PART I

Introduction

Chapter 1

Enterprise Resource Planning

This is not a book about software. One more time: This is not a book about how to select software and install it on your computers. Rather, it's a book about how to implement superior business processes in your company — processes that yield a competitive advantage.

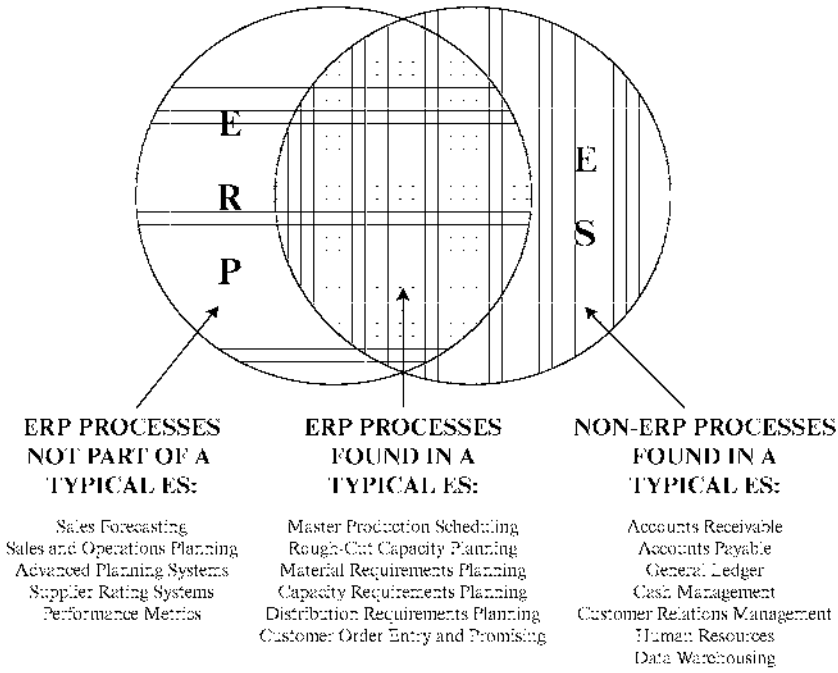
Right now you might be thinking: "Wait a minute. The name of this book is ERP. How can it not be about software?"

The answer is that Enterprise Resource Planning (ERP) is not software. One more time: ERP is not software. There's a lot of sloppy terminology flying around today in the business press, and one misnomer is to label enterprise-wide transaction processing software systems as ERP. These software packages support effective resource planning and make much of it feasible, but they don't truly do it. Plus these packages contain many business processes other than resource planning.

Therefore, we need to trot out another acronym that does refer to software: ES. This stands for Enterprise System or Enterprise Software. In his book *Mission Critical,*[1] author Thomas H. Davenport describes enterprise systems as "packages of computer applications that support many, even most, aspects of a company's information needs."

That makes sense to us. Now for another distinction: Not all ERP business functions are contained in the typical Enterprise Software

Figure 1-1
ERP Processes



(ES) suite. Similarly, the typical ES contains software support for business processes that are not a part of ERP. In Figure 1-1, we can see that distinction graphically. Please note the three areas on that diagram. The rightmost part of the figure refers to those functions contained within a typical ES that are not part of ERP; the leftmost area is for those ERP functions not normally supported by an ES; the area of overlap in the center references those ERP functions typically supported by Enterprise Software.

Now let's take a look at just what this ERP thing is all about.

WHAT IS ENTERPRISE RESOURCE PLANNING AND WHAT DOES IT DO?

Enterprise Resource Planning (ERP)—and its predecessor, Manufacturing Resource Planning (MRP II)—is helping to transform our industrial landscape. It's making possible profound improvements in

the way manufacturing companies are managed. It is a strong contributor to America's amazing economic performance of the 1990s and the emergence of the New Economy. A half century from now, when the definitive industrial history of the twentieth century is written, the evolution of ERP will be viewed as a watershed event. Let's describe Enterprise Resource Planning as:

> An enterprise-wide set of management tools that balances demand and supply,
>
> containing the ability to link customers and suppliers into a complete supply chain,
>
> employing proven business processes for decision-making, and
>
> providing high degrees of cross-functional integration among sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development, and human resources, thereby
>
> enabling people to run their business with high levels of customer service and productivity, and simultaneously lower costs and inventories; and providing the foundation for effective e-commerce.

