An Assessment of the Human Elements Factor in Telecommunications Technologies Adaptation and Management

Mehdi Khosrowpour, (mlk@email.psu.edu), Penn State University at Harrisburg
Terry J. Stahler, Harsco Corporation

Abstract

Technological advancements of the past two decades in computer and telecommunication technologies have assisted many organizations in achieving higher levels of efficiency and effectiveness while other organizations have not been as successful in reaping some of the benefits that these technologies offer. This paper discusses the role of different factors, particularly the role and impact of the human elements factor, on the successful adaptation and management of telecommunications technologies in organizations.

Introduction

Now, more than ever, the technological advancements achieved in telecommunication technology over the past two decades have had a profound impact upon the fundamental structures of society, and particularly, upon organizations. As these technologies have matured and developed, many organizations have been looking into the organizational and managerial impact and changes that can be made that would allow the organization and its management to achieve greater utilizations of these technologies (Krovi 1993; Maule 1994).

American corporations have long recognized the importance of telecommunications to such an extent that their basic business functions

have been formally integrated into their information management systems function and supported by management and specialist positions (Grover & Goslar, 1992). In recent years, telecommunications managers have been entrusted with linking all aspects of the organizations thus allowing the flow of information rapidly and efficiently to decision makers at all levels of the organization. This is the reason that today's communication managers must have a strong understanding of organizational structures, behavior, and management in addition to technological expertise in both communication and information management technologies (Gillette, 1992b).

A generation ago, telecommunications

managers were strictly assigned to manage voice communication functions. But, as the technologies of telecommunication and computers merged, the role of communication manager has changed to one that is more of a planner and facilitator assisting the organization in adopting the emerging technologies of telecommunication for effective use and cost savings (Gillette, 1992a; McCreary, Boulton & Sankar, 1993).

Organizational Adaptation

During the 80s, the primary driving force for many organizations in providing internal telecommunications networks was the ability to provide more flexible and cost effective networks; ones that could specifically support the organizational goals (Gillette, 1992a). At the same time, the development of internal networks was not free of organizational behavior problems. Telecommunications management soon learned that while integration of communication technology is technologically feasible, it is often resisted for social and psychological reasons (Szewczak & Gardner, 1989).

One reason that organizational members may resist the integration of telecommunication systems is the fear that connectivity will allow management to monitor their performance through what is called "Silent Supervision" (Szewczak & Gardner, 1989). Organizational members' fear was justified for example at AT&T which allowed telecommunications to be linked to computers so that management could monitor employee performance (Kallman, 1993).

Although employees may have some reservations about how connectivity can be used for monitoring, management believes it will provide an element of control. Management believes that electronic monitoring provides a more consistent and objective approach to employee performance measurement. First, there is no bias in relation to race, age or gender involved with the collection of data since this approach provides an impartial method of collecting performance data. Secondly, it provides fair performance evaluations to reward high achieving

employees since this approach fairly and accurately records individual productivity (Kallman, 1993).

In many organizations during the 80s, telecommunications systems were approached cautiously and with relatively low expectations (Szewczak & Gardner, 1989). Many managers could see and understand the potential use of such technologies to improve organizational efficiency and effectiveness in light of the human resistance to the adaptation of these technologies (Ryan, 1992). As a result many organizations decided to take an apprehensive approach toward rapid adaptation of telecommunication technologies. As Stephens (1987) states "employees did their jobs using 18th century methods with 20th century tools" (P. 14).

Successful acceptance of telecommunications systems by users are implemented through the integration of value-added services (Maule, 1994). Value-added services are those additional services that help the user adapt to the change process much quicker. Among the commonly provided value-added services are training, documentation and knowledgeable support personnel. Users will adapt to new technological tools as long as they perceive that these tools will provide additional value and complement their existing work processes, and in some cases users will even drive technologists for faster adaptation of technologies (Maule, 1994).

A survey of 186 of the largest American organizations by Steinbart and Nath (1992) reports that help desks are found to be perceived by employees as a sign that the organization's top management is concerned about the success of telecommunications systems. As a result, the researchers note that organizations with help desks rate their success in managing their telecommunications systems higher than do organizations without help desks. Their results further indicate that organizations with help desks reported much higher success rates in using telecommunications systems to transfer data across international borders than organizations without help desks.

