PART ONE

INTRODUCTION AND BACKGROUND

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Introduction

This chapter initiates our dialogue into enterprise resource planning (ERP) systems, focusing on the following questions.

- Why investigate ERP systems?
- How does ERP create value?
- What is the purpose and scope of this book?
- What is the outline of this book?

Why Investigate Enterprise Resource Planning Systems?

Enterprise resource planning systems are a corporate marvel, with a huge impact on both the business and information technology worlds, including each of the following dimensions:

- ERP affects most major corporations in the world;
- ERP affects many SMEs (small and medium enterprises);
- ERP affects competitors' behavior;
- ERP affects business partner requirements;
- ERP has changed the nature of consulting firms;
- ERP provides one of the primary tools for reengineering;
- ERP has diffused many "best practices";
- ERP gave client server computing its first enterprise product;
- ERP has changed the nature of the information systems function;
- ERP has changed the nature of jobs in all functional areas;
- ERP cost is high;
- ERP has experienced huge market growth.

ERP Affects Most Major Corporations in the World (Bowley 1998). A single ERP system (SAP's R/3) is used by more than 60% of the multinational

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firms. Further, according to Arthur D. Little's global strategy leader, an ERP company (SAP) "is conquering the world. Almost every important company is more or less in its hands."

ERP Affects Many SMEs (Foley and Stein 1997). The impact of ERP is not limited to large firms. In 1995, SAP generated 90% of their revenues from large global companies, but by 1997 SAP expected 50% of its revenues to come from SMEs (small and medium enterprises). Roughly 35% of SAP's 1997 customers had revenues of under $200 million.

ERP Affects Competitors' Behavior. On June 24, 1996, Oracle's Application Division announced that "[s]everal companies went live with their Oracle Applications implementations during the quarter, including Silicon Graphics, Inc. and Quantum Corporation, both of whom successfully deployed large-scale implementations." In addition, at the same time, Oracle's Application Division announced that "among the customers added that quarter included … Western Digital …." Western Digital was a direct competitor of Quantum.

When one corporation adopts ERP, should its competitors do the same? If the software provides a competitive advantage and/or would create value, then the answer is probably Yes. But which software should they choose and who should implement it for them? We might expect that, if one company successfully implements ERP for competitive advantage, then the same software and consulting team would be chosen to implement ERP for its competitors – after all, who would have greater experience with the industry? Yet how would the firm that originally implemented ERP react to such an occurrence?

ERP Affects Business Partner Requirements. Generally, adopting ERP makes firms more "information agile." Those firms can better process information and integrate it into their business procedures and decision making. As a result, business partners need to adapt to the changes that will occur in ERP-adopting organizations. For example, as ERP-adopting firms operate in real time, they will expect the same of their partners. Further, ERP-adopting firms may begin to integrate ERP systems along the supply chain, potentially pushing ERP to other parts of the supply chain, which in turn are likely to include their partners.

ERP Has Changed the Nature of the Largest Consulting Firms. Enterprise resource planning systems have been critically important to the growth of consulting among the "Big 6" (recently the "Big 5") and other professional service firms. According to *Public Accounting Report* (1998), services involving ERP packages generate one third to one half of the total consulting revenue at national professional services firms.

ERP Provides One of the Primary Tools for Reengineering. In 1990, Hammer's highly influential article on reengineering sparked the corporate world's

interest in obliterating existing processes. Unfortunately, after things were obliterated many firms had no idea what to replace them with. Enterprise resource planning provides perhaps the primary tool for guiding those efforts, so much so that Gendron (1996) called ERP (particularly SAP's R/3) the "electronic embodiment" of reengineering and Hammer (1997) commented that "SAP equals forced reengineering."