Here are some descriptions of ERP, not definitions but certainly good examples.

Enterprise Resource Planning is a company increasing its sales by 20 percent in the face of an overall industry decline. Discussing how this happened, the vice president of sales explained: "We're capturing lots of business from our competitors. We can out-deliver 'em. Thanks to (ERP), we can now ship quicker than our competition, and we ship on time."

Enterprise Resource Planning is a Fortune 50 corporation achieving enormous cost savings and acquiring a significant competitive advantage. The vice president of logistics stated: "ERP has provided the key to becoming a truly global company. Decisions can be made with accurate data and with a process that connects demand and supply across borders and oceans. This change is worth billions to us in sales worldwide."

Enterprise Resource Planning is a purchasing department gen-

erating enormous cost reductions while at the same time increasing its ability to truly partner with its suppliers. The director of purchasing claimed: "For the first time ever, we have a good handle on our future requirements for components raw and materials. When our customer demand changes, we—ourselves and our suppliers—can manage changes to our schedules on a very coordinated and controlled basis. I don't see how any company can do effective supply chain management without ERP."

That's ERP. Here's how it came to be.

The Evolution of Enterprise Resource Planning

Step One—Material Requirements Planning (MRP)

ERP began life in the 1960s as Material Requirements Planning (MRP), an outgrowth of early efforts in bill of material processing. MRP's inventors were looking for a better method of ordering material and components, and they found it in this technique. The logic of material requirements planning asks the following questions:

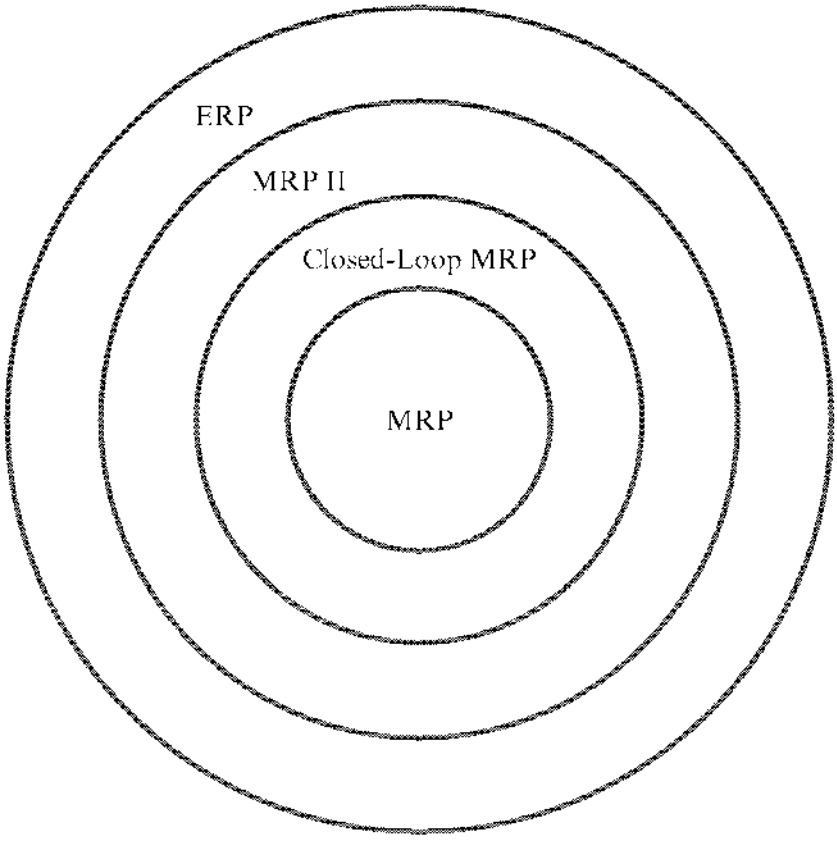
- What are we going to make?
- What does it take to make it?
- What do we have?
- What do we have to get?