In terms of the costs of implementing communications systems to organizations, Bevan (1992) concludes in his study that organizations on average spend approximately \$900,000 a year to manage changes to telecommunication systems. Similar studies, revealed that the relative investment in telecommunication technologies as a whole differs in terms of an organization's international involvement, size, industry, and management of the change process (Torkzadeh & Xla, 1992; Chidambaram & Chismar, 1994).

Emerging Technologies

Telecommunication technologies came to the forefront in the early 1980s with the breakdown of the AT&T structure, the merger of communications technologies with computer technologies, and the emergence of advanced and affordable technologies for organizations of all sizes and types. Electronic mail systems allow users to send and receive information electronically throughout the organization and to customers and suppliers all over the World in ways that could not have been accomplished in the past. A study of Fortune 500 companies revealed that 60 percent of the messages received contained information that the recipient believed would not have been obtained without E-mail (Morrison & Sheng, 1992). Undoubtedly, E-mail has had an enormous impact on how organizations and people operate in today's global environment.

In most organizations, management recognizes the strategic value of telecommunications to reduce costs, provide better customer service, increase profitability, and overall, manage effectively in order to compete. One of the emerging technologies of telecommunications that has been utilized very effectively is electronic data interchange (EDI). EDI allows the exchange of data between the firm and its customers and suppliers. By 1992 the number of EDI users had grown to 23,000 firms. Of these firms, the major functions performed by their EDI systems included sending and receiving purchase orders (83 percent) and sending and receiving invoices (66 percent).

Asynchronous transfer mode (ATM) is

another emerging high speed telecommunications technology that can run both on the local area network (LAN) and the wide area network (WAN) as well as the integrated services digital network (ISDN). Many organizations are now utilizing these technologies on dedicated leased lines by applying a common standard to transmit data from the desktop to the corporate network and from there to any destinations around the World within the shortest amount of time (Lai & Guynes, 1994; Strauss, 1994; Kim, 1995). The future of these technologies is limitless for providing real-time transport capabilities for multimedia applications by incorporating voice, video and data with low latency (Durr, 1994; Hurwicz, 1994; Vetter, 1995).

Organizational Benefits

As acceptance of these new technologies continues, organizations are beginning to reap some of the benefits offered by these technological advancements of telecommunication technologies. Integrated services digital networks now allow organizations to integrate voice, data, text, and video devices over the same network (Durr, 1994; Strauss, 1994; Srinivasan 1995). Many organizations are becoming aware of added benefits, such as the savings associated with reduced travel costs and travel time for managers who traditionally have had to travel distances to be in meetings and now can be more productive by avoiding the travel inconveniences and time wasted (Keen, 1986; Szewczak & Snodgrass, 1989).

Telecommuting has saved organizations considerable costs by allowing employees to work effectively in nontraditional work environments. Telecommuting is the process that allows employees to link to their organizations' systems through the use of telecommunication systems and computers while working at home or at remote locations. One study claims that organizations have saved between \$1,500 to \$6,000 per telecommuting employee by way of reduced office space and other related overhead expenses (Jacobs & Sell, 1996). In addition, it is estimated that in the United States, telecommuting

could replace 19 to 20 percent of travel time and could save organizations as much as \$23 billion per year in energy, transportation and environmental costs (Jacobs & Sell, 1996).

In recent years, telecommunications technologies and applications have been instrumental in the globalization of business. Through the use of a wide variety of applications of these technologies, such as the World Wide Web (WWW), many new opportunities have been made available to organizations, which until a decade ago were not possible for many medium and small size companies. As organizations establish operations around the world, the free flow of information becomes critical (Heywood & Mantelman, 1989; McCreary, Boulton, & Sankar, 1993).

A study of 183 firms concluded that a firm's level of international involvement significantly influenced management's perception of the value and importance of telecommunication technologies (Deans, Karwan, Goslar, Ricks & Toyne, 1991). Global organizations are becoming more efficient and are maintaining greater control over their dispersed operations around the world by utilizing telecommunications technologies to sustain their competitive edge. However, today's global networks are faced with many daunting challenges such as technical issues, regulatory structure and cultural barriers (Gupta, 1992; Steinbart & Nath, 1992).

Despite the huge investments in telecommunications technologies, many organizations are not utilizing these technologies as strategic tools to improve their competitive posture. The primary question facing many organizations is the concern of how to deal with the issue of adaptation of telecommunications technologies in the firm. Are the majority issues of a monetary nature, or are they technical concerns, or are they perhaps concerns about acceptance and use by people? The study conducted for this paper provides some answers and insights to some of the issues facing organizations' adaptation of telecommunication technologies.

