forum content) was chosen as the best measure commitment to the forum. Operationally, leaders were defined as those participants that had sent more messages than average forum participants. Specifically, participants that sent two standard deviations above the mean number of messages for forum were defined as leaders.[91] This group also included all of the identified sysops of the forums. Leaders sent between about forty and sixty percent of the total messages for their forum (Aviation 62%, Law 43%, Religion 54%).

Quality Measures

The quality measure of messages is more art than science. Any set of quality measures is open to interpretation and researcher bias.

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[91]For Aviation, the average number of messages-per-participant was 29 with a standard deviation of 108. Five participants qualified as leaders with more than 245 messages contributed to the forum.

For law, the average number of messages-per-participant was 6 with a standard deviation of 23. Five participants qualified as leaders with more than 52 messages contributed to the forum.

For Law, the average number of messages-per-participant was 19 with a standard deviation of 64. Eight participants qualified as leaders with more than 147 messages contributed to the forum.

In choosing variables, it was necessary to select measures that fit the model, can be measured reliably, and may yield interesting results. This study presents the researcher with an extremely large sample to study. The final sample included more than 1.5 million words in over 14,000 messages. In addition, the messages were filled with incomplete thoughts, references to earlier messages and innuendo. As a result, the only reasonable model of quality data gathering was a content analysis based on a conversation model of communication. Each message was read by a trained coder.[92] The coder would record the simple presence or absence of a list of quality measures.[93]

Choosing the Quality Measures

Most prior conversation analysis has considered specific types of conversation (e.g., work conversation, romantic conversation, negotiation). Conversations in forums are neither exactly random nor goal oriented. Although there are many theories to conversational analysis, the adoption of resonance as a theoretical base suggests a mechanistic approach to behavior.[94] One of the founders of the mechanistic approach, Robert Bales (Bales, 1950), established a simple categorization that seems to be a reasonable compromise. His categories are broad and simple but concentrate on factors that may affect equilibrium in small groups.[95] They include:

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[92]Coders were undergraduate students who received independent study credit and, in one case, pay in exchange for training and coding messages.

[93]See Appendix A for the exact instruction to the coders.

[94]This approach assumes a rather linear process. E.g., A causes B which causes C.

[95]Bales categorization system is fully documented in *Personality and Interpersonal Behavior,* 1970, New York: Holt, Rinehart and Winston, pp. 62-135.

1. Social-emotional area - positive reactions.
   a. Showing solidarity: raises another status, gives help.
   b. Tension release: jokes, laughs satisfaction
   c. Agrees: understands, concurs complies.

2. Task area - answers
   a. Gives suggestion, direction, implying autonomy
   b. Gives Opinion, evaluation, analysis
   c. Gives orientation, information, clarification

3. Task area - questions
   a. Asks for orientation, information, confirmation
   b. Asks for opinion, evaluation, expression of felling
   c. Asks for suggestions, directions, ways of action.

4. Social-emotional area: negative
   a. disagrees
   b. Tension
   c. Antagonism, deflates other's status or asserts self.

The Bales classification is reasonable and well defined but is not exactly designed for forum interaction. There are two main differences between conversations that Bales studied and forum interaction. First, there is a lack of nonverbal cues. Although a shorthand has developed to somewhat replace non-verbal cues, conversations are often without strong non-verbal indicators. Second, there is an enhanced potential for open controversy (Lea & Spears, 1991). The social presence[96] allowed by the forum is less that which is allowed by direct communication. Without status indicators (e.g., age, income, organizational rank) forum participants may be less inhibited so the conversation can become more blunt .

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[96]Social presence is the degree to which the medium facilitates the awareness of the other person and interpersonal relationships during the interaction as defined by Short, J., Williams, E., & Christie, B. (1976).

To some extent or another, all sysops try to limit open online fighting but controversy may lead to more activity. In order to be more sensitive to the needs of this study, Bales' original categories will be recast into two separate groups - message content and message tone.

A theme common to all interaction analysis is the relationship among individuals. While Bales' system is not sensitive enough to the type of non-verbal interaction used in telecomputing, this project did not abandon this area. Many interesting projects have discussed relationships among individuals online. A separate set of variables — source connection — will try to measure interpersonal relationships.

To summarize, any attempt to analyze qualities of conversations was bound to be incomplete. The goal was to create a set of variables that were likely to show a range of interesting quality measures. With this in mind, dependent measures were divided into three general classes — source connection, message content and message tone.

Source Connection

Source connection variables are those that attempt to measure the relationships among individual participants. Two measures were included — the amount of nonverbal communication, and instances of participants directly addressing one another.

Non-Verbal Communication

The ability of forum participants to exchange not only words but also non-verbal cues has been discussed in many previous projects (Rice & Gail, 1987). Use of non-verbal cues moderates the discussion and conveys meaning more easily than words. But the use of non-

verbal communication also implies the establishment of a more sophisticated social system. For non-verbal cues to be effective, they must be understood.[97] Almost by definition, messages with more non-verbal cues represent a more complex social system — at least up to a point.

A list of non-verbal cues was developed from online experience. If any of these cues were present, the message was coded as having non-verbal communication.

Direct Address

The telecomputing service *Prodigy*, a joint venture of Sears and IBM, has recently suffered a series of complaints from users. These complaints center on restrictive forum message policies (Gaffin, 1990; Godwin, 1991; Middlesex News, 1990). One of the offending policies is that participants are not allowed to directly address one another or react to previous messages. Direct interaction could cause an increase in group loyalty (positive effect) or an increase in dissension or digression (negative effect).

Directly address another user was defined as an instance where one forum participant used the name or code name of another system user in their message. Instances where direct address was implied but a name was not used was not included in this category.

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[97]For example, a receiver must understand the difference between a smile :) a wink ;) and laughter LOL — Laughing out loud.

Message Content

Message content variables simply attempted to measure the type of messages that were sent. Specific categories were message topic, reactions, questions and message length.

On Topic

Although forum conversations are not goal oriented communication, they do have a general topic that they are suppose to address. In this study, the forum's topic was viewed rather broadly. Any message that addressed the general topic of the forum (i.e., any religion topic for the religion forum), was coded as being on topic.

Specifically excluded from this category were private messages or any message that dealt exclusively with forum business[98]. If any part of the message was on topic, the entire message was on topic. As a result, message not coded in this category were those that interrupted the flow of the forum conversation.

Reaction

How well do forum messages connect with one another? Are they a series of random statement or is there true interaction going on? The reaction category was used to measure the interconnectiveness of the interaction. A reaction is a message that addresses the specific topic of a prior message.

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[98]Forum business was defined as messages that dealt with the technology or with forum protocol. For example, "You can find new files by choosing 2 from the file menu." or "Maybe we should establish a new library for files on this topic.

Question

A question is a message that encourages a response. Messages do not have to be formal questions to be coded in this category. Any message that solicits the input of other users was coded as a question. Questions exclude comments that could only be answered by one person.[99]

Message Length

Message length is the most quantitative measure of the quality measures. It does indicate a more qualitative change in the message content. Short messages are obviously more simple reactions the interaction. Message length is a measure of the participants invested effort. The more effort, the more the commitment they have to the forum.

GEnie, unlike most systems allow unlimited message lengths so there is no artificial limit on possible invested activity.[100] Message lengths will be measured in number of words per message as counted by a standard word processor.[101]

Message Tone

This separate categorization system concentrated on the level of controversy or general tone of the conversation. All messages were classified as either negative, positive or disagreements. Positive and negative categories measured one participant's reaction to another.

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[99] For example, "Hey Jim, how are your studies coming?"

[100] It was noted, however, that long messages were often critisized by both the sender and receivers.

[101] In this case, word counts were performed by Microsoft Word® for the Macintosh.

These are content neutral, personal remarks. Disagreement, on the other hand, measured on-topic controversies.

Positive and Negative

Both positive and negative messages measure tone. To qualify as one or the other, the message must identify (or directly address) a specific person or message and indicate positive or negative feelings about that person. Positive and negative classifications are idea neutral. The person does not need to agree or disagree with the idea expressed, just comment on its expression or the person expressing it. Positive comments may include "Interesting idea but...", while negative comments may include "In his own inept way, ???? makes a good point." In both cases the comment must be interpreted as a compliment or insult to a specific person.

Disagreements

Unlike positive and negative, disagreements are content dependent. One participant must identify a specific message or idea expressed by another individual, and specifically express disagreement. The level of controversy, as measured by disagreement, should directly contribute to activity.

The Data Sets

The results from the content analysis was entered into database program.[102] This created a database with the following variables.

Data Set Number One

1. **Message ID #:** A number imposed by the researcher for identification.
2. **Forum:** A dummy variable for the forum. 1=Aviation, 2=Law, 3=Religion
3. **Category #:** The category number imposed by the system.
4. **Participant #:** An identification number imposed by the researcher.
5. **Week #:** A researcher imposed ID that will be used for week summary. The earliest week in the entire sample (April 9, 1987) became number one and weeks were numbered to week number 181 (ending September 26, 1990)
6. **Words:** The actual number of words.
7. **Non-verbal:** Yes (1) or No (0).
8. **Direct Address:** Yes (1) or No (0).
9. **On Topic:** Yes (1) or No (0).
10. **Reaction:** Yes (1) or No (0).
11. **Question:** Yes (1) or No (0).
12. **Positive:** Yes (1) or No (0).
13. **Negative:** Yes (1) or No (0).
14. **Disagreement:** Yes (1) or No (0).
15. **Leader:** Yes (1) or No (0).
16. **Week Classification:** 0=Quiet, 1=Definition, 2= Resonance, 3=Recession, 4=Super-res., 5=Defin/recess.

These measures were then transferred into a spreadsheet program[103] to create a weekly summary of activity. Since almost all the variables are dependent on the number of messages per week, actual numbers were only kept for descriptive analysis. Each message category will be expressed in a final database as a

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[102]First assembly of the database was done in Microsoft Works® for the Macintosh version 2.0e. This program was used at this stage for its low memory requirements and high speed on a simple system. Data could be exported directly into other programs.

[103]Microsoft Excel® for the Macintosh version 4.0. This program was used at this stage because its ability to create weekly summaries and extensive data analysis ability.

percentage of total messages for that week. This second database included weekly summary of data above plus all the variable divided by the number of messages.

Data Set Number Two

1. **Record ID #:** A number imposed by the researcher for identification.
2. **Forum:** A dummy variable for the forum from above.
3. **Category #:** The category number imposed by the system.
4. **Week #:** A researcher imposed ID from above.
5. **Messages:** Sum total for this week.
6. **Participants:** Sum total for this week.
7. **Words:** Total number of words for that week
8. **Non-verbal:** Sum total for this week.
9. **Direct Address:** Sum total for this week.
10. **On Topic:** Sum total for this week.
11. **Reaction:** Sum total for this week.
12. **Question:** Sum total for this week.
13. **Positive:** Sum total for this week.
14. **Negative:** Sum total for this week.
15. **Disagreement:** Sum total for this week.
16. **Leader:** Sum total for this week.
16. **Words per message:** Words/Messages.
17. **Non-verbal Percent:** This variable divided by messages.
18. **Direct Address Percent:** This variable divided by messages.
19. **On Topic Percent:** This variable divided by messages.
20. **Reaction Percent:** This variable divided by messages.
21. **Question Percent:** This variable divided by messages.
22. **Positive Percent:** This variable divided by messages.
23. **Negative Percent:** This variable divided by messages.
24. **Disagreement Percent:** This variable divided by messages.
25. **Leader Percent:** This variable divided by messages.
26. **Week Classification:** 0=Quiet, 1=Definition, 2= Resonance, 3=Recession, 4=Super-res., 5=Defin/recess.

In addition to the variables above there were two temporary measures. The average number of messages and the average number of participants per week (for the current and previous four weekly measures) were added to the database. These measures were used to create the dummy variable for Week Classification based on resonance as described above.

Intercoder Reliability

Messages were coded by the researcher and three undergraduate students who received pay and/or independent study credit for doing the coding. The students were first instructed about the technology and electronically visited several forums. They were then instructed as to the coding procedure (See Appendix A for coding instructions). After some practice coding, there was a retraining meeting. Several times during coding, coders met to discuss problems and standardize solutions. All problem messages were refereed to the researcher. Late in the coding, all coders received the same set of messages to code.[104] Intercoder reliability averaged 94.7% across all variables.[105] For negative and disagreeing remarks, intercoder reliability was 100%. Reliability reached a low for reactions and questions at 88.9% and 89.7% respectively. All other variables were between these levels — Direct address 94.2%; Non-verbal 93.6; On topic 91.4%; Positive 95.8%. On some measures, intercoder reliability was lower than was hoped but this study involved a complex analysis of conversation. Intercoder reliability was viewed to be as high as possible.

Problems Faced with Data

The data set discussed above provides a rich source for analysis but is not free methodological problems. Forum activity was

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[104]The messages were two large sections of messages randomly chosen from the data set.

[105]There were four coders. A percentage of agreement was computed for each variable and each possible pair of coders. The percentages of agreement were averaged for each variable for a variable score of intercoder reliability and averaged across variables.

characterized by wild swings level in the level of activity combined with a great deal of inactivity. The result was data that failed to represent normal frequency distributions and difficulty in defining levels of activity.