This is called the universal manufacturing equation. Its logic applies wherever things are being produced whether they be jet aircraft, tin cans, machine tools, chemicals, cosmetics . . . or Thanksgiving dinner.

Material Requirements Planning simulates the universal manufacturing equation. It uses the master schedule (What are we going to make?), the bill of material (What does it take to make it?), and inventory records (What do we have?) to determine future requirements (What do we have to get?).

For a visual depiction of this and the subsequent evolutionary steps, please see Figure 1-2, a modified version of a diagram in Carol Ptak's recent book on ERP.[ii]

Figure 1-2
EVOLUTION OF ERP



Step Two—Closed-Loop MRP

MRP quickly evolved, however, into something more than merely a better way to order. Early users soon found that Material Requirements Planning contained capabilities far greater than merely giving better signals for reordering. They learned this technique could help to *keep* order due dates valid *after* the orders had been released to production or to suppliers. MRP could detect when the *due date* of an order (when it's scheduled to arrive) was out of phase with its *need* date (when it's required).

Figure 1-3
Priority vs. Capacity

Priority	*Capacity*
Which ones?	Enough?
Sequence	Volume
Scheduling	Loading

This was a breakthrough. For the first time ever in manufacturing, there was a formal mechanism for keeping priorities valid in a constantly changing environment. This is important, because in a manufacturing enterprise, change is not simply a possibility or even a probability. It's a certainty, the only constant, the only sure thing. The function of keeping order due dates valid and synchronized with these changes is known as *priority planning.*

So, did this breakthrough regarding priorities solve all the problems? Was this all that was needed? Hardly. The issue of priority is only half the battle. Another factor capacity represents an equally challenging problem. (See Figure 1-3.)

Techniques for helping plan capacity requirements were tied in with Material Requirements Planning. Further, tools were developed to support the planning of aggregate sales and production levels (Sales & Operations Planning); the development of the specific build schedule (master scheduling); forecasting, sales planning, and customer-order promising (demand management); and high-level resource analysis (Rough-Cut Capacity Planning). Systems to aid in executing the plan were tied in: various plant scheduling techniques for the inside factory and supplier scheduling for the outside factory — the suppliers. These developments resulted in the second step in this evolution: closed-loop MRP. (See Figure 1-4.)

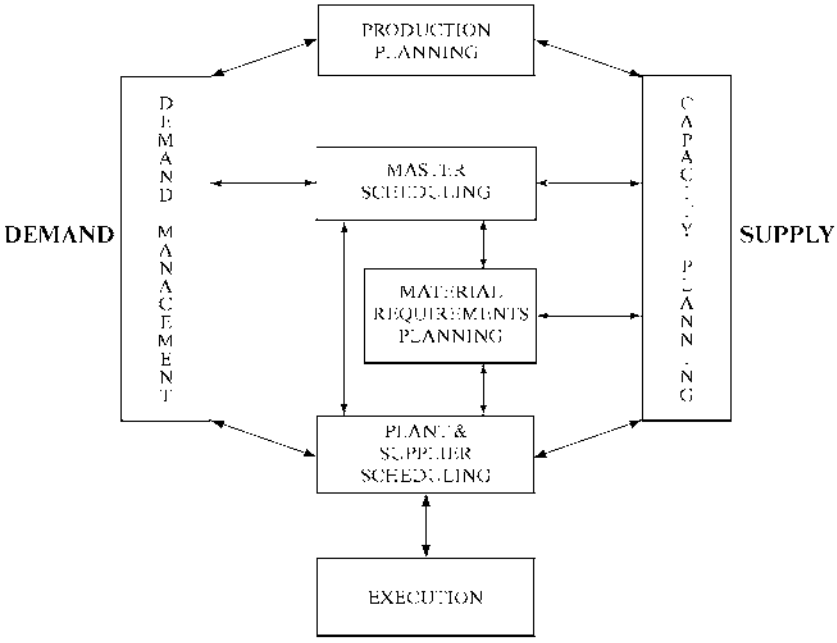
Closed-loop MRP has a number of important characteristics:

It's a series of functions, not merely material requirements planning.

It contains tools to address both priority and capacity, and to support both planning and execution.

