MANAGING THE NEXT WAVE OF ENTERPRISE SYSTEMS: LEVERAGING LESSONS FROM ERP[1]

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Executive Summary

Highly complex enterprise software packages have become a standard way of competing in many industries. By the late 1990s, enterprise resource planning (ERP) systems had enabled Fortune 500 firms to present "one face" to their customers via integrated cross-functional business processes, centralized databases, and point-and-click access to real-time operational data across the business. Today, enterprise systems for supply chain management (SCM) and customer relationship management (CRM) are following in the steps of ERP, and, in many cases, providing a foundation for e-business. Supplier relationship management systems are on the horizon. Based on our ERP research, we have identified five factors for successful implementation: (1) top management is engaged in the project, not just involved; (2) project leaders are veterans, and team members are decision makers; (3) third parties fill gaps in expertise and transfer their knowledge; (4) change management goes hand-in-hand with project planning; (5) A satisficing mindset prevails. Furthermore, we found that a project's position on the maturity curve (early adopter, early majority, or late majority) can influence the implementation route. These five success factors and three maturity curve positions are illustrated in three anonymous cases. The result is lessons for managing the complexities of the next wave of enterprise systems.

Enterprise Systems Are Complex and Difficult to Implement

Enterprise systems are complex software packages that offer the potential of integrating data and processes across functions in an enterprise. Examples include ERP systems (integrating back-office functions such as materials management, order entry, distribution logistics, and financials), CRM (integrating marketing, sales, and customer service interactions with customers), and SCM (integrating processes among firms in a supply chain). Enterprise systems have gained favor because they provide enterprises with a way—albeit a complex way—to replace redundant systems that have proliferated over decades. In so doing, they give management, and others, an enterprise view, often for the first time. They create a new IT foundation for competing. Yet the first wave, the ERP

systems, has proven very difficult to implement successfully.

The early (*Fortune 500*) adopters of integrated ERP modules found them incredibly risky to implement. Although failures to deliver projects on time and within budget were an old IT story, enterprise systems held even higher risks—they could be a "bet-our-company" type of failure. In addition, the heavy reliance on consultants to reduce the risks of failure significantly increased ERP project costs. These high costs also initially deterred mid-sized firms and units of global firms from seeking the benefits of an ERP system.

We believe this first wave of enterprise systems projects holds lessons for better managing the complexity of the next wave of enterprise systems, thereby minimizing their risks and costs. Following are the five success factors that capture these lessons.

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[1] Jeanne Ross was the senior editor accepting this paper.

Five Success Factors for Managing Enterprise Systems Projects

We define systems project success as: an up-and-running system with agreed-upon requirements delivered within schedule and budget.

Over the past decade, we have studied one dozen ERP implementation projects in depth. We have also examined academic research on systems implementation practices, practitioner reports of early ERP projects, and recent ERP factor studies by researchers on four continents.[2] From this research, we conclude there are five success factors, shown in Table 1:

Table 1: Five Success Factors for ERP Projects

1. Top management is engaged in the project, not just involved

2. Project leaders are veterans, and team members are decision makers

3. Third parties fill gaps in expertise and transfer their knowledge

4. Change management goes hand-in-hand with project management

5. A satisficing mindset prevails

Two caveats apply to this model. Before describing these success factors in detail, though, we make two caveats about the applicability of this model.

First, our model has been found to be a good predictor of success for ERP projects that impact the firm's *value-chain*—for example, projects that involve multiple cross-functional modules (that is, materials management, manufacturing, sales/distribution, along with financials). However, ERP projects that involve only a single corporate function (for example, financials or human resources modules only) do not have the same complexity, due to the lack of cross-functional integration; so our model does not fit as well for these types of projects.

Second, as other researchers have pointed out, a successful ERP project phase is but one part of ERP success. Subsequent continuous improvement initiatives that typically follow have their own success factors. Furthermore, companies with a successful ERP project phase can still fail to achieve their intended ERP benefits.[3] Although our selected three anonymous companies did in fact realize significant ERP benefits, our goal is simply to provide a model of success factors that can be used to avoid the pitfalls of the project phase, not follow-on phases. We assume a successful project phase better positions a company for post-implementation success.

Here are the five success factors.

Top management is engaged in the project, not just involved. Top management support has been well recognized in the academic literature as a factor critical to successful implementation of large systems. However, because enterprise systems demand fundamental changes in cross-functional business processes, we found that not just support, but *active engagement*, of top managers is critical for enterprise system success. To achieve such across-the-company change, top management must be actively *engaged* not only in project planning but also in project execution, that is, keeping the project on track and endorsing and communicating changes in resources, schedules, and rollout plans.

