

# Sharpening the Videoconference Target

August E. Grant, Ph.D.

**V**ideoconferencing has been considered one of the most promising of the “new” communication technologies since widespread adoption of the technology began in the 1970s. Few technologies have enjoyed such a steady rate of improvement over such a long period of time. Systems have dropped in price from up to \$200,000 for a complete system 20 years ago to less than \$10,000 today. As the prices have dropped, the quality and the number of features have increased as dramatically.

Sales and usage of videoconferencing systems have increased at a fairly steady rate, but the technology has not enjoyed the type of dramatic acceleration in market growth that many proponents have predicted. This article takes the position that videoconferencing has not yet reached the “critical mass” necessary for dramatic growth across markets. In the process of defining critical mass, a number of practical suggestions for promoting growth of the technology are proposed.

The term *critical mass* may be one of the most overused terms in analysis of communication technologies. In general, critical mass can be defined as the number of users necessary in order for use of a technology to spread. For certain communication technologies such as videoconferencing, however, critical mass has a special meaning.

This article uses a very specific operational definition of critical mass to explore the biggest barrier to widespread adoption of videoconference technology. We'll begin with a brief look at an incredibly practical theory relating to the adoption of interactive technologies, using fax technology to

illustrate the theory. We'll then apply the theory to illustrate one of the biggest hurdles that videoconference technology must vault before becoming as ubiquitous as comparable technologies.

## A Practical Theory of Critical Mass

Just over a decade ago, Lynn Markus<sup>1</sup> created a profoundly useful theory that explored the issue of critical mass for interactive media such as the telephone, fax machine, and videoconferencing. Markus based her theory on a wide variety of studies in collective action—the process by which people work together to achieve goals that serve a common good.

Markus' theory is premised upon the fact that these interactive technologies can be described as an “accelerating production function.” In practical terms, this means that the greater the number of users of an interactive communication technology, the more valuable that technology is to all other potential users, thereby serving the “common good.” Ultimately, interactive technologies that succeed do so because they achieve “universal access” in a community of users. In this case, universal access refers to the fact that the technology becomes available to all members of a community. Universal access within a community is important because the value of the technology increases with the number of different users of the technology. The maximum value to all users is obtained when everyone is using the technology.

One of the keys to understanding Markus' theory is that universal access must take place within a “community.” For many technologies, the community of users is



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large and diffuse, such as “all businesses in the United States.” For some technologies such as videoconferencing, however, it may be more useful to consider smaller and more narrowly-defined communities. Before exploring the issue of community further, it is necessary to examine critical mass theory more closely. We will do this by applying the theory to fax machines.

### **Critical Mass and Fax Machines**

Fax machines provide an excellent illustration of this theory. The fax machine was invented in the '50s—not the 1950s, but the 1850s. Alexander Bain created the first facsimile transmission technology by connecting signals from synchronized pendulums over wires. Bain's device allowed transmission of photographs over wires, and led to widespread transmission of photographs for newspapers by the turn of the century.<sup>2</sup>

Fax technology grew slowly through the first two-thirds of the century. In the 1960s, standards were developed that allowed machines made by different manufacturers to communicate with each other. The standards were revised in the 1970s to accommodate higher-speed transmissions and digital technology. It wasn't until the 1980s, however, that the fax machine reached critical mass in the business community.

Until that time, most fax machines were purchased in pairs, enabling transmission of document facsimiles between two specific locations. Microprocessor technology, competition, and the use of standards pushed prices lower. In turn, more companies were able to adopt fax technology.

By the mid-1980s, enough businesses were using the technology that users became aware of fax as an occasional option to overnight mail for transmission of time-sensitive materials. Every such successful use led users to more strongly consider fax as an option. In short, fax machines became an accepted way of doing business, and people started asking each other if they had fax machines.

Those who didn't yet have a fax machine (or access to one) only needed to be asked a few times before they began looking into the purchase of a fax machine. (Remember, these machines were very different from today's common fax machines; they used thermal paper and cost \$1,000 to \$5,000 each.) True to the theory, every new organization that purchased a fax machine made the technology more useful for all other organizations. The ones that already had the technology had new communication partners, and the ones who had not yet adopted the technology had increasingly more reasons to buy a machine.

### **The “Community” and Critical Mass**

One of the most remarkable aspects of the history of fax technology is the size of the “community” that adopted the fax machine. In essence, this community consisted of virtually all businesses and organizations. The technology certainly spread more quickly in some industries and institutions than others, but once critical mass had been reached, adoption spread to all other organizations.