It has provisions for feedback from the execution functions back to the planning functions. Plans can then be altered when necessary, thereby keeping priorities valid as conditions change.

Figure 1-4
CLOSED-LOOP MRP



Step Three—Manufacturing Resource Planning (MRP II)

The next step in this evolution is called Manufacturing Resource Planning or MRP II (to distinguish it from Material Requirements Planning, MRP). A direct outgrowth and extension of closed-loop MRP, it involves three additional elements:

1. Sales & Operations Planning—a powerful process to balance demand and supply at the volume level, thereby providing top management with far greater control over operational aspects of the business.
2. Financial interface—the ability to translate the operating plan (in pieces, pounds, gallons, or other units) into financial terms (dollars).
3. Simulation—the ability to ask "what-if" questions and to obtain actionable answers—in both units and dollars. Initially

this was done only on an aggregate, "rough-cut" basis, but today's advanced planning systems (APS) enable effective simulation at very detailed levels.

Now it's time to define Manufacturing Resource Planning. This definition, and the one to follow, come from APICS—The Educational Society for Resource Management. APICS is the leading professional society in this field, and its dictionary has set the standard for terminology over the years.

> MANUFACTURING RESOURCE PLANNING (MRP II)
> A method for the effective planning of all resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer "what-if" questions. It is made up of a variety of functions, each linked together: business planning, sales and operations planning, production planning, master scheduling, material requirements planning, capacity requirements planning, and the execution support systems for capacity and material. Output from these systems is integrated with financial reports such as the business plan, purchase commitment report, shipping budget, and inventory projections in dollars. Manufacturing resource planning is a direct outgrowth and extension of closed-loop MRP.[iii]

Step Four—Enterprise Resource Planning (ERP)

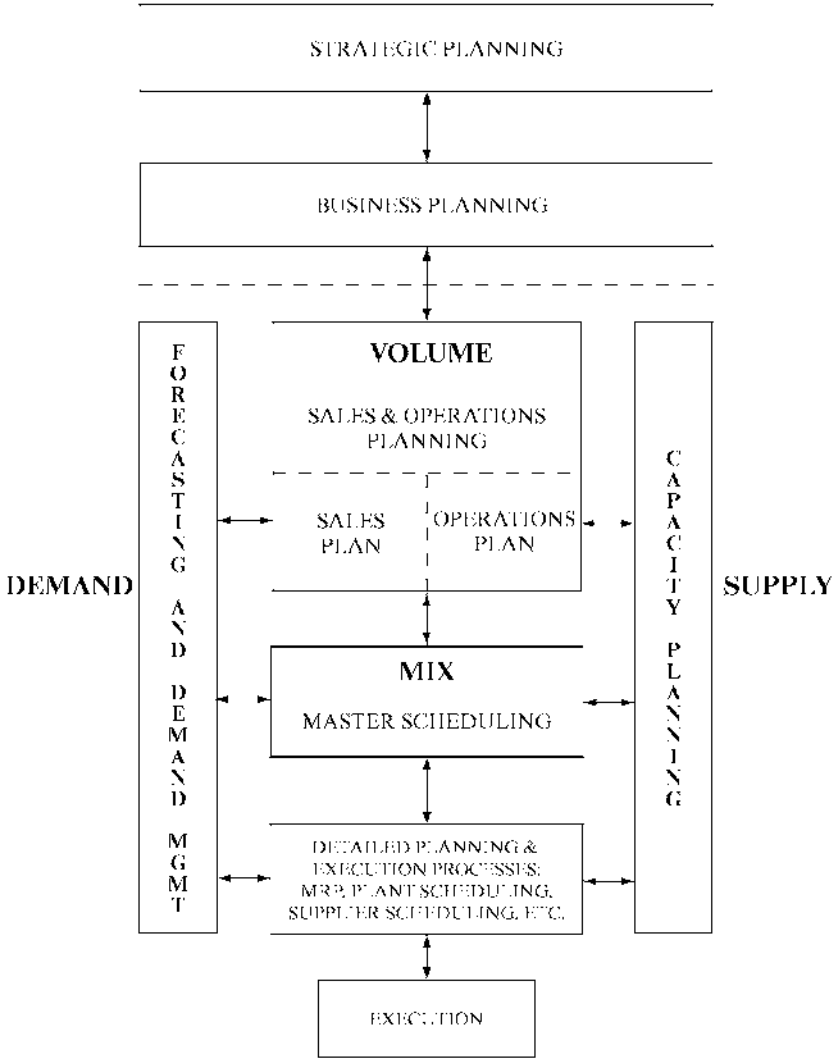
The latest step in this evolution is Enterprise Resource Planning (ERP). The fundamentals of ERP are the same as with MRP II. However, thanks in large measure to enterprise software, ERP as a set of business processes is broader in scope, and more effective in dealing with multiple business units. Financial integration is even stronger. Supply chain tools, supporting business across company boundaries, are more robust. For a graphical view of ERP, see Figure 1-5.