One limitation of the study — data was collected on only active forum participants — caused part of the data problems. If a person visited the forum and did not leave a message, no activity was recorded — even if that person was otherwise active. This means that the data represent the result of a decision process — the decision to participate.[106] The result was data that is characterized by surges and doldrums of activity.

There were important differences between individual's activity level. Many people choose only passing participation in the forum, while others became extremely active. Considering that many people probably chose not to participate for every one that did (consistent with any large collective action), the data probably represents relatively rare events. The result was a frequency distribution that was strongly positively skewed.

Since the preliminary study started with a sample of over 2700 weekly measures, it was not reasonable to believe that a normal curve will form from a larger sample. Frequency distributions of activity are probably more correctly described as a Poisson distributions (especially if you consider the effect of visitors). Poisson distributions describe the frequency of relatively rare events

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[106]For example, it does not record the activity of everyone that looks at a product in a store, only those that buy it.

and are highly skewed to the left. Examples of Poisson distributions would include incidence of simultaneous telephone calls out of all telephones in an area or the number of simultaneous insurance claims out of all people covered. Most of the time the frequency of events will be relatively low. But at times, the frequency can be exceedingly high (e.g., Mother's day or hurricane damage). It is, although, those relatively rare events that you use to plan your system.

The unusual characteristics of the data means that the analysis must account for surges, skew error, and outliers — without losing the theory. The point of this study was to look at relationships between level of activity. In particular, how are the users reacting to the levels of activity presented to them? The model presented above suggests a momentary decision based on a longer term impression. Remember that forum users were presented with all messages created since their last visit. Past activity was collapsed into one presentation. The momentary decision was to act at this time, or later — when more messages were likely. As a result, measures of past activity were treated differently than current activity.

There was only one past activity variable — the independent variable week classifications. Each week was assigned one of five classes based on past activity. The most difficult decision was defining the period of resonance. Surges of activity made classification difficult. The question was how to define true resonance from an accidental surge.[107] The decision was made to

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[107]An accidental surge may be caused by simple coincidence. The same

classify resonance based only on sustained activity.[108] By using average data, rather than momentary measures, the frequency distributions are not changed in any important manner. The level of activity, however, is closer to that which should be perceived by users. It was important to use momentary measures to record the momentary decision.

Plan of study

The initial desire was to use the most powerful statistics possible. The first plan was to use ANOVAs on weekly data but ANOVA assumes normal distributions. Without normal distributions ANOVA results can often fail to reject a true null hypothesis (Blalock, 1979) — especially with subcategories of unequal size (Tabachnick & Fidell, 1983). Despite several attempts to transform the data and reduce the effect of outliers,[109] the assumptions of ANOVA could not be met on a consistent basis. In addition, ANOVA results were generally inconstant.

The decision was to rely mostly on message level data and Chi-square tests. One variable, words-per-message, was tested with ANOVA. Correction procedures will be discussed in Chapter Seven.

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way that grocery store lines are always busy when you are ready to leave and quiet when you are not.

[108]A later study should consider the difference between sustained and surges of activity.

[109]A great deal of the skew error was the result of many variables being reported as a percentage of total messages for the week. This was necessary since an increase in message activity would naturally result in increased opportunity for qualitative measures (e.g., more messages means more direct addresses). The major problem was that in low activity weeks, one message can have a dramatic effect on percentage data.

Otherwise, weekly data was retained for illustration purposes only — since it is easier to visualize activity on a weekly basis.

There were two remaining problems with the chi-square method. First, large sample size makes it easier to show a significant relationship, even if it is not a strong relationship. With this in mind, a probability of >0.01 was required for chi-square significance. Second, since this was not a true sample but rather a population, chi-square was not a conclusive test. The chi-square was used to look for significant relationships. Then, Cramer's V, which tests the strength of the relationships, were used to test if important results were found. With such a large sample size, the chi-square can show a significant relationship even if that relationship is not strong enough to be useful.

In addition to traditional Chi-square/Cramer's V tests, there was a need to look at interaction effects. Interaction effects could be demonstrated with two-way ANOVAs but the skew error combined with unequal cell sizes would increase the likelihood of rejecting a true null hypothesis (Blalock, 1979). The chosen method was a series of partial chi-squares[110] and a study of weekly variables.[111] First, chi-squares were performed for leader versus non-leaders at each stage of the forum life cycle. Second, life cycle chi-squares were done separately for leaders and non-leaders. This was done to see if both participant classes were affected by changes in the forum life cycle.

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[110]Selected partial ANOVAs were used for the continuous variable of words per message.

[111]This partial analysis approach was suggested by Blalock (Blalock, 1979).

Hypothesis

The plan for this study set up a two by five contingency table for the independent variables — Week Category and Sender Class. This meant that this study had two specific guiding research questions.

- What is the effect of past activity level on current quality measures of the forum interaction?
- Do forum leaders act qualitatively different than forum followers?

The dependent quality measure variables were placed in one of three classes — Source Connection, Message Content and Message Tone. For the sake of clearer organization, the remainder of this study will look at the dependent variables within these classes. This plan resulted in a set of six primary hypotheses and nineteen specific null hypotheses.

Source Connection

The guiding research hypotheses within source connection were:

H1: Forum leaders use more source connections (non-verbal communication and direct address) than non-leaders.
H2: The level of source connection will be dependent the week classification.

The null hypotheses for source connection were:

Hø1: There is no difference between forum leaders and non-leaders with respect to *direct address* messages.
Hø2: There is no difference between forum leaders and non-leaders with respect to *non-verbal* communication.
Hø3: There is no difference among week life cycle categories with respect to *direct address* messages.
Hø4: There is no difference among week life cycle categories with respect to *non-verbal* messages.

Message Content

The primary research hypothesis for message content were:

H3: Forum leaders' messages contain different message content than non-leaders.
H4: Message content will be dependent the week classification.

The specific null hypotheses for message content were:

Hø5: There is no difference between forum leaders and non-leaders with respect to *on topic* messages.
Hø6: There is no difference between forum leaders and non-leaders with respect to *reaction* messages.
Hø7: There is no difference between forum leaders and non-leaders with respect to *questions.*
Hø8: The mean of leaders' *message length* (in words) is the same as that of forum non-leaders.
Hø9: There is no difference among week life cycle categories with respect to *on topic* messages.
Hø10: There is no difference among week life cycle categories with respect to *reaction* messages.
Hø11: There is no difference among week life cycle categories with respect to *questions.*
Hø12: The mean of *message length* (in words) is the same across all week categories.

Message Tone

The primary research hypotheses for message tone were:

H5: Forum leaders' messages contain a different message tone than non-leaders.
H6: Message tone will be dependent the week classification.

The specific null hypotheses for message tone were:

Hø13: There is no difference between forum leaders and non-leaders with respect to *negative* comments.
Hø14: There is no difference between forum leaders and non-leaders with respect to *positive* comments.
Hø15: There is no difference between forum leaders and non-leaders with respect to *disagreeing* messages.
Hø16: There is no difference among week life cycle categories with respect to *negative* comments.
Hø17: There is no difference among week life cycle categories with respect to *positive* messages.
Hø18: There is no difference among week life cycle categories with respect to *disagreements.*

Descriptive Analysis

In addition to the variables above. One addition hypothesis was added to the descriptive section. The question was, "Do forum leaders contribute messages at different stages in life cycle than non-leaders?" While it was not possible to determine the number of times participants chose not to leave a message, it was possible to look at the proportion of messages. This led to the null hypothesis:

> $H_{\emptyset}19$: Forum leaders and non-leaders send the same proportion of messages in each forum life cycle.

Summary

This chapter proposed what may seem to be a complex study. The complexity is the result of the number of variables that have been measured. It is important to remember that this was a descriptive and exploratory work. The complexity of the study comes from the desire to have the description as complete as possible.

Through theoretical foundations, two predictions have been made. First, qualitative aspects of forum activity change over a proposed forum life cycle. Second, forum leaders act differently than non-leaders. These predictions resulted in a simple two-by-five contingency table — two participant classes (leaders and non-leaders) by five life cycle categories (quiet, definition, resonance, recession, and super-resonance). The next chapter will look at the amount of each quality measure within this table.

CHAPTER SEVEN
RESULTS

As discussed above, the data analysis was conducted in two parts—descriptive data, and the content analysis of quality measures. The results will be presented in the same order.

Descriptive Analysis

In the Chapter Seven, very little discussion was devoted to descriptive analysis. But descriptive analysis was essential to understanding forum activity, choosing reasonable methods of analysis, and interpreting results. This section was designed to simply describe forum activity and prepare the reader for the best understanding the next content analysis.

The descriptive analysis has three sections. The first section presents a description of the quantitative variables — number of participants and the number of messages. The second section considers the only hypothesis proposed for the descriptive analysis ($H_{\emptyset 19}$). The final section provides a broad description of quality measures. After the descriptive analysis is complete, the reader should be better prepared to understand the findings of the formal content analysis.

Quantitative

This sample for this study consisted of a total of 1,381,616 words in 10,847 messages that were sent over about a two and a half year period. With weekly data measured on twenty-four forum categories, the final data set represented 1997 weekly measures per variable. These message were produced by a total of 749 forum participants or about 14.5 messages per participant. Forum leaders were defined as those participants that had sent more than two standard deviations from the mean number of messages for their forum. These eighteen forum leaders sent 55% of all messages.

While the average number of messages per week was 5.46, the median was 2.0 and the mode was zero. Messages had a standard deviation of 10.00, skew of 3.49 and a Kurtosis of 15.58. With a maximum of 91 messages per week, 48 weekly measures (2% of the total sample) could have been classified as outliers for the number of messages.

Forum participants showed the same variation. On average, there were 1.87 participants-per-week (Median = 1.0, Mode = 0.0). Participants had a standard deviation of 2.67, skew 1.65 and a Kurtosis of 2.28. With a maximum of 14 participants per week, 60 weekly measures (3% of the total sample) qualified as outliers for the number of participants (>9.9 participants).

Perhaps the most important finding of the descriptive analysis have already been discussed. The abnormal distributions found in these forums have profound impacts on the way we view both forum activity and collective actions. Forum activity was characterized by

severe positive skews.[112] These positive skews combined with important outliers support the model's basic premise of heterogeneity among potential participants. If anything heterogeneity was more pronounced than expected.

The skews produce a problem for the researcher. With highly skewed data, many statistical methods (common among mass media researchers) may become misleading. The next chapter will discuss the skew error problem in more detail. For the remainder of this chapter, statistics will have to be reported in light of the skew error.

Descriptive Hypothesis

Now that the activity has been described quantitatively, it is possible to look at the one descriptive hypothesis ($H\emptyset_{19}$). With this hypothesis, we are looking at the relative amount of activity at the various stages of forum life cycle. Figure 31 graphically shows this relationship. In general, forum leaders and non-leaders sent about the same number of messages. The big difference came as leaders drastically increased their messages in Super-Resonance (See Table 2). At this time, leaders sent many more messages than non-leaders.

$H\emptyset_{19}$: Forum leaders and non-leaders send the same proportion of messages in each forum life cycle.

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[112]Skew significance was tested, as suggested by Tabachnick and Fidell (Tabachnick & Fidell, 1983), by creating a standard error for the skew (S_S).

$$S_S = \sqrt{\frac{6}{N}}$$

The probability of obtaining a certain level of skewness (S) if the data came from a normal distribution can be evaluated using a z distribution where:

$$z = Z / S_S$$

A z value in excess of ± 2.58 would indicate an abnormal distribution.

FIGURE 3 1
PROPORTION OF LEADER AND NON-LEADER MESSAGES
ACROSS THE FORUM LIFE CYCLE

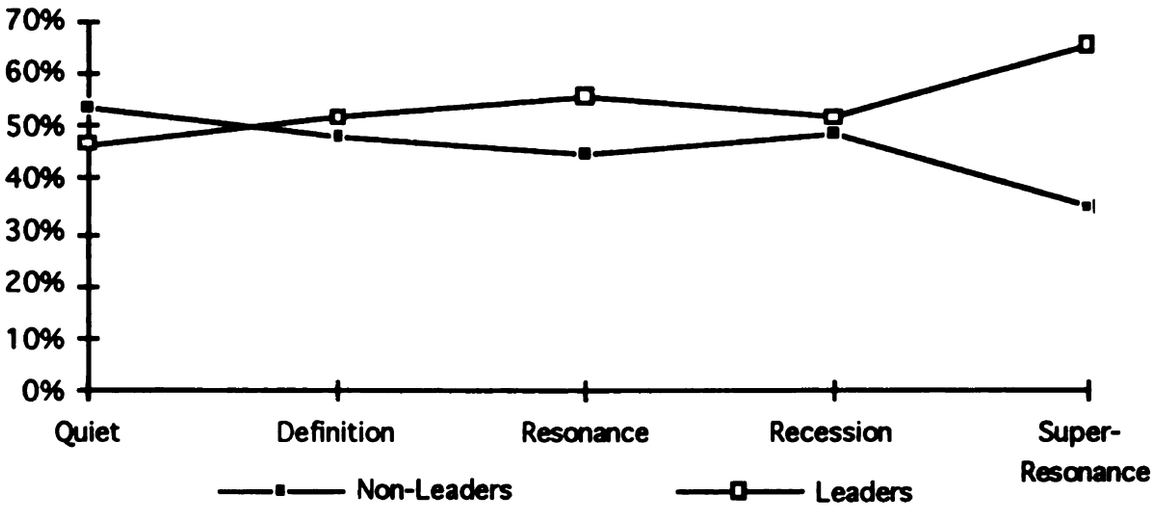

TABLE 2
CHI SQUARE MESSAGES

	LEADERS	NON-LEADERS
QUIET	47%	53%
DEFINITION	52%	48%
RESONANCE	55%	45%
RECESSION	50%	50%
SUPER-RES.	65%	35%
TOTAL	55%	45%

$X^2 = 193.7$, $a < 0.001$, Cramer's V = 0.22

The results suggest a reason to reject the null hypotheses and find that leaders and non-leaders are affected by life cycle. An important finding was the relative number of messages in the Recession stage as opposed to Definition. Although these stages were defined as the time immediately before and after Resonance, there was a clear lack of activity during Recession.