It is important to note that the “community” that adopted fax technologies was the set of businesses and other organizations that use the fax for a range of communication among organizations. Notably absent from this community is the residential market. Although a small percentage of residences have fax machines, these are primarily used for business purposes. Application of critical mass theory suggests that residential fax machine use should grow slowly until a critical mass is reached, whereupon widespread adoption should begin.<sup>3</sup> One important indication of critical mass for residential fax will be a shift from using the machines for business communication to using them for routine non-business communication such as personal letters.

In applying the lessons of the fax machine and critical mass theory to videoconference technology, the first consideration is defining the “community” of potential adopters. As with fax, it is certainly practical to define the community as the set

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of all businesses and organizations connected through a common network. Given the global ubiquity of the telephone network, the fax “community” certainly is global in nature. The bandwidth requirements of videoconferencing technology, however, suggest a more limited definition of community for videoconference technology. Since ISDN lines or an equivalent, high-bandwidth network is needed for full-motion videoconferences, the community is limited to the areas served by such networks. ISDN and other high-speed networks are simply not as ubiquitous as ordinary telephone lines. The limited reach of these networks therefore prescribes a limit on communities of users of videoconference technology.

The key is that the theory does not specify that a community must be large, global, or even national. For understanding critical mass issues related to videoconference technology, a community may be defined as a group of organizations connected by information flow. Figure 1 illustrates the connections within the widget industry. In this case, the central organizations are the manufacturers of widgets, which, although not connected to each other, are connected to a common set of suppliers and vendors. Adoption by any one of these organizations makes adoption by the organizations to which it is connected more likely. The two barriers are:

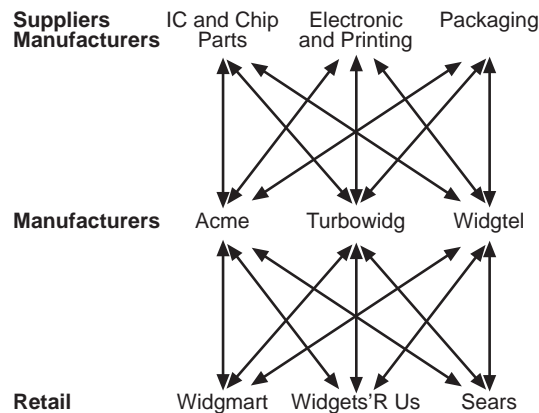
- Getting the first few organizations to buy videoconferencing equipment.
- Making other organizations aware that their customers and suppliers have videoconferencing capability.<sup>4</sup>

### Videoconferencing Communities

The primary lesson of this is that it is possible to identify communities of all sizes, from a handful to hundreds of organizations. After identification of these communities, the next step is ascertaining which organizations possess videoconference equipment.

The most important community to consider for adoption of videoconference technology, especially at this early stage, is a

**Figure 1**  
**Communication Patterns in the**  
**Widget Industry**



Source: A. E. Grant

single, large organization. Any organization with multiple, geographically-dispersed offices (whether dispersed across a city or around the globe) can be considered a community. The greater the number of locations of the company that have videoconference technology, the more likely that all offices will soon adopt the technology. Indeed, the best market for videoconference equipment and services of any type is an organization that is already using the technology. The more units within a company that have access to videoconferencing technology, the more valuable the technology will be to everyone within the organization.

If less than a tenth of the members of a community have videoconference technology, it is less likely that anyone within the community will adopt the technology. In this case, the only practical way to market the technology is in pairs, so that someone purchasing the technology will have a use for it.

If more than a tenth of the organizations in an identified community have videoconference capabilities, the other 90% of organizations are prime candidates for adoption of the technology. Following Markus' propositions, an “intervention,” i.e., an aggressive marketing campaign with

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special incentives for the first few organizations to adopt, should start a bandwagon effect that should lead to almost universal adoption in the community. (If more than a quarter of the organizations have the equipment available, the task of persuading others to adopt should be disproportionately easier. Remember, the greater the number of communication partners who already have an interactive communication technology, the more likely that a person or organization will adopt it.)

One caveat is that the technology must be readily available to people within an organization in order for that organization to be considered an “adopter.” Traditionally, the expense and complication of videoconference technology has required that a central unit in an organization “control” access to the technology, not only scheduling videoconferences, but also scheduling connect time, and support personnel.