ERP Has Diffused Many Best Practices. Enterprise resource planning systems are based on so-called best practices – the best ways of doing processes. SAP's R/3 incorporates over a thousand of them! What this means is that any firm that installs R/3 has access to a wide range of best practices. Furthermore, new business practices are being added all the time. As new best practices are found and embedded in particular applications, they become available for inclusion in new versions of R/3; as they become available, other firms install them. Hence there is a cycle of finding best practices, building them into the software, and diffusing them out to new users.

Firms should therefore ask the following questions.

- What business processes give us competitive advantage?
- What new processes would give us competitive advantage?
- How do we know that there is something unique in those processes?
- Is this process worth more or less than moving to a set of processes that are widely available?
- What would be the cost of this best practice diffusing to my competition?

ERP Gave Client Servers Their First Enterprise Product. In the early 1990s, client server computing was an available technology that offered many advantages over existing mainframe solutions. Unfortunately, there was limited software available to exploit the advantages. Enterprise resource planning changed all that when it became one of the first dominant corporate applications of client server computing.

ERP Has Changed the Nature of the Information Systems Function. Historically, the job of the information systems function was primarily one of designing, developing, and implementing software. Now, with ERP systems, the design and development functions are being outsourced. Enterprise resource planning systems are replacing major portions of most firms' software needs. This changes the basic nature of the information systems function from one where systems analysts and programmers are needed to one where knowledge of existing software packages is critical.

Not only have needs changed, but personnel have become more mobile. Historically, information systems personnel would have knowledge only of firm-specific legacy applications. With ERP software that changes, knowledge

can be used at more than one firm. Knowledge of almost any ERP package is useful not just in one organization, it is useful around the world. Thus, as the use of ERP package software grows, there is more mobility among personnel in information systems than has ever been seen.

In addition, this mobility is changing the consulting business that supports ERP package software. Consultants armed with knowledge about such a package can now take that knowledge from one firm to another. The consultant actually becomes more and more valuable with each new implementation of the software.

ERP Has Changed the Nature of Jobs in All Functional Areas. Enterprise resource planning has changed the nature of jobs in functional areas, such as manufacturing. As noted by Corcoran (1998),

> IT [information technology] professionals in manufacturing say ERP systems are blurring the lines between IT and users. There is a huge demand for users or line-of-business personnel who also have professional level IT skills. But traditional IT types who know only about technology and nothing about the business are not needed now as they once were. "Understanding the business is probably the most critical [aspect,]" says Joan Cox, CIO at the space and strategic missiles sector of Lockheed Martin in Bethesda, MD. "Its more important to understand how you want things to flow through your factory than [to have] the skill of programming – except for the few places where SAP doesn't do what's needed so you need coders."

ERP Cost Is High. According to the META group, the average cost of ownership for an ERP implementation is $15 million, typically at a cost of $53,320 per user. These estimates include software, hardware, professional services, and internal staff costs for the full implementation, plus two years of post-implementation support. As noted by Escalle, Cotteleer, and Austin (1999), ERP costs can run as high as two to three percent of revenues.

ERP Has Experienced Huge Market Growth. According to Frye (1994), in 1993 – the early days of client servers – five vendors accounted for 74% of the client server ERP software: Oracle, $88 million; SAP America, $71 million; D&B Software, $30 million; IMRS, $30 million; and Computron, $17 million. The entire market was $319 million. In 1998 the license/maintenance revenue market was $17.2 billion, and in 2000 the market is expected to be $24.3 billion (PricewaterhouseCoopers 1999). The market growth in ERP has been huge.

How Does ERP Create Value?

Historically, legacy information systems have been functionally based and not integrated across multiple locations or functional areas. The same information was captured multiple times, in multiple places, and was not available in

real time. Jobs and processes were narrowly defined in concert with the division of labor and the industrial revolution. As a result, some information never made it out of different pockets of the corporation. Processes and job definitions saw to it that information remained a local good. When information did "go global," often there were different informational reports of the same events. Thus, there were information asymmetries between the different local and functional groups and top management.

