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THE MYTH OF DOING MORE WITH LESS:
THE IMPACT OF INFORMATION TECHNOLOGY ON AN
ORGANIZATION

A Research Paper
Presented To
The Research Department
Air Command and Staff College

In Partial Fulfillment of the Graduation Requirements of ACSC

by

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Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the US government or the Department of Defense.

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Preface

As the flight commander responsible for the Scott Air Force Base's network serving 10,000 customers, I saw firsthand what it takes to implement and maintain rapidly expanding networks and their applications. Although not a command and control system, our customers demanded it be available 24 hours a day, in the office, at home, or on the road. Dealing with customer requirements and demands was often frustrating because of lack of manpower, training, and money to provide what they needed and wanted.

One of the things I recognized was a need for configuration control of the network and that business processes must change to take full advantage of information technology (IT). In addition, IT and how it's implemented can and will impact an organization's culture, and the organization must be flexible and adapt to the changes. When starting this research project, I was surprised at how much literature there was already supporting this argument.

I wish to thank members of the HQ Air Mobility Command's Directorate of Communications and Information for providing information on manpower standards and business process changes. Thanks also to members of the 375th Communications Group for their advice and training on proper network management. Special thanks to my husband who provided technical expertise.

Abstract

Information dominates our society and the way we do business. Organizations use electronic mail (E-mail) to communicate worldwide with clients. The Internet and World Wide Web (WWW) sites are flourishing, with information accessed with amazing speed across worldwide links. The Air Force has even cited Information Superiority as one of its core competencies. In many organizations, use of the network and Internet have become indispensable, resulting in a demand they be 100 percent reliable.

Leadership has believed that information technology (IT) and small computer networks will save time and manpower, allowing them to do more work with less people. In the rush to implement the technology, leaders and managers have failed to consider how IT, specifically small computer networks, impacts an organization's culture and processes. It is not enough to simply install a network and expect immediate increases in productivity. Processes will and should adapt to IT's characteristics and advantages.

A survey conducted within Air Command and Staff College illustrates how organizations must consider certain factors when implementing IT, including its impact on the mission. Although IT is shown as an enabler in getting the job done, results show potential negative behavior which can impact the organization. To prevent this negative impact, leaders must take a long-term strategic view to successfully implement IT for its full benefit instead of throwing the latest software and hardware at the same old processes.

Chapter 1

Introduction

There is no doubt we are in the "Information Age." Computer sales are booming for both office and home. Organizations are networked into the "global village" and using electronic mail (E-mail) to communicate worldwide with clients. The Internet and World Wide Web (WWW) sites are flourishing, with information accessed with amazing speed across worldwide links. The Air Force (AF) especially has recognized this explosion in information accessibility and has even cited Information Superiority as one of its core competencies. In many Air Force organizations, use of the base network and Internet have become indispensable, resulting in a demand they be 100 percent reliable.

The demand for information technology (IT) grows everyday because of the belief it saves time and manpower. Organizations have fiscally justified the idea of doing more work with less people by substituting small computer networks. Unfortunately, what organizations have found is that the networks do not decrease the amount of manpower needed. Worse, productivity is not rising to justify the cost. In the rush to implement the technology, leaders have failed to consider how IT impacts an organization's culture and processes. It is not enough to install a network and expect immediate increases in productivity. Processes will and should adapt to IT's characteristics and advantages.

Organizations and management must consider certain factors when implementing IT, including its impact on the values and mission. Questions to ponder include whether people are now inundated with more information than they can digest because of the network, how people are dealing with this information overload, and if the interpersonal contact is being lost. Another factor to consider is if the network does save time, money, and people. Management must take a long-term strategic view to successfully implement IT for its full benefit instead of just throwing the latest software and hardware at the same old processes and problems.

There is no argument about the advances made possible by computer technology. Precision guided munitions allow us to target the enemy's centers of gravity without risking collateral damage. Aircraft simulators provide pilots with 99 percent of the mission tasks they have to learn without the expense of launching a plane.¹ The availability of information for decision-making and intelligence purposes is astounding. IT has made our lives better. However, an organization must change its processes and understand the societal impact of IT. The goal should be to *automate, informate, and transform*, and approach IT implementation similar to a revolution in military affairs (RMA), as we do with our other technologies for weapon systems.

Notes

¹"We're Looking For New Ways to Share," *Air Force Times*, no. 29 (17 Feb 97), 8.

Chapter 2

Understanding Information Technology's (IT) Impact

Many computer systems have made organizations more effective and efficient. But large expenditures on the latest equipment and software are often out of proportion for the attained value, while social costs are typically ignored. This means computerization has important social and cultural dimensions that are often neglected.

—Suzanne Iacono and Robert Kling, in *Computerization Movements and Tales of Technological Utopianism*

The small computer and computer networks are here to stay. By the early 1990s, computing and telecommunications accounted for half of the capital investments made by private firms.¹ Over the past decade, the small computer has left the realm of the office and is in numerous homes across the world. What has caused this phenomenal growth of small computers, software, and networking to not only organizations, but to the home?

IT's Rapid Evolution

The driving force behind the growth is that communications, to include software, hardware, and computer components, has evolved quickly and is more readily available to the casual buyer than it was ten years ago. The IT revolution has seen continued advancement of both cost reductions and performance improvements that have led to rapid infusion of personal computer (PC) technology in society and the acceleration of local area networks (LANs). New IT architectures, such as extensive communications

networks, more accessible distributed databases, and user friendly and affordable PCs have contributed to the growth within organizations.² These enhanced hardware and software technologies allow organizations to maintain extensive amounts of information on line and allow people 24-hours-a-day access via worldwide networks.

The public appeal of the Internet has grown exponentially, from its easier access, growing commercialization of it, and the government's promotion and technological support for the National Information Infrastructure.³ More people are willing to pay for connectivity at home because of lower costs, as seen by the surge in demand for America OnLine access when they offered a flat-rate monthly charge in December, 1996. On-line connections doubled from the previous month to 11 million a day and on-line hours rose to 100 million hours, an increase of over 60 percent.⁴ In 1994, there were about 1,000 WWW sites. Now, nearly 1,000 new on-line sites go up everyday.⁵

Organizations see technology as a tool that furthers their goals and are rapidly computerizing. Most view it as an efficient economic substitute for labor or older technology. Trends show a shift from a society where industrial activity dominates to one where information processing dominates.⁶ Whatever reason, technology is not only part of the world, it has become a way of defining it. Technology eliminates human activities and replaces them with technical functions. Results are judged according to whether they are technologically feasible vs. socially acceptable (i.e., its impact on people).⁷

The Information Technology Productivity Paradox

Computerization provides many advantages and new capabilities to organizations. As a result, many organizations offer improved services to customers, such as 24-hour

banking or product ordering, airline reservations over the phone, or E-mail across the world. Much of this effort in automation was implemented in the belief that computerization would save time, money, and require less employees, while increasing overall productivity. Because of those resource assumptions, higher level managers have balked at investing in more sophisticated computer applications without associated staff reductions. Many managers view computer systems in direct economic terms—in terms of money spent or saved.⁸ The military is no exception to this trend. The implementation of the Defense Message System (DMS) program to provide writer-to-reader message service to desktop computers had manpower savings based on eliminating the base communications centers. Reduction of information management specialists throughout organizations was based upon the proliferation of small computers and networks. But how valid is the assumption that IT will save organizations resources, especially money?

Myth of Using IT to Save Time, Money, and People

There is a problem in defining and measuring productivity. Martin Neil Bailly asserts in his article “Great Expectations: PCs and Productivity” that US companies have installed billions of dollars worth of computer and PC technology which has changed the way Americans conduct business. At the same time, the growth of productivity has declined. Measuring productivity with IT, especially in offices, is more than output per hour of work. Instead, the task is to measure real output—the value of goods and services produced.⁹

The simplest definition of productivity refers to a ratio of outputs divided by inputs. Economic measures of productivity are defined by ratios of outputs to total costs, and are

more sensitive to labor rates and equipment costs.¹⁰ If the productivity of individual workers increases, it seems fewer workers will be needed to produce the given output. However, this ignores how improvements in efficiency of processing information within companies has led to large increases in demand for information work. Computers may make information work easier to do, but they also increase the amount of such work to be done.¹¹ Another fact is a great deal of improvement due to computer use has come in service industries, such as reservations or ordering systems, where productivity is difficult to measure. Perhaps the most important issue is management can't expect PCs and computer networks to compensate for collapsing infrastructures and poor work habits.¹²

Scott Morton, in his book *The Corporation of the 1990s: IT and Organizational Transformation*, brings up a key point on the correlation of computerization and employees—IT investments are often based on direct cost savings accomplished through personnel reduction. The Air Force is no exception. With its Defense Management Review Decision (DMRD) 924, the regionalization of each base's Standard Base Level Computers to a Regional Processing Center, Air Mobility Command (AMC) took 138 manpower cuts. For implementing DMS, which will eventually replace the Automatic Digital Network (AUTODIN) used for processing classified and unclassified message traffic, AMC lost 84 manpower slots. Both these initiatives were designed to implement new IT systems and the manpower cuts came from personnel (3C0X1 career field) directly supporting the antiquated systems. However, the AF Network Control Center Manpower Standard was approved in late 1996 and is now being implemented. The results are a growth of 1,500 3C0X1 slots AF-wide, with 226 going to AMC. These slots are designated for the support and administration of each AF base's small computer network,

and more than offset the cuts from DMRD 924 and DMS.¹³ An organization needs to rethink systems investment rationale applied to IT initiatives. A direct connection to personnel reductions may not be possible or reflect true benefits that should be gained.¹⁴

Employing IT to Boost Productivity

It appears organizations are not properly employing computerization to boost productivity. Many times in buying small computers and network equipment, managers are looking solely at the machines to improve productivity. However, improvements can't truly be measured without associated changes in business processes and practices.