Survey

To learn more about the contemporary issues of telecommunication adaptation issues in organizations, a survey of 107 organizations belonging to the Technology Council of central Pennsylvania (TCCP) was conducted. TCCP is headquartered in Harrisburg, Pennsylvania, and represents the telecommunications technology interests of the organizations of the 20 county region of South Central Pennsylvania. The companies included in this survey represented manufacturing, financial, retail, and service industries. They varied in size from small (with annual sales of less than \$100 million), medium (annual sales of \$100 to \$500 million), and large (annual sales over \$500 million).

The participating companies were surveyed regarding the various applications of telecommunications technologies currently utilized in their organizations. Table 1 summarizes the results utilization of different technologies.

Table 1
Telecommunication Technologies Utilized

Technology	Number of Companies	Frequency (Y.)
Audio Conferencing	70	65.42
E-Mail	97	90.65
EDI	37	34.58
Internet	97	90.65
Intranet	36	33.64
Leased Lines	57	53.27
Video Conferencing	38	35.51
Voice Mail	79	73.83

Telecommunications and Top Management Support

Top management support can have significant impact on the success of implementing telecommunication initiatives in organizations. This idea is based on two assumptions. First, employees of those organizations that had top management support view telecommunication

technologies as a supporting function to accomplish organizational goals and objectives. Secondly, telecommunications initiatives often require a certain degree of reengineering which require the full support of top management. The survey results clearly support the belief that top management in the participating organizations overwhelmingly understood the important value of telecommunication technologies in support of organizational goals and objectives. Consequently, the majority of employees share their support of the adaptation of telecommunication technologies in their perspective organizations.

Employees and the Change Process

There is an assumption that, in general, employees are not willing to accept telecommunications technological change when they are not included in the change process. This assumption is perpetuated by arguments such as: (1) the extent to which employees adapt to technical change, (2) the extent to which employees feel that management uses telecommunications systems to monitor their performance, and (3) the employees' level of expectation for the telecommunication system.

Two-thirds of the employees in the participating organizations in this survey indicated that they are often included in the process of evaluating benefits of new telecommunication technologies and that their input is encouraged. At the same time, only half of the employees felt that they adapt well to technological change. Possibly, management is assuming that by virtue of allowing employees to participate in the evaluation process, employees should be well prepared to adapt to the technological changes that would be introduced by telecommunication technologies. Perhaps, employees should be fully supported through both technical support as well management support during the implementation of telecommunications initiatives.

User Support Center

Help desk support for users or users support centers can have significant impact on the

successful implementation of telecommunication initiatives. The underlying assumption for this argument is that employees will utilize technology better if they are provided with a support mechanism. In addition, employees can indirectly view user support as an indication of a strong management support for new technology. Furthermore, employees more easily accept change if they are provided with support mechanism.

In relation to the usefulness of the help desk support for users, only 59 percent of the employees of the companies surveyed for this study agreed that their help desks provide useful information in support of their needs when new technology projects are implemented. The remaining 41 percent were not sure about the usefulness of their help desks. As to the knowledge level of the help desk personnel, only 57 percent of the respondents felt that the personnel were knowledgeable and 43 percent were not sure that the help desk personnel were adequately knowledgeable to support the users needs.

As the result of the responses toward the effectiveness of the help desk support, many participants had doubts about the role of the help desk support in maximizing telecommunication project benefits. Again, only 57 agreed that the help desk personnel will help them to maximize the benefits with 43 percent responding that they were not sure. One can argue that perhaps it is not always the knowledge level of the help desk personnel that make them ineffective but other factors that hinder their effectiveness such as the inability to communicate effectively and the lack of knowledge about the organizational tasks and users functions. Furthermore, lack of effectiveness on the part of the help desk personnel can greatly impact the confidence level of the users and their perception about their own ability to successfully maximize the benefits of the initiatives.

Telecommunications Standards

During the past decade, there has been tremendous discussion regarding the lack of ef-

fective global telecommunication standards and its impact on the success of organizations' telecommunications initiatives. Organizations that operate more than one site, particularly international firms with locations around the world, have been greatly effected by the lack of universal industry standards. Obviously, telecommunications standards provide a more seamless integration of resources throughout the corporation.