Enterprise resource planning systems provide firms with transaction processing models that are integrated with other activities of the firm, such as production planning and human resources. By implementing standard enterprise processes and a single database that spans the range of enterprise activities and locations, ERP systems provide integration across multiple locations and functional areas. As a result, ERP systems have led to improved decision-making capabilities that manifest themselves in a wide range of metrics, such as decreased inventory (raw materials, in-process and finished goods), personnel reductions, speeding up the financial close process, and others. Thus, ERP can be used to help firms create value. In particular, ERP facilitates value creation by changing the basic nature of organizations in a number of different ways.

ERP Integrates Firm Activities

As noted by Hammer (1997), "[i]ntegration is the defining characteristic of SAP." Enterprise resource planning processes are cross-functional, forcing the firm out of traditional, functional, and locational silos. In addition, an organization's different business processes are often integrated with each other. Further, data that were formerly resident on different heterogeneous systems are now integrated into a single system.

ERPs Employ Use of "Best Practices"

Enterprise resource planning systems have integrated within them a thousand or more best practice business processes. Those best practices can be used to improve the way that firms do business. Choice and implementation of an ERP requires implementation of such best practices.

ERP Enables Organizational Standardization

Enterprise resource planning systems permit organizational standardization across different locations. As a result, those locations with substandard processes can be brought in line with other, more efficient processes. Moreover, the firm can show a single image to the outside world. Rather than receiving

different documents when a firm deals with different branches or plants, a single common view can be presented to the world, one that puts forth the best image.

ERP Eliminates Information Asymmetries

Enterprise resource planning systems put all the information into the same underlying database, eliminating many information asymmetries. This has a number of implications. First, it allows increased control. As noted in Brownlee (1996, p. R17) by one of the users, "[i]f you don't do your job, I can see that something hasn't been done." Second, it opens up access to information to those who need it, ideally providing improved decision-making information. Third, information is lost as a bargaining chip, since information is now available both up and down the organization. Fourth, it can "flatten" an organization: because information is widely available, there is no need for non–value-adding workers whose primary activity is to prepare information for upward or downward dissemination.

ERP Provides On-Line and Real-Time Information

In legacy systems, much information is captured on paper and then passed to another part of the organization, where it is either repackaged (typically aggregated) or put into a computer-based format. With ERP systems, much information is gathered at the source and placed directly into the computer. As a result, information is available on-line to others, and in real time.

ERP Allows Simultaneous Access to the Same Data for Planning and Control

Enterprise resource planning uses a single database, where most information is entered once and only once. Since the data is available on-line and in real time, virtually all organizational users have access to the same information for planning and control purposes. This can facilitate more consistent planning and control, in contrast to legacy systems.

ERP Facilitates Intra-Organization Communication and Collaboration

Enterprise resource planning also facilitates intra-organization (between different functions and locations) communication and collaboration. The existence of interlocking processes brings functions and locations into communication and forces collaboration. The standardization of processes also facilitates collaboration, since there are fewer conflicts between the processes. Further, the

single database facilitates communication by providing each location and function with the information that they need.

ERP Facilitates Inter-Organization Communication and Collaboration

The ERP system provides the information backbone for communication and collaboration with other organizations. Increasingly, firms are opening up their databases to partners to facilitate procurement and other functions. In order for such an arrangement to work there needs to be a single repository to which partners can go; ERP can be used to facilitate such exchanges.

What Is the Purpose and Scope of This Book?

The purpose of this book is to examine some of the most important and interesting issues, cases, and ideas associated with ERP systems. However, this book is not an ERP encyclopedia. It focuses on those issues that are critical to consultants and managers. Also, it focuses on those notions that are more unique to ERP rather than to software in general. For example, although project management is critical to any ERP implementation, it remains project management, and a great deal of material is available on information systems project management in other sources. The book does not focus on the hands-on issues, since those issues differ from software to software and information is available from a number of other sources. For example, a detailed analysis of SAP is available in ASAP (1996) and Curran and Keller (1998). This book rarely focuses on details associated with a particular ERP system, although specific systems are sometimes used to illustrate certain concepts.