Engagement means having one's own "skin in the game." We found top executives doing this through two visible means: 1) by being active members of the project oversight board, and 2) by being committed sponsors and champions.[4]

Due to the enterprise-wide nature of these systems, the executives in these roles must be at a sufficiently high level, for two reasons: first, to ensure that the enterprise system aligns with the enterprise's business processes; second, to ensure that all the relevant stakeholders buy into the goals and the needed business changes. Lower-level managers do not have the clout to achieve these two objectives.

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[2] For specific mappings to other ERP factors and tests of the model with case study data, contact the authors.

[3] For a multi-phase ERP implementation framework that emphasizes the interdependencies between the project phase and post-implementation phases, see Markus, M.L. and Tanis, C., "The Enterprise System Experience—From Adoption to Success," in *Framing the Domains*, edited by R.W. Zmud, Cincinnati, Ohio: Pinnaflex, 2000, pp. 173-207.

[4] For discussion of these roles for systems projects in general, see Beath, C.M., "The Project Champion," and Edwards, B., "The Project Sponsor," in *Information Management: The Organizational Dimension*, edited by M.J. Earl, Oxford University Press, 1996, pp. 347-358 and 359-380, respectively.

Project leaders are veterans, and team members are decision makers. Leadership and composition of enterprise project teams differ from other IS projects because enterprise projects can be "bet-our-company" projects. Increasing the likelihood of success requires internal project leaders who have already "earned their stripes" leading projects that have had major process impacts on the entire enterprise. A proven track record is crucial, due to the magnitude of these projects.

In addition, the team members—specifically the business managers with deep business process knowledge and the power users from functional units on the team—must be among the best in the business, if not the best. They also must be empowered to make decisions on behalf of their business division or function. Otherwise, the project will simply get bogged down in bureaucratic decision making. Furthermore, the business members need to be on the team full time, working alongside the technical members.

Third parties fill gaps in expertise and transfer their knowledge. Enterprise systems require multiple kinds of specialized expertise: not just know-how on managing enterprise-level projects but also knowledge about cross-functional business processes and specific vendor products and how to configure them to suit the firm's needs. More than likely, an internal team will not have all this requisite knowledge. The best way to fill the gap is to draw on the expertise of the vendor and consultants who specialize in implementing that vendor's products.

For ERP projects, for instance, clients can contract with the ERP vendor for off-site training for team members, on-site technical consulting as needed, or remote help-line support—or all three. But, to fill day-to-day roles on the internal project team, companies have typically contracted with a major IT consulting firm that has been designated as a consulting partner to the specific ERP vendor.[5] When internal project leaders lack experience managing enterprise-level IT projects, a consultant may also take on a highly visible role as team leader.

For early ERP projects, finding consultants with expertise on a given package was difficult, and finding a consultant lead who had already managed a large ERP project was even more difficult. By the late 1990s, though, it was relatively easy to find deep expertise from a third party for ERP project management, cross-functional business processes, specific ERP packages, and client-server technologies. Today, both functional and technical knowledge transfer is also typically part of the contract with a third-party implementation partner.

Change management goes hand-in-hand with project planning. Change management must be rigorously planned and generously resourced for two reasons. First, enterprise systems involve major business process changes and, for most organizations, a new way of working across functions. Second, ERP system modules are tightly integrated and usually replace large numbers of legacy systems, thereby affecting numerous departments at the same time. Thus, managers and users not only need to be trained on their new system and new processes but they also need to understand how their new processes directly impact, in real time, the work of employees in other work units.

As a result, change cannot be left to just happen. It must be managed as an integral part of the implementation plan. Bringing about such extensive changes requires sharing the vision, gaining upfront buy-in, communicating often (and to everyone affected), and providing training on the new system and business processes, via well-paced training programs.[6]

A satisficing mindset prevails. Given the complexity of enterprise systems projects, the organization's leaders need to buy into a "satisficing" mindset in which 80 percent solutions are accepted as "good enough." Our research uncovered three types of satisficing decisions.

First, while packaged solutions for a single function are typically customized to tightly fit the business, such customization does not work for large enterprise systems. Not only does customization significantly increase time and cost but it also significantly increases the project's risks. The software modules are so integrated that a change to one can affect others in unexpected ways. Customization also significantly increases the time, cost, and risks of every subsequent upgrade.