Let's now look at a complete definition of ERP, based on the description we saw a few pages back:

> ENTERPRISE RESOURCE PLANNING (ERP) predicts and balances demand and supply. It is an enterprise-wide set of forecasting, planning, and scheduling tools, which:

Figure 1-5

ENTERPRISE RESOURCE PLANNING



- links customers and suppliers into a complete supply chain,
- employs proven processes for decision-making, and
- coordinates sales, marketing, operations, logistics, purchasing, finance, product development, and human resources.

Its goals include high levels of customer service, productivity, cost reduction, and inventory turnover, and it provides the foundation for effective supply chain management and e-commerce. It does this by developing plans and schedules so that the right resources manpower, materials, machinery, and money are available in the right amount when needed.

Enterprise Resource Planning is a direct outgrowth and extension of Manufacturing Resource Planning and, as such, includes all of MRP II's capabilities. ERP is more powerful in that it: a) applies a single set of resource planning tools across the entire enterprise, b) provides real-time integration of sales, operating, and financial data, and c) connects resource planning approaches to the extended supply chain of customers and suppliers.

The primary purpose of implementing Enterprise Resource Planning is to run the business, in a rapidly changing and highly competitive environment, far better than before. How to make that happen is what this book is all about.

The Applicability of ERP

ERP and its predecessor, MRP II, have been successfully implemented in companies with the following characteristics:

- Make-to-stock
- Make-to-order
- Design-to-order
- Complex product
- Simple product

- Multiple plants
- Single plant
- Contract manufacturers
- Manufacturers with distribution networks
- Sell direct to end users
- Sell through distributors
- Businesses heavily regulated by the government
- Conventional manufacturing (fabrication and assembly)
- Process manufacturing
- Repetitive manufacturing
- Job shop
- Flow shop
- Fabrication only (no assembly)
- Assembly only (no fabrication)
- High-speed manufacturing
- Low-speed manufacturing

Within the universe of companies that make things — manufacturing enterprises — ERP has virtually universal application. This book deals with how to implement ERP in any of the above environments. Some people struggle with this applicability issue; they sometimes say: "We're different, we're unique, it won't work for us." We've heard that a lot over the years. What we have *never* heard is: "We're different, we're unique, Generally Accepted Accounting Principles (GAAP) won't work for us." Well, ERP is the *logistics analog* of GAAP. It's a defined body of knowledge that contains the standard best practices for managing that part of the business. The main difference between the two is that ERP and its predecessors have been with us for about four decades; double-entry bookkeeping and its offshoots have been around for four centuries. More on this later.

ERP as a Foundation

Today, there are a wide variety of tools and techniques that have been designed to help companies and their people produce their products better and more efficiently. These include Lean Manufacturing, Six Sigma Quality, Employee Involvement, Factory Automation, Design for Manufacturability, and many more. These are excellent tools with enormous potential.

But . . . none of them will ever yield their full potential unless they're coupled with *effective forecasting, planning, and scheduling processes.* Here's why:

It's not good enough to be extremely efficient . . . if you're making the wrong stuff.

It's not good enough to make items at a very high level of quality . . . if they're not the ones needed.

It's not good enough to reduce setup times and cut lot sizes . . . if bad schedules prevent knowing what's really needed and when.

