

ERP: Payoffs and Pitfalls

Takeaway: Want to get a good argument going in IT circles? Ask someone about the effectiveness and return on investment of enterprise resource planning software--programs designed to integrate the scattered functions of a company onto a single computer system.

Enter Harvard Business School postdoctoral fellow Mark J. Cotteleer, whose recent working paper explored the influence of ERP software on a company's operational performance. In general, he says, ERP has paid off for companies that install systems correctly. In an e-mail interview with HBS Working Knowledge's Sarah Jane Johnston, Cotteleer discusses the success and failures of ERP programs and how to avoid implementation pitfalls.

Q: What is the investment in ERP today, and at what rate are companies implementing these software applications? A: The market for enterprise-level software applications in 2001 was estimated at \$47 billion and continued to sustain double-digit growth rates. ERP application spending alone accounted for 40 percent of that amount, or about \$19 billion (growth was about 6 percent). Other implementation expenses including hardware and implementation consulting services add substantially to this total. It is not uncommon to estimate that hardware, training and implementation services will amount to somewhere between 300 percent and 500 percent of the amount a company spends on software.

In general, has ERP fulfilled its promises to users? We have all heard about a handful of high-profile implementations that have met with trouble. Hershey could not ship candy at Halloween, Nike lost shoe orders and Foxmeyer could not process orders. Because of the size and scope of many of these implementations, failure can have spectacularly bad consequences.

In general, however, I think there is reason to be optimistic about the payoffs companies are getting out of ERP. Our research is beginning to reveal the kinds of improvements that companies are seeing in operational measures such as order lead times, collection periods, and on-time shipping. Broader company-level studies have demonstrated higher-level benefits in measures such as ROA, productivity and even market capitalization. Finally, executives have spoken. In our most recent surveys of information technology executives, 86 percent describe their implementations as successful, more than 60 percent also report that the benefits of these implementations exceeded expectations.

Of course, sometimes companies are disappointed. Turning the above executive statistics on their head, we see that 14 percent of implementations are troubled or abandoned and 40 percent either just meet or fall short of expected benefits. These figures represent significant numbers of companies. Implementation is costly and time-consuming, and very often exceeds estimates of required resources. The key is to have a prepared organization and an effective plan for implementation.

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~Mark J. Cotteleer, postdoctoral fellow, Harvard Business School

Is there a particular company or industry that has had success as an early adopter?

Two companies that we often use as examples are **Cisco Systems** and **Tektronix**. Cisco represents the classic, accelerated implementation approach. They claim to have implemented ERP in nine months for \$15 million. Cisco had many advantages as they embarked on their initiative. They were much smaller then than they are now, and had a relatively simple legacy environment. However, at the time they were also experiencing exponential growth and the failure of their legacy information systems. They did many things right to get the system selected, implemented and stabilized in a relatively short period of time.

Tektronix faced a much different implementation challenge. As an older company, primarily a manufacturer of measurement instruments and color printers, they faced a much more complex legacy environment, a more diverse product family and a more geographically distributed implementation rollout. Tektronix provides an excellent example of how functionally and geographically phased implementation can work. Both the Cisco and the Tektronix implementations are well documented in the teaching cases we use with our students.

As much as their implementation approaches, what sets these two companies apart is what they were able to do post-implementation. Cisco has been able to document billions of dollars in value that stem, in large part, from their ability to build off a solid, integrated information technology infrastructure. Tektronix was able to leverage their new infrastructure not only to improve data visibility across the enterprise, but also to clearly identify operating relationships in support of their strategy for business acquisition and divestiture.

Your research demonstrates how ERP can improve order lead-time. Can you describe how this technology impacts overall operational performance? Once a system is in place, how can managers maximize performance improvements over time? I think there are both short-term and a long-term answers to that question. In the short term, managers need to focus on stabilizing new processes and technology, and on providing an environment where people can learn to use them. Users need time to translate the training they have received to action in a live environment. This can be a difficult process for many. In order to help them, I would recommend the following:

Stay the course. There are likely to be many things that you would have done differently had you only known better during the implementation. It will be tempting to try to address those things right away. I would resist that temptation for a couple of months if possible. Otherwise the company faces the risk of creating a moving target when it comes to employees learning their new roles. Furthermore, understanding may still be imperfect. In trying to resolve an issue you may unintentionally create others. Of course, this warning does not extend to technical or process issues that critically impact operations. The most severe problems may need to be addressed right away.

Deploy "super users." Super users are members of the user community that participated in the implementation project. These individuals can represent important sources of credibility and vicarious knowledge that other employees will rely on during the first weeks following implementation. Shrewd managers will assemble implementation teams with an eye toward how these valuable resources will be reintegrated back into the organization following deployment.

