

William M. Newman

*DESIGNING
INTEGRATED
SYSTEMS
FOR THE OFFICE
ENVIRONMENT*

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DESIGNING INTEGRATED SYSTEMS FOR THE OFFICE ENVIRONMENT



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Consultant



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DESIGNING INTEGRATED SYSTEMS FOR THE OFFICE ENVIRONMENT

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PREFACE

Computer system developments since the mid-1970s have been notable for two reasons. First, they have been characterized by intense, sometimes frenzied technical activity as hardware prices have plummeted and software has proliferated. Second, they have created a major new market area, variously known as office information systems or office automation, with a dominant influence on the industry's development. The overall result has been to bring computing within reach, both economically and literally, of many of the western world's office workers.

There is a need to document developments in office automation and its supporting technologies. It is not sufficient to focus on one topic or the other, for the two are closely related. The student of interactive computer systems, for example, needs to appreciate the uses to which these systems are put—many of which lie in the office. Those with an interest in office automation need to understand the strengths and limitations of the technology. This book is an attempt to cover the two interrelated topics of office systems and their supporting technology.

There are a number of ways of viewing this subject area; the approach taken here is to place emphasis on the *design activity*. Office automation has been a highly innovative field, in terms of both the design of systems and the development of new ways of using them. It has produced new designs for office computers, including the ubiquitous personal computer, and for software such as text processors, spreadsheet packages, electronic mail systems, and database managers. It has also inspired organizations to design new methods of work sharing and collaboration exploiting the new technology as it has become available. One area where innovation and design have been particularly intensive is the *user interface*—the interface across which the computer system and the user communicate. Another is *integration* of system functions so as to make them more conveniently accessible to the office worker. In all these areas it is important to understand not just what systems exist, but also how they have been designed. From this understanding we can move ahead to design new and better systems.

The book tackles this subject area in four steps:

- 1 It introduces the main issues, including the process of design itself and the characteristics of the office environment.
- 2 It covers the basic technology supporting office systems, including hardware, software, and the user interface.
- 3 It covers the main applications for computers in the office: text processing, graphics, communication, and information management.
- 4 It looks in detail at integration, presenting the underlying concepts, describing several systems in detail, explaining how they are applied in the office, and discussing their impact.

The book is aimed at the computer professional or student looking for an in-depth coverage of this complex field. It is likely to be of particular value to designers, both technical and managerial, who need a better understanding of how to approach design problems. While the coverage is in-depth, it does not rely on extensive technical background on the part of the reader.

The book may also be used as a text for teaching the subject of office automation. It will be of particular use in undergraduate computer science teaching, where it offers a framework that may be supplemented by additional reading in specific topics; suggestions for further reading are included at the end of every chapter. It will also be of value to teachers in business schools who need a balanced presentation of the technical and nontechnical aspects of office automation.

A number of acknowledgments must be made to the organizations and people who helped make this book possible. First and foremost, Xerox Corporation helped bring about many of the innovations and designs described in these pages, particularly through their support of research at the Xerox Palo Alto Research Center (PARC); I was privileged to be a member of the research staff at PARC during the years 1973 to 1978. A number of companies have adopted and developed further the ideas emerging from Xerox and have made them available to office workers via the personal computer. Among these have been Apple Computer Inc., who were kind enough to provide me with the computer equipment on which many of the examples shown in this book were implemented. Additionally, Xerox Corporation kindly provided access to workstations and printing equipment.

I was helped greatly by the comments of the following reviewers, who read and commented on the manuscript: Mik Lamming, Xerox PARC; Michael Lesk, Bell Laboratories; Gordon Davis, University of Minnesota; Clarence Ellis, Xerox PARC; Stanley Zdonik, Brown University; Margaret Olson, New York University Graduate School of Business Administration; and Mary J. Culnan, American University.

Above all, my wife Karmen supported and encouraged me throughout the long period during which this book turned from a design concept into a reality.

William M. Newman

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INTRODUCTION

1.1 INTERACTIVE COMPUTERS IN THE OFFICE

Just in the last few years, members of western society have acquired a significant new skill—the ability to deal directly with computers. They have become familiar with entering text on keyboards and pushing function keys, and also with interpreting the messages presented on computer display screens. They have adapted many of their daily practices to take advantage of the computer: to obtain cash from an automated teller, to retrieve stock market prices from an online information service, or to type a letter with the aid of a word processing package. They are gradually incorporating the computer into their working and leisure lives.

The computers that people are thus learning to use are *interactive* computers, so-called because they act on people and people act on them. They are programmed to conduct a “conversation” with their user, displaying information on the screen and waiting for the user to respond by keying in commands or data (Figure 1.1). In recently developed systems the user can interact by means of electronic pointing devices such as the “mouse” shown in Figure 1.2. In these systems the information is displayed in a variety of graphical forms, and commands are given by pointing with the mouse to a menu on the screen. The hardware of the computer is thus supplemented by *software*; that is, by sets of computer programs. These combine to create an *interface* between the user and the internal capabilities of the computer. Advances in the design of user interfaces and in the level of users’ computing skills are making possible new computer applications every year.