Back in the early 1980s, a new way of thinking about manufacturing came out of Japan, and it was truly revolutionary. In this country we've called it Just-In-Time (JIT), and more recently it has evolved into Lean Manufacturing.[1]

As with most new tools and processes, its early adherents promoted JIT with a missionary zeal — and rightly so. This is great stuff. Some of them, however, took the approach that MRP/MRP II was no longer necessary for companies doing JIT. The MRP establishment pushed back and the result was a raging debate that generated a lot of heat and not much light.

Today we can see the situation much more clearly, and we feel this view has been best articulated by Chris Gray, president of Gray Research in Wakefield, NH. Chris says that improvements to business processes take one of three forms:

1. Improving process reliability. Six Sigma and other Total Quality tools are predominant here.

[1] Also called Agile Manufacturing or Synchronous Flow Manufacturing.

2. Reducing process complexity. Lean Manufacturing is heavily used here.
3. Coordinating the individual elements of the overall set of business processes. ERP lives here.

Enterprise Resource Planning, when operating at a high level of effectiveness, will do several things for a company. First, it will enable the company's people to generate enormous benefits. Many companies have experienced, as a direct result of ERP (or MRP II) dramatic increases in responsiveness, productivity, on-time shipments and sales, along with substantial decreases in lead times, purchase costs, quality problems, and inventories.

Further, ERP can provide the foundation upon which additional productivity and quality enhancements can be built — an environment where these other tools and techniques can reach their full potential.

Effective forecasting, planning and scheduling — knowing routinely what is needed and when via the formal system — is fundamental to productivity. ERP is the vehicle for getting valid plans and schedules, but not just of materials and production. It also means valid schedules of shipments to customers, of personnel and equipment requirements, of required product development resources, and of cash flow and profit. Enterprise Resource Planning has proven itself to be the foundation, the bedrock, for supply chain management. It's the glue that helps bind the company together with its customers, distributors, and suppliers — all on a coordinated, cooperative basis.

More about Software

Now that we've kicked the ERP topic around a bit, let's double back on the software issue. Software for ERP is like a set of golf clubs. You could give the greatest, most expensive set of golf clubs ever made to either one of your friendly authors, but they wouldn't break 120. Why? It's simple; neither of us knows how to play golf.

On the other hand, let's say we send Tiger Woods out on the pro tour with only a four-wood and a sand wedge. Would Tiger win any tournaments? Not a chance. He'd never even make the cut. The reason: To be competitive at the highest levels of the game, you need a full set of clubs in the bag.

Two principles flow from this analogy:

1. The acquisition of the tools, of and by itself, will not make you proficient in their use and thus will *not* provide a competitive advantage.
2. To be truly competitive, you need a good and reasonably complete set of tools.

Too many companies have bought an extremely expensive set of "golf clubs" (an enterprise software system) but haven't learned how to play golf. That's why we read about so many "ERP failures" in the business press. The fact of the matter is that ERP hasn't failed at all in those cases; it hasn't even been attempted. Saying that ERP failed in these cases is like saying that *golf failed* because one of your authors bought a $2,000 set of golf clubs and didn't break 120. Golf failed? Makes no sense.

The ABCs of Implementation

Let's look at the ABCs of implementing Enterprise Resource Planning. The concept is derived from the basic ABC approach to inventory control, in turn derived from Pareto's law. In that technique, the A items are considered very significant, costly, important, etc. Hence, they deserve the most attention and the most careful planning and control. The B items are of less significance than the A items, and, hence, less time is devoted to each of them. The C items, while essential, are of least overall significance and are given proportionate attention.

This ABC approach, applied to implementation, states that *Item C is the computer,* both the hardware and software. It's essential since ERP can't be done manually, but it's of lesser significance overall than the other elements.

Item B is the data: the inventory records, the bills of material, the routings, etc. They are more significant and require more of the company's overall attention and managerial emphasis.

Item A is the people, the most important element in making it happen. If the people part of the implementation process is managed properly, the people will understand the objectives and how to get

there. They'll take care of getting and keeping the data accurate. They won't allow the "computer tail" to wag the "company dog," as has been the case far too often. People are the key.