Today, most consultants recommend selecting the best suite of enterprise system modules for the entire business, and then configuring the modules in as "vanilla" a form as possible. Some functionality in the customized legacy systems will be lost, it's true, but accept-

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[5] In the latter half of the 1990s, the typical ERP project budget allocated three to five times the initial software license costs to third-party consulting costs (e.g., see Doane, M., *The SAP Blue Book: A Concise Business Guide to the World of SAP*, DA Press, 1998).

[6] For example, see Kotter, J.P., "Leading Change: Why Transformation Efforts Fail," *Harvard Business Review*, March-April 1995.

ing this 80 percent solution greatly increases the likelihood of project success. [7]

Second, the choice of deployment strategy largely determines the timeline for the project and the complexity of the project. It also requires a satisficing mindset. The choice ranges from a speedy "big bang" (cutover to all modules at once) to a phased rollout over multiple sites. Based on the traditional project metrics of on-time, within-budget, the big-bang strategy poses greater project risks. However, when compared to the risks imposed by a major, unexpected change in the business or the loss of a key top manager, the long-rollout strategy can be riskier. The goal should be to reduce complexity of implementation for the enterprise as a whole, which means the choice might be optimal for some units, but not for others.

Third, accommodating an unexpected event once the project is under way also requires a satisficing mindset. For example, the project plan may need to accommodate a major acquisition, a new supply chain initiative, or unanticipated government legislation. Accommodating these types of events is not uncommon and often requires changing project scope, publicized milestones, or both. Although such actions avoid total derailment of the project, they are often less than optimal.

The Success Factors in Action

As noted, over the past decade we have studied a dozen ERP implementations in depth. We selected the following three anonymous cases because they illustrate not only the five success factors but also different implementation paths, due to their place on the adoption curve.

According to the innovation diffusion theory of Everett Rogers,[8] the number of adopters of a new type of enterprise system will follow a normal, bell-shaped curve when plotted over time. Innovators and early adopters fall at the far left side of the curve while laggards are at the far right. But the majority of adopters fall into one of two groups: early majority and late majority.

The three projects described here cover a seven-year time span: one is an early adopter, the second is early majority, and the third is late majority. These three cases illustrate different ways that the success factors were achieved over the ERP maturity cycle. The best implementation practices from earlier projects were successfully incorporated into later projects, in different ways.

All three are manufacturing firms and all three implemented SAP AG's R/3 ERP software—the client-server version. However, in addition to the time of their implementation, these projects differed by number of system users, business divisions impacted, and geographical spread. Each case is based on interviews with more than a dozen IS leaders, business managers, and business users.[9] Briefly, the three are:

- **"Material," An Early Adopter.** Material is a $3.5 billion global manufacturer that replaced more than 200 legacy systems using a four-release implementation schedule that included all major R/3 modules except HR. The ERP purchase decision was made in late 1994, project kickoff was April 1995, and implementation was completed in late 1997. The price tag exceeded $100 million.

- **"Valvo," An Early Majority Adopter.** Valvo is a privately held $430 million manufacturer in the U.S. Midwest that replaced its major legacy systems across 15 sites with a "big bang" implementation. It included all major R/3 modules except HR. The ERP purchase decision was made in mid-1996, project kickoff was in late September 1996, and the project was completed by year-end 1997. The system was within the budgeted price tag of $17 million.

- **"Asea," A Late Majority Adopter.** Asea is a new profit center located in the Asia-Pacific region of Consumer, one of the three largest players in its industry. As part of its restructuring as a country office, Asea implemented R/3 sales and distribution, materials management, and financials. The ERP purchase decision, which required Asea to choose between two systems designated as company standards, was made in July 2000, project kickoff was in late September 2000, and implementation was completed less

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[7] For a discussion of additional resolution strategies that may be needed to address software "misfits" when Western business models are being implemented in an Asian culture, see Soh, C., Kien, S.S. and Tay-Yap, J., "Cultural Fits and Misfits: Is ERP A Universal Solution?" *Communications of the ACM*, 43:4 (April 2000), pp. 47-51.

[8] Rogers, E.M., *Diffusion of Innovations*, 4th edition, New York: The Free Press, 1995. According to this theory, 2.5% of the adopters are innovators, 13.5% early adopters, 34% early majority, 34% late majority, and 16% laggards.

[9] The authors are greatly indebted to the IS leaders and other company managers who shared their personal insights and made possible the dissemination of these ERP project lessons. Each case study has also been written as a teaching case by one or both authors.

than four months later. The price tag was $150,000.

