The ERP Revolution: Surviving Versus Thriving

Jeanne W. Ross

August 1999

CISR WP No. 307
Sloan WP No. 4086
© 2001 Massachusetts Institute of Technology. All rights reserved.
Title: The ERP Revolution: Surviving Versus Thriving

Author: Jeanne W. Ross

Date: August 1999

Abstract: This paper presents preliminary findings from a research project that examined how firms are generating business value from their investments in enterprise resource planning implementations. The research, which was done jointly with Benchmarking Partners, describes the stages of ERP implementations, the obstacles that firms encountered in generating benefits from the system, and some critical success factors. This research report will be the basis for a paper that examines the implications of ERPs on organizations.

13 pages

This paper is also available as Sloan Working Paper No. 4086.
Introduction

Recognizing the need to present a single face to global customers, to respond rapidly to customer demands, and to seek out economies of scale, business executives are reexamining the capabilities offered by information technology. In the process many firms are ripping out the legacy systems that form the base of their information processing capabilities and installing enterprise resource planning systems (ERPs). ERPs replace a firm’s disparate transaction processing systems with an integrated system that embodies the newly understood tight interdependencies among a firm’s functional units. ERPs hold much promise for revitalizing IT infrastructures and enabling global business process integration, but implementation of these highly touted systems has proven to be very expensive and the rewards for implementation appear to be elusive. In this white paper, I will share the experiences of fifteen manufacturing companies that have completed a significant ERP implementation and are attempting to generate a positive return on their ERP investment.

The research study

This research examined the impacts of packaged ERP systems on organizations. Specifically, it was intended to identify how firms were leveraging their ERP environments to generate business value. Thus, we intended to identify firms that had gone live with one of the leading ERP packages (SAP, Baan, PeopleSoft, or Oracle) firm-wide or within a major division. All implementations included manufacturing modules and some combination of financial, sales and marketing, and other modules.

Data was collected in August and September, 1998, and involved forty hour-long telephone interviews at fifteen different companies. Interviews at each firm sought three different perspectives on the ERP implementation: (a) an executive who sponsored the implementation, (b) a manager who headed up the implementation, and (c) a business executive whose function or division was impacted by the implementation. The sample intentionally sought diversity in the ERP packages. Eight of the firms had deployed SAP, three had implemented Baan, another three used Oracle, and one was a PeopleSoft client. Implementation costs, which included internal personnel costs in only half the firms, ranged from $2 million to $130 million. Implementation time from the signing of the contract until the final “go-live” ranged from one to five years. The firms ranged in size from $125 million in sales to over $25 billion (US).

Motivation for an ERP

All respondents provided insights into why their firms had adopted an ERP. In many cases, the reasons differed across the respondents in the same firm reflecting the multiple factors motivating their decision. The six most common reasons cited by respondents for their ERP implementations were: (1) need for a common platform, (2) process improvement, (3) data visibility, (4) operating cost reductions, (5) increased customer responsiveness, and (6) improved strategic decision making. These reasons proved to be interrelated, as the new systems platform enabled new capabilities which were expected to generate important performance outcomes (see Figure 1).
The dominant motivation for an ERP was to provide a common systems platforms. For one firm Year 2000 compliance was the driving concern. But for the other firms that mentioned Y2K as a concern, it proved to be merely the catalyst to replace an aging IT infrastructure with one that was more manageable and more of an enabler for new business processes. For example, at one firm, the cost of Year 2000 compliance was estimated at $30 million, which was equal to the estimated cost of implementing SAP. The firm decided to implement SAP as the single solution to its Y2K problem and its need for a common systems platform to support the business.

Several firms deployed an ERP to replace legacy systems that had been built on a myriad of outdated technologies, which had led to high-cost support. The ERP would standardize much of their IT environment which they had expected would lead to lower cost support. For some firms the more critical issue was the difficulty of integrating the disparate systems that had grown up over time. At one firm a new system had so many interfaces with existing systems that integration testing took nine months and no one wanted the system by the time it was ready to go live. At several firms, the systems integration challenge resulted, at least in part, from mergers and acquisitions. Through business combinations these firms had inherited systems that did not integrate effectively with similar systems. One firm in the study had twenty-three different accounting systems; another had fourteen bills of material. These developments had made firms’ underlying information platforms highly inefficient and unreliable, and for some firms, it had become difficult, if not impossible, to compete in a global environment.