An example common to all organizations is the number of preliminary drafts done by using small computers. Because the capability exists, the number of drafts has skyrocketed. Does that result in better reports or better decision making? If the computer and its software is so good, why do we still need the same number of administrative personnel? Often, true efficiency can mean career suicide—managers will keep the same number of employees and increase the flow of paper from departments so it looks like they are more productive.¹⁵

What IT has done is provide capabilities that make people feel more productive. The ability to print faster with more varied fonts gives employees the impression they are being more productive, as well as increasing personal satisfaction.¹⁶ Employee productivity may pay off with increased customer satisfaction for improved products and quicker response time to their queries. Computer applications can improve the quality of work done rather than reduce number of people working in a specific office. There is also the quality vs. quantity tradeoff. People might feel they are doing more by spending time to make the

product look better, experimenting with fonts, enhancing with charts and graphs, but in reality they aren't. However when it comes to actual numbers, there is just not enough proof. Implications of the tradeoff mean any potential productivity gains from IT are absorbed by workers who pursue other goals than simply speeding up their work.¹⁷

Computers analyze and process information and do it quicker, easier, and cheaper than just a few years ago. The computer hardware revolution lowered the cost of information, but its value remains difficult to assess. Where do we draw the line on number of drafts? Have we figured out how to sift through the mountains of information now available to us? How do we tell which is worthless? As information processing gets less expensive, companies do more of it, and the temptation to do too much can be overwhelming. There is a need for organizations to re-think how they will use IT.

IT Requires Changes in Business Processes

Computerization is one strategy among many that organization can use to reduce costs or improve revenues and service. IT implementation must be done in conjunction with improving the organizational structure, reallocating responsibility, reducing levels of hierarchy, and reducing the amount of internal review. Computerization often seems most effective when coupled with a sensible reform program, rather than a freestanding effort to modernize.¹⁸ Senior leaders must understand the implications of IT and develop a strategy to fulfill the mission and their customers' and employees' needs. For the Air Force, one way to implement this strategy is to consider it along the lines of a Revolution in Military Affairs (RMA). An RMA starts with a new idea for military operations as a result of new strategies or new enemies. This new operation may pull existing technology along to

more advanced forms or may not involve any improvement in existing technology at all. Organizations then make a deliberate decision to update doctrine and adapt to the new methods. By using a similar approach of the RMA, Air Force leaders can grasp IT's impact and help determine the best way to implement it.

Notes

¹Suzanne Iacono and Rob Kling, "Computerization Movements and Tales of Technological Utopianism," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 87.

²M. Scott Morton, *The Corporation of the 1990s: Information Technology and Organizational Transformation* (New York: Oxford University Press, 1991), 31.

³Iacono and Kling, 87.

⁴Steve Case, Chairman and CEO, America On-Line, in "What's Hot: AOL Inside and Community Update," Jan 97, available on American Online Server.

⁵James Martin, "Internet Overload: Disaster in the Making?" *PC World*, (Oct 96), 146.

⁶Iacono and Kling, 88.

⁷John Murphy, "Fundamentals of a Responsible Technology," in *The Underside of High-Tech—Technology and the Deformation of Human Sensibilities*, ed. John Murphy, et. al. (New York: Greenwood Press, 1986), 203.

⁸Rob Kling, "The Centrality of Organizations," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 121.

⁹Martin Neil Bailly, "Great Expectations: PCs and Productivity," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 219-221.

¹⁰Kling, "The Centrality of Organizations," 122.

¹¹Paul Attewell, "Information Technology and Productivity," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 232.

¹²Bailly, 220.

¹³Chief Master Sergeant Julie Southwick, Air Mobility Command 3C0X1 Functional Manager, E-mail message to author, subject: Manpower Numbers, 30 Jan 97.

¹⁴Morton, 44.

¹⁵Bailly, 223.

¹⁶Kling, "The Centrality of Organizations," 122.

¹⁷Attewell, 231.

¹⁸Kling, "The Centrality of Organizations," 123.

Chapter 3

Perspectives on Implementing IT

Just because computers offer us certain advantages does not mean we want to take advantage of them, nor does it mean that they would necessarily be advantageous for the social interchange that, in the vast majority of cases, is essential for individual fulfillment.

—Melvin Kranzberg
in *The Information Age—Evolution or Revolution?*

In the haste to install the latest and greatest computer networks, management often overlooks or is not aware of possible impacts on the organization. Many analysts have seen the impact of electronic communications within a workplace and how ignoring it may minimize any positive influence they had hoped to bring about. It is essential leaders understand the various theories of using IT, the impact of electronic communications, specifically small computer networks and associated applications, how people deal with it, and the enablers and inhibitors in providing effective computerization.

Technological Determinism and Its Worldview

For technology to further human interests, management must understand its worldview. Technology is a mode of experiencing and must be accommodated to the social world instead of the other way around, eliminating the assumption technology is in charge or directing human development.¹ This describes technological determinism—how

changes in technology influence social outcomes. Some inventions cause societies to change to adapt to them, while others don't. Technology is the driving mechanism, with individuals and society seen as serving the requirements of a technological system which shapes their purposes. Technology becomes an end in itself rather than a means to an end.² Consider how the development and mass proliferation of the automobile changed America. Because of transportation, workers were no longer required to live in the cities or near their jobs. The automobile gave individuals greater freedom and offered more options concerning their lifestyle. As a result, a mass migration from the city to the suburbs occurred, leaving cities struggling while outlying areas flourished.³ Computerization has similar positive and negative impacts on organizations and must be considered when implementing IT to avoid offsetting any productivity expectations.

The Societal Impact of IT

Electronic communications, such as teleconferencing or E-mail, have definite impacts on social interaction as automobiles did on the cities. Studies have shown that electronic communications can result in misinterpretations, angry and uninhibited exchanges, and feelings of isolation or depersonalization among its users.⁴

M. Lynne Markus, in "Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work," proposes several theories of the possible impact of electronic communications. These perspectives, summarized in Table 1, deserve to be examined and understood by leaders so they can minimize IT's impact and gain its full advantage. The first theory is that of technological determinism, where changes in technology influence social outcomes, regardless of the user's intentions.

Table 1. Theoretical Perspectives on the Social Effects of Electronic Media

Perspective	Explanation of Negative Effects About Behavior
Technological Determinism • Social effects are determined by the characteristics of technology, regardless of user's intentions • Relevant technological characteristics of electronic media include "cues filtered out" and new capabilities	• Negative outcomes occur with E-mail because E-mail filters out cues necessary for people to regulate their social interaction • Negative outcomes occur with E-mail because it has new capabilities that depersonalize social interaction
Rational Actor • Social effects result from intended human actions within the constraints afforded by technological characteristics • People may intend negative outcomes when private motives differ from socially desirable outcomes • People may anticipate negative outcomes and take steps to avert them	• Negative outcomes occur because people engage in bad uses of E-mail, either deliberate or accidental • People may know using E-mail has the risk of negative social outcomes because it filters out cues. However, E-mail may produce benefits. Therefore users may take steps to avoid E-mail's potential negative side effects on social interaction
Emergent Process • The effects of technology use result from unpredictable actions among technological characteristics, user's intentions and behaviors, and social definitions of good and bad uses	• When negative effects occur, they are often unintended and unanticipated. They may even be the result of actions people take to avoid the potential negative effects of using electronic media

Source: M. Lynne Markus, "Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 497.

As many people who use teleconferencing and E-mail have discovered, these applications filter out certain personal, social, and behavioral cues used to maintain relationships and regulate face-to-face communications.

A second theory is that of the rational actor, where social effects result not from the technology itself, but from the choices individuals make about when and how to use it. Some people deliberately choose E-mail because it allows them to avoid face-to-face interaction and problematic relationships. Managers must be aware of this possibility and

focus on users' intentions and behaviors, such as whether they use technology in ways likely to achieve or avert negative social effects.

