Managing Microcomputers in Large Organizations

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Board on Telecommunications
and Computer Applications
Commission on Engineering
and Technical Systems
National Research Council

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Preface and Acknowledgments

Most people in the business of information management had been expecting microcomputers for years. Yet their arrival in the Christmas season of 1981 took many by surprise. It was another example of technology being in advance of our ability to use it and to manage it. Since that time, further technological advances have made microcomputers more powerful, more economical, and simpler to use. These so-called personal computers have spawned a revolution in the way information is gathered and exchanged.

For large organizations the revolution means a basic change in the relationship of end users to central computing facilities. Until recently end users depended on data processing specialists to create and operate their programs. With new development in personal computers and software, however, end users are growing more and more independent of the specialists: Many professionals with no prior experience in data processing have introduced personal computers into their working lives.

The proliferation of microcomputers has overwhelmed many organizations and in the process created two serious problems for management: How do we control the headlong transition from centralized to decentralized computation without stifling the creativity of the end user? And how do we manage the use of microcomputers to enhance productivity and make the organization's total computing capability cost-effective?

The National Research Council's Board on Telecommunications and Computer Applications held a forum in late 1983 to address these and related concerns. The meeting featured experts from two broad areas of experience: senior executives from the private and public sectors who have directed the use of computers in their own companies or in the federal government, and technology innovators who are directly responsible for the increasing popularity of personal computers.

This book is the product of that meeting. Written by and for executives, it probes these questions: Where is microcomputer technology going? What are the implications of these directions for large organizations? What are the emerging issues critical to top management? And how are selected large organizations dealing with these issues?

Many people shared in the creation of this book. In particular, I wish to thank the members of our steering committee (see page viii) and the contributing authors. Staff members of the Board on Telecommunications and Computer Applications who organized the forum—Jerome D. Rosenberg, senior staff officer and forum director; and Lois A. Leak, administrative secretary—also deserve special thanks, as does Paula Kaufmann, who edited the transcript of the meeting.

I also wish to recognize and thank our sponsors: Arthur Young and Company, the Tennessee Valley Authority, the U.S. Department of Defense, the U.S. General Services Administration, and the U.S. Veterans Administration.

Francis A. McDonough*
Chairman

*Francis A. McDonough is deputy assistant administrator of the Office of Information Resources Management, U.S. General Services Administration. He championed the development of the federal government's Managed Innovation Program, which is fully described in Chapter 9.

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Vision and Value

Getting the Most out of Microcomputers

*John M. Thompson**

I believe we are now in the second wave of the computer revolution. The first wave focused on the use of information technology to *replace* people; now we are more concerned with *supporting* people. We are moving from the automation of structured tasks of the first 10 to 15 years of the computer revolution into the support of unstructured tasks, the support of managerial activity.

Much of the discussion in this book concerning end-user computing and managerial support uses words and ideas that have been around for years. Now, however, different media and technologies are available. In the late 1960s we saw timesharing; in the 1970s, minicomputers; in the early 1980s, the information centers—a sort of in-house timesharing service bureau. Now in the mid-1980s, we are seeing an influx of personal computers (PCs), end-user computing, and networks. There is a lot of talk about the need to integrate all of these technologies to support people in their workplace.

John Diebold sets the stage for this discussion when he talks about the millions of computer-literate people in the workplace for whom microcomputers can unleash imaginations and creativity. He also reminds us of the proliferation of technological alterna-

*John M. Thompson is vice-president of Index Systems, Inc., Cambridge, Massachusetts.

tives with a rather catchy phrase: "option shock." The theme of unleashing creativity recurs throughout this book. In the industrial revolution we invented machines to provide leverage to human muscle; perhaps now we are inventing machines that can provide leverage to the human mind. To carry the analogy a little further, in the nineteenth century we provided support to the blue-collar worker; in the twentieth century we have been providing support to the white-collar worker. Some time early in the twenty-first century we must find a way to bring it all together.