A majority of the firms expected that their new ERP-based systems environment would enable process improvements. In some cases, they were looking to specific processes, such logistics, production scheduling, or customer service. These tended to be cost-driven reasons for ERP implementations. In other cases, management was more generally concerned with process standardization to ensure the quality and predictability of their global business processes. Through process standardization these firms anticipated reduced cycle times from order to delivery. These firms tended to be driven by concerns over customer responsiveness.

Another motivation for an ERP was data visibility. Because ERPs are highly integrated, they have the potential to make much better decision-making information available to managers. This visibility, which gives an end-to-end view of supply chain processes, was expected to improve operating decisions. In addition, respondents viewed this data visibility as key to their ability to present a single face to distributed customers and to recognize global customers as a single entity. The impact of data visibility was expected to extend to strategic decision making. The online, real-time transaction processing characteristic of ERPs can provide current rather than historical information on a firm’s performance thereby facilitating increased responsiveness to market conditions and new internal capabilities.

Although respondents were very clear about their motivations for adopting ERPs, they often had not established metrics for determining how well they were achieving their objectives. The most common metrics focused on cost reduction objectives. Other metrics monitored customer responsiveness in terms of customer satisfaction, and measured process improvement in terms of inventory value, inventory turns, time to delivery, order accuracy, and related process metrics. But most of the firms had been live with the system for less than a year and felt that that they were not yet able to see measurable benefits from their new platforms. Consequently, it is
difficult to distinguish more successful from less successful firms in this study. Nonetheless, the evidence that emerged from the interviews indicated that all firms were generally on the same path and that success depended upon a firm’s ability to traverse that path.

**The Stages of an ERP**
The stages of an ERP resemble those of a diver escaping from an island prison. First, the diver plans an approach, carefully considering whether to follow through on his intentions and mapping out the path he will take. Second, the diver takes the dive off a cliff and heads toward the bottom of the sea. Third, he attempts to resurface, anxious to do so before he runs out of breath and hopeful that he will not be shot when he emerges. Fourth, the diver reaches the surface and starts to swim to freedom. Finally, if the diver is successful, he arrives at a distant shore, transformed from prisoner to free man.

The comparable stages in the ERP journey are (1) design, (2) implementation, (3) stabilization, (4) continuous improvement, and (5) transformation. These stages as they relate to organizational performance are shown in Figure 2. I will briefly review each stage.

**The Approach—ERP Design.** In the planning stage firms made two important design decisions. First, they decided whether or not to accept the process assumptions embedded in the software. While all four software packages provided choices in how the software could be configured, they embodied some assumptions as to how data should flow through the system. This created a kind of “technological imperative” relative to traditional systems development approaches, where managers had decided on processes and then built systems to support them.

One important assumption of an ERP is process integration. Most firms had established linkages among their legacy transaction processing systems but these existed as bridges between systems so that system users or operators controlled the access to the bridge and determined when and how data was shared between systems. With these ERP packages, data flows much like a river. Once data enters the system, users lose control over where it flows. It is absorbed by the system and has a pervasive effect on organizational processes. In firms where managers wanted to change their technology platform, but not their organizational processes, management sometimes resisted process changes required by the system. As one respondent explained:

*We did not intend to change processes; we wanted a better system that allowed us to do things the way we’d always done them. (Cost accounting supervisor)*

In contrast, other firms had intended, when they implemented their ERPs, to adopt the “best practices” embedded in the software. They portrayed a very different attitude toward process change:

*With Baan, we have to fit the organization around the software, so process change is inevitable. (Demand manager)*

Firms that accepted the “technological determinism” of their ERP generally rejected requests to customize the software. A CEO whose firm had just completed its second ERP implementation
noted that one difference between the firm’s first and second implementations was its approach to customization:

*We told people that they could write down every change they felt they needed on this piece of paper and we would take it to the steering committee who would reject it.* (CEO)

Firms that wanted to limit process change or to dictate the nature of such change typically had to customize the software in order to do what they wanted to do. This customization allowed the firm to engineer its processes but it also led to concerns about the ability to support the system and manage new releases.