The emergent process perspective focuses on social definitions of what technology is good for and accepts the possibilities that negative effects might occur, despite good intentions. An example of this includes a corporate reliance on E-mail to replace all communications. Markus discovered in a study of a large company that the rule was to use E-mail to minimize phone calls and meetings, in turn raising social and efficiency concerns. E-mails had to receive timely response and it was perceived E-mail messages got faster responses than telephone calls. In the haste to respond quickly to E-mail, people who visited the office were usually dealt with quickly or ignored. When employees would visit their bosses, the beeping terminals notifying of E-mail took precedence. Face-to-face meetings have some unique characteristics, such as the air time in meetings is limited, only one person can talk at a time, and the time and meeting size all bear on what will be said. These factors all impact at the social level. E-mail, on the other hand, can allow more participation, but does not eliminate the need for personal communications. Personal communications is still necessary to clarify questions and obtain general group agreement and understanding over a particular issue. E-mail can leave all parties with different understandings or conclusions about the same issue. The other problem is managers who use E-mail or other electronic communications to manage people. The emergent process perspective suggests negative impacts occur, despite the best intentions. This can be seen a lot in military organizations, where E-mail has taken the place of face-to-face communications, especially in geographically separated units.

Markus' theoretical perspectives point to the possibility of misuse, whether intentional or not, of electronic communications. This misuse may cause the loss of interpersonal communications because of time spent on the network. This loss can negatively impact an organization's culture, the way they do business, and their overall productivity.

IT's Impact on Productivity

An example of productivity not increasing is illustrated in a study of 187 New York firms. Assessments were made of changes in employment and workload resulting from specific computer applications (processing accounts receivable, querying inventory levels, preparing shipping labels). Mean output per worker rose 78% compared to the immediately previous technology. However, overall employment in these applications didn't decline because the volume of work done jumped 76%, effectively absorbing the productivity gain. Clerks produced more notices and made more queries. The study concluded the amount of work done increased with computerization, absorbing time and other resources that might otherwise have been freed up.⁵

IT productivity improvement studies focus on changes within a single communications channel, such as using E-mail vs. the phone. Each communications channel has its own speed of transmission—speech is faster than typing. While IT improves productivity within one channel (shift from typing to word processing), it degrades productivity if it shifts communications from faster to slower channels (from speech to typed communications).⁶ Another interesting fact is people tend to be terse in face-to-face communications because of shared assumptions. However, in writing, people tend to elaborate because less shared background knowledge is assumed to exist.

Indexicality, as this is called, shows IT may be shifting communications that would have occurred in a faster and indexically-spoken medium to a relatively slower written channel, offsetting potential productivity gains.⁷

Cultural Assumptions About IT

Understanding the concept of cultural assumptions can help mitigate the problems of adopting and implementing IT. Edgar Schein states in *Organizational Culture and Leadership* two subcultural elements, management and technology, may clash with taken-for-granted assumptions. He cites that many assumptions held by senior managers are quite different and opposed to the assumptions of IT professionals.⁸ When a CEO or commander has an IT system or application installed in the organization, is he/she aware of the degree to which the IT designers are making assumptions about what he/she wants in terms of an organizational design and control system?⁹ Many are aware of the cost issues of IT, but are not aware of organizational implications of adopting IT.

According to Schein, some assumptions fall into the category about people and learning. It is assumed people already know how to communicate and manage, therefore IT will enhance this process. This is a dangerous assumption—IT will not help those people who do not know how to manage. Another is that IT facilitates task performance and efficiency, so people will adopt to it. Many people have motives, feelings, and anxieties that make them unwilling to learn new things.¹⁰

Another category of assumptions is how management might use information for control purposes. The first assumption asserts a more fully connected organization with open channels will be a better one. This runs the danger of increased information slowing

down the decision process and perhaps invites more local creativity and innovation than desired.¹¹ This may not work in those businesses requiring tight discipline and coordination. A corollary assumption is that managers want a more open networked organization in which information will be readily available to all. In most cases, managers gain their power from controlling information and therefore may be opposed to opening the channels more widely. A related problem is the managers who over-controls the information. Management might have immediate access to the same information as the workers and be monitoring it so closely that the employees might not have time to react and take care of situations before the boss intervenes.

A third assumption is managers know how to use information responsibly and appropriately. However, IT implementors view many managers as misusing the information. Therefore it is up to the IT implementors to figure out the correct users of information, educate managers on its usage, and to prevent certain uses that would be harmful to the organization.¹² An example of this assumption is how the Air Force is now defining what constitutes proper usage of the computer network and Internet to prevent unauthorized access to questionable WWW sites and non-business related E-mail.

Management must be aware of this potential clash between the subcultures. Their task is more than just training people to use the new tool, but how assumptions are going to have to change and/or give way. Processes must be invented to allow the strengths of management and technology to interact to form integrative new solutions.¹³

IT's Positive Impact

While computerization guarantees faster delivery of the messages and access to more information, what impact does it have on employees? What do managers need to be aware of to maximize effectiveness? Lee Sproull and Sara Kiesler assert that IT serves as an enabler for the peripheral employees—those workers who are the first and often only contact customers have with an organization (sales clerks, customer service representatives at the military personnel flight, etc.).¹⁴ Because the peripheral employees are so far down the chain from the center of the organization, they often do not know what is going on (an informational problem), or they may not care (motivational problem).

“Plugged-In” Employees

IT, specifically E-mail, electronic bulletin boards, and discussion groups, allows peripheral employees to connect with others they normally wouldn't. As a result, they feel more “plugged into” the organization and are given the opportunity to make connections with other employees who would otherwise be invisible or unknown. This increased “connectedness” allows for communications with people in geographically dispersed areas or on different work shifts. The AF has recently recognized this connectedness as a morale booster, especially at remote locations, and leaves it to the local commander's discretion to allow personal use of E-mail to communicate with families and friends.¹⁵

Sproull and Kiesler found peripheral employees who communicated electronically became better integrated into the organization and participated actively in the organization.¹⁶ Giving people a voice is strong value in our culture; however, managers face three problems with it.¹⁷ The first problem is of logistics. Peripheral employees are

far from the organization's hub, and getting their opinion may be time consuming. The second problem deals with motivation. Peripheral workers may be reticent, distrustful, and fear recrimination. The last problem is management's motivation—they may not want to hear what workers have to say. Effective implementation of IT offers the chance to minimize those problems. E-mail, electronic bulletin boards, and the like can allow employees to communicate more easily issues, recommendations, and problems. Sproull and Kiesler discovered people prefer using E-mail when communicating up the chain to negotiate or solve problems because it reduces the "status imbalance."¹⁸ With IT, management may be the first to hear about bad news instead of being the last. The key to success here is the effective implementation of IT. Appropriate rules and procedures must be instituted to avoid information overload for employees and management.

Getting the Most From IT

Just because employees now have access to a lot more information does not necessarily mean they will be more productive. They might be more committed to the organization and like their jobs more, but that does not mean they produce more.¹⁹ Management faces a danger by looking only at the short term perspective and the relationship between performance and amount of information—the more information an employee has access to, the better job he/she will do—is not always true. Instead, management must take the long term view and look at increasing employee participation by electronic communications as a capacity building strategy with implications for long-term performance. There are three components of such a strategy—creating connections among employees, building new skills, and increasing an employee's ability to absorb new ideas.²⁰ Connections with people in other offices and/or areas of expertise can help get the

job done faster and better. Extracurricular mail can contribute to a capacity building strategy, by increased skills from using the system.

To implement this strategy, there is a need for re-engineering business processes to take advantage of IT's capabilities. IT will then be an enabler in mission accomplishment.

IT As An Enabler

Because of the way small computer networks are implemented, with no change in processes even considered, people are swamped with E-mail and information. They must first sift through the "extracurricular" mail to get to the "hot ones." Then they have to balance between answering the mail or meeting with their workers to see what is really going on. The adage about the commander must get out from behind his/her desk is becoming harder to do because of important message traffic they are expecting via E-mail. It also raises the issue of the need to login from home on weekends/holidays so as not to miss an important tasking or message. How are organizations and individuals dealing with this deluge of information? Is IT an enabler in getting the job done, or merely another stumbling block to effective management or leadership?

IT has the potential for improving business processes, coordination, direction, and connectivity within and outside of an organization. However, for effective implementation, managers must be aware of the enabling and inhibiting factors of IT and plan accordingly. An enabler is that which will significantly improve group processes and performance through various technologies supporting connectivity and coordination through organization. An inhibitor is the opposite, something which will have a negative impact on IT's implementation, possibly causing it to not even be used, or if it is used, not

used to its full potential. Table 2 summarizes the enablers and inhibitors of IT effectiveness.

A key enabler is effective network management. If an organization does not plan or budget for network growth, it will impact how it conducts business or even how employees use the network. The Air Force has recently taken a step towards better network management with the issuance of its Network Control Center Concept of Operations (CONOPS). This CONOPS stresses:

The success of the AF Global Engagement mission depends on protected and reliable networking. Smaller force levels and access to fewer forward bases increases dependence on force-enhancing capabilities of automated communications and information systems. Commanders at all levels rely on sophisticated C4I systems for decision making. Reliance on these systems to support routine and tactical contingency missions places a premium on the communication unit's ability to provide network management.²¹

Table 2. IT Enablers and Inhibitors

	Enablers	Inhibitors
General	• Computer hardware/software advances	
Communications Networks	• Powerful, transparent internal networks • External networks and standards	• Effective network management
Distributed Database Capability	• Easy access to distributed databases	• Effectiveness of software • Data resource management policy • Capability of dictionary/semantic resolvers
Workstations	• Networked, hierarchical systems • Interface to simplify usage and access to network/database resources	• Interface with data/knowledge base resources • Cognitive support/facilitation
IT Architecture	• Integrate existing operational systems	• Application of architecture for organizational flexibility/growth

Table 2—continued

	Enablers	Inhibitors
IT Infrastructure/Usage	• Improve group processes and performance (groupware) • IT-literate and IT champion management	• Effective IT standards • General productivity • Support of management processes • System investment rationale • User attitude/readiness/ training • Quality of IT workforce

Source: M. Scott Morton, *The Corporation of the 1990s: Information Technology and Organizational Transformation* (New York: Oxford University Press, 1991), 39.