Advances in the network and the videoconference technology itself have the potential to reduce the degree of central control over access to videoconference technology within an organization. The latest equipment needs no camera operators or other support personnel, and can use “dial-up” ISDN lines as easily as the telephone and fax use ordinary phone lines. Videoconference technology will probably never be as ubiquitous as telephone technology, but, with the attainment of critical mass in a community, it should become as ubiquitous as fax technology has become.

The idea of examining communities of users rather than users themselves represents an important departure in conceptions of videoconferencing. One important corollary to this discussion is that the technology must be readily available to a person in order for that person to be part of a community of users. Many firms have attempted to market videoconference facilities in hotels and other centrally-located meeting places. Although these facilities offer the potential for any person to be considered part of a community of users, practical concerns relating to travel to the conference site, availability and

scheduling of equipment, and the cost of using these facilities are extreme barriers to this extension of the community.

### Action Plan

Kurt Lewin, a noted social scientist, once said that there is nothing as practical as a good theory.<sup>5</sup> This section applies Markus’ critical mass theory to suggest specific action items for videoconference equipment and network providers, adopting organizations, and end users.

These items must be considered in light of the latest developments in videoconferencing. The most important of these is economic—the price to engage in videoconferencing has dropped dramatically in the past few years. At one point, a complete videoconference system could cost \$100,000 or more. In the past few years, equipment has been made more compact (as well as more automatic), with prices dropping to less than \$20,000. Early this year, Polycom introduced a complete set-top videoconference system that cost only \$6,000. (In fact, the Polycom introduction may lead to a price war in videoconference equipment that could drop prices well below \$5,000 by the middle of 1999.) Equally important are advances in networking technology that are providing more routes for transmission of videoconferences, as well as price declines for installation and operation of network services such as ISDN.

The dramatic decline in the cost of videoconference equipment changes the financial equation for purchasing videoconference equipment, with the cost of ISDN or another connection representing a larger proportion of the cost of videoconference equipment. As Kyle Nicholas has pointed out, however, once an ISDN line is acquired for videoconferences, it can also be used for a variety of other purposes, spreading the cost of the connection.<sup>6</sup>

### *Videoconference Equipment and Network Providers*

The people who provide and sell equipment and network connections have the most to gain from applying the commu-

nity concept to their business. The first step is identifying communities. This identification can be based upon common-sense analysis of organizational relationships or detailed quantitative analysis of relationships within an industry.

The next step is ascertaining the current level of videoconferencing use within the community. Organizational communities that have few or no users are not good targets for marketing or sales efforts. These efforts should instead be focused on communities that have a considerable numbers of users. As adoption spreads throughout those communities, the technology will eventually become more valuable to organizations in other industries as well.

The other goal of videoconference manufacturers and vendors should be to help both current and prospective users identify other current users. It is not enough that you know someone who has the technology—you also have to know that they have the technology and how to connect with them over their system.

As noted earlier in this article, a large organization can also be considered a community. The same techniques used to analyze an industry can be applied to a large organization to determine the potential for adoption of the videoconference equipment. Again, one key to this process is ascertaining the availability of the technology to employees at all levels of the organization.

### *Organizational Adoption*

Organizations considering adoption of videoconferencing technology can apply the critical mass theory in a number of ways. First, we will consider a set of economic factors related to videoconference use, and then address issues relating to communities and access.

For many people, the primary impetus for buying a videoconference system is bottom-line oriented: It can save money. Early proponents emphasized reductions in travel expenses, suggesting that the more remote the meeting, the greater the savings through videoconferencing, as the company saves money on airfare, lodging, and per

diem expenses. Twenty years of experience, however, indicates that videoconferences are not a substitute for all travel. Not only do many employees consider travel to be a perk, but many meetings are not appropriate for videoconferences.<sup>7</sup>

A factor that is just as important, but receives much less attention, is the impact of videoconference technology on the “top-line,” the overall revenues of a company. Any time an employee has to travel to a meeting, it costs the company money in terms of lost productivity—the employee is spending time on the road that might better be spent in the office. The increase in productivity has the potential to increase overall revenues, with little or no increase in cost.

Another top-line oriented factor is the fact that readily-available videoconferencing technology can speed negotiations and resolution of problems. Research studies have demonstrated that the bandwidth available for communication is an important factor in specific types of information exchange.<sup>8</sup> Many of the most critical types of meetings involve negotiation and compromise, which are accomplished much more easily on a face-to-face basis than over the telephone. Videoconferencing represents a compromise between the two, potentially allowing a “face-to-face” meeting to take place as quickly as a telephone call, whereas a real face-to-face meeting would take hours or days to arrange.<sup>9</sup>

The most important step that an organization must take to get the most out of their videoconference technology is to know their community. In addition to keeping track of which vendors and clients have videoconference equipment, it is important to let others know that your organization has the technology available. Another lesson from the fax machine: The more often you ask someone whether they have a videoconference system, the more likely they will be to purchase a system.