The second design decision firms made was regarding process standardization. Senior management decided the scope of process standardization, specifically whether processes would be standardized across the entire firm or only within certain subunits. This was a key decision because it was difficult to change after the ERP was in place. One respondent noted that an ERP is like concrete—easy to mold while it is being poured in but nearly impossible to reshape after it has set. Generally, firms with related businesses found merit in standardization across business units, but not all adhered to an architecture that called for a single instance of the system. One implementation head whose firm had installed separate instances at each site explained the rationale:

*Culturally, it was not possible to do this any differently. It would have been cheaper to have a single installation throughout Europe, but it never would have gone in, due to our culture of autonomy.* (Project Director)

**The Dive—Implementation.** While most firms carefully planned for implementation, deploying implementation teams that trained users on the new system and, to some extent, on new processes, most found that the “go live” tended to be highly disruptive. This was because the new system tended to be married to new processes. It was not possible to implement them at two separate points in time because they were highly interdependent. Consequently, the “go live” introduced major organizational change. One manager described the resulting confusion this way:

*It’s like turning out the lights, people don’t know where they are going—sometimes they end up in a different room.* (Business Manager)

In most cases, managers involved with the implementation found they had underestimated the extent to which individuals would be affected. Asked what they would do differently if they were to do the ERP project again, most responded that they would offer more training on how the system would change business processes. One respondent noted:

*People thought they’d implement the system and then go back to life as usual. They need to understand that we aren’t going back. With a big package like this, life is permanently changed. It’s a commitment to a new way of life.* They say ‘go
away and let me do my job,’ but that’s not going to happen. (Director, IS Operations)

**Resurfacing—Stabilization.** All fifteen firms in the study noted that immediately following implementation, there was a period of stabilization, during which the firm was attempting to clean up its processes and data and adjust to the new environment. All firms acknowledged an initial performance dip, although some firms that had staged multiple implementations found they were able to minimize the impact in later implementations. Although the typical stabilization period for a first implementation appeared to be four to twelve months, the intensity and length of firms’ performance dips varied. Some firms had particularly difficult stabilization periods:

> When we first put it in, it was a disaster. The system was so slow that we had to limit the number of users in each area, so some transactions couldn’t be entered. People were working crazy hours just to catch up on the data entry. Things weren’t getting shipped. Some orders were wrong. Customers were furious. The really horrible pain lasted for about four months, until we replaced our database with Oracle. We are just now reaching stabilization (18 months after go-live), where we are operating at about the level that we were before we put the system in. (IT Manager)

Typical activities during stabilization included cleaning up data and parameters (sometimes referred to as business rules), providing additional training to new users, particularly on business processes, and working with vendors and consultants to resolve bugs in the software. At most firms, some early benefits of the ERP started to emerge during stabilization. Many observed that end-of-period reporting cycles had been reduced. And the process of cleaning up the data led to significant improvements in understanding firms’ products and processes:

> Our bill of materials is in better shape. It is more accurate and provides greater detail than before. Thus, information is higher quality. We are getting better data on what we’re shipping. For example, one assembly had 114 options, but 97% of customers ordered one of seven, so we have reduced the number of options available. (Director of Finance)

**Swimming: Continuous Improvement.** Following stabilization, firms entered a stage in which they were adding functionality through new modules or bolt-ons. In particular, they were implementing EDI, bar-coding, sales automation, warehousing and transportation capabilities, and sales forecasting. Approximately half of the firms in the study were in this stage (the other half were still in stabilization) and these firms were starting to generate significant operating benefits. One firm had cut inventory by 30% in the first year, another had increased inventory turns from eight to twenty-six times a year. A third firm had improved its order fill rate from 95% to 98%, and another had cut $35 million out of logistics expenses. Respondents also noted that they had closed plants, reduced headcount through consolidation, optimized transportation, and reduced working capital. Less tangible results include simplified systems support, increased flexibility to adapt to external changes like the adoption of the EMU, increased system reliability, and improved sales force morale.
During this stage firms were primarily focused on continuous improvement but they were starting to engage in process redesign and they implemented new structures and roles to leverage the system. In particular, most firms were adopting process orientations in their firms. This typically meant that they had become more matrixed, such that new process teams or process executives were added to the firm’s formal structures. A number of firms had added new roles such as data police or a process team, who had responsibility for ensuring the integrity of the firm’s data and processes and for identifying opportunities for process change.