In the remaining descriptive analysis, remember that weekly data expresses quality measures as an average percentage of total messages. High activity periods should not necessarily result in a similar increase in other measures.

Quality Measures

This dissertation provide a great deal of insight into quality measures of forum interaction. Most of the analysis will be done in the next section. This section was designed to provide the reader with a broad summary of results from the quality measures of forum interaction.

To start, Table 3 summarizes the quality measures. The skew error (discussed above) makes the weekly percentages (weekly avg.) deceptively low — due to weekly measures with no activity. In addition to weekly averages, mean and mode were also computed. Again, due to the skew error, these measures do not give a clear picture of forum activity. Finally, "proportion" gives the total proportion of all messages of those with each dependent variable.

TABLE 3
SUMMARY STATISTICS FOR QUALITY MEASURES

	DA	*NV*	*OnT*	*Reac*	*Quest*	*Pos*	*Neg*	*Dis*
Proportion	44%	39%	94%	94%	32%	7%	2%	5%
Weekly Avg.	22%	22%	61%	55%	22%	5%	1%	3%
Stand Dev.	0.30	0.29	0.47	0.47	0.29	0.16	0.061	0.10
Kurtosis	0.13	0.46	-1.72	-1.85	0.88	20.17	145.25	38.74
Skew	1.12	1.17	-0.48	-0.24	1.32	4.24	10.91	5.71

Proportion = Proportion of all messages with each variable.
Weekly avg. = Average percent of messages that contain each variable.
All other measures refer to weekly averages.
DA= Direct Address, NV= Non-verbal, OnT= On Topic, Reac= Reaction,
Pos= Positive, Neg= Negative, and Dis= Disagreements.

"Direct address" was only counted when one participant actually used the name of another participant. Less than half the messages were direct address (less than 25% as a weekly average), but this was more often than expected. Participants used each other's names much more often than may seem normal in an interpersonal conversation.[113] The messages often seemed to be a hybrid between a interpersonal comment and a written letter. The messages may start, "Linda, last week I flew there too... ."

Non-verbal communication was more dependent on a personal style than anything else. Some people used it extensively. Others used very little non-verbal communication. While it was thought that leaders would use more non-verbal than non-leaders, it seemed more dependent on experience and demonstrativeness of the sender. The next section will elaborate on the change in non-verbal across life cycle.

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[113]Imagine if you were talking to someone and they used you name one out of every four times they spoke.

This study defined "On topic" messages rather liberally.[114] Off-topic messages were strictly personal comments and forum management statements (e.g., "Hi, BOB" or "Use *S to send your message."). As a result, the clear majority of messages were somehow "On-topic." The percentage of on topic messages was inflated. A number of message were on the topic of the forum, but were not on the same topic as previous messages. A later study will have to consider a more refined measure of topic diversity.

Questions seemed to be used differently throughout the forum life cycle. In inactive areas, questions were attempts to start a conversation or solicit for information. At more active times, questions were more likely a statement of opinion or a challenge to another person's opinion. The success of a question to get a response seemed to be directly related to the prior activity of the person asking. If the person asking was active in the forum or somehow likely to stay to "talk," the question was more likely to get a response. A later study may consider the effect of questions on forum activity but should consider different types of questions.

A great deal of the messages were reactions and there seems to a clear connection between messages. But the topic of conversation varied wildly. Forum discussion topics were much more diverse than was represented by the high percentage of on-topic messages. Often forum messages, especially at active times, seemed to resemble the normal topic flows of interpersonal communication. Messages

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[114]On Topic messages were any message that had anything to do with the general topic of the forum. For example, anything to do with aviation was "on-topic" in the aviation forum.

reacted to one another but there was always a consistent topic under discussion. Topics seemed to flow freely from one topic to another.

Positive, negative and disagreeing comments were only a small percentage of all messages but they tended to have the most overt impact on later messages. If an increase in the number of messages did not result from a statement of opinion, at least the conversation became more concentrated on the opinion. A later study may look at the relationship between these types of messages and later activity.

Finally, a nagging questions throughout this study was, "Do high activity periods occur in response to relative pricing structure or world events rather than characteristics of the forum itself?" The price of GEnie's services were competitive with alternative at that time. In addition, the start-up cost of telecomputing services usually included a twenty to thirty dollar initial fee.[115] As far as relative health of the economy and world events, Table 4 was created to look at high forum activity periods in relationship to date and subject. High activity periods (resonance and super-resonance) occurred throughout the study period. World events did sometimes affect forum activity in the same that they affect all conversation. A quick reading of high activity message areas indicated that there was a mixture of important and rather mundane subjects discussed. For example, high activity message areas in aviation included the Eastern Airlines strike but also stories from flight school.

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[115]From personal experience.

TABLE 4
TOPICS OF HIGH ACTIVITY PERIODS
Resonance and Super-Resonance

Forum	Category	Start	End	Weeks
Aviation	News and Rumors	3/30/89	5/25/89	8
Aviation	News and Rumors	6/22/89	7/27/89	5
Aviation	News and Rumors	8/3/89	9/14/89	6
Aviation	Learning to fly	11/24/88	1/12/89	7
Aviation	Learning to fly	3/16/89	2/15/90	48
Aviation	Learning to fly	4/26/90	5/17/90	3
Aviation	Instrument Flying	5/11/89	6/8/89	4
Aviation	Products & Equipment	10/27/88	12/1/88	5
Aviation	Products & Equipment	9/21/89	10/19/89	4
Aviation	Products & Equipment	11/23/89	12/14/89	3
Aviation	Products & Equipment	1/18/90	5/10/90	16
Aviation	Pro Pilots Corner	3/30/89	4/6/89	1
Law	Ask An Attorney	5/10/90	5/17/90	1
Law	Ask An Attorney	6/21/90	8/2/90	6
Law	Ask An Attorney	9/6/90	10/4/90	4
Law	Ask An Attorney	6/4/87	10/1/87	17
Law	Ask An Attorney	11/19/87	12/10/87	3
Law	Legacy Lounge	2/4/88	2/11/88	1
Religion	Religion in the USA	5/31/90	6/14/90	2
Religion	Religion in the USA	6/28/90	8/9/90	6
Religion	Protestant Issues	8/18/88	11/3/88	11
Religion	Protestant Issues	3/2/89	3/9/89	1
Religion	Protestant Issues	5/25/89	6/29/89	5
Religion	Protestant Issues	8/3/89	8/24/89	3
Religion	Protestant Issues	12/21/89	3/22/90	13
Religion	Protestant Issues	4/26/90	6/14/90	7
Religion	Islamic Issues	3/30/89	4/6/89	1
Religion	Islamic Issues	9/27/90	10/4/90	1
Religion	Sacred writings - Q &A	9/15/88	9/29/88	2
Religion	Sacred writings - Q &A	3/16/89	3/30/89	2
Religion	Sacred writings - Q &A	5/25/89	6/1/89	1
Religion	Sacred writings - Q &A	6/22/89	11/16/89	21
Religion	Sacred writings - Q &A	2/22/90	3/1/90	1
Religion	Sacred writings - Q &A	7/5/90	7/12/90	1
Religion	Religion & Science	12/15/88	5/11/89	21
Religion	Religion & Science	7/20/89	1/25/90	27
Religion	Religion & Science	3/1/90	8/16/90	24
Religion	Religion & Science	9/20/90	10/4/90	2
Religion	Other Religious Groups	7/20/89	8/31/89	6
Religion	Other Religious Groups	3/1/90	3/15/90	2
Religion	Other Religious Groups	4/19/90	5/24/90	5
Religion	Other Religious Groups	6/14/90	7/5/90	3

The Content Analysis

The remainder of the results section concentrates on the real center of the content analysis. In this section, results from the contingency table approach, developed in Chapter Seven, are presented. Results are organized as were the variables — source connection, message content, and message tone. But before results can be discussed, a discussion of the method is necessary.

Problems with the Methods

During the course of this study, alternative methods of analysis were considered. The first choice was ANOVA using weekly averages. This method assumed a normal distribution of data. As discussed above, the data were heavily skewed with many outliers. As such, the data was not normally distributed. In most cases, the problem with the skew error could not be overcome. Skew error may lead to a false rejection of null hypotheses. Given the likelihood of false results, ANOVA was considered a problematic measure.

Chi-square was chosen as the correct measure for this study. Chi-square is not affected by the skew error in weekly data (because message level data was used), but other considerations are necessary. As an inferential statistic, Chi-square is not useful in where a population rather than a sample is under study. If the Chi-square shows a significant relationship exists between variables, it is necessary to test the strength of the relationship. Therefor, the most useful statistic is the Cramer's V (discussed above). The Cramer's V measured the strength of the relationship.

In the case of the data presented in this study, the Cramer's V did not indicate a strong relationship for any variable. From normal standards, the data produced a relationship too weak to be considered useful (Blalock, 1979). It is believed however, that with some refinement of the model and the methods, a useful relationship can be demonstrated. Given this problem with the findings, the results that follow will be discussed for the relative strength of their relationship only. A further discussion of the weak relationship can be found in Chapter Eight to follow.

On the following pages, each dependent variable will be discussed. All specific null hypothesis for each variable will be discussed before moving on to the next variable. Finally, the support research hypotheses will be discussed in a summary section for each dependent variable class.

Source Connection

There were two source connection variables — direct address and non-verbal. In general, leaders and non leaders acted pretty much the same but there was some reason to believe that there were changes across the forum life cycle.

Direct Address

The two specific null hypotheses associated with Direct Address were:

Hø1: There is no difference between forum leaders and non-leaders with respect to *direct address* messages.
Hø3: There is no difference among week life cycle categories with respect to *direct address* messages.

There was little reason to believe that these data demonstrated a difference between leader and non-leaders use of direct address. The only point at which direct address may be used differently was in super-resonance. In super-resonance weeks, 51% of leader and 42% of non-leader messages contained direct address. With 2473 super-resonance messages, the Cramer's V indicated a poor strength of the relationship. Although another study may find a strong relationship here, this study accepted the null hypothesis (Hø1) that there as no difference between leaders and non-leaders use of direct address.

The effect of forum life cycle, while still weak, displayed a stronger effect on direct address than participant class. More than a simple relationship, the data supported the concept that leaders acted differently than non-leaders. The effect of life cycle on non-leaders' use of direct address was stronger than that for leaders. In addition, while non-leaders peaked their used of direct address at resonance (50% direct address), leaders peaked their use of direct address at super resonance (51% direct address). Despite the weak Cramer's V, hypothesis Hø3 was rejected.

FIGURE 32
PERCENT DIRECT ADDRESS MESSAGES

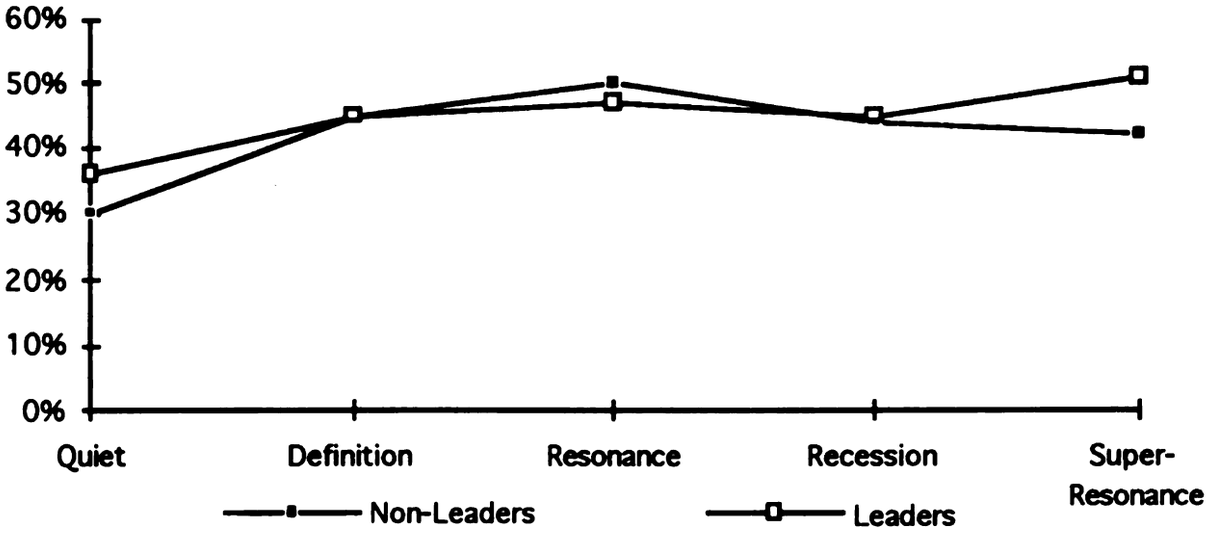

TABLE 5
CHI SQUARE RESULTS FOR DIRECT ADDRESS

	% Direct Address			Chi	Cramer's
	Non-L	Leader	Total	Square	V
Quiet	30%	36%	33%	10.25*	0.06
Definition	45%	45%	45%	0.01	N.A.
Resonance	50%	47%	48%	4.60	N.A.
Recession	44%	45%	44%	0.06	N.A.
Super Res	42%	51%	48%	20.55*	0.09
Total	42%	45%	44%	15.19*	0.04
Chi-square	135.57*	74.88*	189.72*		
Cramer's V	0.17	0.11	0.13		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Non-Verbal

For non-verbal two null hypotheses were proposed.

