



COMPUTERIZED MANUFACTURING RESOURCE PLANNING

JOHN D. GREIMAN

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Introduction

A manufacturing company's survival is increasingly dependent on management's ability to increase productivity and utilize the company's resources effectively. The systems of yesterday no longer suffice—today's manager needs information on an hour-by-hour, day-by-day basis.

In the late 1960s and through the 1970s, Manufacturing Resource Planning (MRP) was the watchword. Of the companies that tried MRP, less than 10 percent were able to use that technique as fully as they had expected, according to an American Production and Inventory Control Society (APICS) 1981 survey. Why? Is MRP not the excellent planning tool that we expected?

Now the buzzwords are JIT (Just In Time), KANBAN, and “zero inventories.” Much has been written in the literature of professional societies such as APICS which says that these Japanese import systems are the way to achieve manufacturing excellence and the way for American manufacturers again to achieve dominance in the world's markets.

Are JIT, KANBAN and zero inventories in conflict with MRP? Must a manufacturer choose between the systems?

This book answers these questions. *Computerized Manufacturing Resource Planning* shows that JIT, KANBAN, and zero inventories offer direction, not a goal, and that the

personal computer (PC) can be used as a bridge between MRP and JIT. The materials manager, purchasing agent, manufacturing or design engineer, controller, personnel director, and manufacturing vice president are shown how to monitor activities in a new manner. Using a simple-to-understand software, these managers can design their own reports, charts, and graphs to help prepare data to cope with product design changes, to negotiate better deals with vendors, and to improve customer service.

The approach taken in this book combines the resources of the PC and JIT systems to “close the loop” in an MRP system. You, the manager, are shown how to use the PC’s power to develop charts, tables, and reports that will increase your span of control. We also show you how to employ these reporting tools to enhance the intuitive part of the decision-making process and how to design these new tools to suit your own style of management.

There are two approaches to capturing and analyzing data: you can either select data from source documents such as shop or purchase orders and key these data into your PC data base, or you can retrieve these same data from the MRP data base stored in your company’s mainframe computer. In both cases you can use PC software to manage and analyze the data stored in the PC. This is the approach described in the many examples that follow.

Computerized Manufacturing Resource Planning is written for you, the manufacturing manager, a nontechnical user of a PC. The detailed, technical side of the PC is not covered, nor are the very serious problems of using PCs to update or manipulate data on a centralized data base. These are subjects beyond the scope of this book.

Those who already have a basic familiarity with software used for spreadsheets, graphics, and word processing will learn how to personalize the many templates shown in this book. For those who do not have a basic familiarity with or access to a PC, the book will be an invaluable introduction to the PC’s use in a manufacturing environment.

Many illustrations show you how to use PC software packages to enhance productivity. We emphasize the use of spreadsheets as the foundation for your analyses and as the basis for graphs and word-processed reports.

Many users of business graphics report that they manage up to five or six times more data with less effort when they use graphic summaries of data, especially for exception

reports. A recent study by the University of Pennsylvania's Wharton School shows that managers who use graphics in their presentations are more successful in winning their points than those who use numbers alone. Our experience supports this finding, and we show you how to convert your spreadsheets into charts that help you get your point across graphically.

Computerized Manufacturing Resource Planning will help you, the manufacturing manager, to increase productivity and attain manufacturing excellence in today's fast moving world of manufacturing.

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Chapter 1

MRP II + JIT + PC = Manufacturing Excellence

This chapter will give you a basic understanding of the software that permits you, a manufacturing manager, to use a personal computer to expand your span of control. When you complete this chapter you'll be able to:

- Explain why the scheduling of a batch-oriented MRP system makes special requests for analyses and reports difficult to do on a timely basis;
- Describe how MRP has evolved from a batch-processed system to a computer-based, decision-enhancing environment;
- Describe how the desktop personal computer can be teamed with the mainframe computer to provide you with more timely data;
- Explain why you can now design your own reports to fit your management needs;
- List the many areas of manufacturing where the PC and the mainframe can help you to do a more effective job of managing.

MRP II: BACKGROUND

8 a.m. Target Manufacturing (a fictitious company used

to illustrate many points in this book) comes to life on another Monday morning. You're the materials manager; and on Friday, V.P. of Manufacturing Bernie Makers, your boss, tossed one of the usual bombs at you. Competition is cutting into sales and margins on A123, a top-selling product. You have to be ready on Wednesday with alternatives to save A123. The new MRP run should be ready and waiting on your desk.