Consider buffering performance with capital (human or otherwise). It's natural to expect some difficulties right after implementation. Even Cisco and Tektronix--our examples of successful implementation--faced initial challenges. One way to support performance in the short term is to apply greater resources than would normally be used. This might mean building inventory prior to implementation in order to keep order lead time down (as the company we studied did) or staffing up in accounting in order to close the books for the first couple of months. Of course this cannot be a long-term strategy, but it may help get the company through those first difficult months before people really get used to the new technology and process. In the long term, companies should look for opportunities to resolve post-implementation issues and to reduce the capital needs of the company (if that is one of its goals).

The post-implementation period can bring dramatic value to companies if they keep a couple of things in mind:

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ERP is the beginning, not the end. Cisco Systems' example illustrates the value that can be achieved when companies view their ERP implementations as laying a foundation for their IT infrastructure. Clearly the company benefited from the implementation of a stable transaction platform represented by ERP. However, the explosive value they realized came from their ability to leverage the ERP investment in new directions. For example, supply-chain initiatives such as direct fulfillment and dynamic replenishment were made possible for Cisco only after they had used ERP to implement standard processes and data.

Protect the data. Information systems evolve over time in response to the demands of their environment. Managers presented with opportunities to expand an ERP solution or to provide targeted solutions for different constituencies across the company must ensure that in executing these opportunities they do not allow IT infrastructure attributes to drift from the ERP-imposed standards that made them effective.

Most specifically, managers should protect data standards and integration. Departure from data standards introduces inefficiencies in communication and understanding as different parts of the company must, once again, struggle to translate the information they obtain from elsewhere. Integration failures create repositories of information that may evolve along separate paths, serving different purposes. Eventually, the company could find that, through a lack of discipline, its information systems architecture has once again evolved into a hodge-podge of nonintegrated, noncommunicating technology islands that hinder rather than support the

business objectives of the company. I would note that alternatives do exist for maintaining links between data. If the company finds that it must introduce special purpose data standards, it can at the very least make sure it retains the ability to map one standard to the other. Increasingly there are tools available to help with this.

What should managers take into consideration before implementing an ERP system? What lessons would our business readers find most interesting and useful? First and foremost, recognize that "successful" and "painless" are not the same thing. Full-scale implementation of ERP represents, essentially, a total replacement of the company's central nervous system. There are going to be lots of aches and pains along the way and things might not work perfectly right away. That said, if you adopt a determined and realistic approach, successful implementation is achievable. Among other things, I would keep the following in mind:

Know thyself. Make sure that you understand your business processes before you begin altering them through ERP implementation. Also, try to get a set of pre-implementation process performance metrics in place before you begin. Knowing your "current state" allows two things. First, it may help identify areas where process improvements can be undertaken immediately. Quick improvements can serve as morale boosters for the implementation team as well as a way to show the company early payback for its investments. Second, knowing the current-state gives the company a basis for understanding whether or not it has actually improved following implementation. It's amazing how many companies get to the end of an implementation (months or years down the line) and find that they no longer have access to the data that will help them understand how they have impacted business performance.

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The devil is in the data. Get ready to battle over things that you never gave much thought to before, and expect that more of those battles will be over data than over functionality. Some of the basic assumptions about what data mean to different parts of the business may be challenged through the implementation. Differences in commonly used data--such as customer and component information--may have historically been shielded by the existence of nonintegrated applications. Those days may be over. Over the years we have witnessed pitched battles erupt over, for example, how to define units of measure. Project managers should develop an approach to resolving these issues and defining ownership of critical data elements.

Know the difference between understanding something and liking it. Decisions will need to be made that will create winners and losers--sometimes it's a zero-sum game. The key is to recognize when this is true and to have a fair and transparent process in place for making these decisions. People need to understand how and why a decision has been made and, importantly, that it will be adhered to. Implementations get bogged down when the different constituencies within the company stop believing that everyone is in it together. Importantly, they also get bogged down when project managers focus on finding a way to make everyone happy. Sometimes that way does not exist. Managers should recognize that and move on when needed.

Were you surprised by anything in your research? What other projects or research are you currently working on? I am always surprised when managers express the fear that these systems will somehow equalize performance across companies. There are just too many other factors at play for this to be true. As the research shows, companies cannot even maintain similar performance across operating units over which they exercise complete control. ERP and other enterprise-level technologies offer a platform for business execution. The level of that execution is still dictated by people that work for the company. The best that we hope for is to succeed in implementing information technologies that will enable people to maximize the application of their talents in pursuit of company goals.

We are currently trying to extend our research findings beyond ERP to incorporate enterprise systems generally. To do this, we are continuing our work in the ERP domain, but also broadening it to include analyses of customer relationship management (CRM) implementations. One project we are working on looks at the performance of over 150 sales representatives within a company. It seeks to understand what role CRM availability and usage plays in the improvement and potential standardization of individual, rather than business unit, performance. Other projects are aimed at understanding implementation success at the project level. For example, we have just completed a study that sheds light on some of the contingencies companies face when modifying enterprise-level software packages in order to improve system performance.



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