As a group, these three cases illustrate the evolution of the U.S. markets targeted by the major ERP software vendors—from projects by large *Fortune 500* companies, to mid-size firms, to smaller projects. On a broader plane, they also illustrate approaches to managing complex enterprise systems in general. Thus, they hold lessons for managing the next wave of enterprise systems.

Material, An Early Adopter

Like other *Fortune 500* firms, Material embarked on several business process reengineering projects in the early 1990s to become a process-based organization. The new CEO set ambitious financial, business, and workplace goals for the year 2000, and the first steps toward achieving these goals involved consolidating the finance function and reengineering the firm's logistics and order-fulfillment processes. The reengineering teams concluded, however, that the existing custom-developed systems, which supported separate businesses and functions, could not be modified to support the envisioned new processes.

In 1994, the company hired a career IS executive as its first CIO, with a clear mandate to align the IS organization with the new vision and significantly cut IS operational costs worldwide. On the advice of the CIO, Material's top management team bought into the concept of implementing an ERP package to introduce simplified and common global business processes on a client-server architecture. In December 1994, a contract was signed with SAP for all its major modules, except human resources, a function already supported by the PeopleSoft package. In January 1995, the operation and support of more than 200 legacy systems were outsourced to Hewlett-Packard. These "bold moves" sent a clear signal that there would be no turning back.

By early 1995, a 100-week, four-release implementation plan had been agreed on for reengineering the company's global business processes and implementing all ERP modules across the enterprise. The aggressive timetable was meant to minimize the likelihood that a key senior business executive would "jump ship" or cease to support the project before it was completed. An executive committee established to oversee the project received weekly progress reports on weekly goals (each was 1 percent of the project). The steering committee included the CFO, three business unit heads, the VP of corporate human resources, and two other functional VPs. This high-level membership signaled to the entire company that the project had top-level leadership.

Six global development teams were formed with IS managers as the team leaders. All team members were dedicated full-time to the project and were co-located on adjacent floors at U.S. headquarters. Fully staffed, the team included about 115 business, 12 human resources, and 120 information systems personnel. Some of the business team members held high-level "business leader" roles, which meant they were accountable for obtaining buy-in to the re-engineered business processes across the business units, enterprise-wide. After the project was under way, two new internal program manager positions were filled with external hires known to the CIO. One became the IS program manager for the global development teams; the other managed the strategic vendor alliances, both for the legacy systems and the new systems infrastructure.

A Big 5 consulting firm was engaged to assist with the business process re-engineering projects. Due to their expertise in organization design and change management, these consultants continued as the third-party implementation partner on the ERP project. Initially, they played primary roles in leading the project and migrating to the new IT platform. On average, more than 50 consultants worked side-by-side with the internal team members. As the project progressed, though, Material's own managers took over all the leadership roles, and formal mechanisms were put in place to ensure knowledge transfer from the consultants to the employees. As the IS organization increased its technical and project management skill-sets, the consultants were released from the project; all full-time consultants were released prior to the final of the four releases.

From the outset of the project, process reengineering was to focus on configuring the system for "good enough" cross-functional processes. "Best-in-class" processes would become the focus during successive waves of process-driven change, as the company learned more about the package and the new functionality expected in future upgrades. Variations from common, global solutions across the business units were to be driven by customer and by product differences rather than by business unit differences. There were to be no bells-and-whistles, and bolt-ons were to be kept to a minimum.

Change management activities were led by organizational development (OD) and training specialists, who were employees within the HR department, but were assigned to the project full time. After the project was under way, the company increased both financial and personnel resources devoted to change management. In particular, the number of business employees trained as power users at headquarters was increased from 500 to 900 to achieve a 1:7 ratio of on-site trainers and support personnel at the local sites. Material's HR staff also assisted with the design of two financial incentive plans to help retain employees critical to the project. One incentive was a year-end cash bonus; the other was a project completion bonus, which consisted of stock options.

The four-release plan was carefully designed to achieve "early wins" and maintain an aggressive timetable.

- Release 1 focused on consolidating the finance function, a corporate unit with computer-savvy leaders.

- Release 2 was a pilot project to implement the full suite of modules within a European business unit whose acquisition strategy had left it with major data integration problems.