"Good morning, Ms. Jones."

"Lots of data to wade through here—but I'll also need the latest costed bill of material with annual usage data. And Bernie says Tension Corp. is using the new-style housing. I'd better get vendor performance info on JB7F, our housing. And it would be helpful if I could get a summary of usage for parts that could be substituted."

"Harry, Bob here. That June 30th MRP run is great. Thanks, buddy. But there's additional information I'll need by tomorrow A.M. for the A123 model.

"First, I'll need the bill of material with each component costed by its annual usage. Then I'll need a list of parts that have the same characteristics to sub for JB7F, the housing. If I recall, the JB7F makes up the bulk of the material costs on the A123. And, oh yeah, info on vendor performance for all the housings we buy—they're in the CAS classification. I'll need this so we can figure out the best sources of supply and where we should make the final assemblies. And . . .

"Oh? You've got the data, but . . . but . . . you've got to schedule these requests.

"Six weeks? I know you have priorities for orders, financial statements, other reports. And, yeah, I know your programmers have their schedules set for six months. Let me see what I can do by hand from the data you gave me."

Now, how do I make a good presentation on Wednesday?

This is a familiar scenario for the materials manager faced with making decisions more rapidly than ever before as competitive pressures mount and the marketplace quickly changes its demands. Add to this the ever present pressures on the data processing manager to interrupt the schedules of a batch-oriented system and provide for the day-to-day needs of multiple users—and the frustration of not being able to satisfy all those demands.

Making decisions more rapidly than ever before also increases the risk involved. And the cost of suboptimized deci-

sions is too great for most companies to bear. Management needs new tools to improve the use of the available resources of materials, labor, facilities, and money.

The MRP system is designed to make a company's business plan a reality because the company can order the right materials at the right time to ensure top customer service, low inventory investment, and a level shop load. MRP insists on teamwork. This means that salespeople know what products are available; manufacturing people know what to produce and when; purchasing agents know what to buy, when to buy it, and when orders should be changed; and financial managers have a clear picture of purchase commitments and delivery schedules and can plan cash requirements more precisely.

But MRP's power was limited at first because it could be used only in a centralized electronic data processing (EDP) facility, where conflicts in schedules often prevented the quick response needed to overcome a "now" situation. Thus the use of this powerful tool was limited by the very technology that made its existence possible.

AN EVOLUTION, NOT A REVOLUTION

MRP has evolved in two ways since its conception in the 1960's. The first change is the broadening of its scope from only the time-phased management of materials (Material Requirements Planning) to the management of all resources that contribute to successful manufacturing (Manufacturing Resource Planning, or, MRP II). The second change is the evolution of computing support technology from the batch-processed, centralized facility's monolithic, inflexible approach to the interactive system approach in which the manager's control is enlarged and individual management "style" is emphasized.

This technological evolution started slowly in the 1960s with the advent of the microprocessor, a low-cost "computer on a chip." Microprocessors soon found their way into larger computers (as components that were used to perform specific functions), into pocket calculators, watches, automobiles—almost everywhere.

In the late 1970s, the home computer emerged as the first PC. By 1980 these desktop systems began to invade the small business computer market previously dominated by minicomputers. The PC's hardware was more compact than the larger

mini's; while components were functionally similar, the PC's were smaller and less expensive. It was possible to purchase a system for well under \$10,000.

Access from a PC to a mainframe data base began with remote data communication to the public data bases that act as information utilities. Typical of these are The Source and Dow Jones/Retrieval Services. A subscriber to these public data bases can select data for varied purposes, such as measuring the performance of his/her company against pertinent market segments.

MRP II TODAY

The tools now available for MRP II—the low-cost PC teamed with the power of the mainframe computer's data base—give manufacturing management the ability to make decisions rapidly and in the context of today's situation, not last month's or last quarter's. The PC provides windows into the data base from which you can access, select, manipulate, report and present data for timely use.

Your own management "style" can become an essential ingredient in the decision-making process. User-oriented software frees the manager to develop charts, tables, and reports in a style that fits the individual's managerial method. Simulation software can enhance the intuitive part of the decision-making process.

We will show you how the PC can be used to expand your control over:

- customer service
- production costs
- parts standards
- vendor performance
- productivity
- labor utilization;
- facilities utilization
- make or buy decisions

This is a "how to" book. The material makes minimal reference to technology—we don't want to turn you into a programmer, just an informed, effective user of micros. The manager who can combine access to mainframe information with the PC's management software solves the old problems of poring over voluminous printouts, retyping reports, and manually producing charts and graphs.