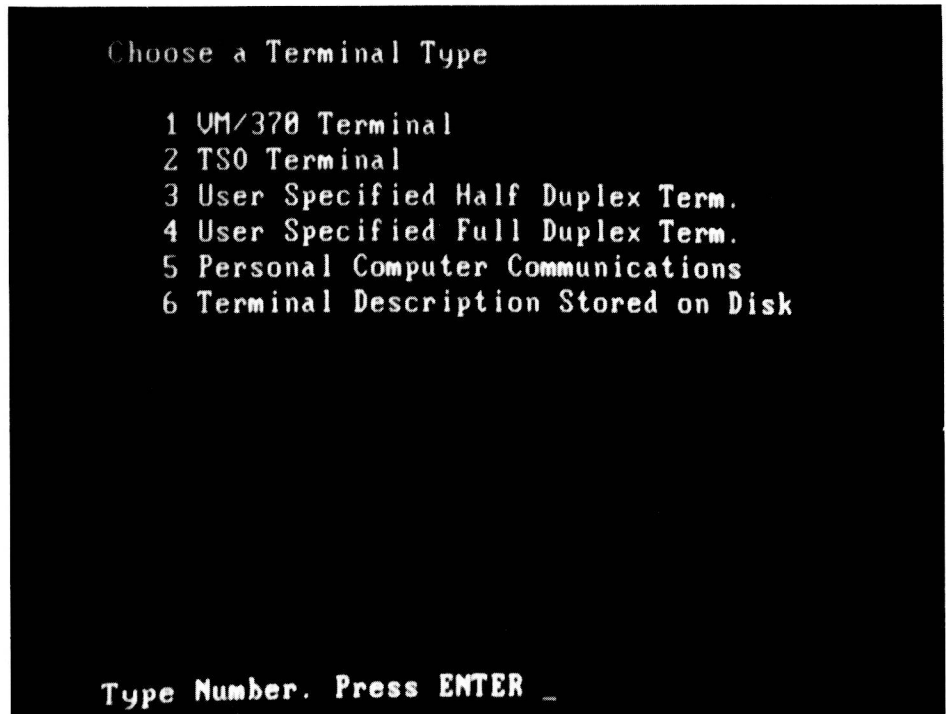


FIGURE 1.1 Interaction with a computer system via a menu of choices; the user types a number to request a choice.

One area in which the use of interactive computers is growing especially rapidly is the office. The population of interactive office computers has grown from a few thousand in 1975 to several million in 1985; that is, from approximately 1 for every 10,000 office workers to 1 for every 10. Computers provide the office with a new tool for performing routine tasks and solving problems. Among the many applications of interactive computers are text preparation, generation of charts and graphs, financial planning, and internal and external mail. These examples of *office systems* are shown in Figure 1.3.

With the increasing range of uses for office computers a new problem has arisen for their designers: how to *integrate* these applications more tightly. The need for integration can be seen in the cumbersome techniques that are still needed to apply computers to office work. For example, it is impossible on many office computer systems to do the following:

- In the middle of typing a report, stop and read an incoming electronic message and then return quickly and automatically to the same place in the report and carry on typing.
- Print out an acceptable-looking letter on the same printer as is used for plotting pie charts and bar graphs.

- Add a 1-page diagram to a 20-page typed draft report and file them together for final editing later.

Instead the user is likely to find that reading mail loses the place in typing, that two different printers are required for text and graphics, and that illustrations must be filed on paper while the text is filed on a disk. Any one of these is enough to upset the flow of work in the office.

In situations like these the office computer system needs to be better *integrated*, to ensure that it at least provides an acceptable alternative to manual methods. An integrated system can do more than this, however. The system shown in Figure 1.4 can produce graphs directly from tables of data and can create typeset-quality text, shown in exact replica on the screen before it is printed. These are new and exciting capabilities for the office worker.

Integration is an important issue for a number of reasons. First, it depends on very advanced technology, and especially on high-quality graphical display hardware and on large, complex systems of software; this dependency needs to be understood by anyone involved in the design activity. Second, integration is itself a relatively ill-defined concept; there is still some confusion about what it means and what aspects of interactive systems it should be applied to. Third, the expected benefits of integration need to be spelled out more clearly for users: will integration help them to be more productive, and if so, in what ways? These are some of the topics discussed in later chapters. This chapter briefly outlines some of the basic underlying issues: the design process, the

FIGURE 1.2 The Apple Macintosh personal computer, showing display screen, keyboard, and “mouse” pointing device.