The essays in Part I examine where microcomputer technology has come from and where it appears to be headed. Thomas Willmott discusses what he calls the "technology push" in his description of the first two phases in the evolution of the personal computer. In the first phase the personal computer is simply an individual workstation. It is characterized by a cottage industry of software producers supplying the workstation and trying to make it useful. Now we are moving into a second phase, in which microcomputers become part of a network. This phase raises many kinds of different problems that are echoed in this report: Where is the data? How do I manage it? How do I exercise control? Do I control? Willmott, as well as other contributors to this volume, evokes the image of some bright scientists making machines faster, cheaper, and smaller and then pushing them into our organizations, saying, "There! You figure out what to do with them!"

The notion of "technology push" is reinforced by Mitchell Kapor, who writes about the "heroic geniuses" producing software. Software producers are not driven by a careful analysis of market need, says Kapor. Instead, they are driven by the need simply to figure out what to do with the personal computer. Because nobody really knows what to do with these computers, somebody gets a good idea, tries it, and perhaps it works in the marketplace.

Kapor predicts that soon the general drive will be toward software systems that integrate five major areas of microcomputer use—spreadsheet, data base, word processing, graphics, and communications. New developments will allow easy movement between windows and create open systems that can interact with other hardware and applications software systems—in which each of the five elements is not compromised by being part of an integrated system. The design objectives of such systems is to produce individual applications that are just as good as the avail-

able stand-alone versions. In addition, the "home" of the data would be absolutely transparent to the user. For those of us who have used any form of a personal computing system, be it a personal computer or distributed from a timesharing system, this all sounds very powerful. In fact, combining the power of the technology in both hardware and software seems a little like having a Ferrari on the island of Grenada. Right now PCs make a great deal of power available, but there are not many places for us to use that power yet.

Robert Metcalfe predicts widespread use of local area networks with peripheral sharing, information access, and personal communications. Some have predicted that the 1980s will be remembered as the critical decade in which everyone became interconnected. If this is the case, it is apparent that the communications applications of microcomputers will become increasingly important. We can expect communications to emerge as one of the critical issues of the mid-1980s.

Part II of this report probes the implications of this technology push. John Bennett discusses its meaning for the managers of information systems (IS). In short, the IS manager must improve service or lose. Bennett describes some of the tools now available to the manager to improve the productivity of the IS department. He also describes the reactions of IS managers to the rapid growth in microcomputer use occurring in their companies: Proliferation inevitably raises the issue of control, specifically control of data. To those who ask the question "Why control?" the answer heard most often is: "Because in two years' time the data that is recognized as a critical resource of this corporation will not be in my machine, but will be on everybody else's desk. My chief executive is going to turn to me and say, 'How in the world did you ever get us into this mess?' "

Bennett also points out that a major part of the job of the IS manager is to open the gates and facilitate access to corporate data by a variety of different systems, including microcomputers. Related to this is the need for IS managers to take responsibility for educating management. Although it is a significant departure from their traditional role of information processing, more and more the responsibility of IS managers to educate is being termed critical to their success. Bennett outlines a very successful program at United Technologies to educate 1,000 senior managers.

Finally, Bennett raises the issue of security as one of the major

worries of the IS manager. Horror stories abound in this area. I know one IS manager who put his career in jeopardy by walking around his executive suite and picking up floppy disks left on the top of file cabinets. When he took them back to his office, he found that he had all of the corporation's recent and projected financial data, the latest competitive analysis, and some sensitive data about personnel salaries for the leading 100 people in the corporation. People were leaving sensitive data around on floppy disks that they would never leave around on a piece of paper. This represents a whole different set of security issues from what we have dealt with for the last 20 years in managing information systems, and we have to learn the differences fast. By 1990 the workstation will probably be as common as the telephone. Managing this change has significant implications for organizations.

Ray Kline reports on what the federal government is doing in its Managed Innovation Program. His "stick-and-carrot" metaphor is particularly appropriate to describe the control-support system of the government's program. While the imposition of standards and restrictions on users is necessary, users can be offered in return more support for their work. Such support includes easier procurement procedures, and new tools for education.

James Bair examines some of the implications of small computer technology for managerial support. He describes a major shift away from a very specialized awareness in information technology to a mass awareness in our society and the implications of this shift within corporations and between corporations and society.