- Release 3 involved implementing the new client-server infrastructure enterprise-wide, including a new frame-relay WAN, LANs, and desktops to

Table 2: Material's Success Factors	
1. Top management is engaged in the project, not just involved	• Project clearly linked to CEO vision and sponsorship • Executive committee provided project oversight
2. Project leaders are veterans, and team members are decision makers	• Seasoned CIO accountable for project • New IS program manager assumed leadership role from consultants during the project • Co-located, full-time team members from IS, business, and HR, with project completion incentives for critical personnel • Business leader roles responsible for business process buy-in • Year-end and end-of-project bonuses to retain critical team members
3. Third parties fill gaps in expertise and transfer their knowledge	• Consultants initially responsible for project leadership, package knowledge, and business process re-engineering knowledge • Mechanisms put in place for knowledge transfer
4. Change management goes hand-in-hand with project planning	• Internal change management experts dedicated to project full-time • Expansion of training budget after pilot (Release 2)
5. A satisficing mindset prevails	• Initial project outcome to be "good enough" re-engineering, with minimal reliance on customization bolt-ons • Phased conversion strategy: financials for "early win" (Release 1), business unit pilot for all modules (Release 2), client-server platform for enterprise-wide use (Release 3), multiple business unit waves (all modules, new version of the software for Release 4) • Aggressive Release 4 schedule extended to incorporate lessons from prior rollouts, and return of business team members delayed

support more than 10,000 business users in more than 100 locations across three continents.

- Release 4 consisted of rolling out to each business unit in turn the full suite of modules of a new version of R/3 that incorporated multi-national features (legal, monetary, and linguistic).

Material discovered, however, that its initial 100-week release plan severely underestimated the time and resources needed to implement all the modules in each business unit. After the European business unit pilot (Release 2), the training budget was significantly increased to expand the training time for business process changes and to increase the number of power users (called "champions") trained at headquarters. The Release 4 rollout schedule was extended (from 30 to 60 days), to still be speedy, but not rash. However, after problems were encountered with the first business unit rollout of Release 4, the organization had to devise yet another satisficing solution: the schedule was further extended, and the business team members were delayed in returning to their business units, as was the issuance of the project completion bonus.

For a summary of how Material's project maps into our five-success-factor model, see Table 2. As an early adopter, Material was one of the first U.S.-based multi-nationals to conduct a global rollout of SAP R/3. Hence, the consultants and the IS leaders learned together how to implement ERP globally. Although the initial 100-week schedule proved too aggressive, and the initial training budget inadequate, the company "declared victory" on completion of a modified Release 4 in late 1997.

Benefits from the initial project included a 50 percent increase in inventory turns, a 20 percent reduction in administrative costs, and logistics savings amounting to millions of dollars. The CIO was tapped in subsequent years to lead a new business division, the IS program manager for the project became the new CIO, and the president of the first North American business unit to "go live" became CFO.

Valvo, An Early Majority Adopter

Among mid-size companies with its geographic dispersion, Valvo (like Material) was an early implementer of a complex, value-chain ERP suite. At the same time that Material was piloting the suite of SAP R/3 modules in its European business unit (early 1996), the VP of operations at Valvo was charged with forming an internal team to investigate the viability of im-

plementing ERP to support Valvo's anticipated growth. Like many other mid-size manufacturers in the mid-1990s, Valvo's management was "information poor." A 30-person systems development staff spent most of its time developing custom interfaces among a patchwork of aging mainframe packages running on HP and IBM/MVS platforms, and newer homegrown reporting tools on PCs, all of which "blew up" on a regular basis. A business strategy consultant had recommended to top management that Valvo needed to "cut loose" from its existing systems and replace them with an ERP solution to meet its growth objectives.

Because ERP projects were well under way at Material and other large manufacturing firms, the Valvo study team was able to benchmark its approach via on-site visits. Based on an analysis of seven vendors and its own benchmarking results, the internal study team recommended to top management that a single ERP package be purchased. Rather than attempt the best-of-breed ERP solution recommended by the strategy consultant, implementing a single vendor suite would avoid the past problems of maintaining interfaces across different vendors' products. A contract was signed with SAP in the summer of 1996 for financials, materials management, production planning, sales and distribution, and human resources modules.

From its own benchmarking of other ERP implementations, the team also learned that the consultant's recommendation to deploy ERP in a 3-to-5-year phased strategy might not be best for Valvo. Firms that had taken this "go-slow" plan did not appear to be among the more successful ones. Valvo was also much smaller than most early adopters, so its multi-site implementation appeared to be less complex. The board of directors accepted the recommended big-bang strategy, realizing it was higher risk, but also higher reward.

Valvo's CEO assumed the executive sponsorship role. He became responsible for ensuring that all VPs were not only committed to the ERP project but were also willing to empower the project leaders to make decisions on their behalf, so that speedy implementation was viable. The project leaders informed the CEO of roadblocks, which he helped eliminate. Together, they provided the executive team with regular updates, and decided which decisions to escalate to the executive leadership team.