**Transformation.** Although none of the firms in the study felt they had transformed themselves, several were looking ahead to that stage. In particular, managers were anticipating that they would leverage organizational visibility for increased agility. One senior manager noted:

> We will focus more on combinations of products and services to address customer needs. Over the last 50-60 years we sold what we wanted to make. In the future, we will provide the products and services that customers need, relying, when necessary, on external sourcing. This means we will be increasingly connected with our suppliers, partners, and customers. (Business Vice President)

Other respondents noted that transformation would involve changing organizational boundaries, particularly with regard to systems. One CIO expects that his firm “will see our customers’ sales trends vs. plans quicker than they will.” The extension of the firm’s ERP into customer and supplier systems was cited as a likely scenario at a number of firms.

In summary ERPs appear to hold the potential for significant business process improvements, customer responsiveness, and strategic decision making. However, realizing those benefits requires some persistence through wrenching organizational changes. It is not clear how many firms that have or are implementing ERPs will actually achieve the benefits. What is clear is that there are a number of possible pitfalls that put the benefits at risk, and that careful planning can reduce the risk of failure.
Obstacles to Success
Despite the bountiful literature on the things that can go wrong in an ERP implementation, most firms were not well prepared for the organizational changes that their implementations wrought. This section will discuss four types of pitfalls reported by study participants:

1. Failure to establish metrics;
2. Inadequately resourcing the post-implementation stage;
3. Ignoring management reporting requirements;
4. Inadequately addressing resistance to change.

**Metrics.** The organizational changes that accompany ERP implementation are enormous, and managers in most firms under-estimated the scope of the outcomes they should have anticipated. The business cases for the ERP implementations tended to be vague—often referring to the need for a more solid infrastructure without quantifying anticipated business benefits. Consistently, firms that did not have clear performance metrics that clarified expectations for their ERPs were unable to determine whether they were benefiting from the implementation. The stabilization period for these firms was particularly discouraging because everyone could see the problems and few people could see any benefits, whereas firms that had established metrics could identify some improvements even as they dealt with the confusion of major process change. In some cases, the actual performance benefits were different from those anticipated, but a lack of metrics proved to be a much bigger problem than vague or non-existent metrics:

> One thing we definitely should have done was to set some much more specific performance targets and establish a way of tracking them. We didn’t identify tangible benefits like inventory turns, cycle time improvements, cost reductions. If we were to do this again, we should have clear goals and an understanding how we would achieve them. We need that clarity. (Director of IS Operations)

**Ongoing Resource Requirements.** Because the cost of implementing an ERP was high, management tended to be anxious to declare victory and move on to other concerns. Respondents noted, however, that the post-implementation stage was critical to receiving value from the ERP. Typically, implementation resulted not only in new processes, but in some processes that had been automated becoming manual. Consequently resource requirements increased in some areas. In addition, the post-implementation stage involved some sorting out of opportunities for process redesign. In this stage, firms were adding functionality and reengineering processes. Thus, the firms that were most excited about the benefits they were receiving were continuing to pour significant resources into the ERP program. They found that management must aggressively pursue ERP benefits but at most firms it was difficult to sustain management attention:

> There is some low-hanging fruit available immediately but some managers may not recognize it and thus it won’t get picked. The problem is that most plant managers have no clue what they’re getting into. They are very busy being prosperous right now. The changes required by the ERP could be viewed as hurting the business in the short run because they are at capacity. (CIO)
**Management Reporting Requirements.** A number of respondents noted that their ERP was an effective on-line transaction processing system but that it was not a management support system. Thus, the increased availability of data did not translate into management information. In some cases, this meant that management could not determine how the business was performing after systems implementation. While many respondents recognized the potential for improved management reporting, they cautioned that querying was not easy, and managers were inclined to rely upon formal reports.