By recognizing inhibiting factors and planning accordingly for training, network standards, policies, and network growth to offset them, management can effectively use IT to accomplish their mission.

Notes

¹John Murphy, "Fundamentals of a Responsible Technology," in *The Underside of High-Tech—Technology and the Deformation of Human Sensibilities*, ed. John Murphy, et. al. (New York: Greenwood Press, 1986), 192.

²Daniel Chandler, "Technology or Media Determinism," n.p., on-line, Internet, no date, available from [http://www.aber.ac.uk/\(tilde\)dgc/tecdet.html](http://www.aber.ac.uk/(tilde)dgc/tecdet.html).

³Rob Kling, "Computers as Tools and Social Systems," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 19.

⁴M. Lynne Markus, "Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 490.

⁵Paul Attewell, "Information Technology and Productivity," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 232.

⁶*Ibid.*, 229.

⁷*Ibid.*, 231.

⁸Edgar Schein, *Organizational Culture and Leadership*, (San Francisco: Josey-Bass Publishers, 1992), 279.

⁹*Ibid.*, 293.

¹⁰*Ibid.*, 282.

¹¹*Ibid.*, 286.

¹²*Ibid.*, 286.

¹³*Ibid.*, 294.

Notes

¹⁴Lee Sproull and Sara Kiesler, "Increasing Personal Connections," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 450.

¹⁵"Vital Links," *Air Force Times*, no. 26 (27 Jan 97), 12.

¹⁶Sproull and Kiesler, 460

¹⁷*Ibid.*, 462.

¹⁸*Ibid.*, 463.

¹⁹*Ibid.*, 472.

²⁰*Ibid.*, 473.

²¹*Air Force Concept of Operations: AF Network Control Center*, (Air Force Communications Agency), Dec 96, available <http://infosphere.safb.af.mil/bncc/conop/conop.htm>.

Chapter 4

A Study of IT's Impact Within the Air Force

The previous discussion has shown the possible negative effects of IT within an organization, mostly impacting the unit's culture. To compare the theories discussed and to see if the Air Force is facing the same problem as private industry, a survey was conducted within the Air Command and Staff College (ACSC). The purpose of the survey was to see how people were using electronic communications in daily business, if any positive or negative societal effects were observed, and if the rational actor or emergent process perspectives can be used to explain the results.

Subjects

ACSC is the professional military education (PME) program for mid-career AF officers. The student body also consists of officers from other American military services, civilians, and international military officers (IOs). The faculty and staff is just as diverse, with a cross-section of AF military and civilian ranks, sister service officers, and IOs.

Because of how IT is used at ACSC, it was essential to sample faculty, staff, and students. Seventy surveys were distributed to ACSC faculty and staff. Various work sections were selected to participate so responses from senior management, administrative personnel, instructors, and the network administrators/technology implementors could be

included. Six student seminars participated for a total of 60 surveys, representing 10 percent of the student body. Only US students completed the survey. ACSC designs each seminar with a representative sample of career fields so students are exposed to people from differing backgrounds. Because the student respondents represent a wide range of career fields and experience levels, it was felt six seminars provided enough of a sample.

How IT is Used at ACSC

ACSC is typical of many Air Force organizations in its recent (in the last 2-3 years) implementation and use of information technology. Faculty and staff each have desktop computers interconnected via a local area network, which connects them to the rest of Maxwell AFB-Gunter Annex and allows off-base E-mail and Internet access. Each ACSC student is issued a laptop computer for use during the school year, providing E-mail, Internet access, word processing, graphics, spreadsheets, and other capabilities. For the 1996-97 academic year, the school has relied heavily upon the network. Many required student readings are contained in "cyberbooks"—the on-line schedule and lesson plan for each course of instruction. These cyberbooks and schedule updates are downloaded to the student's laptop hard drive as required, allowing them to work off-line at home. E-mail is used extensively by both faculty and students to communicate on- and off-base.

Survey Instrument

This study used a self-administered questionnaire (Appendix A) based upon one developed by M. Lynne Markus. Responses were based on a Likert scale of 1 to 5, with 1 meaning "strongly disagree" and 5 meaning "strongly agree." The questions, many of which were based on Markus' survey, were designed to solicit responses across two

dimensions.¹ The first dimension of questions focused on if IT was either making closer relationships between bosses and subordinates or having the opposite effect. This was to see if the rational actor or emergent process perspectives could be evidenced and explain the social effects of IT. The second dimension examined how E-mail and other IT applications were used, the frequency of electronic communications, and their perceived impact on productivity and efficiency.

Survey Results

Out of 130 surveys distributed, 115 were returned, for a response rate of 88 percent. The only demographic information which had any bearing dealt with the experience level of the respondents. The majority considered themselves to be somewhat to very experienced with IT. The rest of the demographic information (service and career field) was not used. Faculty/staff and student only responses were compared to see if there were major differences in agreement on IT's impact. Table 3 summarizes the means for both dimensions overall. Tables 4-6 summarize the first dimension and Tables 7-9 illustrate the second dimension. Tables are located in Appendix B.

Interpretation of Results

ACSC appears to be still evolving in how IT is implemented and used. Some Air Force organizations, such as HQ AMC have had the technology longer, rely upon it more, and have integrated it as part of daily operations. Hence, some questions came out with more of a neutral response, and the overall mean for each dimension shows this neutrality. If used at a location where IT implementation is further along, the results may be quite different. If the survey is re-accomplished in 2-3 years here at ACSC, the results may well

change. Another factor that may have impacted the survey results is that ACSC is it is an academic environment, with a new class every year. A base-level unit or a major command staff may use IT differently (processing of TDY orders, electronic coordination of staff summary sheets, and daily read files are a few examples of IT use at Scott AFB and other AMC bases) to accomplish its mission and the emphasis on coordination is probably different. However, we can still draw some conclusions on IT's impact so far at ACSC and trends that are occurring can apply to any organization.

The Closeness Dimension: IT's Impact on Behavior

Survey results do not show conclusively if IT is perceived to improve relationships or if there is a trend toward de-personalization. However, results do show a perception that people can use IT, especially, E-mail, to avoid personal contact (#4). This illustrates the possibility of the rational actor perspective in action, where negative outcomes occur because people engage in bad uses of E-mail, either deliberate or accidental (see Table 2). Faculty and staff felt more strongly than the students that E-mail can create misunderstandings that a meeting or phone call could clarify (#10), another illustration of IT's potential negative impact. Comments include: "Electronic media is not a substitute for paper or direct personal contact" and "The network and E-mail are important and useful tools that should not take the place of personal contacts."

Both groups tended towards a positive to neutral response on if IT can be used to circumvent the chain of command (#11), another potential negative impact. As for sending electronic "attaboys" (#15), both faculty and students disagreed it was an appropriate method. One respondent stated "it's better than not getting anything at all"

and another said "E-mail both helps and hurts. As E-mail is more convenient, I use it to say thank you more often, but getting an E-mail thank you is less effective than a letter."

The high number of neutral responses for the questions of feeling closer to my subordinates or my boss (#1-2) is probably because very few ACSC faculty and none of the students while at school actually have people working directly for them. However, one faculty member pointed out:

Seems to be the presumption that a computer network has replaced/changed the interpersonal contact between subordinates, me, and seniors. Perhaps it has simply added another pathway for interaction.

The Productivity/Efficiency Dimension: IT's Use at ACSC

The second dimension examined if IT is considered an enabling factor and how it impacts efficiency and productivity. Both students and faculty felt strongly that IT as they used it is an enabler in getting their job done, as shown in responses to such questions as "I am more productive," "It helps me get my job done," and "Access to the Internet enables me do a better job" (#17, 24, 27). Faculty had a higher agreement on the question "Information flows faster and improves my decision-making" (#20) This may be because of their role and how they receive information related to their daily operations, vs. the students who are not assigned permanently and are not impacted by many of the operational decisions.

Many respondents stated positively they feel limited in what work they can accomplish when the network is down (#29), indicating ACSC's heavy reliance on the small computer network. One student states "I have learned not to store files on the LAN so it's not a problem when the LAN goes down." This reliance points to several other

aspects for IT to be a true enabler as illustrated in Table 2, such as the need for better network control, robustness, training, standards, and rules.