Hø2: There is no difference between forum leaders and non-leaders with respect to *non-verbal* communication.
Hø4: There is no difference among week life cycle categories with respect to *non-verbal* messages.

There was very little support found to reject either hypotheses. Chi squares looking for a relationship between participant class and the use of non-verbal communication failed to support any relationship. Cramer's Vs were not calculated when chi-squares did not reach a 0.01 level of significance. The chi-squares between life cycle and use of non-verbal communication did reach the 0.01 level of significance but the Cramer's V indicated a relationship too weak to be considered useful. From the descriptive analysis above, these finding supports the belief that non-verbal communication was used more by the more experienced and expressive participants. Both null hypotheses (Hø2 and Hø4) were accepted for non-verbal communication.

Source Connection Summary

Turning to the research hypotheses for source connection

H1: Forum leaders use more source connections (non-verbal communication and direct address) than non-leaders.
H2: The level of source connection will be dependent the week classification.

One of the two research hypotheses received weak support from these data. The first hypotheses (H1) had to be rejected. Forum leaders did not use more source connection than non-leaders. Although there was weak support to indicate that forum leaders used direct address differently than non-leaders, it can not be said that participant class was useful in predicting direct address.

For the second source connection hypothesis, there was some support to indicate that direct address direct address was used differently across the forum life cycle. The more important finding was that forum non-leaders were more affected by life cycle than leaders. Hypothesis 2 was accepted with weak support.

FIGURE 33
PERCENT NON-VERBAL MESSAGES

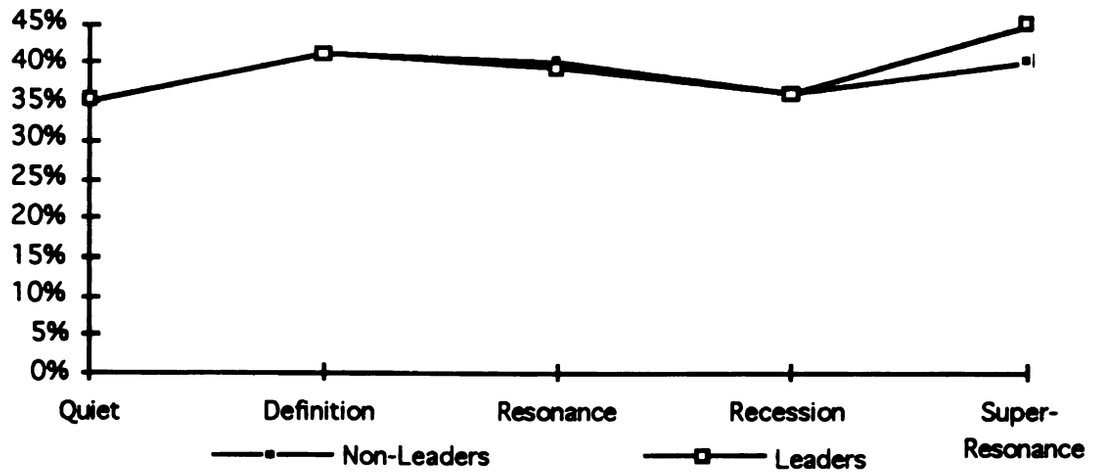

TABLE 6
CHI SQUARE RESULTS FOR NON-VERBAL

	% Non-Verbal			Chi	Cramer's
	Non-L	Leader	Total	Square	V
Quiet	35%	35%	35%	0.01	N.A.
Definition	41%	41%	41%	0.02	N.A.
Resonance	40%	39%	39%	0.32	N.A.
Recession	36%	37%	36%	0.03	N.A.
Super Res	40%	45%	43%	5.20	N.A.
Total	38%	40%	39%	2.81	N.A.
Chi-square	13.91*	32.00*	43.05*		
Cramer's V	0.05	0.07	0.06		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Message Content

The four message content variables included "on topic," "reaction," "question" messages. In addition, words per message was a measure of message content.

On Topic

For on-topic messages, hypothesis Hø9 will be considered first.

> Hø9: There is no difference among week life cycle categories with respect to *on topic* messages.

What was found was a decrease in the proportion of on-topic messages at resonance and an increase in on topic messages at super-resonance. Despite the weak relationship indicate by the Cramer's V, it is believed that there was an effect of forum life cycle on the use of on topic messages. This effect was somewhat stronger for forum leaders than for non-leaders. Hypothesis Hø9 will be rejected for this study.

As for hypothesis Hø5:

> Hø5: There is no difference between forum leaders and non-leaders with respect to *on topic* messages.

If you look at individual (or total) life cycle stages, the chi-squares failed to support any relationship between participant class and use of on topic messages. On the other hand, if you look at the total trend, forum leaders seem to be more affected by life cycle classes and non-leaders. As a result, there was some reason to reject hypothesis Hø5.

FIGURE 34
PERCENT ON TOPIC MESSAGES

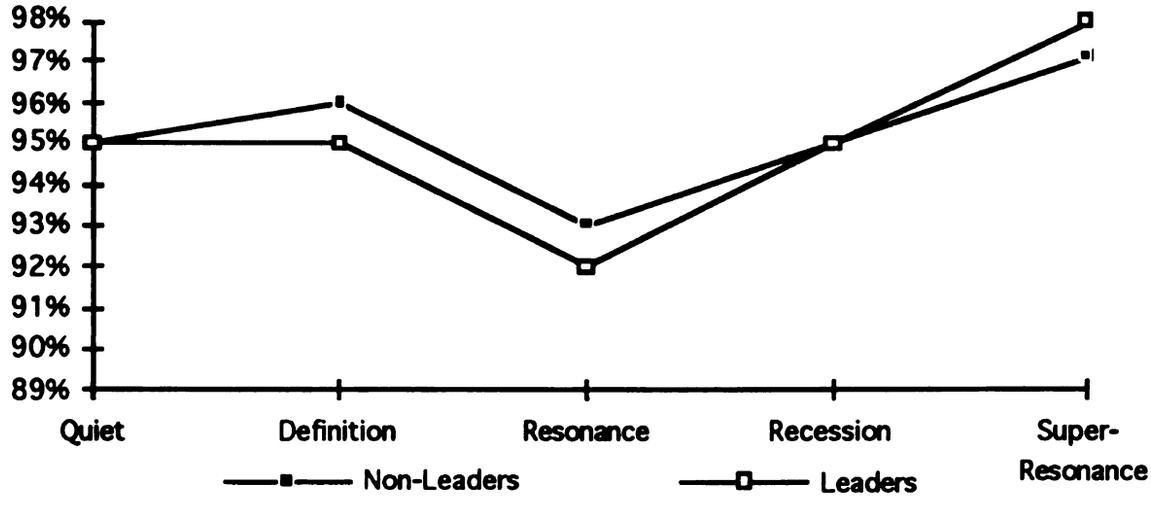

TABLE 7
CHI SQUARE RESULTS FOR ON TOPIC

	% On Topic			Chi	Cramer's
	Non-L	Leader	Total	Square	V
Quiet	95%	95%	95%	0.14	N.A.
Definition	96%	95%	95%	2.64	N.A.
Resonance	93%	92%	93%	0.73	N.A.
Recession	95%	95%	95%	0.02	N.A.
Super Res	97%	98%	98%	4.74	N.A.
Total	95%	95%	95%	0.02	N.A.
Chi-square	22.28*	64.35*	80.97*		
Cramer's V	0.07	0.10	0.09		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Reaction

For reaction, the most interesting finding was the difference between leaders and non-leaders. While non-leaders changed somewhat dramatically in their proportion of reactions, leaders did not. Leaders remained relatively flat in their proportion of reactions (96%-98%). Non-leaders tended to increase their proportion of reactions with and increase in activity. The strongest differences between leaders and non-leaders occurred in the quiet, definition, and recession stages (lower activity stages). In resonance and super resonance stages (higher activity stages), non-leaders began to use reactions in the same proportion as leaders.

As for the reaction null hypotheses:

> $H_{ø6}$: There is no difference between forum leaders and non-leaders with respect to *reaction* messages.
> $H_{ø10}$: There is no difference among week life cycle categories with respect to *reaction* messages.

Hypothesis $H_{ø6}$ was rejected because non-leader consistently sent less reactions than leaders. Hypothesis $H_{ø10}$ can be rejected but only for non-leaders. The data did not support a strong effect of life cycle on leaders.

FIGURE 35
PERCENT REACTION MESSAGES

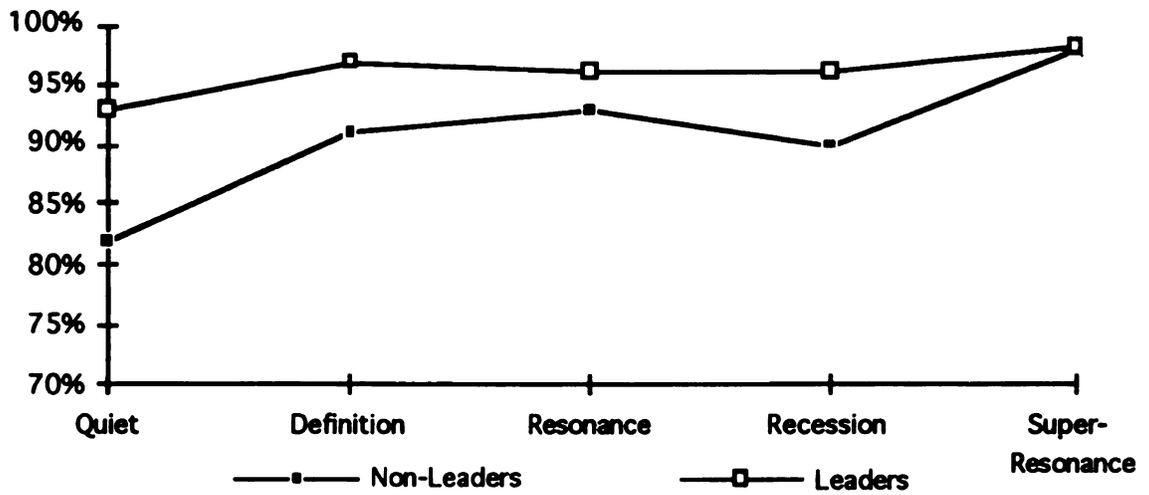

TABLE 8
CHI SQUARE RESULTS FOR REACTION

	% Reactions			Chi	Cramer's
	Non-L	Leader	Total	Square	V
Quiet	82%	93%	87%	84.98*	0.17
Definition	91%	97%	94%	29.64*	0.14
Resonance	93%	96%	95%	11.54*	0.06
Recession	90%	96%	93%	7.08*	0.12
Super Res	98%	98%	98%	0.05	N.A.
Total	90%	96%	93%	155.43*	0.12
Chi-square	187.73*	40.33*	257.18*		
Cramer's V	0.20	0.08	0.15		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Question

Again, the difference between accepting and rejecting the null hypotheses depended on overall trends in the data. It was clear from the overall trends that leaders sent a lower proportion of questions than non-leaders. The most important difference between leaders and non-leaders came at the resonance stage. Non-leaders peaked their proportion of questions at resonance while leaders peaked at definition.

Measurement error may have lead to the lack of demonstrable effect of life cycle on the proportion of questions. In the descriptive analysis, it was noted that there were two types of questions. Some questions were used to solicit opinions, information or reactions. Other questions were used more for commentary. A later study may consider the effect of different types of questions.

Of the two null hypotheses for questions, one was accepted and one was rejected.

> Hø7: There is no difference between forum leaders and non-leaders with respect to *questions.*
> Hø11: There is no difference among week life cycle categories with respect to *questions.*

Hypothesis Hø7 was rejected for two reasons. First, at the resonance stage, there was weak support for a difference between leaders and non-leaders. Second, in looking at the overall trend, it is believed that leaders sent fewer messages than non-leaders.

Hypothesis Hø11 was not rejected. There was too little support to believe that either leaders or non-leaders use of questions were affected by forum life cycle.