Bair also underlines the importance of communications and the need for the microcomputer business to support communications. This idea has been echoed by many others in the field of executive support. In the early days we coined the term "decision support system." In the late 1960s and early 1970s we had a rather naive notion that decisions were the executive activity that needed support. Later research pointed out, however, that executives spend far more time communicating than making decisions. Instead of decision support systems we must talk about communications support systems, or perhaps learning support systems, or management support systems, or just plain support systems. The real task is to bridge the gap between technology and people by understanding what people do that needs supporting.

Jim Bair gives us another insight in this area. He says he has

spent a great deal of time trying to figure out how to measure productivity, only to discover that nobody wants to measure it anymore. I suspect that many of us have as an objective the improvement of "productivity," something we have not defined and cannot measure. We all intuitively understand that using the technology to improve productivity is a worthy objective. But what does that mean? How do you know when you've done it? How does it apply to our organizations? There is an increased reluctance to hone in on what productivity is. At the same time there is a great move to double it!

Part III explores some specific and vital management issues. Alastair Omand—one of the few senior IS people who report to the executive committee of a very large corporation—believes there are two major issues raised by microcomputers in organizations that the chief executive officer (CEO) should really worry about. The first is data management and its associated problems of accessibility, compatibility, and security. For this he recommends putting a person in a position of organizational responsibility for the corporation's data. The CEO's second worry is the shift in skill sets—another variation on the persistent theme of education. Other contributors deal with this theme from the perspective of the effects of microcomputers on the entire culture of the organization, but the point made by all of the contributors is that top management, and chief executives in particular, must worry about how this technology will change their organizations. Their users must become developers and managers. They must keep up with shifting technical trends and watch for the changing role of information systems in their organizations.

Other important issues, according to Omand, should be left to the line management of the organization to handle. Product proliferation, or "option shock," as John Diebold calls it, causes concern about "connectivity." Will we be able to interconnect everyone? Will we be able to supply adequate technical support? Will we have huge duplication of effort between people who do not talk to each other in the organization? Omand recommends that we leave these problems to the users, keeping them in charge, letting them take advantage of technological change.

Acquisition practice raises another set of concerns. There are questions about cost justification and how to achieve good cost savings, what interface to have with vendors, buying equipment that becomes obsolete very fast, and trouble with license restric-

tions on software. For all of these very real issues Omand recommends that the chief executive officer make use of existing mechanisms like the purchasing department and the control mechanisms through the budget.

Roger Sisson views the discussion on microcomputers as really a discussion about end-user computing. He suggests that putting motivated people together with good tools and relevant data will produce what he calls "distributed creativity." In other words, looking at data seems to facilitate innovative thinking.

Distributed creativity is not a term that would have fared very well in the early 1970s. A decade later, however, we are getting used to this sort of concept. It is tied in with the theme of unleashing creativity and the notion that something very fundamental is now going on that we do not really understand. It has been brought on by new tools, data, and the technology push.

Part IV presents a number of case studies that suggest the possibilities for dealing—on a day-to-day basis—with the challenges of the microcomputer revolution. Norman Epstein sees control as the overriding concern for management. From this comes his concept of personal comput*ing* rather than personal comput*ers*. Other contributors to this section suggest alternative approaches to the dual questions of control and support. In most cases the vehicle chosen is less important than what actually happens in support of people.

Several essays in this volume refer to Gibson and Nolan's stages of growth curve, which can also be called a technology learning curve. Gibson and Nolan first published their article on the four stages of growth at a time when we were approaching maturity in the earliest—data processing—technology learning curve. We are now on another technology learning curve involving personal computing.

We hear much talk about the first and third stages on this curve: getting started, and getting control. We do not find many people worrying about the second stage, getting value. Perhaps this is because value is a difficult word that, like productivity, defies definition and measurement. But the question will not go away. Why are the technology pushers doing this to us, and what value can we get out of it for whom?

I believe value can be derived for at least three levels of people in organizations, but for each level opportunities are different. As the leader of the organization, the senior executive can set the