Close to two-thirds (64%) of the participants indicated that there is no problem with communications hardware or software standards in their particular location, about 36 percent were not sure or disagreed. But why disagreed about the coexistence of the corporate-wide telecommunication standards in their organizations, 52 percent stated that there were no corporate-wide standards in place in their perspective organizations. This issue of the importance of telecommunications standardization was further compounded in the way that the participants responded to the question of the importance of corporate-wide telecommunications standards. More than eighty percent (82%) indicated that standards are very important to the success of telecommunication adaptation and utilization in their organizations.

Clearly the issue of lack of global telecommunications standards can add to the frustration level of users and to their ability to adapt to the current diverse standards offered by the telecommunication industry world-wide. At the local level, the issue of the telecommunication standard might not be of value, however, as the organization attempts to utilize the technology initiative throughout the corporation then it could become a major bottleneck and a factor effecting the success of the project.

Implications

Telecommunications literature is abundant with research that points to the importance of this technology to organizations and its role in competing both domestically and internationally. In most organizations, top management clearly understands the value of telecommunication

technology in support of organizational functions as well as its value as a strategic tool that can have significant impact on the firm's strategic postures. However, as organizations expand into a global environment, management needs to take a more active role in supporting telecommunications initiatives both throughout the organization and in government policies to facilitate the development of the needed infrastructure for flow of information throughout the world based on effective universal standards.

As was discussed earlier in this paper, today the range of telecommunications technologies is far beyond the telephone technology of 60s and 70s. Some modern organizations are successfully implementing and utilizing telecommunication systems such as audio conferencing, electronic mail, electronic data interchange, Internet, Intranet, leased lines, video conferencing and voice mail technologies. But as organizations invest more and more into the technologies of telecommunications, top management must give greater recognition to the human element of this technology.

The study conducted for this paper positively indicates and supports the issue that the human element affects the overall success of telecommunication initiatives. Among these human related elements includes the role of top management, users and the change process, and user support centers. Although the issue of communications standards can be identified as a technical issue, its impact on the user can classify this issue as one with as many human concerns as technology concerns.

One would assume that due to the importance of the human element in the overall success of technology based initiatives, management would give it the same level of attention as is given to the technology components, if not a greater level of attention. But unfortunately, the reality is different. Organizations, overall, allocate the majority of their technology-related initiatives for the purchase and installation of technology, and normally as little as 5-10 percent is allocated toward the human related tasks such as

training and users support. In many cases, the project can easily run out of funds by the time it reaches the training and users support level which are usually planned toward the end of project.

Ordinarily, the human factor is assessed slightly during the technology evaluation and assessment and then brought into focus during the utilization and management phase of the technology. Normally, the human factor is not give much recognition during the design and implementation phases of the project. Figure 1 illustrates a proposed model demonstrating four stages of telecommunications systems development and the level of attention needed for both technology and human components.

It is crucial for the success of any telecommunications technology related initiatives that management provide significant attention toward the human elements of the project. This attention should be both in terms of recognition of the importance of the human elements and by the allocation of funds necessary to manage the human elements effectively. Obviously, this kind of support requires profound changes in the traditional thinking and perceptions of top management in regard to the value and impact of the human elements on the success of technology related initiatives. Without this change of policy and direction, organizations are failing to achieve the highest level of returns on their investments from technology related initiatives.

Conclusion

The technological revolution of the past several decades in the telecommunication industry have had significant impacts on organizations and on the ways in which organizations manage resources and compete domestically and globally. Experts believe that this revolution will continue to change the fundamental structures of organizations both in terms of internal relations as well as relations with customers, suppliers, government, and competitors. Successful organizations of the 21st century will rely heavily on telecommunication technologies for managing their organizations globally.

This paper greatly recognizes the value of telecommunications in terms of its role and benefits to organizations. This research attempts to raise the awareness level of top management in relation of the value, importance of the human elements, and management's role in the success of telecommunications initiatives. Management needs to change its views of the human element factor from its traditional thinking. The human elements must be given as much recognition, if not higher, then technology itself if it is to expect full return from technology-based initiatives. Higher recognition must follow with a greater allocation of funds as well as direct involvement in managing the human factor.

Greater recognition and investments in the human elements of telecommunication initia-

Figure 1
Four Phases of Technology Systems Development and Support
for Technology Components and Human Elements.