FIGURE 36
PERCENT QUESTIONS

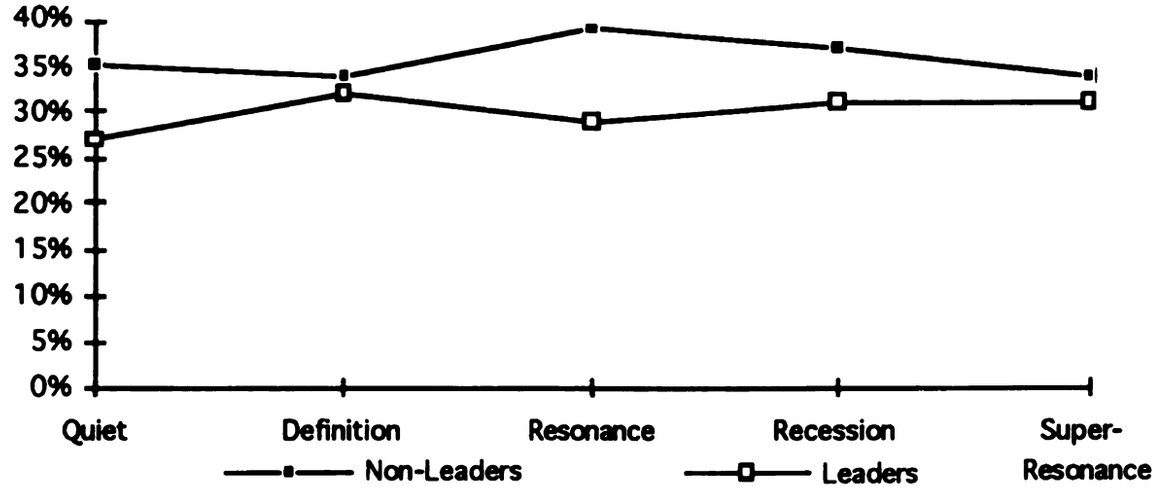

TABLE 9
CHI SQUARE RESULTS FOR QUESTIONS

	% Questions			Chi	Cramer's
	Non-L	Leader	Total	Square	V
Quiet	35%	27%	31%	18.73*	0.08
Definition	34%	32%	33%	0.39	N.A.
Resonance	39%	29%	33%	36.42*	0.10
Recession	37%	31%	34%	1.97	N.A.
Super Res	34%	29%	31%	9.18*	0.06
Total	36%	29%	32%	58.97*	0.07
Chi-square	8.47	6.68	7.30		
Cramer's V	N.A.	N.A.	N.A.		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Words per message

With other quality measures, Chi-square analysis was a more appropriate measure but with words-per-message ANOVA was necessary. The interval level data was not as applicable to Chi-square without loss of information.

The problem with ANOVA was that it is affected by skew error (non-normal distributions). Despite every attempt to correct skew error, some remained. As a result, the ANOVA findings should be somewhat suspect. This variable is being reported for two reasons. First, it was viewed as an important measure of invested effort. Second, ANOVA results (as well as actual number differences) were so strong that the decision was made to set aside the failure to meet all ANOVA assumptions. Still, it should be noted that skew error may cause a false rejection of the null hypothesis.

Table 10 and Figure 37 summarized the differences in average number of words per message based on treatment. Notice first that non-leaders tend to use twice the number of words as leaders (Non-leaders 87.08, Leaders 42.44). Second, notice that words-per-message drops dramatically during the Recession stage. There was also a important effect of life cycle category. These results mean that $H_{\emptyset 8}$ and $H_{\emptyset 12}$ can be rejected with the warnings discussed above.

$H_{\emptyset 8}$: The mean of leaders' *message length* (in words) is the same as that of forum non-leaders.
$H_{\emptyset 12}$: The mean of *message length* (in words) is the same across all week categories.

FIGURE 37
AVERAGE NUMBER OF WORDS PER MESSAGE

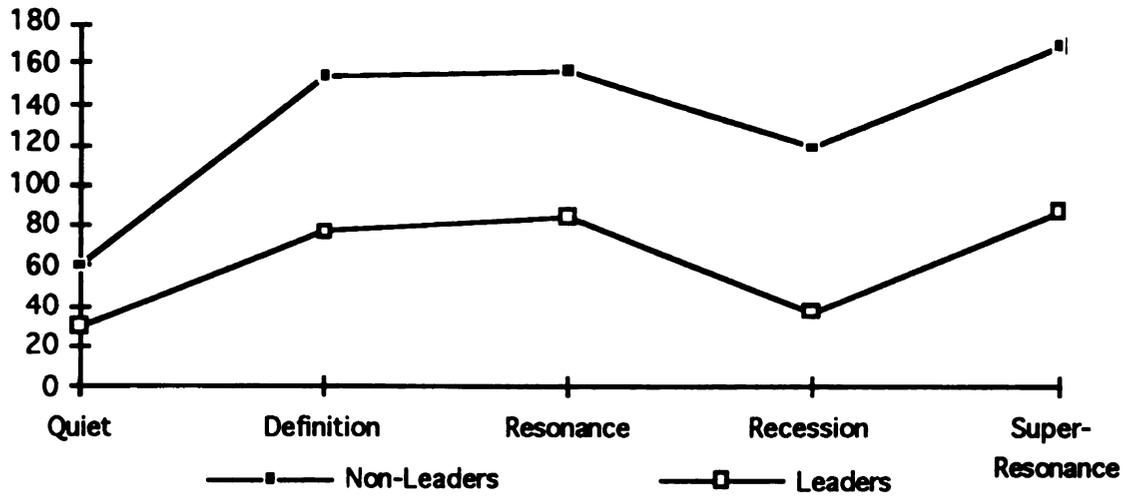

TABLE 10
WORDS-PER-MESSAGES BY TREATMENT

Words	Non	Leader	All
Quiet	59.87	29.35	60.04
Definition	153.99	76.70	134.95
Resonance	156.01	84.29	134.16
Recession	118.17	37.65	96.59
Super	169.38	87.24	116.75
Total	87.08	42.44	79.77

Figure 37 and Table 10 above present data with measures that were not altered in any way. For the ANOVA, several corrections were attempted. First, weekly measures with only zero or one messages were removed from quiet category. The effect of this action was to reduce the overall skew error and bring the mean and variance measures closer to those of other categories (lessening the possibility of a significant effect). Second, outliers were reduced, by treatment, to three standard deviations from the treatment mean.[116] Finally, a logarithmic transformation was performed on the original data (plus one to correct for data with zero values) as suggested by Tabachnick (1986). Results of these tests are presented in Table 11.

TABLE 11
ANOVA RESULTS - WORDS.

Groups	*Count*	*Sum*	*Avg*	*Variance*
Quiet	522	1008.47	1.93	0.11
Definition	161	301.02	1.87	0.44
Resonance	252	488.28	1.94	0.27
Recession	144	192.13	1.33	0.96
Super	60	122.16	2.04	0.03

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*
Between	45.87	4	11.47	38.80	>.001
Within	335.1	1134	0.30		
Total	381.0	1138			

[116]This means that data was split into treatment groups before means, standard deviation and outliers were removed as suggested by Tabachnick (1983).

Since words were tested with ANOVAs, it was possible to order tests for interaction effects. The question became "Where such tests appropriate?" Interaction effects were not tested for two reasons. Unequal cell numbers can be corrected with an unweighted mean analysis, random section of data points, or a regression analysis approach but further important assumptions would have to be ignored.[117] At this point, the researcher felt that breaks with assumptions were too far for reasonable conclusions to be drawn. Second, on examining the actual data, there did not seem to be enough differences between leaders and non-leaders at different stages in the forum life cycle. Non-leaders consistently sent 65% - 67% of all words sent.[118]

In place of normal interaction effects, three selected partial effects were tested with ANOVAs (using the final transformed data). First, there seemed to be a noticeable decrease in average words from resonance to super-resonance. Second, there was also a noticeable decrease in average words from definition to recession. Finally, did an overall increase in message activity, from quiet, to resonance, to super-resonance result in a important change in the number of words?

The results from these partial ANOVAs (presented in Table 12) were rather surprising. The ANOVAs did not support the first or

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[117]With unequal n, a factorial design becomes nonorthogonal. Hypotheses about the various main effects and interactions are no longer independent, nor are sums of squares additive (Tabachnick, 41, 1983).

[118]The exception to this trend was in recession weeks. Non-leaders sent 76% of all words. While this difference may be significant, higher variances and lower cell numbers make it even more likely that invalid results will be found.

third partial effects. There was not a important difference in the number of words between resonance and super-resonance or between quiet, resonance and super resonance categories. However, the results did support the hypothesis that there was a important effect of definition to recession categories on words.

If you were to look at the raw word averages in Table 12, these results seem rather surprising — even suspect. But if you look at the averages of the transformed variables (in the ANOVA Tables), these results become much more understandable. After the transformation, the variable did not appear nearly as different as in the highly skewed data set. This was a perfect example of the errors that could be produced by breaking the assumptions of the tests. Since the skew error should have made it too easy to reject the null hypotheses, the first and third partial ANOVAs easily accepted the null hypothesis that there was no difference in the average words per message. The difference between definition and recession can be conditionally[119] supported by rejecting the null hypothesis that there is no important effect of these two categories on words.

[119]Support is conditioned on the understanding that there is an increased chance to reject a true null hypothesis.

TABLE 12
PARTIAL ANOVAS OF WORDS.

Groups	*Count*	*Sum*	*Average*	*Variance*
Resonance	252	488.3	1.9	0.27
Super	60	122.2	2.0	0.03

Source of Variation

	SS	*df*	*MS*	*F*	*P-value*
Between	0.47	1	0.47	2.11	0.15
Within	68.88	310	0.22		
Total	69.35	311			

Groups	*Count*	*Sum*	*Average*	*Variance*
Definition	161	301	1.87	0.44
Recession	144	192.1	1.33	0.96

Source of Variation

	SS	*df*	*MS*	*F*	*P-value*
Between	21.8	1	21.80	31.612	>0.001
Within	208.9	303	0.69		
Total	230.7	304			

Groups	*Count*	*Sum*	*Average*	*Variance*
Quiet	522	1008	1.93	0.11
Resonance	252	488.3	1.94	0.27
Super	60	122.2	2.04	0.03

Source of Variation

	SS	*df*	*MS*	*F*	*P-value*
Between	0.587	2	0.29	1.93	0.15
Within	126.2	831	0.15		
Total	126.8	833			

Message Content Summary

With so many variables and possible sources of variation, it is not surprising that some support can be found for both message content hypotheses. While the methodological problems discussed above gave reason to question any individual finding. The consistent results of some effect give reason to continue this line of research.

H3: Forum leaders' messages contain different message content than non-leaders.
H4: Message content will be dependent the week classification.

What was more important for this class of variables was the source of the variation. In Chapter Eight, there will be a closer examination of the possible ramifications of individual variables.

Message Tone

There were not enough positive, negative, or disagreeing messages to properly test hypotheses $H\emptyset_{13}$ to $H\emptyset_{18}$. All of the message tone variables had a frequency below five in at least one cell of the partial chi-squares. Rather than eliminating life cycle or participant class categories, the decision was made to reduce all three variables into one called "opinion." Opinion became a measure of incidents were participants expressed an overt personal opinion about another participant or the issue under discussion. Since new null hypotheses would simply be null version of the research hypotheses for message tone, this section will simply discuss any support found for the research hypotheses.

H5: Forum leaders' messages contain a different message tone than non-leaders.
H6: Message tone will be dependent the week classification.

As with the variable "reaction" above, the main source of the variation in the use of opinion messages was associated with the non-leaders. While the proportion of opinion messages from leaders varied from 6% (recession) to 11% (resonance), non-leaders' proportion varied from 7% (recession) to 19% (resonance). Leader and non-leader messages contained an nearly equal proportion of opinion late in the forum life cycle. In the recession and super resonance stages, non-leaders proportion of opinion was only 1% higher than that for leaders.

Support for the two message tone hypotheses (H5 and H6) was limited. It was clear that forum leaders and non-leaders used message tone differently, but the effect of life cycle on message tone could only be supported for non-leaders. Hypothesis H5, therefor, was supported, but support for hypothesis H6 was limited to an effect on non-leaders only.