A new CIO, who had joined the company a year earlier, co-led the project with the business leader of the ERP study team. Between the two, there was both

deep Valvo business knowledge and considerable project management expertise, including enterprise-wide IT project know-how. However, after Valvo's Board approved the big-bang strategy, the CEO appointed a third project co-leader who had recently led strategic planning and quality management initiatives. His overall role was to help mitigate the high business risks of the project. Valvo's earlier benchmarking studies had shown that "change management was a killer," so the three co-leads split their responsibilities so that each had a primary focus: technology, business processes, or change management.

A team structure with full-time business leaders, power users, and systems analysts was put in place for the core business modules (sales/distribution, finance/controlling, materials management/production planning). A "best people possible" approach, which included personality profiling, was used to select the business team members. Counting the three project co-leads, a total of seven of Valvo's 28 director-level business managers were dedicated to the project full-time.

A major remodeling project at the headquarters building made it possible to customize a large open space for upwards of 70 people so they could work near each other. To minimize interruptions, incoming phone calls were directed to a phone bank in an adjacent hallway and team members were given private voice mailboxes and pagers. The project co-leads worked from an adjacent area that was separated only by a six-foot partition.

Valvo selected an IT vendor as their third-party implementation partner based on the vendor's established relationship with Valvo and its expertise in planning and installing Valvo's new client-server architecture. Because it is more difficult for mid-size firms to get third-party help when projects hit technical roadblocks, the project leaders reasoned that by contracting for a large number of services (not only ERP project consulting but also hardware/software purchases and ongoing technical support), they would have sufficient leverage with that vendor to receive assistance when they needed it. However, identifying a project leader from the consulting firm became more complicated than expected. Many of the candidates simply did not believe in the viability of big-bang ERP implementation. Their concerns were reinforced by a high-profile guru who was proselytizing that big bangs could be "death." Like Material, the Valvo team was confident in its own capabilities, so it eventually got buy-in from a project leader in the consulting firm. Also like Material, the consultants were re-leased early—in this case, by the go-live date, rather than when the project team disbanded.

All team members were sensitized to the change management implications of the project. During the early plant visits, team members were charged with learning what each plant thought was unique so that its uniqueness could be taken into account either in the new business processes or in the training at the plant prior to go live. Power users with high credibility at the plants were purposely included in the plant visits to help foster consensus on a common set of high-level processes.

As part of the "to-be" business process documentation, core team members documented the changes needed at the individual and workgroup levels, according to seven categories, such as new work, newly automated work, eliminated activities, and work to transfer to a different workgroup. The project budget was significantly increased (30 percent) at the end of the planning phase, after the team better understood the training required to move from the current ways of working to the "best practices" involved in using the package.

Every salaried Valvo employee was motivated via a monetary incentive to do whatever was necessary to make the big-bang implementation succeed. Everyone would receive a pay bonus if the project was delivered on-time and within budget. The company's board authorized the set of measures that defined success. The set included system response time, close-down of legacy systems, book closing deadlines, and such. Eight months prior to the go-live date, all core team members were also given stock options as a retention incentive.

Several satisficing decisions were made to minimize the complexities of the big bang implementation. The HR module was excluded from the initial project and the geographical scope was reduced to include only North American sites (headquarters, 10 plants, and four distribution centers). From the outset, management also committed to a "vanilla" implementation, whereby the business would adopt the "best practices" embedded in the software package. The only changes allowed to the source code were vendor-approved changes that would be supported in future versions of the package.

A major planning assumption, which came back to haunt the project team later, was completion of a distribution center consolidation project (from 17 to four distribution centers). The consolidation project was

managed independently of the ERP project. While the technical infrastructure for the new distribution facilities was installed well before the agreed-on date, the new distribution centers were still hiring staffs when the ERP training was to begin. Consultants warned of post-implementation risks, but a project delay would impact the company-wide incentive plan, which only allowed a 30-day rollback for the go-live date.

Top management chose the 30-day rollback and the project was officially delivered on time and slightly under budget. But the project leaders had to lower management's expectations for shipping product during the initial weeks, until the new distribution center staffs were familiar with Valvo's business partners and had been trained on the new ERP system and the new business processes.