Although most respondents felt the network is an enabler in mission accomplishment, some possible negative trends should be noted. These included the amount of people who stated they are asked to re-draft products constantly and the feeling that we do not need as many administrative personnel (#18-19). While the numbers at this time do not point to IT as an inhibitor, they do show a possible trend toward IT's misuse and the perception we can do away with certain skills because of its capabilities. Another notable trend is the large amount of people who felt they received many E-mail messages not related to their work and/or were inappropriate (#8-9). Non-work related and inappropriate E-mail may be considered inhibiting factors, especially if enough is received to overload the recipient or make them feel threatened. However, the respondents didn't feel they were yet overloaded with E-mail, despite the amount of "extra" mail received (#21-23).

There was a positive response to the need for a unit to establish rules and procedures for how network will be used (#16). As one student put it, "Use of the Internet is great. Now how do we separate wasting time and accomplishing work on the net?" Another student pointed out "E-mail content and distribution needs better management. Very few E-mails really need base-wide distribution." Although an overwhelming majority said they are careful how they word E-mail messages because they might be forwarded, most felt it was OK to forward E-mail without the originator's consent (#12-13). These issues and how to limit inappropriate messages can be addressed in effective rules and procedures.

Question #28, dealing with the practicality of a paperless environment, evoked a negative reaction from both students and faculty. A common complaint from students is

the initiative to place numerous readings on the computer via the cyberbook. The school has done this because of a dramatic reduction in funding for printing and to provide the most recent publications. However, most students bear the cost themselves by printing the readings to have paper copies from which to more easily read. Others struggle to read from the small laptop screens. According to Schein, a common assumption is that a paperless environment is more efficient and desirable; and a paperless office is based on notions of reduced costs and greater accessibility of information.² However some tasks may require the ability to look at many things at once than electronic screens can provide. Many faculty and students feel the goal of a paperless office is unrealistic, but this might be attributed to a resistance to change vs. actually being unattainable.

The survey and respondent comments point to a need for effective procedures as IT use becomes more widespread within an organization. Management must be aware the rational actor or emergent process perspectives can occur. Being forewarned, they can minimize the IT's negative impacts by changing business processes up front.

Notes

¹M. Lynne Markus, "Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 500.

²Edgar Schein, *Organizational Culture and Leadership*, (San Francisco: Josey-Bass Publishers, 1992), 281.

Chapter 5

Summary: Taking Advantage of IT

When computerization yields major productivity payoffs, it will be as a result of the confluence of three factors: the new technologies themselves, the know-how to apply them successfully, and the wholesale substitute of the new technologies and methods for older ways of doing things.

—John Leslie King, in *Where are the Payoffs from Computerization?*
Technology, Learning, and Organizational Change

From the survey results and literature review, there is no doubt IT and its opportunities can be and are a positive factor in mission accomplishment. However, leaders and managers must understand several implications. IT places the greater burden of information work upon organizations (24-hour access to information, instantaneous tracking of cargo, the “pulling” of detailed intelligence as needed) and it takes sizable investments of money and people to provide this kind of access. Providing information on demand absorbs benefits accruing from increased productivity elsewhere.¹ We cannot simply install a computer network and expect to see immediate payoffs. Organizations will have to re-engineer their processes and ways of doing business to take full advantage. Computerization will not automatically result in needing less people. To maintain and use what is installed will require a more highly trained workforce.

Another impact of the IT infusion is how information flows within an organization. Because information is so available, the definition of control changes. The military is

traditionally very rigid in its command and control (C2) structure and how information flows up and down the chain of command. IT advances allow more people to access data that before was more tightly controlled. Decision making is no longer a flow of recommendation up and orders down, but by development of shared sense of direction. An example of this shared sense of direction is the military's goal of the warfighter "pulling" or selectively accessing only the information needed, vs. "pushing" all available information on the planners to make the decisions. Organizations may see conferring and networking as the way for getting things done. Because there is so much information and it flows very fast, planning is no longer done by a few, leading to more openness and less secrecy.² To take full advantage of IT and to achieve its core competency of Information Superiority, the Air Force may have to change its way of thinking on command structures.

Organizations and individuals are already heavily dependent upon IT and expectations are great. We can easily compare the information super highway's impact to the impact the car had on society. Along with the increased mobility the car provided, it also brought pollution, deadly accidents, movement of folks out of cities to suburbs, and became institutionalized and taken for granted. Hence, it became hard to alter on a social scale even with big incentives, such as carpooling.³ We face similar problems with IT as it becomes more ingrained in our society and way of doing business. To minimize the negative effects and emphasize the positive aspects of IT, managers must implement IT with a long term strategic view.

The Long Term Strategic View

Computerization raises such questions as who will get access to what kinds of information and software? How much should be spent on support and training? How should resources and status be divided within an organization? Who has control of the IT processes? These questions go beyond day-to-day organizational issues and into that of social and political design. Some analysts say we have entered an age of technological utopianism, where the use of some technologies make life enchanting and liberating for all.⁴ As a result, people who become accustomed to new technologies won't want to or can't return to the previous way of doing business. The ACSC survey results support this argument, with the majority of respondents saying they would use E-mail, given a choice and the number who feel limited in what they can accomplish when the network is down (#5, 29). Because there is no turning back, managers must consider how to accommodate new technologies and what will change as a result of their accommodation. A way of approaching this long term strategic view is to transform the organization by going through a series of steps, much like an RMA. This approach is detailed in Appendix C.

Recognition of Process Changes

Redefining business processes to take full advantage of IT is a challenge, but not impossible. Implementing changes goes beyond just teaching the software capabilities. The process change must be addressed and implementation plans and business rules developed for all end-users. Frameworks, such as a corporate body to oversee process changes and software solutions do exist for implementing processes redefinition, as described in Appendix D. These basic guidelines on business process changes, installing groupware

software, and effective training can be part of the RMA and lay the foundation for successful IT implementation.

Conclusion

As information and information processing dominates our society and the future, organizations must learn how to properly implement and use IT. While the best way to initiate process changes depends on the organization and its mission, approaching it as an RMA is a familiar and effective method for the military.

Leaders must understand that IT will not necessarily decrease the amount of manpower needed or increase productivity. IT can have both positive and negative impacts on an organization's culture. By taking a long term strategic view, management can avoid IT's de-personalizing aspects and exploit its enabling factors. By adapting rules and processes and understanding the societal impacts of IT, we can achieve the goal of *automating, informing, and transforming*, thus gaining the full benefit of IT's capabilities.

Notes

¹Paul Attewell, "Information Technology and Productivity," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 236.

²Harlan Cleveland, "The Twilight of Hierarchy," in *Information Technologies Social Transformation*, ed. Bruce Guile (Washington, D. C.: National Academy Press, 1985) 62.

³Rob Kling, "Computers as Tools and Social Systems," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 19.

⁴Rob Kling, "Computer Scientists as Social Analysts," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 42.

Appendix A

ACSC Survey

The Impact of Computerization Within an Organization

This survey is part of an ACSC student research project to determine how computerization impacts an organization. Computerization includes the use of a small computer network within an organization and its applications, such as electronic mail (E-mail), word processing, spread sheets, graphics, forms, automated calendar/scheduling, Internet access, etc.

To answer the questions, please use your previous experience with small computer networks and while here at ACSC.

Please indicate the extent of your agreement or disagreement with the following statements by circling a number from 1 to 5, where 1 means strongly disagree and 5 means strongly agree.

Because of the capabilities of the small computer network and its applications

	1	2	3	4	5
	Strongly Disagree	Disagree	Neutra l	Agree	Strongly Agree
1. I feel closer to my subordinates	1	2	3	4	5
2. I feel closer to my boss	1	2	3	4	5
3. I get less feedback on my performance	1	2	3	4	5
4. People can avoid personal contact	1	2	3	4	5
5. If I had a choice, I wouldn't use E-mail	1	2	3	4	5
6. I couldn't live without E-mail	1	2	3	4	5
7. When the network goes down, I start feeling anxious	1	2	3	4	5
8. I receive many inappropriate E-mail messages	1	2	3	4	5
9. I receive many E-mail messages not related to my work	1	2	3	4	5

10. E-mail creates misunderstandings that a phone call or meeting would prevent	1	2	3	4	5
11. People use E-mail to circumvent the chain of command	1	2	3	4	5
12. I am careful how I word E-mail messages because they might be forwarded	1	2	3	4	5
13. E-mail should not be forwarded without the original sender's consent	1	2	3	4	5
14. People cannot exert their authority via E-mail	1	2	3	4	5
15. E-mail is a good way to send "attaboys"	1	2	3	4	5
16. We need effective business rules/processes to better control how the network is used	1	2	3	4	5
17. I am more productive	1	2	3	4	5
18. We do not need as many administrative personnel	1	2	3	4	5
19. I am asked to re-draft products constantly	1	2	3	4	5
20. Information flows faster and improves my decision making	1	2	3	4	5
21. I am swamped with too much information to do my job effectively	1	2	3	4	5
22. I spend more time reading my E-mail than I spend face-to-face with my subordinates/peers	1	2	3	4	5
23. I feel compelled to either come in on weekends or log in from home to keep up with my E-mail so I don't miss a tasking	1	2	3	4	5
24. It helps me get my job done	1	2	3	4	5
25. It is more of a stumbling block in getting my job done	1	2	3	4	5
26. Prevents me from working on what is really important	1	2	3	4	5
27. Access to the Internet enables me to do a better job	1	2	3	4	5

28. The goal of a paperless environment is realistic	1	2	3	4	5
29. When the network is down, I am limited in what work I can accomplish	1	2	3	4	5

Comments:

Statistical Data

1. ____AF ____Navy/Marines ____Army ____Civilian

2. Please enter your career field specialty: _____

3. When working with small computer networks and their applications, I consider myself

- a. very experienced.
- b. somewhat experienced.
- c. limited in experience.
- d. I had no previous experience until coming to ACSC.