Class ABCD

At the risk of getting into what might look like alphabet soup, we need to introduce another concept based on the letters A, B, and C plus one more. Here goes.

By the mid-1970s the term MRP had become a buzzword. Almost everyone, it seemed, was "doing MRP." Many companies weren't happy with their results. On the other hand, some companies were achieving spectacular results. Companies' reactions to MRP ranged from: "It hasn't helped us at all." to "It's terrific; we couldn't run the business without it."

It became obvious that there were profound differences in how well companies were using this set of tools. To help focus on this issue, Oliver Wight, the leading pioneer in this field, developed the ABCD classification. (See Figure 1-6.)

Figure 1-6

Class A	Effectively used company-wide; generating significant improvements in customer service, productivity, and costs.
Class B	Supported by top management; used by middle management to achieve measurable quality improvements.
Class C	Operated primarily as better methods for ordering materials; contributing to better inventory management.
Class D	Information inaccurate and poorly understood by users; providing little help in running the business.

Class D installations have often been viewed as "another computer failure." This strikes us as a bum rap for the computer, because the computer is the only element that's doing its job. Has the computer failed? No, it's working. Has ERP failed? Not really; it hasn't

had a chance. What has failed? The *people* in the company. They've failed to implement and operate this set of tools successfully.

Class C means a company has reduced its inventories, in some cases substantially, and probably is better able to manage engineering changes. The return on investment (ROI) for Class C typically is very good. However, the company really hasn't changed the way it runs the business.

The company operating ERP at a Class B level has dramatically improved its ability to deliver the product on time to its customers, minimize shortages in the plant, avoid unplanned overtime, reduce inventories, and cope with the myriad of changes that typically confront a manufacturing organization.

Class A yields all of the Class B benefits and more. The business is managed with one consistent set of numbers, from top management's sales & operations plans down through the detailed schedules for the plant floor, the suppliers, the distribution centers and, most important, the customers. Financial plans and reports are developed from the highly accurate operational numbers used to run the business on a day-to-day basis. Extensive use is made of simulation, performing what-if analyses using the ERP data base, in both units and dollars.

To evaluate their performance, many companies have used the *Oliver Wight ABCD Checklist for Operational Excellence* (Fifth edition, 2000, John Wiley & Sons, New York, NY). This checklist is a series of questions which an organization can self-administer to determine how effectively it's using the tools of ERP, and this process results in a letter grade (A,B, C, or D) and helps to determine the path for improvement.

Implementers and Re-Implementers

This book deals with how to implement ERP at a Class A level. Further, it applies to both first-time implementers and to *re-implementers*, companies whose first implementation resulted in Class C or D results and who now want to get the full bang for their buck. For those of you who'll be re-implementing, be of good cheer: Many companies now getting Class A results got there via re-implementation. The steps involved in a re-implementation are virtually identical to a first-time implementation; the main difference is

that some of the necessary steps may have already been accomplished satisfactorily.

Many companies today need to re-implement. Some of these are companies who, as we saw earlier, thought they were implementing ERP, but actually were only installing enterprise software. Their motivations were largely software-driven: Y2K compliance, legacy systems becoming unworkable, multiple hardware platforms supporting too many operational systems, etc. The problem is that, in many cases, the new software was installed but not much else changed.

Many companies' ERP implementations in the past started out with the best intentions in the world. Company S, for example, wanted to re-engineer and improve processes, to improve the way they managed the business, and to give far better customer service to an increasingly demanding customer base. During the implementation, however, they were overwhelmed by the software. Enterprise software tends to be highly complex, and complexity can make it very difficult to install. As the implementation project took longer and longer, and cost more and more, top management became more and more impatient. The result: a decision to forget about implementing better business processes and just get the software running.

Thus, Company S has new software but is still running the business in much the same old way, and thus they need to re-implement.[2] If you're in this category, this book is intended for you every bit as much as for the company implementing for the first time.

The Implementers' Dilemma

In the chapters to come, we'll talk a lot about the "Proven Path," which is the implementation approach we recommend. The company that follows the Proven Path can be virtually assured of a successful implementation. The dilemma is that some companies may not be able to follow the Proven Path, and the reason has to do with software.