**Addressing Resistance.** It is not surprising that a systems implementation as large as an ERP would encounter resistance. What was interesting about the resistance described by respondents in this study was the variety of forms it took. In most firms there was traditional resistance to changes in individual jobs. Often these changes were significant:

> Persons in mid-level positions have, in many cases, been the most susceptible to job changes and some are very uncomfortable with them. For example, the materials manager used to be “action central.” Everybody gave him information and he made decisions. Now SAP accumulates the information so that everyone can make decisions locally. The materials manager will try to subvert the system rather than recognize that the nature of the job has changed. He should be identifying ways that people can make better decisions, work at improving organizational processes. Instead he wants to keep sole access to information. (Functional Leader)

A more difficult form of resistance could be called intellectual resistance. The ERPs required that employees understand general business processes well beyond their immediate responsibilities. Employees who had difficulty grasping how their behaviors could affect operations several processes removed from theirs could introduce contaminated data into the system. For example, in one firm goods that were in inventory could not be shipped because the system did not believe they existed. Thus, employees had to understand standardized process and comply with them:

> It is very hard for people to change from things they know well and are good at. We find that the people who were most effective in the old environment were those who knew how to “beat the system.” With SAP beating the system is not good; what’s good now is discipline. These people have a lot of unlearning to do and it’s very painful. (Business Vice President)

A third form of resistance was rooted in company culture and politics. It has become politically incorrect to speak of a technological imperative, so most managers involved in ERP implementations talked instead of how the system would “enable” change. Nonetheless, the experience of persons using the system was that a computer was dictating how they would do things. At one firm an influential mill manager publicly insisted that “no blankety-blank computer is going to tell me how to run my business.”

Firms were addressing resistance in a variety of ways. New incentive programs that emphasized stock options were being used to focus attention on corporate goals. This helped ease individual
resistance. Training was particularly important for teaching new processes and better understanding of the business. One firm, which allocated 20% of its ERP program budget to training implemented a unique change management training program:

> We are putting everyone through a 2-hour change management session that is training people not only on systems and processes but on how they will feel. In this session, we are explaining that: people will have to think differently about the way they do their jobs; that there are new emotions they will have and that it’s ok to be “ticked off,” that this won’t be easy; and that not only will the system not do everything they are accustomed to systems doing, it will do things for them that they were comfortable with and wanted to continue to do. (CIO)

Firms that recruited new employees found that they were often attracted to the new systems and processes. One executive noted that SAP had had a positive influence on college recruiting, because it provided an image of being state-of-the-art.

**Discussion**

For the firms in this study the difficulty of implementing an ERP was not the introduction of a new system, nor was it the simple fact of change. The real challenge was that, as part of their ERP implementations, these firms were instilling discipline into undisciplined organizations. This was a major cultural change—one that did not immediately look to many employees like an improvement. Thus, firms that were progressing to continuous improvement and possibly to an eventual transformation were doing more than addressing the obstacles to ERP implementation. Typically, strong senior managers were demonstrating their commitment to their firms’ ERP initiatives in a number of ways:

1. They assigned their best people 100% of the time to the project.
2. They developed a clear business case that clarified performance objectives.
3. They demanded regular reports based on established metrics.
4. They communicated goals and established program scope.
5. The established a long-term vision.

Senior executives who were committed to generating benefits from ERP implementations were dogged in their determination to instill a new culture of organizational discipline. This meant that they implemented mechanisms to sustain standardized processes and data. In addition, they communicated the paradox that standardization is key to flexibility. In doing so, they extolled the virtues of a disciplined organization as one in which the predictability around transaction processing would ensure quality processes and empower decision makers to respond to customer demands:

> In a way, we are slaves to the system and we have accepted the technological imperative that that implies. We cannot improvise on process because such innovations will ripple through the company and cause problems for someone else. It frees us in other ways to do the things we want to do. (CEO)
Ultimately, an ERP implementation can lead to a totally new organizational environment characterized by an increased emphasis on process, strategic vendor alliances, and constant change. In this environment the focus on organizational process will require technical and process expertise that will allow constant reassessment of organizational processes and the systems they depend upon. While processes will be standardized, they will not be static. Firms will introduce process changes mandated by new software releases. Simultaneously, they will identify process changes that respond to new customer and market demands and look for software modules or bolt-ons that support new process requirements. Unlike the legacy systems of the past that constrained organizational process change, ERPs, due to regular upgrades, will force change on already dynamic organizations.
Figure 1: Motivations for ERP

- Process Improvement
- Data Visibility
- Common Platform
- Cost Reduction
- Strategic Decision Making
- Customer Responsiveness

Infrastructure  Capability  Performance
Figure 2: Stages in the ERP Journey

- Design
- Implementation
- Stabilizing
- Continuous Improvement
- Transformation