Note: Questions based upon survey conducted by M. Lynne Markus, reported in *Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work*, published in *ACM Transactions in Info Systems*, Apr 94..

Appendix B

Impact of IT on ACSC: Survey Results

Table 3 shows the overall means for both the closeness and productivity/efficiency dimensions, as described in Chapter 4. Results are shown based on faculty, student only responses, plus a combined response.

Table 3. Means for Closeness and Productivity Dimensions

	Faculty/Students	Faculty Only	Students Only
Closeness Dimension	3.18	3.26	3.09
Productivity/Efficiency Dimension	3.13	3.11	3.15

Tables 4-6 illustrate the results for questions that are part of the closeness dimension. Question 3 has been reversed scored to show strength of support for those items with “agree” and “strongly agree.”

Students and faculty were asked to indicate the extent of their agreement or disagreement with each question, prefaced with the following statement:

Because of the capabilities of the small computer network and its applications:

Table 4. Closeness Dimension—ACSC Faculty and Students

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I feel closer to my subordinates	2.94	0.94	8%	21%	43%	25%	3%
2. I feel closer to my boss	3.01	0.96	6%	23%	39%	28%	4%
3. I get less feedback on my performance	2.58	0.72	4%	45%	43%	8%	1%
<i>reverse scored</i>	3.42						
4. People can avoid personal contact	3.84	1.03	2%	16%	4%	53%	25%
10. E-mail creates misunderstandings that a phone call or meeting would prevent	3.18	1.04	3%	30%	24%	34%	10%
11. People use E-mail to circumvent the chain of command	3.14	1.09	3%	33%	20%	33%	10%
15. E-mail is a good way to send "attaboys"	2.7	1.3	25%	22%	17%	30%	6%

Table 5. Closeness Dimension—ACSC Students

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I feel closer to my subordinates	2.62	0.94	13%	31%	40%	15%	2%
2. I feel closer to my boss	2.82	0.99	9%	29%	36%	22%	4%
3. I get less feedback on my performance	2.75	0.77	4%	33%	51%	11%	2%
<i>reversed scored</i>	3.25						
4. People can avoid personal contact	3.91	1.01	2%	13%	7%	49%	29%
10. E-mail creates misunderstandings that a phone call or meeting would prevent	3.27	1.03	5%	20%	24%	44%	7%
11. People use E-mail to circumvent the chain of command	3.16	1.02	2%	31%	25%	33%	9%
15. E-mail is a good way to send "attaboys"	2.62	1.37	31%	20%	13%	29%	7%

Table 6. Closeness Dimension—ACSC Faculty/Staff

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I feel closer to my subordinates	3.24	0.83	3%	12%	46%	36%	3%
2. I feel closer to my boss	3.18	0.88	3%	17%	42%	33%	5%
3. I get less feedback on my performance	2.42	0.64	3%	56%	36%	5%	0%
<i>reversed scored</i>	3.58						
4. People can avoid personal contact	3.78	1.03	2%	18%	2%	57%	22%

Table 6—continued

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10. E-mail creates misunderstandings that a phone call or meeting would prevent	3.1	1.04	0%	38%	25%	25%	12%
11. People use E-mail to circumvent the chain of command	3.12	1.16	5%	35%	15%	33%	12%
15. E-mail is a good way to send "attaboys"	2.78	1.23	20%	23%	20%	32%	5%

Tables 7-9 indicate student and faculty responses on questions dealing with IT's productivity and efficiency dimension. Questions 5, 6, and 18 have been reversed scored to show strength of support for those items with "agree" and "strongly agree."

Table 7. Productivity Dimension—ACSC Faculty and Students

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. If I had a choice, I wouldn't use E-mail reversed scored	1.89 4.11	1	39%	47%	4%	7%	4%
6. I couldn't live without E-mail reversed scored	2.98 3.02	1.24	13%	27%	20%	28%	12%
7. When the network goes down, I start feeling anxious	2.68	1.14	17%	31%	20%	29%	3%
8. I receive many inappropriate E-mail messages	3.51	1.28	7%	20%	15%	30%	28%
9. I receive many E-mail messages not related to my work	4.11	0.95	2%	7%	9%	43%	39%
12. I am careful how I word E-mail because they might be forwarded	4.16	0.81	0%	6%	8%	50%	36%
13. E-mail should not be forwarded without the original sender's consent	2.73	1.12	9%	48%	11%	26%	6%
14. People cannot exert their authority via E-mail	2.42	1.05	13%	56%	14%	11%	6%
16. We need effective business rules/processes to better control how the network is used	3.61	1.02	3%	16%	16%	49%	17%
17. I am more productive	3.84	0.91	2%	9%	14%	55%	21%
18. We do not need as many administrative personnel reversed scored	2.84 3.16	1.03	9%	34%	24%	30%	3%
19. I am asked to re-draft products constantly	3.03	0.97	2%	35%	27%	31%	5%
20. Information flows faster and improves my decision making	3.62	0.83	2%	9%	24%	57%	9%

Table 7—continued

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. I am swamped with too much information to do my job effectively	2.41	0.75	5%	59%	25%	11%	0%
22. I spend more time reading my E-mail than I spend face-to-face with my subordinates/peers	2.76	1.06	7%	44%	21%	22%	6%
23. I feel compelled to either come in on weekends or log in from home to keep up with my E-mail	2.18	1.04	26%	48%	10%	13%	3%
24. It helps me get my job done	4.01	0.72	1%	3%	10%	66%	20%
25. It is more of a stumbling block in getting my job done	2.03	0.7	20%	59%	18%	3%	0%
26. Prevents me from working on what is really important	2.18	0.8	14%	63%	14%	8%	1%
27. Access to the Internet enables me to do a better job	3.78	1.05	4%	9%	17%	45%	25%
28. The goal of a paperless environment is realistic	2.25	1.12	30%	37%	13%	18%	2%
29. When the network is down, I am limited in what work I can accomplish	3.27	1.1	4%	28%	14%	44%	10%

Table 8. Productivity Dimension—ACSC Students

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. If I had a choice, I wouldn't use E-mail reversed scored	2.02 3.98	1.12	36%	45%	4%	9%	5%
6. I couldn't live without E-mail reversed scored	2.85 3.15	1.21	17%	24%	24%	28%	7%
7. When the network goes down, I start feeling anxious	2.67	1.13	16%	33%	22%	25%	4%
8. I receive many inappropriate E-mail messages	3.67	1.28	5%	20%	11%	29%	35%
9. I receive many E-mail messages not related to my work	4.24	0.95	2%	7%	4%	40%	47%
12. I am careful how I word E-mail because they might be forwarded	4.33	0.79	0%	4%	9%	38%	49%
13. E-mail should not be forwarded without the original sender's consent	2.62	1.12	11%	51%	9%	24%	5%
14. People cannot exert their authority via E-mail	2.49	1.04	11%	55%	15%	15%	5%
16. We need effective business rules/ processes to better control how the network is used	3.85	0.92	2%	9%	13%	55%	22%
17. I am more productive	3.67	0.94	2%	13%	16%	55%	15%

Table 8—continued

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
18. We do not need as many administrative personnel reversed scored	2.87 3.13	1.01	5%	40%	18%	35%	2%
19. I am asked to re-draft products constantly	3.15	0.91	0%	30%	31%	33%	6%
20. Information flows faster and improves my decision making	3.42	0.89	2%	15%	31%	45%	7%
21. I am swamped with too much information to do my job effectively	2.65	0.79	4%	44%	36%	16%	0%
22. I spend more time reading my E-mail than I spend face-to-face with my subordinates/peers	2.82	0.99	4%	44%	25%	22%	5%
23. I feel compelled to either come in on weekends or log in from home to keep up with my E-mail	2.33	1.13	25%	40%	15%	16%	4%
24. It helps me get my job done	3.91	0.67	2%	2%	11%	75%	11%
25. It is more of a stumbling block in getting my job done	2.2	0.64	11%	60%	27%	2%	0%
26. Prevents me from working on what is really important	2.25	0.86	13%	62%	15%	9%	2%
27. Access to the Internet enables me to do a better job	3.6	1.05	5%	11%	18%	49%	16%
28. The goal of a paperless environment is realistic	2.15	1.1	33%	40%	9%	16%	2%
29. When the network is down, I am limited in what work I can accomplish	3.11	1.12	7%	29%	16%	40%	7%

