Microcomputer Software for Management Science and Operations Management

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ople Software Enclosed

Microcomputer Software for Management Science and Operations Management

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Software developed by
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Microcomputer Software for Management Science and Operations Management

To the professors who had such an influence on our careers:

Jack Silber, Roosevelt University
Albert J. Simone, University of Hawaii
Kenneth D. Ramsing, University of Oregon
Alan Eliason, University of Oregon

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Preface

Without question, the use of microcomputers is increasing. Organizations of all sizes and types have learned that a personal computer can help managers get their jobs done faster, more accurately, and more efficiently. This emphasis is becoming more important in the classroom as well.

One of the objectives of management science and operations management is to help people make better decisions. Many of these decisions are complex and require a substantial amount of quantitative analysis. In this book, we will show you how to perform this analysis of management-science and operations-management problems using popular microcomputers, including the IBM PC, the Apple II, and compatible microcomputers.

This book can be used in a number of different courses, including management science, quantitative analysis, and production/operations management. It covers a wide range of management-science and operations-management techniques, including:

1. Linear programming.
2. Transportation models.
3. Assignment models.
4. Forecasting techniques.
5. Inventory models.
6. Simulations of inventory systems.
7. Expected-value models.
8. Queuing models.
9. PERT models.
10. Markov models.
11. Game-theory models.
12. Quality-control techniques.
13. Aggregate planning.
14. Assembly-line balancing.
15. Time studies.

We have made every effort to eliminate errors and potential problems with this book and the enclosed software, and are com-

mitted to developing the best educational material possible. Unfortunately, errors sometimes do occur. We would like your help. Please let us know if you find any errors in the book or in the software. If you are the *first* person to notify us in writing of the error, we will send you a reward of $2.00 and a letter of appreciation. (Any error that has a ripple effect counts as two errors only.) We would also like your suggestions for improvement for both the book and the enclosed software. If you are the *first* person to make a suggestion that we use in a reprint of the book or the next edition, we will also send you $2.00 and a letter of appreciation. Please send all correspondence to the following address:

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We would especially like to thank Professor William Foeller, at SUNY-Fredonia, who originally suggested the idea of microcomputer software and then worked with us for the past two years to develop the programs for both the IBM and Apple versions. His hard work and desire for an error-free and user-friendly software package helped make this book the useful and reliable tool it is intended to be.

Finally, we owe our gratitude to Professor David Kelly, George Mason University, and to our editor, Richard Carle, at Allyn and Bacon. Dr. Kelly developed the important sensitivity analysis coding for the linear programming algorithm. Mr. Carle, who has supported and encouraged us through five books, had the foresight to recognize the powerful role of microcomputer software in this field. We look forward to having him as our editor for many future books and editions.

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1

Introduction to the Use of Microcomputers in Management Science and Operations Management

1.1 INTRODUCTION

■ ■ The introduction of microcomputers at the college level is altering the educational process forever. The purpose of this book and its software package is to help students become effective future managers by understanding the important role of the microcomputer in solving problems.

The use of computers in solving management science and operations management problems offers a number of advantages over the traditional hand-calculator approach to problem solving. First, the accuracy, speed, and ease of use of these programs permit students to concentrate on important formulation concepts by minimizing the time and frustration involved in solving complicated problems by hand. As a result, students have more time to study the assumptions of particular models and determine whether or not these assumptions are met for a particular problem. Students also have more time to investigate how the results of a quantitative problem can be incorporated into a decision that involves many other qualitative factors. Finally, students now have the ability to perform sensitivity analysis quickly and efficiently by simply reentering the input data to see what impact these changes have on the output.

1.2 USING MICROCOMPUTERS TO SOLVE MANAGEMENT SCIENCE AND OPERATIONS MANAGEMENT PROBLEMS

■ ■ To use these computer programs effectively, you should have some knowledge of the management science and operations management techniques and the microcomputer you will be using. Before using one of these programs to solve a problem, you should understand the overall objective of the technique, the assumptions made in using the technique, the input data needed to run the program, and the proper use of the results. For a deeper explanation of each quantitative technique discussed in this book, refer to our textbooks: *Quantitative Analysis for Management* (2nd edition), and *Production and Operations Management* (2nd edition), both published by Allyn and Bacon, Inc.

These programs have been developed for both the Apple II and the IBM PC computer. They will also work with many other computers that claim compatibility with either the Apple II or the IBM PC. Once you know which microcomputer you will be using, you will need certain fundamental information about that computer. The next section summarizes this information for both the IBM PC and the Apple II.

Regardless of which microcomputer you use, you should follow a number of procedures in running these programs. For simplicity, we have used several common conventions in presenting each topic and program. For example, in looking at the sample computer programs and computer runs in this book, note that all your responses follow the appearance of a question mark on the screen. The computer programs also tell you exactly what must be entered to solve each type of problem. All you have to do is respond to questions or supply the data the computer requests. When you do run one of the programs, remember that you must hit the **RETURN** or the ↵ (enter) key after entering one or more pieces of data on a particular line. Many beginning students forget to do so and spend several minutes waiting for the computer to do something. In some cases the computer will ask you to enter several numbers on the same line. In this situation, separate each number from the next with a comma. Don't forget to hit the **RETURN** or the ↵ key at the end of the line.