FIGURE 38
PERCENT OPINION MESSAGES

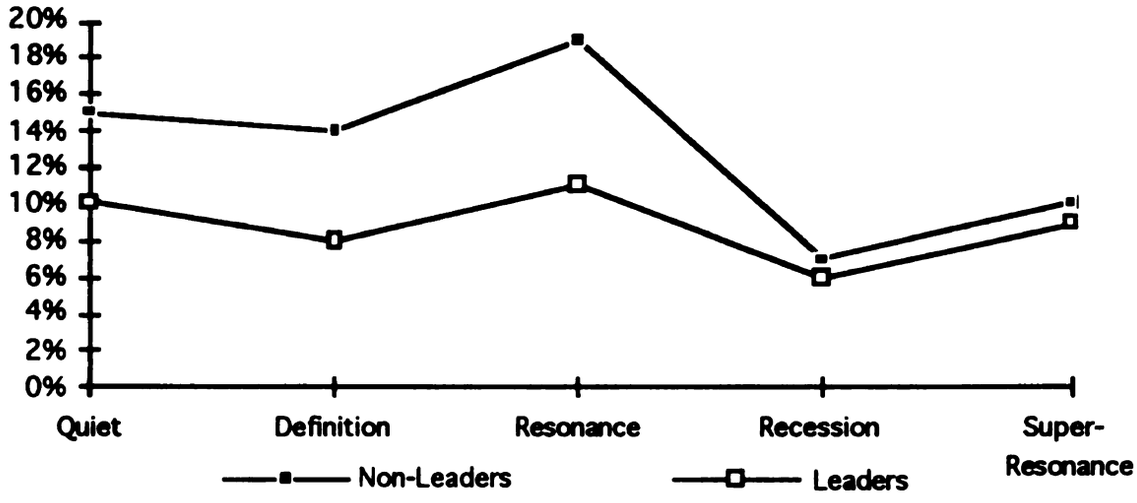

TABLE 13
CHI SQUARE RESULTS FOR OPINION

	% Opinion			Chi Square	Cramer's V
	Non-L	Leader	Total		
Quiet	15%	10%	13%	12.37*	0.06
Definition	14%	8%	11%	14.66*	0.10
Resonance	19%	11%	14%	46.41*	0.11
Recession	7%	6%	6%	0.03	N.A.
Super Res	10%	9%	10%	0.36	N.A.
Total	15%	10%	12%	64.73*	0.08
Chi-square	48.18*	9.18	48.91*		
Cramer's V	0.10	N.A.	0.07		

* Significant at the 0.01, Non-L = Non-leader
N.A.= Not applicable due to poor significance of Chi-Square.

Summary

The most surprising finding of this study was the failure to show reasonably strong relationships between the dependent and independent variables. This alone suggests a host of possibilities that will be discussed in the next chapter.

The descriptive analysis found an activity level that was highly skewed. The great bulk of the weekly measures studied had no activity in many forum categories. A frequency distribution of activity per week would show a steep curve from no activity with a long tail of weekly measures with intense activity. This non-normal distribution affected the interpretation of activity and the choice of statistical tests.

Overall it was found that leaders sent slightly more than half of all messages (55%). Leaders sent more messages in every life cycle class except "quiet." Leaders were much more active in super-resonance weeks

The descriptive analysis also showed that most messages were "on topic" (94%) and/or "questions" (94%). On the other hand, very few of the messages contained positive (7%), negative (2%), or disagreeing (5%) remarks. Direct Address (44%), non-verbal (39%) and question messages accounted for a minority proportion of the remaining messages.

The data did not support the hypothesis that leaders and non-leaders differed on their use of direct address. Life cycle did affect the use of direct address with non-leaders being affected more than

leaders. Non-leaders peaked their use of direct address in resonance while leaders tended to peak in super-resonance.

Neither participant classes or life cycle categories were useful in predicting non-verbal communication. In all, it seemed that the use of non-verbal communication was more a function of personal preference than anything else.

Leaders varied their proportion of on topic messages over the forum life cycle more than non-leaders. Although the support for the difference was very weak, there were indications that participants tended to stray off the topic more in resonance weeks and concentrate more on topic in super resonance.

The data indicate that while leaders stayed consistent with their proportion of reactions, non-leaders did not. Non-leaders proportion of reaction seemed to be affected by their level of activity. The more a non-leader sent messages, the higher the proportion were reactions.

It was clear that non-leaders asked a higher proportion of questions than leaders. The difference between leaders and non-leaders was strongest at resonance.

Non-leaders also sent more words per message than leaders. Through ANOVAs, it was found that leaders and non-leaders differed on message length. Message length was affected by life cycle. In particular, recession was typified by a dramatic decrease in the number of words per message.

Finally, proportion of non-leaders opinions were affected by life cycle. In particular, non-leaders sent a much higher proportion of opinion remarks in the quiet, definition and resonance stages. There

was also a dramatic decrease and matching of the leaders proportion in the recession and super-resonance stages.

CHAPTER EIGHT
DISCUSSION

At this point, the study feels like the final chapter of a good old-fashion murder mystery. We know something happened. We have assembled our suspects. We have an overwhelming number of clues. If were only so simple, it would now be time to point a finger at the guilty party. Unfortunately, the best that can be done is to interpret the results and identify directions for future research.

Limitations - What Was Not Found

As mentioned before, the most surprising finding was the weakness of the relationships. There are several possible causes for this problem. Each will be discussed below with a suggestion for future research.

Model Mispecification

The first thing to question is usefulness of the model under study. The resonance model was developed for the purposes of this study. As a new model, it is understandable that it needs refinements. The two independent variables — life cycle and participant class — present different problems to the model.

There is already one possible refinement to the description of life cycles. Does a forum that has been through either recession or super-resonance stages act the same as a forum that has not? Like a musical instrument that sustains a note after input energy has stopped, it is possible that forums (at least for some time) sustain a different potential for resonance than one that has not achieved resonance before. Oberschall (Oberschall, 1980) discussed the possibility that the success of one collective action eases the success of related collective actions (see Figure 10 above).

A nagging problem for the model had been the definition of participant class. Only two participant classes were used in this study. Logically, it is very possible that more are needed. When Rogers (Rogers, 1983) developed diffusion of innovations, he defined five adopter classes. It is reasonable that there may be a similar grouping of potential participants.

In addition, this study defined forum leaders as being those that contributed the most messages. Forum managers, those designated by the service to control the forum, were included in this group but so were some others. The true definition of a "forum leader" need further investigation.

Measurement Error

The methods used to measure the variables may have caused the weakness of the relationship. The dependent variables may have been defined too liberally or too specifically. From reading the messages, it was clear that they often had several different purposes. For example, a single message may have contained several questions

or comments to different people. These were treated as one message — even though they had several parts. A more refined message analysis may be necessary.

The method used to operationalize the life cycle may have caused problems as well. In particular:

- Was weeks the appropriate unit of measure?
- Was average past activity correctly defined?
- Was the forum category (rather than the forum as a whole) the correct place to measure the collective action?
- Was the method used to place weeks into a life cycle class the best possible?

Any or all of these decisions may have been incorrect and resulted in problems for the study. Later studies will have to consider the lag effects of past action on future activity in forums.

Limitations on Statistical Methods

The skewness of the data limited the range of appropriate statistical methods. Chi-square was chosen because it is not affected the skewness of the distributions but other methods may bring out more information. Future researchers need to be prepared for the possibility of heavily skewed data. New methods of analysis may be necessary. These methods must be able to determine relationships in non-normal distributions.

Population Under Study

The population under study was not a random sample. It was chosen specifically to be representitive of current teleccomputing systems. Later studies may find different or stronger results based on changes in the population.

The telecomputing forum has many formats. The system under

study allows some of the freest access with the fewest rules. System users are allowed to come and go with very little trouble. Another form of the telecomputing forum is called a "listserve" system. Listserve systems, popular on Bitnet, Internet, Usenet and other UNIX based environments, require the potential participant to subscribe to the forum. Messages are electronically mailed to the participant so that the forum becomes a more normal part of their daily routine. These systems imply more commitment to the forum but users are free to come and go. This additional commitment may change the motivations to participate.

More modern software has begun to allow system users to download the entire contents of a forum (including CompuServe and American Online). In these forums, there seems to be a tendency to create more and smaller conversation areas. In addition, there is not the close tie from one forum area to another. Again, there may be a different traffic pattern associated with these variations.

The population under study is admittedly unusual. Users have been found to be predominately male, younger, with higher than normal education and socioeconomic status. The homogeneity of the group under study may have contributed to the weak results. The homogeneous group may have violated an assumptions of collective action theories — heterogeneity among potential participants. If the group of potential participants are homogeneous, they may not have reacted differently to the situation.

There are two possible solutions to the sampling problem. The first is to enlarge the study to a true sample of online forums. It is possible that a larger group of online forums may yield a more

heterogeneous population. Second, the problem may correct itself as forums develop. In the coming years, it is possible that forums may become a more popular medium. It they do, the population should become naturally more heterogeneous.

Characterizing the Forum

The weak relationships notwithstanding, the model was supported in many subtle ways. First, there were several quality changes in the conversation along the life cycle. Second, forum leaders behaved differently than forum followers. These two results answered the specific research questions (posed in Chapter Six) but more explanation is necessary to truly characterize forum activity (a goal in Chapter One). What follows is a discussion of forum activity based on the findings of this study and experience reading forum messages.

The Participants

It is easiest to understand activity from the perspective of the participants. This study defined two participant classes. First, there are the forum leaders. These people have made a real commitment to the forum. With the overwhelming number of messages they send, they have become proficient and relaxed about the communicating in this manner. Forum leaders want the support of the non-leaders for the continuation of the forum. Leaders must enjoy their leadership roll since they are not paid.[120]

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[120]In general, most leaders do receive online time.

The second participant class was the non-leaders. Non-leaders do not have the same emotional and economic (money) investment in the forum. Rewards for participation must be greater for the non-leaders in proportion to their investment. Non-leaders are looking for information or fun and are not as willing to invest work. The differences between leaders and non-leaders build inherent problems into the system.

The last two paragraphs have made some broad statements. Readers may agree (or disagree) based on what they already know or feel. The question is, "How can this study support these characterizations?" Support is not found in any one variable but in more consistent trends.

To start, the strongest differences between leaders and non-leaders occurred in measures of the actual amount of activity. By definition, forum leaders were those that sent above two standard deviations from the mean amount of activity. Out of 749 participants, eighteen were defined to be forum leaders. It was not surprising that forum leaders sent more messages than non-leaders. What was surprising is how many more messages forum leaders sent. These eighteen people sent 55% of all messages. With this in mind, it was not too surprising that leaders' messages were shorter than non-leaders.

The short messages were part of a pattern of leader behavior. In general, leaders were more casual in their behavior. The study showed that leaders sent fewer strong opinions and had less variation of their proportion of direct address, reactions, and opinions. Leaders did vary more with on-topic messages (although this differ-

ence was weak), but the variation was likely due to a heighten willingness to be off topic. Non-leaders were much more dramatic in their behavior. Not only did they send more opinions, they were less likely to send a reaction, but more likely to send a question.

Forum leaders, as defined in this study, send a bulk of the messages. It is reasonable to believe that they try to promote conversation. Besides creating most of the forum areas, leaders were more likely to react to previous messages as well as use direct address. On the other hand, non-leaders play an important role in the forum. Despite the fact that they send fewer messages, they actually send more statements of opinion — including positive, negative and disagreeing comments. Non-leaders also send more words on average than leaders. If you consider the importance of quality measures, this description fits the resonance model. Leaders provide the bulk of input energy while followers create the real flurry of activity in the form of opinions and ideas (words).

The Life Cycle

The data also indicated a possible refinement to the resonance model. The most important challenge came when looking at the distribution of messages over the life cycle. As originally described, forum leaders start the conversations and can then relax a little once they are under way. How is it possible then that non-leaders sent more messages in the quiet stage and proportionally fewer in resonance? Leaders, for their part, sent more messages in resonance and super-resonance stages. It would seem from this finding that non-leaders start conversations and leaders follow. It is important to re-

member that the association does not imply causality. A later study will have to look at whether active conversations are attributable to leader or non-leader messages.

Still, how can these findings be true if resonance is valid? An important consideration is to re-examine the motives of participants. Leaders want to encourage activity. They have invested a great deal of time and effort into the forum. Since there is more reward from active weeks, forum leaders should naturally be more interested in maintaining active conversations than starting new ones. Remember the amount of effort it takes to start a resonance effect as opposed to maintaining one.

Forum non-leaders should be a heterogeneous group with an equally diverse range of interests. While it may be rewarding to participate in an active conversation, it is not as rewarding as participating in an active conversation tuned to your own special interest. As a result, forum non-leaders have a greater motivation to start new conversations — though perhaps not the energy to maintain them.

Putting this in terms of resonance. Input energy is contributed by forum leaders as they create the vibrating system (forum). Non-leaders become the restoring force as they try to draw the forum to their own center of interest. Leaders act more like inertia as they try to encourage activity that is already taking place. The energy that drives an established forum is therefore shared between leaders and non-leaders. Each participant class is playing a part in the forum's success. In this way, the remaining findings are appropriate to the model.

Suggestions for Sysops

While this study did not look at the relationship past quality measures and current activity (to determine what promotes activity), there can still be a valuable lesson for sysops. Most important, the data suggests that forum leaders are not "in sync" with their participants. Specifically forum leaders may not be doing enough to encourage new topics of discussion and too much to promote current discussion areas. A more realistic goal may be to try to maintain a lower level of activity. In this way, more of the forum content can be provided by outside participants rather than sysops.

A second finding of this study suggests that some sysops may be living in too much fear of what is called "flaming." Flaming is a unique phenomenon to online activity.[121] Without strong nonverbal cues, some remarks can be misinterpreted. Combine the lack of nonverbal cues with a lower level of inhibitions online (Dick, 1992b; Dick, 1986; Hiemstra, 1982) and flames can start in a conversation as people argue over relatively minor points.

Almost all sysops try to control flaming. In an extreme case, the online service *Prodigy* currently has policies that severely restrict inter-participant interaction (Gaffin, 1990; Godwin, 1991; Middlesex News, 1990). This may be understood as a difference between forum leaders and non-leaders. Non-leaders seem much more interested direct interpersonal interaction, even conflict. In reading messages,

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[121]"Flaming" is a term used in the online community to describe arguments that become more severe than the situation warrants. Frequently these arguments become very personal and result in an on-going feud between participants.

several cases of running online feuds seemed to have a positive effect on active areas. In addition, these feuds have become more civil than what was once observed. It is also important to note that there is now a great deal of non-verbal shorthand (up to 41% for non-leaders and 45% for leaders). Although the previous amount of non-verbal is not known, a more mature system of non-verbal communication could moderate much of the effects of flaming.