The final task of an organization is the facilitation of the use of the technology. Barriers such as complex scheduling procedures, paperwork, and tight central control

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of the videoconference system will keep many people from making frequent use of the system, thereby denying the company both the top-line and bottom-line benefits of videoconferences. As an example, I recently offered to use my videoconference system to participate in a defense of a doctoral dissertation for a student I was helping to advise in another state. I knew the college in question had just purchased a system, but the doctoral student indicated that the equipment was not available for this purpose. Instead, the equipment will sit idle (as it does most of the time)—and I agreed to participate via speakerphone.

#### End Users

Individual end users can get as much out of the application of the concept of community as organizations. The first step is realizing that most initial purchases of videoconferencing equipment involve two or more units that are designed to communicate with each other. Being aware of others (both inside and outside your organization) who have videoconference equipment will increase the utility of the technology to you, as well as increasing the benefits from the technology.

The next step: identify the communities to which you belong, and then ascertain the availability of videoconference equipment to your contacts in these communities. In turn, the more often you let people know that they can communicate with you through this medium, the more likely they will be to do so, again increasing the utility of the technology. (As a practical matter, users should consider adding some notation on their business cards letting others know they have videoconference technology.)

In the process, Markus offers one more important lesson. She refers to the level of resources that a person must devote to a technology, describing three types of resources: time, money, and interest. As discussed above, the most common resource committed to videoconference technology is money, but the potential savings in time should be considered as well. Knowledge of your community is perhaps the most impor-

tant factor in determining the effectiveness of videoconferences in saving both time and money.

#### Conclusions

In comparing videoconference technology to other interactive technologies, one important difference must be noted. The telephone can be used without notice at almost any time (and, with cellular technology, anywhere), and fax technology does not require both the sender and receiver to attend to a message at the same time. On the other hand, videoconferences are typically scheduled in advance and require three or more people to be available at the same time in order for the conference to take place.

This difference means that videoconferencing has an inherently smaller market than either the fax or telephone, but it does not affect the application of Markus' critical mass theory of interactive media to videoconferencing. The recognition and identification of communities of current and potential users of the technology should be a major factor in pushing the penetration of the technology to the point that a critical mass will be reached in the general business community. nto

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<sup>1</sup> M. L. Markus, "Toward a Critical Mass Theory of Interactive Media: Universal Access, Interdependence, and Diffusion," *Communication Research*, Vol. 14, No. 5 (1987):491-511.

<sup>2</sup> L. Robinson, *The Facts on Fax* (Dallas: Steve Davis Publishing, 1986).

<sup>3</sup> Ironically, a major barrier to critical mass for residential fax machines may be the prevalence of fax software and modems for personal computers. With these technologies, a home user finds it more difficult to justify purchase of a stand-alone fax machine, but the effort required to send or receive faxes with a computer (compared with dedicated fax machines) reduces the frequency of use, especially for non-business communication.

<sup>4</sup> A set of quantitative tools is available to facilitate the identification of communities using patterns of organizational relations and information flow. For more information, contact the author.

<sup>5</sup> A. J. Marrow, *The Practical Theorist: The Life and Work of Kurt Lewin* (New York: Basic Books, 1969).

<sup>6</sup> K. Nicholas, "Teleconferencing," in A. E. Grant and J. H. Meadows, Eds., *Communication Technology Update—Sixth Edition* (Boston: Focal Press, 1998).



<sup>7</sup> For a discussion of appropriate meetings, see A. M. Noll, "Teleconferencing Target Market," *Information Management Review* (Fall 1986):65-73.

<sup>8</sup> See L. K. Trevino, R. L. Daft, and R. H. Lengel, "Understanding Managers' Media Choices: A Symbolic Interactionist Perspective," in J. Fulk and C. Steinfeld, *Organizations and Communication Technology* (Newbury Park, CA: Sage, 1991). R. L. Daft and R. H. Lengel, "Organizational Information Requirements, Media Richness, and Structural Determinants," *Management Science*, Vol. 32, No. 5 (1986):554-571.

<sup>9</sup> It should be noted that high-bandwidth communication is less appropriate when there is a simple information exchange or little or no ambiguity. In these cases, the same studies cited above demonstrate that lower bandwidth leads to fewer errors and more rapid completion of tasks.



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