Some questions will ask you to enter either a YES or a NO. All these types of responses must be answered in the *upper case* mode (capital letters). When you start to run one of these computer programs, it is a good idea to hit the **Caps Lock** key, which will place all responses automatically in upper case. On some Apple II computers this is not necessary because all entries are automatically in capital letters.

Enter the data in the sequence in which they are requested. If you are asked to enter an annual demand figure followed by an ordering cost, be sure to enter the demand value first and then the ordering cost. Finally, use care and common sense in entering data. For example, annual demand figures can never be negative. And probability values must be positive numbers between zero and one. If you enter data that lie outside the normal range, you may run into difficulties and have to restart the computer program. Therefore, be sure all the data you enter make sense and are consistent with the technique you are using.

1.3 USING THE IBM PC

■ ■ In a few short years, the IBM PC has taken the lead in microcomputer sales. Many schools use this computer or one that claims to be compatible with it. This section describes what you need to know to use the IBM PC in running the programs accompanying this book. You may also wish to refer to an IBM reference manual or one of the many books on the IBM PC.

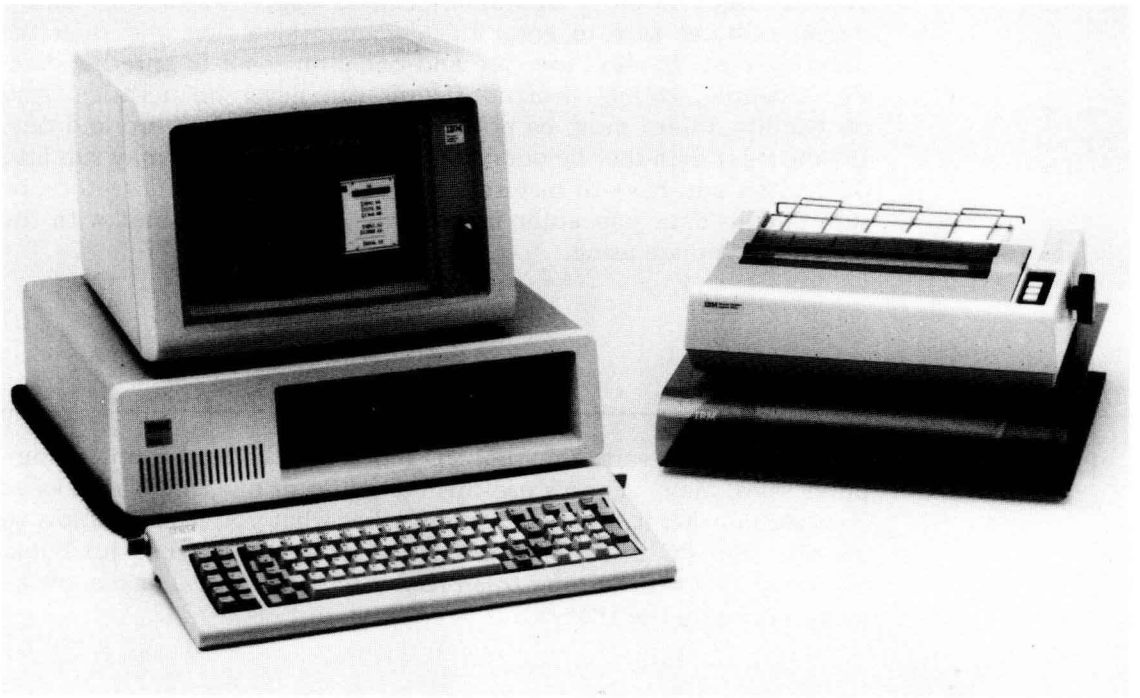
■ Overview

The IBM PC system consists of a processor box, a monitor that is placed on top of the processor box, a keyboard, and sometimes a printer. This equipment, or *hardware*, is shown in Figure 1.1. If you look at the processor box in more detail, you will see either one or two disk drives facing you in the processor box. The disk drive on the left-hand side of the processor box is called the A drive. It is the disk drive into which you insert the computer program disk.

The screen is either monochrome or color. In most cases, adjustment knobs control the intensity and picture quality of the screen. Do not turn these controls all the way up. This could quickly burn out the screen. Your instructor may adjust the screen for you and tell you not to make any further adjustments.