The PC's ability to solve these problems is graphically

depicted through the liberal illustration of the use of such software tools as electronic spreadsheets, word processing, report generators, data base managers, and graphics.

Computerized Manufacturing Resource Planning guides you to the most successful uses of the PC in the manufacturing environment. The text, illustrations, and projects provide a structured guide rather than a “cookbook recipe.” You’ll be able to adapt the book’s pointers to your own particular needs and situation.

MANUFACTURING EXCELLENCE

MRP II is moving from a paper environment, with fixed, predetermined computer outputs, into an interactive computing, management-oriented system environment. Decision-making capabilities are enhanced so the manager can maintain fingertip control over functional areas, control that is necessary to complete the execution systems demanded in a JIT environment.

With a PC on your desk and access both to the public and the private data bases now available, you can plan and control facilities, labor, finances, and materials. The risk in making decisions more rapidly to keep pace with the demands of the marketplace are reduced with this new management tool.

Teaming the PC and the mainframe results in a system that stresses flexibility. The individual manager’s need for flexibility can be combined with the structure and discipline imposed by the uniform use of one set of numbers inherent in the MRP system. And the execution systems that were lacking in the MRP II environment, but which have now been fostered by the JIT philosophy, are strengthened by the use of the PC.

The PC allows the manufacturing manager to “close the loop” in all functional areas of the MRP II system. Or, to put it another way: $\text{MRP II} + \text{JIT} + \text{PC} = \text{Manufacturing Excellence}$.

Chapter 2

An Overview of PC Hardware and Software

This chapter is an overview of the hardware and an introduction to the software that makes the PC such a powerful tool in the manufacturing environment. Those who already possess a good understanding of PC hardware components and how they work may prefer merely to skim this chapter to see if you pick up a few new facts. Those who do not have this basic understanding should read the chapter in order to fully comprehend the illustrations that follow in the rest of the book.

At the end of this chapter there is a project for you to develop. You are going to determine where the PC can be useful in your own company's manufacturing system. Then, in Chapters 3 through 7, you'll construct the components of a word-processed report that will contain a spreadsheet and a graph in addition to the text of the report itself. You'll also develop templates that you can use as your data is updated.

When you complete this chapter you'll be able to:

- List the main components of PC hardware;
- Describe how a PC differs from a mainframe computer;
- Specify the general hardware components you'll need to permit your PC to "talk" to a mainframe computer and to tap the information in its data base;

- Indicate when you'll need to use a dot-matrix or a letter-quality printer;
- Understand how interface software makes it possible for a PC to communicate with a mainframe computer.

AN OVERVIEW OF PC HARDWARE

The personal computer is a tool for the individual, one that can perform all the functions of a larger computer within hardware limitations. The PC's roots are found in the home computer, which became popular in the late 1970s. The PC's potential business use was seen by 1980, and in the next two years software and then hardware advancements enlarged the business capability of the PC. The PC system we discuss in this book refers to business systems, rather than home computers.

The PC has the same components and performs the same functions as its larger cousins, the minicomputer and the mainframe computer. (We will use mainframe to refer both to the minicomputer and to the larger, true mainframe computers.) The PC contains one or more microprocessors, which form its central processing unit (CPU). Control of the computer and its peripherals is performed in the CPU. Most CPUs still use an 8-bit processor, but the trend is towards 16-and 32-bit processors because of their greater price-performance value (the term "bit," which represents the computer's smallest unit of storage, is defined with other terms in the glossary). The 16-and 32-bit CPU's increased performance is due to twice as many pathways for the movement of data, resulting in increased speed, and an exponential increase in storage locations that can be addressed by the larger processor chips.

The PC also contains peripheral devices, such as a cathode-ray tube (CRT) display, one or more disk drives, a keyboard, and a printer. We'll briefly describe some of these devices, plus optional devices such as a "mouse," and a modem later in this chapter. Figure 2-1 shows a typical PC and some common peripherals.

What separates the PC from its larger cousins? The first difference is its small size. The PC is either a desktop or a portable machine. The computer and its accompanying peripherals form a personal workstation; it can access data from large, centralized data bases and operate as an independent computing system.

The second characteristic is the PC's limited speed, stor-