Technology Components		High	
Human Elements High	High	Technology Evaluation and Assessment (Phase One)	Technology Design and Development (Phase Two)
	High	Technology Implementation and Adoption (Phase Three)	Technology Utilization and Management (Phase Four)
Technology Components		High	
Human Elements		High	

tives can multiply the overall benefits of the applications of this technology in ways that organizations have yet to experience. This goal will not be easily accomplished unless there is a fundamental change in the overall thinking of top management regarding the value of the human elements. □

References

1. Bevan, K. (1992). Telecommunications managers cope with a changing marketplace. *Telecommunications*, 26(1), 57-60.
2. Chidambaram, L. & Chismar, W. G. (1994). Telecommunications technologies: Use and investment patterns in U.S. multinational corporations. *Journal of Global Information Management*, 2(4), 5-17.
3. Deans, P. C., Karwan, K. R., Goslar, M. D., Ricks, D. A., & Toyne, B. (1991). Identification of key international information systems issues in U.S.-based multinational corporations. *Journal of Management Information Systems*, 7(4), 27-50.
4. Durr, M. (1994). The fastest, cheapest way to link remote offices. *Datamation*, 40(18), 44-46.
5. Gillette, D. (1992a). Corporate network infrastructure public, private, or hybrid? *Information Systems Management*, 8(4), 65-67.
6. Gillette, D. (1992b). Educating communications managers. *Information Systems Management*, 9(2), 70-72.
7. Goslar, M. D. & Grover, V. (1992). Communications' place in the organization: A report from corporate IS management. *Information Systems Management*, 9(4), 22-27.
8. Gupta, U. G. (1992). Global networks promise and challenges. *Information Systems Management*, 9(4), 28-32.
9. Heywood, P. & Mantelman, L. (1989). Untying Europe's tangled web of communications. *Data Communications*, 18(3), 171-182.
10. Hurwicz, M. (1994). Frame relay or leased lines-Which is cheaper? *Datamation*, 40(7), 39-42.
11. Jacobs, S. M. & Sell, M. V. (1996). Telecommuting: Issues for the IS manager. *Information Systems Management*, 13(1), 18-22.
12. Kallman, E. (1993). Electronic monitoring of employees: Issues & guidelines. *Journal of Systems Management*, 44(6), 17-21.
13. Keen, P. G. W. (1986). *Competing in Time Using Telecommunications for Competitive Advantage*. Cambridge, Massachusetts: Ballinger Publishing Company.
14. Kim, B. G. & Wang, P. (1995). ATM network: Goals and challenges. *Communications of the ACM*, 38(2), 39-44, 109.
15. Krovi, R. (1993). Identifying the cause of resistance to IS implementation: A change theory perspective. *Information & Management*, 25(6), 327-335.
16. Lai, V. S. & Guynes, J. L. (1994). A Model of ISDN (Integrated Services Digital Network) adoption in U.S. companies. *Information & Management*, 26(2), 75-84.
17. Maule, R. W. (1994). A state telecommunications architecture for technology transfer. *Information Resources Management Journal*, 7(1), 34-43.
18. McCreary, J., Boulton, W. & Sankar, C. (1993). Global telecommunications services: Strategies of major carriers. *Journal of Global Information Management*, 1(2), 6-18.
19. Morrison, J. & Sheng, O.R.C. (1992). Communications technologies and collaboration systems. *Information & Management*, 23(2), 93-112.
20. Ryan, H. W. (1992). Managing change the comfort of technology we know. *Information Systems Management*, 9(3), 60-62.
21. Srinivasan, S. (1995). Business applications of ISDN. *Information Systems Management*, 12(3), 53-55.
22. Steinbart, P. J. & Nath, R. (1992). Problems and issues in the management of international data communications networks: The experiences of American companies. *MIS Quarterly*, 16(1), 55-76.
23. Stephens, M. (1987). Concord finds networking problems include both people and equipment. *InfoWorld*, 9(31), 14.

24. Strauss, P. (1994). An ISDN survival guide. *Datamation*, 40(20), 59-65.
25. Szewczak, E. J. & Gardner, W. L. (1989). Social and organizational impact of local and telecommunications systems-Open Questions. *Information Resources Management Journal*, 2(1), 14-25.
26. Szewczak, E. J. & Snodgrass, C. R. (1989). ISDN as an information resource for strategic management of multinational firms. *Information Resources Management Journal*, 2(3), 15-25.
27. Torkzadeh, G. & Xia, W. (1992). Managing telecommunications by steering committee. *MIS Quarterly*, 16(2), 187-199.
28. Vetter, R. J. (1995). ATM concepts, architectures, and protocols. *Communications of the ACM*, 38(2), 30-38, 109.