What Is the Outline of This Book?

This book focuses on five primary aspects of ERP systems:

    (1) background (Chapter 2),
    (2) systems and their capabilities (Chapters 3–6),
    (3) ERP system life cycle (Chapters 7–13),
    (4) electronic commerce (Chapter 14), and
    (5) risk (Chapter 15).

Background

A wide range of information and other technologies are necessary to drive ERP systems, including client server computing, networks, relational database systems (and data warehouses), software concepts (including package software

and legacy software), requirements analysis concepts (e.g., "as is" modeling),
and reengineering.

Systems and Capabilities

Analysis of ERP systems and capabilities starts with the ERP vendors and part-
ners, reviews some of the modules available in two ERP systems, and discusses
issues such as using ERP software from a single vendor or a "best of breed"
approach. In addition, the models and processes at the base of ERP applica-
tions are reviewed, along with a short summary of how ERP systems work.
Then a detailed analysis of ERP data input and output is made in order to deter-
mine potential sources of ERP costs and benefits. Finally, the advantages and
disadvantages of "clean slate" reengineering versus ERP technology enabled
reengineering are discussed.

ERP Life-Cycle Issues

The chapters in Part Three of this book incorporate a general life-cycle model
of the process that a firm goes through with ERP systems. This cycle may be
broken down as follows.

- Deciding to Go ERP
- Choosing an ERP System
- Designing ERP Systems
  - Should Business Processes or ERP Software Be Changed?
  - Choosing Standard Models, Artifacts, and Processes
- Implementing ERP: Big Bang versus Phased
- After Going Live
- Training (an issue of concern *throughout* the entire life cycle)

Electronic Commerce

Enterprise resource planning provides information backbone that can provide
a basis for building electronic commerce applications. Ultimately, ERP sys-
tems must integrate with other systems, or ERP vendors must generate their
own solutions to electronic commerce. In either case, ERP systems can facili-
tate electronic commerce.

Risk

This introduction has focused on the positive side of ERP systems. Yet where
there are huge opportunities for growth and value creation, there are also huge
opportunities for risk. Our analysis presents a model that is based on identify-
ing risk throughout the life cycle.

Materials in This Book

Chapters

Each chapter addresses a relatively independent chunk of ERP material. In general, however, the material builds as the book moves from chapter to chapter. Throughout, a wide range of real-world examples are used to illustrate or generate major points about ERP systems. Those examples come from the literature as well as from interviews with a number of companies.

Appendices

Appendices take three different forms. First, there are "long cases." Geneva Steel (Appendix 3-1) provides insight into expectations for ERP systems and addresses some cultural issues of change. Microsoft (Appendix 9-1) provides an investigation into the different organizational entities involved in the choice of an ERP system and allows analysis of the issue of whether to change processes or software. Quantum (Appendices 11-1–11-3) provides insight into the implementation process.

Second, there are "short cases." Quantum (Appendix 5-1) allows analysis of virtual data warehouses and how they interface with ERP systems. Chesapeake Display and Packaging (Appendix 8-1) provides a real-world example of a firm's choice process between different ERP systems. Appendix 8-2 summarizes one inquiry that I received from a CFO regarding his firm's choice of an ERP system. A case study of XYZ Company (Appendix 12-1) provides insights into some of the concerns that a medium-sized firm had regarding evaluation of its ERP system. An interview with Les Porter (Appendix 14-1) provides some insights into an emerging form of Internet-enabling ERP, using J.D. Edwards as an example.

Third, the appendices provide more detail on ERP information. "In-House or Outsourced" (Appendix 7-1) provides some drill down on an increasingly important way of going ERP. Deloitte Consulting's post-implementation checklist (Appendix 12-2) provides a quick summary of some key post-implementation information.

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