For a summary of how Valvo's project maps to our five-success-factors model, see Table 3. A few months after go live, Valvo's board declared the project a success and distributed a bonus to all salaried employees, based on the pre-established incentive criteria and a satisfactory recovery from an initial drop in product shipping schedules. The ERP project benefits include avoidance of Y2K remediation costs, a 35 percent reduction in inventory costs, and a significant improvement in order-fulfillment rates. As further evidence of success, by the end of 2000, the company had incorporated its ERP project approach into a methodology for all major projects, and major cost savings were being achieved from B2B extensions to its ERP applications.

Table 3: Valvo's Success Factors	
1. Top management is engaged in the project, not just involved	• CEO sponsored and championed the project, and eliminated senior management roadblocks • Top management committee accountable for project oversight
2. Project leaders are veterans, and team members are decision makers	• Seasoned CIO and business managers as project co-leads • Co-located, full-time team members for core module teams • 25% of business directors dedicated to project • Retention incentive for all core team members
3. Third parties fill gaps in expertise and transfer their knowledge	• Consultants provide client-server architecture expertise, package knowledge, and ERP project experience by function • Knowledge transfer included in the contract
4. Change management goes hand-in-hand with project planning	• Project co-lead and other full-time resources dedicated to change management • Documentation of change management issues incorporated into team processes • Incentive pay for all salaried employees based on detailed success metrics for the project
5. A satisficing mindset prevails	• Adoption of "best practices" embedded in the package; implemented vendor-approved source code modifications only • Big-bang strategy for speedier implementation, but lessons from benchmarking of early adopters incorporated into project plans to reduce implementation risks • Exercised 30-day delay for go-live date and lowered management expectations for initial weeks due to delay in consolidation project on critical path

Asea, A Late Majority Adopter

In the second quarter of 2000, Asea was identified as being in a key growth market in the Asia-Pacific region by its consumer-products parent based in the United Kingdom (Consumer). Until that time, Asea had been a small branch office with no importing, direct sales, or distribution responsibilities. The business plan was to establish Asea as an independent end market, which, in keeping with Consumer's mainly country-based operations, would be managed as a profit center. Asea was to begin direct importing by January 1, 2001, which meant it had six months to implement a new system to support direct selling and inventory management for multiple sales channels.

Consumer delivers IT services under a shared services model operating out of three regional data centers, in Europe, North America, and Asia-Pacific. Within each region, IS organizations provide support services to groups of end markets (such as, identifying IT solutions, building business cases for IT projects, and coordinating internal and external personnel).

The corporate IS group at Consumer is responsible for setting strategy and determining global IT platform standards. Each end market, though, can choose which platform standard to implement as well as the timing of the implementation. Two ERP package standards had been selected a few years earlier because the standard for operating units in the larger, more complex markets (SAP R/3) had proven too costly for the operating units in the smaller markets. But the ERP standard for the smaller markets was not viewed as optimal for rapidly growing markets because it was not scalable. Thus, Asea's had a decision to make: SAP or not.

A factor in favor of SAP was the expertise housed in Consumer's Asia-Pacific data center. Due to a combination of reasons, including government incentives and low labor costs, the Asia-Pacific center was located in Malaysia. In 1999 it evolved into a shared services model (APSS), with a center of excellence in SAP that leveraged the country's abundant SAP resources (due to a large number of early R/2 installations in Malaysia in the oil and gas industry). Y2K compliance projects and a recent merger had quickly given the APSS staff significant expertise in implementing R/3 at various Consumer locations. Many of the early projects involved a Big 5 consulting partner, and some had also used SAP's rapid implementation methodology (AcceleratedSAP). This internal expertise was then directed toward producing R/3 templates for Consumer's end-market offices in Malaysia and

Singapore. APSS also hosted the operational systems, and by the year 2000, its annual hosting costs for an SAP R/3 user were well under half the average cost across Consumer's end markets.

In the summer of 2000, a study team recommended to Asea's country manager that SAP R/3, rather than the ERP standard for small end markets, be implemented. By using an R/3 template developed by APSS for a similar end market in the region, the project could be completed quickly, in two phases. Phase 1 would support direct importing by the beginning of 2001. Furthermore, by using APSS consultants, Phase 1 could be completed in eight weeks at a fixed cost of $100,000, leaving a one-month buffer for training business users. Phase 2, which required a unique system for direct sales in a local language not yet supported by SAP, would be completed a few months later at an estimated cost of $50,000.

The country manager served as project sponsor, but left day-to-day decisions to the team leaders and designated business process owners. He and the IS head of the area organization also served in a project oversight role.