Table 9. Productivity Dimension—ACSC Faculty/Staff

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. If I had a choice, I wouldn't use E-mail reverse scored	1.78 4.22	0.86	41%	49%	3%	5%	2%
6. I couldn't live without E-mail reverse scored	3.1 2.9	1.26	10%	29%	17%	29%	15%
7. When the network goes down, I start feeling anxious	2.68	1.15	18%	30%	18%	32%	2%
8. I receive many inappropriate E-mail messages	3.37	1.26	8%	20%	18%	32%	22%
9. I receive many E-mail messages not related to my work	4	0.93	2%	7%	13%	47%	32%
12. I am careful how I word E-mail because they might be forwarded	4	0.8	0%	8%	7%	62%	23%
13. E-mail should not be forwarded without the original sender's consent	2.83	1.11	7%	45%	13%	28%	7%

Table 9—continued

Question	Mean	Std Dev	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14. People cannot exert their authority via E-mail	2.35	1.05	15%	57%	13%	8%	7%
16. We need effective business rules/ processes to better control how the network is used	3.39	1.06	3%	22%	19%	44%	12%
17. I am more productive	4	0.86	2%	5%	12%	55%	27%
18. We do not need as many administrative personnel reverse scored	2.82 3.18	1.06	12%	28%	30%	27%	3%
19. I am asked to re-draft products constantly	2.92	1.01	3%	41%	22%	29%	5%
20. Information flows faster and improves my decision making	3.81	0.72	2%	3%	17%	68%	10%
21. I am swamped with too much information to do my job effectively	2.19	0.62	7%	73%	15%	5%	0%
22. I spend more time reading my E-mail than I spend face-to-face with my subordinates/peers	2.7	1.12	10%	45%	17%	22%	7%
23. I feel compelled to either come in on weekends or log in from home to keep up with my E-mail	2.05	0.94	27%	55%	7%	10%	2%
24. It helps me get my job done	4.1	0.75	0%	5%	8%	58%	28%
25. It is more of a stumbling block in getting my job done	1.88	0.71	28%	58%	10%	3%	0%
26. Prevents me from working on what is really important	2.12	0.73	15%	65%	13%	7%	0%
27. Access to the Internet enables me to do a better job	3.95	1.02	3%	7%	15%	42%	33%
28. The goal of a paperless environment is realistic	2.35	1.12	27%	35%	17%	20%	2%
29. When the network is down, I am limited in what work I can accomplish	3.42	1.05	2%	27%	12%	48%	12%

Appendix C

A Long Term Strategic View for Implementing IT

Information technology is more than just installing the equipment. It presents new strategic opportunities for organizations to reassess their missions and operations. As Scott Morton states in *The Corporation of the 1990s: Information Technology and Organizational Transformation*, organizations should look at *automating, informing, and transforming*, where automate and informate set the stage for transformation.¹

Automate/Informate/Transformate

Automating takes the cost out of production by reducing the number of workers for the job. Informating is what happens when automated processes yield information as a by-product. Based on trends from the automated process, employees do invisible work in their minds, such as seeing patterns and analyzing the data on the screen. Instead of just controlling the information, they become analysts and pinpoint trends and problems. To improve the organization's performance, management may have to change skill levels and practices. Another characteristic of the informate stage is new skills and information are developed to a point where new market opportunities open up.

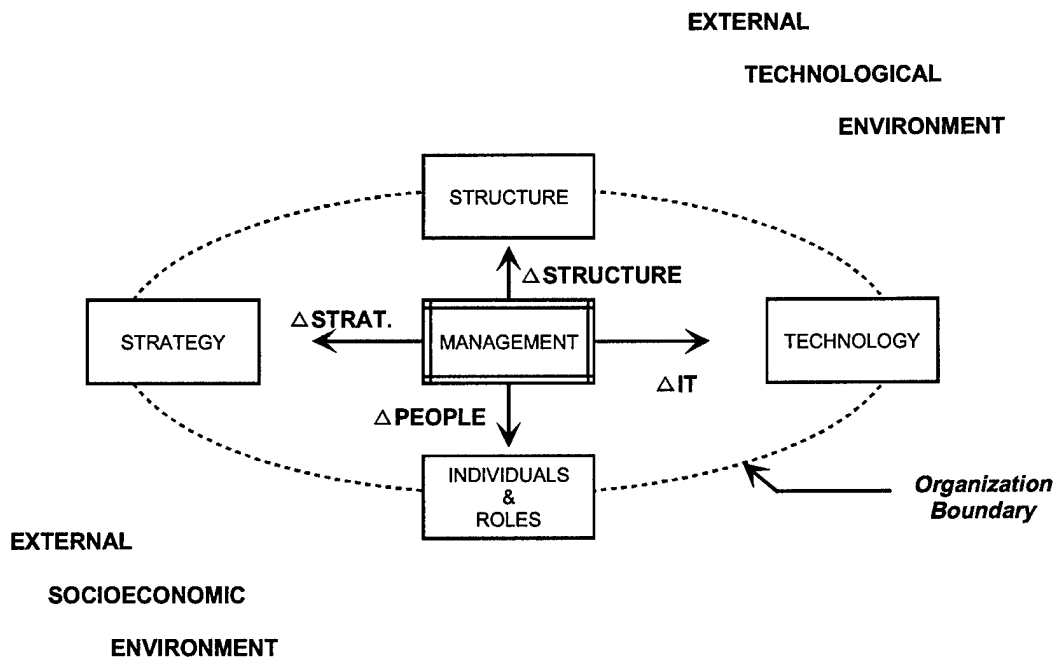
Morton contends that transformation reflects a fundamental difference in character exhibited by an organization that has been through the automate and informate stages and

are now on the third.² All successful organizations will have to pass through transformation, a stage characterized by leadership, vision, and a sustained process of organization empowerment so basic as to be hard to accomplish. If this sounds very much like the Quality Air Force, it is, but goes beyond it. Transformate not only includes a broad view of quality, it addresses the unique opportunities presented by the environment and enabled by IT.³ Hence, successful application of IT will require changes in management and organizational structure. Because IT is a critical enabler of the redefinition of the organization, it will permit the distribution of power, function, and control to wherever they are most effective, given the mission and objective of the organization and its culture.⁴

Figure 1 shows how an organization, with a vision and an understood view of the business purpose/mission, illustrates the challenge of management in transforming an organization. An organization is comprised of five sets of forces in dynamic equilibrium among themselves even as the organization is subjected to influence from the external environment.⁵ Management must ensure the organization (all five forces) moves through time to accomplish its objectives. Structure, Management Process, and Individuals and Roles are the people issues—its culture; and as such the critical points. Within this framework, it appears IT should affect tasks in the organization and ultimately its strategy. However, often there is no visible improvement in productivity or profitability. Morton cites four reasons which management must understand to successfully transformate the organization and obtain IT's true value.⁶ These factors include:

1. Benefits are there, but not visible or measurable. This includes customers who can order over the phone vs. having to physically go to the store.

2. Benefits from IT are generated, but not captured. Normally there is a huge investment in IT to stay competitive. This results in lower costs to the consumer but not higher profits for the organization.
3. External demands more—improvements are societal vs. economic returns. Customers demand 24-hour access to ATM machines, ordering systems, Internet access, etc. If a company doesn't provide it, customers will go elsewhere (or sue, as in the case of America On-Line).
4. There may be no bottom-line impact from the IT investment. This deals mainly with how IT is implemented (such as applying IT to areas of low payoffs), and is especially true if IT is laid on top of existing practices and no one stepped back to rethink the processes.



Source: M. Scott Morton, *The Corporation of the 1990s: Information Technology and Organizational Transformation* (New York: Oxford University Press, 1991), 17.

Figure 1. The Role of Management in the Change Process

An extremely critical point to remember about IT (or any other change in technology or process) is that changing the way people work can be extremely threatening and takes great deal of investment in training, information dissemination, and preparation. A major cause for no visible positive impact of IT on improved economic performance is an organization's lack of investment early enough in human resources and training. The

cultural elements shown in Figure 1 are critical in the transformation process and will determine the success or failure of IT. By taking a long term strategic view of implementing IT, these cultural elements and problems associated with IT can be lessened

A Strategic View of Implementing IT—A Revolution in Military Affairs

Organizations carry into any new era of technology a robust and highly valuable store of knowledge about old ways of doing things and this knowledge is not easily brushed aside.⁷ So what does this mean for leaders and managers? That they have to rethink how business is done at the strategic level and go from there. Organizational strategy should change as result of new opportunities and formulating new strategies is a learning by doing process. How do we rethink our strategy?

Strategy has been traditionally thought of at three levels—corporate, business (strategic business unit) and function, with IT as one of the support functions and considered an administrative expense vs. business investment.⁸ As Morton points out, if IT is to have strategic impact, management must reposition IT from a support function to where it can play critical role in strategy formulation and implementation. For the military, this can be approached as a Revolution in Military Affairs (RMA).