Let's look at the three types of companies wanting to implement enterprise resource planning:

[2] Some call this a "second wave" implementation.

The first type of company has already installed enterprise software. Now it wants to improve its business processes by implementing ERP, and thus capitalizing on the ES investment. The Proven Path will work very nicely for this company, probably in the Quick Slice variant discussed in Chapters 13 and 14.

The second category of company has not yet installed a complete set of enterprise software (although it may have installed a few modules of an ES). ERP is a higher priority than ES; thus software issues will be subordinated to the ERP initiative. This company has what we call a "clean sheet of paper" and the Proven Path applies completely.

In the third case, the company has already begun installing enterprise software or is about to do so. ES is the priority. This company may not be able to simultaneously implement ERP using the Proven Path. Here's the dilemma: workload. Installing enterprise software can be an enormous task. Even with lots of people from outside consulting firms, the time requirements for the company's people are very large.

Later we'll discuss in detail why implementing ERP cannot be subcontracted to outsiders. For now, take it on faith: An ERP implementation is a do-it-yourself project; it requires intimate knowledge of your business. The essence of implementing ERP is to acquire better business processes, and these must be implemented by the people operating the business.

That said, if these folks are pretty much overwhelmed with a) doing their day-to-day jobs and b) participating heavily in an ES installation, they won't have the time or mental energy necessary to do the hard work involved in implementing ERP. Thus this company *will not be able to follow the Proven Path.* They may pay it lip service. They may pretend they're following it. But they can't. They don't have the horses.

We call these companies "dilemma companies" and our advice to them is simple: Don't try to implement ERP simultaneously with installing an enterprise software system if you aren't convinced that your people have the time to do it justice. Rather, we recommend that you:

- recognize the dilemma,
- complete the ES installation,
- start to make a limited number of process improvements during the ES installation, ones that won't consume large amounts of peoples' time. (One excellent process that applies here is Sales & Operations Planning, covered in Chapter 8. Another opportunity is data integrity, discussed in Chapter 10.) As you make these improvements, recognize that you are not following the Proven Path, but rather that you are doing things that are consistent with it and that will make the task easier when you begin an ERP implementation.

Then, following the ES installation, you will have ceased being a dilemma company and have migrated to the Type 1 company previously identified. You have implemented ES software, and are now in a position to initiate a Proven Path implementation of ERP. Bob Stahl, a highly successful ERP consultant based in Attleboro, MA, says it well:

> The Proven Path was sound 15 years ago, before the onset of enterprise software. It's every bit as sound today. However, given today's very complex, hard-to-install software, it's more important than ever to follow the Proven Path correctly and with the right timing.

Coming up in the next chapter: a closer look at the Proven Path.

Q & A WITH THE AUTHORS

TOM: Mike, you were one of the key players at Procter & Gamble's very successful implementations of ERP (which I think you called MRP II). When you got started with MRP II, had P&G already implemented enterprise software, or were you a "clean sheet of paper company," or were you in the dilemma category of having just too much on your plates for a Proven Path implementation?

MIKE: We were all of these. SAP (our enterprise software package) in Europe was 80 percent installed before MRP II got started. In North America, we started with business process improvements, one being Sales & Operations Planning, and the SAP installation came a bit later. Latin America was pretty much a clean sheet of paper. On the other hand, Asia was certified as Class A before we ever heard of SAP or other enterprise software packages.

One last point: Our selection of SAP as the software supplier was influenced somewhat by the fact that an older version of it (R-2) was almost totally installed in Europe. We might have been happy with a number of other software packages, but our European folks had been working with SAP for some time and were comfortable with them. We felt it was important not to require them to change unless there was a compelling reason to do so.

NOTES

[i] *Mission Critical — Realizing the Promise of Enterprise Systems*, 2000, Harvard Business School Press, Boston, MA.

[ii] *ERP — Tools, Techniques, and Applications for Integrating the Supply Chain*, 1999, St.Lucie Press/APICS, Falls Church, VA.

[iii] APICS Dictionary, Ninth Edition, 1998, APICS — The Educational Society for Resource Management, Falls Church, VA.