Collective Action

This study has established a strong base for understanding the nature of forum activity (at least for the researcher). Building on this base, it should be possible to predict forum traffic. As with any media, understanding your audience is an essential part of better serving that audience.

Telecomputing forums may never serve a large portion of the population. But the study of the forum is essential because it is the first of a series of new media that break the traditional models of communication. By permitting true multipoint-to-multipoint communication, forums place users in a unique media environment that should have increasing importance over the years to come.

For sociology, the forum is a large (limitless) public place such as a park. As with any park, certain areas will become more popular than others. While it is understandable that function plays a role in the activity level (e.g., the swimming pool is more popular than the nature trail), certain areas naturally become more of a public meeting place than others. What determines the location (or existence) of a public demonstration in the park is similar to what determines the

location of an active area in the forum.

- The general interest in the activity.
- The location of leaders.
- The presence of others.

There can be a fine line between a riot and one stupid person with a brick. There can be an equally fine line between an active forum and one person sending messages. Any form of collective action (be it a riot, a forum, or a charitable organization) must deal with this line between being an effective force and a token effort. Understanding the process by which people come together for a common goal is essential to understanding many interpersonal situations. Through the study of this admittedly unique situation, we can create an understanding of more common situations.

This project extends to areas of collective action research in two ways. First, collective action needs a model of growth. This study presents an alternative to the critical mass model even if it still needs refinement. Second, past collective action research has paid very little attention to different participant classes within the collective action. Each of these two refinements suggest real-world applications.[122]

The Model

Over the years, the media has indulged itself in the glorification of a "current" issue. For example, depending on the year, the media may have concentrated public service announcements on problems

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[122]In this section, "collective action" is used in the broadest possible sence as any event that requires mass participantion. Since many of today's products would not exist in their current form without a mass market, mass market products are also veiwed as collective actions.

of the homeless, use of safety belts, depletion of ozone. The issue is discussed to the point saturation and then relegated to a much lower level on the agenda. Media critics might call this a "bandwagon effect" combined with a "spiral of silence" but the resonance model may be used to explain the event more completely.

An issue is pushed to a point of super-resonance at which time many supporters move on to another topic.[123] Careful management of the issue might produce a longer lasting (yet more moderate) effect. In advertising, compare your feelings to the slogans "Where's the beef?[124]" and "When it rains it pours[125]." Managing a campaign of public awareness can involve the same life cycle characteristics as managing a forum.

Leaders v. Non-Leaders

The difference between leaders and non-leaders recognize the existence of groups within a heterogeneous population. This study avoided the term "follower" for the "non-leader" participant class. The results of this study show that decision was correct. Non-leaders were not just followers but a separate group with different reactions and expectations.

Non-leaders differed from the expected time-series of leaders and followers. Non-leaders did not simply follow the leaders interests. The data indicated that non-leaders tended to participate earlier in the forum life cycle and that leaders concentrated on areas that were

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[123]This does not mean that the topic loses all interest or can not be resurrected.

[124]Wendy's hamburgers

[125]Morton Salt

already active. A later study may re-evaluate the definition of leaders and non-leaders. In this study, the most active people may not have lead the discussion. This finding supports the collective action proposition of independent decision making by participant to a collective action. It can also issue a warning to marketers of all products.

It is not new to marketers that certain people are more inclined to adopt a product or point of view than others. The same could be said for any collective action. The disparity between leaders and followers of a collective action can caused conflicting expectations. The marketer of an information system (leader) may expect a certain level of participation and price their service accordingly. If the users do not perceive the service in the same way, the marketing effort may fail.

For example, pay cable channels promised a bargain even if you watched very little a month. The marketer viewed the quality of their product in relation to movie theaters. Subscribers, on the other hand, may not perceived the same quality and compared pay channels to broadcast television. The quantity of use may not have been an issue but the quality was.

Recommendations

Throughout this study, recommendations have been made for specific research projects. Many new opportunities present themselves in the new media. Access to participants and the ability to "see" complete records of entire interactions make telecomputing attractive to researchers. If nothing else, the media can act as a

laboratory for developing theories of social interaction.

To advance the study of telecomputing forums, certain areas of research must be followed. First, closer attention must be paid to creating a baseline of "normal" activity before making assumptions about telecomputing interaction. If studies make assumptions about relationships, use, and satisfaction only with systems at abnormally high levels, generalizability of the findings are naturally questionable. Also, computer resource can not be properly allocated if projected use is based on only high activity areas.

Second, the natural next step is to look at the relationship between past qualitative aspects of the conversation and current activity levels. This research should take two forms — qualitative aspects of the messages *and* the participants. Certain types of past activity may do more to encourage current activity than others. In the same way, there may be certain types of participants that more essential than others. In this exploratory study, a rather simple division was made between forum leaders and non-leaders. It could be that there is a more complex set of user types. An area that is ripe for development is the creation of descriptive set of system user-types — similar to that found in diffusion of innovations.

Finally, this research can move away from its current mechanistic approach to interaction — with assumptions of conscious decision making. While this method is necessary in developing basic theories, a more systems-oriented approach may explain more. Explaining forum activity is essentially explaining a community (in cyberspace) with a history and tradition. Past activity affects not only the next week's activity but also becomes a part of a cumulative affect.

Generalizability

It is easy to want to generalize this study to all telecomputing services and even to the information marketplace as a whole. What is important to remember is that telecomputing is not a single product but an environment for business — a world of products.

Collective action is sensitive to the needs of the individual. From the perspective of the user, any collective action is important to the extent that the individual benefits from the contribution (adoption) of others. Looking back at Figure 1, ("World of Telecomputing Products" on page 15), the value of other users adopting the same telecomputing product goes down as the as the level of social presence goes down.[126] For example, it is not essential to the adopter of a banking system to know that others have adopted the same banking system. As long as the service (or an alternative) fits their needs within an acceptable cost, the user is happy.

The value in this line of research is for telecomputing systems with a higher level of social presence. Users are rewarded by the presence of other users. The system is not only more profitable but also a better system through the contributions of the correctly sized audience.

A Final Comment

Forum activity provides a rich environment for collective action research. This project was only a starting point. It has described activity, provided a baseline for future studies, and identified

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[126]"Value," in this sentence, does not include economies of scale — the tendency for cost of a product to go down as the quantity distributed goes up.

problems with this line of study. While readers may disagree with the conclusion, the results justify further investigation. The possibility is great that this type of information will be needed as telecomputing forums develop. The possibility of understanding telecomputing forums as well as collective actions in general is greatly improved by expanding this area of research.

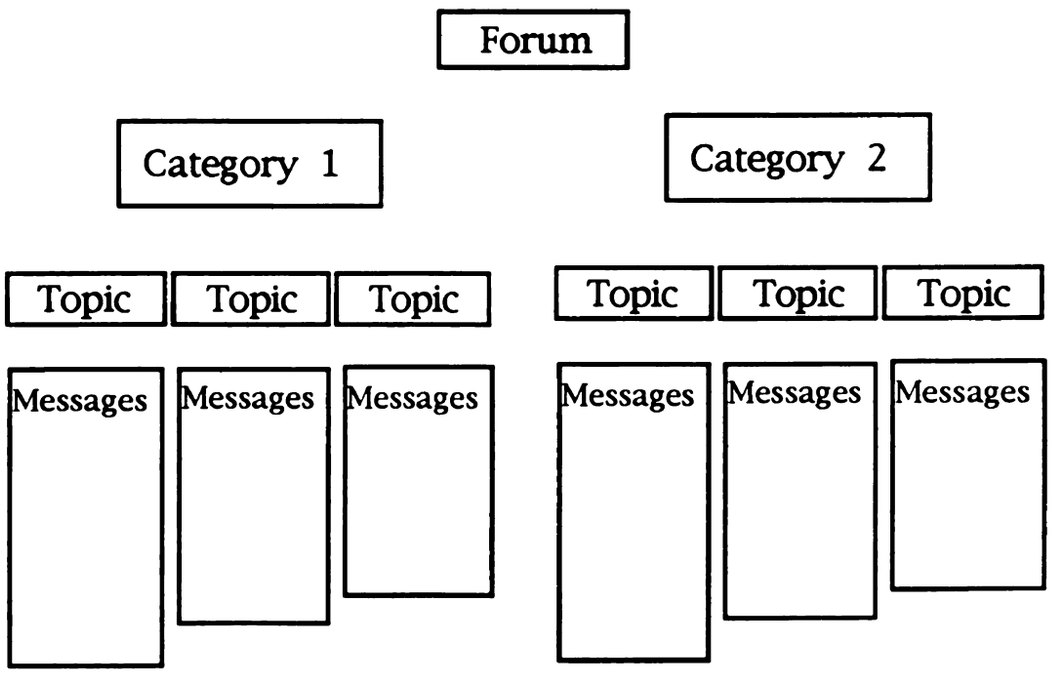
APPENDICES

APPENDIX A
INSTRUCTIONS TO CODERS

Understanding the flow of forum conversations is critical to creating active forums. In this study, we will be looking at the content of forum message. Hopefully, we will be able to define the type of activity that creates forum success.

Your job will be to look at each message and answer a series of questions. The questions fall in three general types: 1.) Basic statistics; 2.) Message type; and 3.) Message tone. Basic Statistics includes simple questions about the message. Message type classifies the message itself. Message tone measures the potential for controversy in the forum.

Structurally, these forums are divided into categories then into topics.



You will be given a printout from one whole category to analyze. The printout will contain:

1. Category header (usually a menu).
2. Topic One header.
3. Topic One messages (in chronological order).
4. Topic Two header.
5. Topic Two messages.
ETC.

A topic header looks like this:

```
**************
Topic 5  Sat May 06, 1989
T. BIERI [Xavier]    at 14:54 EDT
Sub: Airelines and Or thokeratology

How do the Majors feel about Or tho-K?
58 message(s) total.
**************
```

You will not code the header but note the number of messages in the topic. If at all possible, you should code the entire topic at once and you should always read the messages in order. Coding classifications depend on you understanding the flow of the conversation. long breaks while coding a topic could result in errors. If you must stop coding before finishing a topic, review the messages and the personalities present before starting again.

Skip the topic header and move to the first message. All message headers (see sample message below) contain category, topic, and message number, date sent, and sender's ID. If the sender has a forum handle (nickname), it is shown in brackets [Xavier] after their ID. Forum managers (sysops) sometimes move messages from one area to another (usually to start a new topic). In this case, the word "FORWARDED" replaces the sending time. Messages are separated by a series of dashes (---------) while categories are separated by a series of stars (*********).

```
----------------
Category 6, Topic 5
Message 1   Sat May 06, 1989
T.BIERI  [Xavier] at 14:58 EDT

I presently am looking into Or tho-K, for my vision is about 20/200.
Does anyone know any info on how the hiring people look at it? How are
they going to know if I don't tell them? Does the FAA accept it? Anyone
know anyone else that has had it? All kinds of questions. Anything would
probably be helpful....thanx /tim
----------------
```

Definitions

Basic Statistics are simple questions about the message. These include the topic number, message number, date, and inclusion of non-verbal cues and direct address.

Topic Number, Message Number and date, from the header information, are recorded onto the coding sheet.

Non-verbal: Does the message contain non-verbal cues? Yes = 1, No = 0.

An informal shorthand has developed in online communities. These symbols, viewed sideways, are normally used to prevent misinterpreted messages, For example, a joke may be followed by a wink ;) or a smile :). These cued are used to make a message seem friendly rather than insulting. Because transmission errors sometimes cause random characters, only the following will be counted unless a message specifically its own non-verbal cue (e.g., "xxx = I hate it,").

```
:)       :D          8)          8-)  = smile/laughing
:* = kiss,                        ;) = wink
:X = my lips are sealed,          :P = sticking out tongue
{} = a hug,                       :( = frown
: '( = crying,                    0 : ) = angel
} : > = devil,                 [{_} = a beer
```

also included are typing techniques that express emotions (except when used in quotes from other people).

SHOUTING — printing in all capital letters for emphasis. This does not include use of all caps for titles, names, or abbreviations.

Placing *stars* on both sides of a word. For example, "I am *right*"

Multiple exclamation points or question marks — not just one at the end of a sentence. For example "Your kidding!!" is coded in this classification. Also coded in this classification are exclamation and a question mark when used together. For example, "Your kidding !?"

Any series of random characters that replace cuss word(s).

Words that express non-verbal feelings and are not a part of any sentence. For example, "I am always right. (smirk)." Other examples are: <Grumble>, [smile], {hug}, Heh heh, Envy-Envy-Envy.

Direct Address: Has a user been mentioned or addressed by name?
Yes = 1, No = 0.

For this classification, you are looking instances where one participant addresses or talks about another — by name or ID only. If a name is used, the message is probably coded in this category.