Morton states that an IT-enabled business reconfiguration is an evolutionary process. He offers us five stages to follow, with Stages 1 and 2 as the foundation and necessary for subsequent stages to be successful.⁹ These stages include:

1. Localized exploitation—IT used within existing isolated business functions
2. Building electronic infrastructure that permits integration of tasks, processes, functions
3. Business process redesign—rethinking of most effective way to conduct business
4. Business network redesign—use of IT by the organization to include suppliers, customers—moving to virtual organization

5. Business scope redefinition

These five steps can form the foundation for an RMA of IT implementation. Indeed, they closely follow the steps used in defining an RMA. Most Air Force units are at Steps 1 and 2. However, in most cases no thought has been given to going beyond Step 2, especially with redesigning their business processes. The real strategy lesson is recognition and understanding that the real benefits of IT accrue only with the fundamental transformation of business strategy choices, internal processes, the IT platform, and the architecture.¹⁰

Notes

¹M. Scott Morton, *The Corporation of the 1990s: Information Technology and Organizational Transformation* (New York: Oxford University Press, 1991), 15.

²Ibid., 17.

³Ibid., 17.

⁴Ibid., 17.

⁵Ibid., 21.

⁶Ibid., 21.

⁷John Leslie King, "Where are the Payoffs from Computerization? Technology, Learning, and Organizational Change," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 251.

⁸Morton, 123.

⁹Ibid., 123.

¹⁰Ibid., 157.

Appendix D

Recognition of Process Changes

Redefining business processes to take full advantage of IT is a challenge, but not impossible. Implementing changes goes beyond just teaching the software capabilities. The process change must be addressed and implementation plans and business rules developed for all end-users. One example for implementing processes redefinition is illustrated by HQ Air Mobility Command's (AMC) efforts and initiatives. Another factor to consider is the type of software and hardware installed. With these factors, an organization can be on its way to harnessing IT's capabilities and lesson its potential negative impact.

A Validation of Business Processes

When small computer networks were first implemented at HQ AMC, as it was at many bases, the hardware and software were installed with not much thought given to their effective use or upkeep. Many functional areas installed and maintained their own networks and software. This created ownership conflicts, saturation of the network, duplication of software, buying soon-to-be outdated equipment/software, network, and administrative problems. To solve these problems, HQ AMC created a structured process for installing and purchasing software and hardware for their LAN. In 1994, responsibility for maintaining the base network's hardware and software was centralized into one office,

the Base Network Control Center (BNCC) under the 375th Airlift Wing, as designated by Air Staff. However, HQ AMC's structured process for network control and designing new business processes/rules is still in effect.

The overarching committee is the HQ AMC Information Management Steering Committee (IMSC). Its purpose is to improve the availability and usefulness of information for the fulfillment of the Air Force and AMC missions. Along those lines, it provides ever-improving business services and business processes for end-users of AMC information systems. Business services are defined as those proposals and business processes not directly related to airlift, air refueling, flying activities, and C2. The IMSC provides an interface and open forum between the providers of technology and policy (the HQ AMC/SC community) and the customers using the system.¹

The second tier, the Business Process Working Group (BPWG) is responsible for identifying and/or validating the proposals for new or revised AMC business processes. Before any process is automated for general use in HQ AMC, the BPWG will analyze and validate the existing manual or automated process to determine if automation or improvement is potentially warranted, that processes are improved before automation is attempted, and to ensure no "broken" processes are automated.² Validated proposals from the BPWG are presented to the IMSC.

The third tier is the Configuration Control Board/Technical Working Group (CCB/TWG), which establishes and maintains configuration control for the base network and infrastructure. In this body, the technical feasibility of customer's proposals are evaluated and costed in terms of money, resources to implement and maintain, and time for implementation, based upon current workload and other priorities.

Once a proposal has been presented to the BPWG, and the CCB/TWG has evaluated it and made recommendations, it is then presented to the IMSC. If the IMSC approves its implementation, the BPWG is tasked to develop appropriate rules for its use. Rules, business process changes, and training for the most part are conducted/developed before final implementation of the product. This ensures the customers are not surprised by new software and procedures. The BPWG has developed business rules for electronic scheduling, electronic coordination of staff summary sheets, and using enhanced workflow software.

It took several years to iron out this process, but it is one way of assuring IT's impact on an organization is positive and that organization's plan for training and redefining business practices to accommodate IT's capabilities. It also allows for business rules to determine how the network is used, preventing such problems as inappropriate E-mail from bogging down the network, as illustrated by the survey results.

Groupware Implementation

Another consideration that may prove helpful in IT implementation is the type of software installed on small computer networks. Today, organizations have the advantage of selecting a groupware package, an integrated software package designed to enhance workflow. It normally consists of word processing, spread sheets, E-mail, address directory, electronic bulletin boards, and electronic scheduling functions, all linked together for enhancing team processes. As companies connect PCs into the network, groupware is the software that allows many-to-many communication simultaneously (versus just E-mail, with its one-to-one or one-to-many communications) and allows for

collaborative work projects.³ Groupware technologies allow the organization to function more seamlessly, loosening the constraints of place, time and organizational hierarchy.⁴

David Kirkpatrick, in his article *Groupware Goes Boom*, states groupware tools are so powerful, they virtually compel companies to re-engineer themselves. It gives workers well below the top of the organization pyramid access to information previously unavailable or restricted and groupware spreads power far more widely than before.⁵ Because groupware usage can create more data for the already overloaded manager and worker, there is a definite need for specific rules, redefined business processes, extensive training, and top management support to take full advantage of groupware's inherent capabilities. Training especially cannot be underestimated. Comprehensive training will ensure all facets of the product are understood and used, versus just a few capabilities. Through enhanced information sharing and communication, there is tremendous potential for groupware to improve or even redefine business processes.⁶

Bullen and Bennett, in their study of how groupware was used at several companies, found several perspectives for successful implementation and use of groupware. The first perspective is from a functional point of view—what a company should consider before purchasing a package.⁷ They found E-mail is the primary groupware tool used by people and the capability to link messages by author, subject, or distribution list was a key improvement. A negative aspect about groupware is the expectation of electronic calendars to replace the paper ones. What they found was people would print off the ones from the system, write on them, and not update the electronic schedule. In addition, setting up meetings still required lots of personal contact and negotiation to get all the players there. Just scheduling it on the electronic calendar did not guarantee everyone

would come. This aspect of design requires a change in business practice to ensure everyone keeps the calendar up-to-date and refers to it on a regular basis. Business rules for how to schedule people also need to be developed.

From an organizational perspective, Bullen and Bennett found people get most value from tools that parallel their non-electronic activities. E-mail is similar to messages and memos, but is faster and provides traceability. Management support and training are key to successful groupware integration within an organization.

Integrating groupware into an enterprise is no small chore. It requires considerable planning to manage the technological and cultural changes that must occur. Some of the most important challenges managers may face in implementing groupware include:

1. **Information management:** The groupware system is an obvious vehicle for consolidating information.
2. **Security:** Organizations need to protect their internal information from unauthorized access. However, the price of denying access must be weighed against organizational performance.
3. **Cultural acceptance:** There must be commitment at all levels of the organization to break down the cultural barriers to information exchange. People must be motivated to work as teams, and the organization must place a premium on cooperative learning.
4. **Scalability:** The groupware solution must grow as the organization grows.
5. **Rapidly evolving technology:** Organizations must invest in technology today that will ease the transition to tomorrow.⁸

Bullen and Bennett sum up the need for re-engineering business processes to gain the most from IT:

Whenever we observed the importance of groupware technology without a concurrent examination of how work procedures and coordination should perhaps change or evolve, we saw that these systems had little impact on the perceived productivity of the groups. Not enough attention is being placed on examining the basic processes of work and how technology may enhance these processes. Process redesign may be required to achieve productive benefits in using groupware technology.⁹

Notes

¹HQ Air Mobility Command, *Information Management Steering Committee Charter*, 29 Aug 94.

²HQ Air Mobility Command, *Business Process Working Group Charter*, 8 Aug 95.

³Christine Bullen and John Bennett, "Groupware in Practice: An Interpretation of Work Experiences," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 349.

⁴Paul Gustafson, "Transitioning to a Collaborative Groupware Environment," n.p., on-line, Internet, 26 Jul 96, available from http://www.mcs.net/gustafs/latest_prototype/gwstrat.html.

⁵David Kirkpatrick, "Groupware Goes Boom," in *Computerization and Controversy—Value Conflicts and Social Changes*, ed. Rob Kling (San Diego: Academic Press, 1996), 171.

⁶Gustafson, no page.

⁷Bullen and Bennett, 361.

⁸Gustafson, no page.

⁹Bullen and Bennett, 371.

Glossary

ACSC	Air Command and Staff College
AF	Air Force
AFB	Air Force Base
AMC	Air Mobility Command
AUTODIN	Automatic Digital Network
BNCC	Base Network Control Center
BPWG	Business Process Working Group
CCB/TWG	Configuration Control Board/Technical Working Group
CONOPS	Concept of Operations
DMRD	Defense Management Review Decision
DMS	Defense Message System
HQ	Headquarters
IMSC	Information Management Steering Committee
IO	International Officer
IT	Information Technology
LAN	Local Area Network
NCC	Network Control Center
PC	Personal Computer
PME	Professional Military Education
RMA	Revolution in Military Affairs
WWW	Worldwide Web

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