The IBM PC keyboard contains standard typewriter keys plus a number of other keys (see Figure 1.2). The **return key** (↵) is on the right-hand side of the keyboard, directly to the left of the numbers 4 and 7 of the numeric keypad. Immediately to the right of the space bar at the bottom of the keyboard is the **Caps Lock** key, which you should press before running any of the computer programs. The **Break** key is on the upper right-hand side of the key-

FIGURE 1.1 The IBM PC Computer

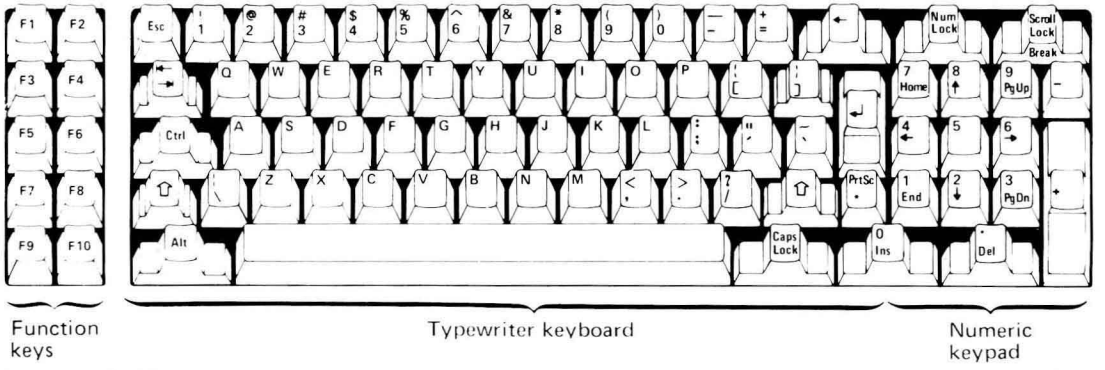


Courtesy of IBM.

board; it is the same key as the **Scroll Lock** key. Also note the delete key (**Del**) at the bottom right-hand corner of the keyboard.

Now look at the left-hand portion of the keyboard. There are ten special function keys, numbered **F1** through **F10.** To the right of

FIGURE 1.2 The IBM Keyboard



Courtesy of IBM.

these function keys is the control key (**Ctrl**). Also note the alternate key (**Alt**). The up arrows (↑) above the **Alt** and **Caps Lock** keys at the bottom left and bottom right are the shift keys, which can be used to type a single letter in upper case. This shift key is identical to the shift key on a typewriter. The backspace key (←) sits just above the enter key (←┘).

■ Setup Procedure

The operating system for the IBM PC is not on this disk when it is received from the publisher. This means you will not be able to place this diskette into the IBM PC without first booting up or loading your computer with the disk operating system (DOS) supplied with the computer. Once this is done, you can perform a simple setup procedure that will place the operating system on this disk. You only have to go through this setup procedure once. If someone has already performed the setup procedure, skip this section and go to the next section on start-up.

Note that you must have the 2.0 version of the operating system, or a later version such as 2.1; this procedure will not work with version 1.0 or 1.1. In addition, you must have two disk drives. The overall procedure is as follows:

1. Insert the disk operating system (DOS) disk into the A drive of the IBM PC. Place this program disk in the B drive. Turn the computer on. Enter the date and time when the computer asks for this information.
2. Once your computer is booted up and you see A>, type b:setup. You will see several messages. After all the messages have been printed, the operating system has been transferred to the program disk.
3. Remove the DOS disk and put our program disk into drive A. You are now ready to use this program disk. Type autoexec.bat. Once you have done this, the program disk will start to run.

This procedure is not as complicated as it sounds. Here is an example of what you will see on the computer screen and what you should do in response. This procedure will be slightly different if you have an operating system other than the IBM Personal Computer DOS Version 2.00 or if you have an IBM PC-compatible computer.

What Appears on the Screen	*What You Should Do*
Current Date is Tue 1-01-1980 Enter new date:	You enter date here.
Current time is 0:00:09.39 Enter new time:	You enter time here.
The IBM Personal Computer DOS Version 2.00 (C) Copyright IBM Corp 1981, 1982, 1983	
A>b:setup	You type b:setup.
A>REM . . . Insert your DOS disk into drive A:	
A>REM	
A>REM . . . Insert your PROGRAM disk into drive B:	
A>PAUSE strike a key when ready	You strike any key here.
A>SYS B: system transferred A>COPY COMMAND.COM B: 1 File(s) copied	
A>COPY BASICA.COM B:	
A>REM	
A>REM . . . Your PROGRAM disk is now ready to use.	

You can now remove the operating system and place the program disk in drive A. Type autoexec.bat to start the management science and operations management programs.

As mentioned previously, you only have to go through the setup procedure once. Once you have gone through this procedure, you no longer need to use the operating system disk.

■ Start-up

The following steps can be used to start the program on the IBM PC:

1. Put the program diskette in drive A, which is on the left-hand side of the processor box. When you handle the disk, make sure to touch only the label. Do not touch the access windows that are cut into the plastic envelope. Also make sure the label is facing up. Carefully but firmly push the disk into the disk drive and shut the disk drive door.

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