Excluded are instances where a forum participant is clearly talking about a non-participant. For example, " I wish George Bush could be here" or " The FAA should dump O'Conner, chief investigator in the crash." E®® on the side of a person being a forum participant. Also, do not count instances where a person uses their own name in a message. This usually takes the form of a signature at the end of a message, or, and introduction at the beginning of a message. While some GEnie accounts have multiple users (e.g., a husband and wife), you can usually check the name against the sender's name in the message header. Again, err on the side that the name belongs to another user.

Message type records basic information about the message content. First, we will look at the message topic. Then we will look at the whether the message contains a question or a response.

On-Topic: Is the message about the general topic of the forum?
Yes = 1, No = 0.

If any part of the message contains a question, answer or information about the forum's general topic (i. e., religion, law, or aviation), then the message is considered "on-topic." Consider only the forum's general topic not the categories or topic's subjects. Ask yourself, "Is any part of this message really about .... (aviation, religion, or law)?"

On-topic messages do not include messages which are solely about using the system (e.g., technical problems). Announcements as to where participants can find files or particular conversation topics are also not on-topic. For example, "how do I upload files?"; "I have moved messages about .... to ....." or " there is a great new file in the library" Other off topic messages include, semi-private messages from one forum participant to another like, "Hi Bob, where have you been?" or "I had to go to Canada on business."

When choosing a content class, in short messages (e.g., "Thanks Jim, I'll try that"), it may be difficult to determine the content class. If it is clear from the flow of the discussion that the current message is directly related to a prior message, then the short message takes on the content class of the prior message. If it is not clear how the current message relates to prior messages, code the message in isolation — not in context.

Question: Does the message contain a question or a explicit request for information/response? Yes = 1, No = 0.

Questions do not have to be formal questions. In addition to formal questions, this class includes requests for information, offers to forward comments, offers to share information if asked or any overt attempt to solicit a response. For example, "I am looking for information about....." or "I know about..... if it helps anyone" would be coded as questions.

True rhetorical questions are not coded as questions. Rhetorical questions do not solicit an on-topic response (if any at all). Frequently you will find these questions in the middle of a larger statement. For example, " how's that for spelling?" or "why did I say that?" Since many questions that seem rhetorical could actually cause a response, err on the side of a question being a true question.

Reaction: Was this message been prompted by an earlier message? Yes = 1, No = 0.

Reactions are messages that answer or comment on previous messages. To qualify as a reaction, the message must address previous participant, message or specific subject. The prior message can either be a question, answer or a previous reaction. What is important is that the message has been clearly prompted by a previous message. This requires that you read each message

fairly carefully and in order. A reaction must come after the message to which it is reacting (but not immediately after). A person can not respond to their own message.

Message Tone is intended to look at controversy in a forum topic. There are two ways that we will look at message tone. First, "personal positive" and "personal negative" classifications will count messages where comments are made about another forum participant. Second, "content disagreement" counts messages that disagree with ideas expressed in a prior message.

These measures record activity that is most like normal interpersonal conversations. As a result, your choices are not as easy to define as the other classifications. While coding message tone, consider the effect of non-verbal cues (listed above). For example, "Sharon has it wrong again! ;)" Expresses disagreement with the idea but a positive feeling towards Sharon because of the ;) wink. Consider the possibility of sarcasm in the message. For example, "Oh I agree with that." may not actually signal agreement. Consider also the conversation history (particularly if you do not understand the topic). For example, "when considering "Don't expect to be spoon-fed," it is useful to note a previous negative comment about the participant making this statement. Clearly this is not a joking statement.

Personal Positive: Does the message contain a positive comment about another forum participant? Yes = 1; No = 0.

To qualify personal positive, the message must identify another forum participant person (or their message) and indicate a positive feeling. The positive classification is idea neutral. The person does not need to agree or disagree with the idea expressed, just comment on its expression or the person (people) expression it. For example, positive comments may include "Nice to see you around here", I'm glad you brought that up", "Thanks", or "What a great group."

When coding positive comments, be careful to understand forum context and non-verbal cues. Sarcasm can make insults seem like agreement. For example, "Thanks Bob, that was helpful. <gritting teeth to choke back laughter>." may not be seen as positive to Bob. If you are not certain that a positive comment is not positive (from prior messages), assume that overt

positive comments are, in fact, positive.

Positive classifications do not include comments about people who are clearly not participants (as defined by direct address above). For example, "St. Thomas has something valuable to say to us all" is not coded in this class. As in direct address above, err on the side of the person being a participant.

To be counted as a personal positive, references to groups must be about current discussion group (e.g., "you people" or " this "bunch") or a reference to a group that a participant has clearly been identified as a member. For example, "NASA knows really what it is doing." does not count in this class unless a prior participant has clearly been identified as part of NASA. In references to groups, err on the side that it does not count in this class.

Personal Negative: Does the message contain a negative comment about another forum participant? Yes = 1; No = 0.

To qualify as personal negative, the message must identify another forum participant person (or their message) and indicate a negative feeling. The negative classification is idea neutral. The person does not need to agree or disagree with the idea expressed, just comment on its expression or the person (people) expressing it. For example, negative comments may include "If you really knew what you were talking about....", "That was stupid", " You people have no imagination", or "I thought someone would understand this."

When coding negative comments, be particularly careful to understand forum context and non-verbal cues. For example, Linda might actually be amused by "I'm sure that Linda has stolen a plane or two, };> " Experience has shown that friendly jokes may be misinterpreted. If unsure, err on the side of including a "personal" statement as a negative comment.

Negative classifications do not include comments about people who are *clearly* not participants (as defined by direct address above). For example, comments about authors, public or historical figures (e.g., "George Bush should be impeached") are not coded in this class. As in direct address above, err on the side of the person being a participant.

To be counted as a personal negative, references to groups must be about current discussion group (e.g., "you people" or "this bunch") or a negative reference to a group that a participant has clearly been identified as a member. For example, "Protestants have never understood the Bible" does not

count in this class unless a prior participant has clearly been identified as a Protestant. In references to groups, err on the side that it *does not* count in this class.

Content Disagreement: Does the message express disagreement with a prior "on-topic" message? Yes = 1; No = 0.

Content disagreement involves direct controversy in the *ideas* expressed. To be coded in this classification, the message must meet two conditions. First, the message must clearly identify a previously expressed idea (but not necessarily a particular message). Do not code a message as "content disagreement" if it disagrees with a popular notion not clearly expressed in a prior message. Second, the message must actually express disagreement, not simply state an opposing viewpoint.

Be aware that in an active conversation, people may take sides. If this happens, a person can express disagreement with one idea by expressing support for an opposing idea.

Content disagreement is only possible in "on-topic" messages so do not consider messages that are not on topic. Also, do not consider parts of messages that would not be considered on-topic. Err on the side of a disagreement being on-topic.

Content disagreement *can* come at the same time as a personal positive or personal negative. For example, "Joe continues to fill his arguments with inconsistent facts" or "Linda makes a good point but I can't agree." Consider these two classifications separately.

General Policies

A problem column is provided on the coding sheet for questions, concerns or good ideas. Create a problem list. When you have something worth noting, assign a problem number to it. Describe the problem or idea in detail on the problem sheet and put the problem number in the problem column.

Consecutive messages by a singly person can be caused by on of two reasons. First the person may have more than one message or idea to send. This is particularly true if the messages are days apart. Second, some services (not

GEnie) have limits on message lengths. Participants who are experienced with other services may break up long messages into two or more short messages. In this case, the messages are minutes apart, on the same topic and often note that the message is continued. In all cases, multiple messages by a single participant will be recorded as more than one message. If there is a series of messages (the second reason), each message is considered separately for coding *except* for the classification "reaction." Normally, a person can not react to their own message but if the first in a series of messages is coded as a reaction, then the whole series is a reaction.

Missing messages are most likely the result of sysop editing. Either the sysop had found a message objectionable and deleted it or a series of messages were moved (forwarded) to a new location. Don't worry about missing messages, simply skip them. If a message clearly refers to a missing message, treat the current message as if the prior message was present. If there is no clear reference to a message, assume no prior message was present.

Coding Summary

Attached is the coding sheet for this study. Code one forum category at a time. When you finish a forum category staple all coding sheets for that category together with a list of problems you encountered and start a new coding sheet.

On the top of each coding sheet record the following information.

Forum - Religion, Aviation or Law

Category - category number

Page ___ of ___ - Page number for that set of sheets and the total number of pages (e.g., Page 1 of 6). Total number of pages is only necessary on the first page.

Coder - your first name or initials.

Date - the date you started this sheet.

In the table, record information as follow. Use pencil in case of errors.

Topic (Top): Enter topic number only when it changes or at the top of a sheet.
Message (Mess): The message number.
Date: The message date. Enter year only when it changes or at the top of a sheet.
Non-verbal (NV): 1=Yes, 0=No.
Direct Address (DA): 1=Yes, 0=No.
On-Topic (OnT): 1=Yes, 0=No.
Question (Que): 1=Yes, 0=No.
Reaction (Reac): 1=Yes, 0=No.
Positive (Pos): 1=Yes, 0=No.
Negative (Neg): 1=Yes, 0=No.
Disagreement (Dis): 1=Yes, 0=No.
Problem (Prob): If you have a question or a problem with a message, put a umber in this box ("1" for first problem, "2" for the second and so on). Then on a separate sheet, explain the problem or question with that message. Use as much detail as necessary.

APPENDIX B
CELL COUNT FREQUENCIES

On the following pages are summary tables of the actual cell frequencies. Each table has six major column sections. The first column lists the life cycle class (Quiet, Deff=Definition, Reson.=Resonance, Recess.=Recession, Super=Super-resonance). The next two columns (Yes) lists the frequency of messages where the variable existed broken down by non-leader (NonL) and Leader (leader). The two "No" columns lists the frequency of messages where the variable did not exist broken down by non-leader (NonL) and Leader (leader). The first total columns list the total number of messages sent by non-leader (NonL) and Leader (leader). The second total columns lists the total number of message where the variable existed (yes) and did not exist (no). The single "Grand Total" column lists the total number of messages for each life cycle class.

TABLE 14
DIRECT ADDRESS CELL FREQUENCIES

DA	Yes		NO		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	475	492	1,088	876	1,563	1,368	967	1,964	2,931
Deff.	314	334	381	410	695	744	648	791	1,439
Reson.	791	909	777	1,033	1,568	1,942	1,700	1,810	3,510
Recess	105	114	135	140	240	254	219	275	494
Super	361	830	500	782	861	1,612	1,191	1,282	2,473
Total	2,046	2,679	2,881	3,241	4,927	5,920	4,725	6,122	10,847

TABLE 15
NON-VERBAL CELL FREQUENCIES

NV	Yes		NO		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	541	476	1,022	892	1,563	1,368	1,017	1,914	2,931
Deff.	283	306	412	438	695	744	589	850	1,439
Reson.	626	757	942	1,185	1,568	1,942	1,383	2,127	3,510
Recess	86	93	154	161	240	254	179	315	494
Super	343	719	518	893	861	1,612	1,062	1,411	2,473
Total	1,879	2,351	3,048	3,569	4,927	5,920	4,230	6,617	10,847

TABLE 16
ON TOPIC CELL FREQUENCIES

OnT	Yes		NO		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	1,491	1,301	72	67	1,563	1,368	2,792	139	2,931
Deff.	670	704	25	40	695	744	1,374	65	1,439
Reson.	1,458	1,791	110	151	1,568	1,942	3,249	261	3,510
Recess	228	242	12	12	240	254	470	24	494
Super	833	1,582	28	30	861	1,612	2,415	58	2,473
Total	4,680	5,620	247	300	4,927	5,920	10300	547	10,847

TABLE 17
REACTION CELL FREQUENCIES

Reac	Yes		NO		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	1,283	1,278	280	90	1,563	1,368	2,561	370	2,931
Deff.	629	724	66	20	695	744	1,353	86	1,439
Reson.	1,463	1,862	105	80	1,568	1,942	3,325	185	3,510
Recess	216	244	24	10	240	254	460	34	494
Super	843	1,576	18	36	861	1,612	2,419	54	2,473
Total	4,434	5,684	493	236	4,927	5,920	10118	729	10,847

TABLE 18
QUESTION CELL FREQUENCY

Que	Yes		NO		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	541	372	1,022	996	1,563	1,368	913	2,018	2,931
Deff.	235	240	460	504	695	744	475	964	1,439
Reson.	606	563	962	1,379	1,568	1,942	1,169	2,341	3,510
Recess	89	79	151	175	240	254	168	326	494
Super	297	461	564	1,151	861	1,612	758	1,715	2,473
Total	1,768	1,715	3,159	4,205	4,927	5,920	3,483	7,364	10,847

TABLE 19
OPINION CELL FREQUENCIES

Opinion	Yes		No		Total		Total		Grand
Type	NonL	Leader	NonL	Leader	NonL	Leader	Yes	No	Total
Quiet	230	142	1,333	1,226	1,563	1,368	372	2,559	2,931
Deff.	99	59	596	685	695	744	158	1,281	1,439
Reson.	294	207	1,274	1,735	1,568	1,942	501	3,009	3,510
Recess	16	16	224	238	240	254	32	462	494
Super	86	149	775	1,463	861	1,612	235	2,238	2,473
Total	725	573	4,202	5,347	4,927	5,920	1,298	9,549	10,847

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