The project was co-led by an Asea business manager, whose responsibilities included change management, and an IS staff member, who had IT project management expertise. Five Asea business users were assigned to the project part-time, and APSS staff provided the R/3 package knowledge and business process knowledge based on Consumer's "way of doing things."

The full-time APSS team members worked on-site in a conference room near the Asea users. However, due to visa restrictions, in any given week, one or more full-time members worked from the APSS offices in Malaysia. English was the language of choice within Asea, but the team members' multi-lingual skills eased formal and informal communications during the project.

Less than one month into Phase 1, the team leaders realized that use of the in-house template was accelerating the Business Blueprint phase more quickly than expected. So an accelerated project schedule was adopted in which Phase 1 resources from APSS would stay on the project for a further four weeks to complete the Phase 2 requirements. Additional quality checkpoints were added, new hires were brought on board sooner, and area employees were trained as backup staff.

Close to the go-live date, the accelerated timetable had to be adjusted when the team learned that a custom bolt-on from a vendor would be delayed. The country manager negotiated a contract with Asea's long-time distributor to use its software to fill in the gap between go live and the completion of the Phase 2 functionality.

For a summary of how Asea's project maps to our five-success-factor model, see Table 4. Although the end market's decision to accelerate the project schedule led to some workarounds in the initial months after go live, the functionality of the entire project was completed sooner than originally planned and within budget. By using in-house expertise and an internal template developed for a similar end market, Asea implemented a robust enterprise system that positioned it well for high growth. This approach for the Asea project then became a model for other low-cost SAP implementations in small end markets. For Consumer's corporate IS group, this project also was a

major "win;" a common enterprise system platform was expanded to include its smaller business units.

Leveraging the Enterprise System Maturity Curve

The three organizations achieved the success factors differently because each project was *breaking new ground at the time it was undertaken.* As noted, Material was an early adopter, Valvo was an early majority adopter, and Asea was in the late majority. Together, they reveal insights about how to manage the complexities of enterprise systems across the maturity curve (see Figure 1).

Early Adopters Achieve Success by: *Learning by Doing.* Our key lesson from Material is that early adopters have to rely heavily on "learning by doing." Material's third-party consultants were experts in pro-

| Table 4: ASEA's Success Factors	
1. Top management is engaged in the project, not just involved	• Asea country manager was sponsor and champion • Direct oversight by country manager and the head of area IS organization • Indirect support and oversight by corporate and regional IS
2. Project leaders are veterans, and team members are decision makers	• Project co-led by Asea business manager • Asea business users assigned to project part-time
3. Third parties fill gaps in expertise and transfer their knowledge	• Project co-led by IS manager from area organization • Consultants from shared services organization (APSS) provided expertise in SAP package and business processes tailored for region • Full-time internal consultants co-located with business users
4. Change management goes hand-in-hand with project planning	• Asea business co-lead was also responsible for change management • Original plan included time buffer for training
5. A satisficing mindset prevails	• Adoption of SAP template developed for similar end market by shared services organization, and minimal bolt-ons • Original 2-phase plan collapsed into one extended phase • Leveraged access to shared services resources to extend on-site support for accelerated timetable • Leveraged long-term relationship with country distributor for temporary work-around due to external vendor delay

ject management and change management, but not ERP systems. Although its project was considered a success, like other early adopters, it stumbled along the way. To help its IS workers shake loose from the fear of failure, Material's CIO introduced a whole new set of values, including freedom to fail. By using consultants to set up a program management structure and a learning environment for the project, the company went on to become one of the earliest U.S.-based multinationals to implement a global R/3 platform.

The Early Majority Achieves Success by: *Benchmarking Early Successes.* Our key lesson from Valvo is that early majority adopters can benchmark early successes. Valvo and many other mid-size U.S. firms were part of an early majority in ERP implementation. They had the advantage of learning firsthand from larger manufacturers that were early adopters. With this knowledge, Valvo's leaders were confident in their abilities to "buck" conventional wisdom about avoiding big-bang approaches. They knew that a slower, phased approach was not ideal for them. They rationalized that a big-bang approach would not be feasible for a large organization with global sites, but would be the best approach for a mid-size firm like Valvo. They searched for a third-party consultant to help, and they incorporated insights captured from their own benchmarking visits, knowing that they would not have the chance to learn from their own multiple rollouts. By applying their benchmarking lessons, and the knowledge about business processes and SAP technologies captured from experienced

third-party consultants, Valvo was one of the first companies to implement a full ERP suite successfully across more than a dozen geographic sites with a big-bang approach, releasing its consultants by the go-live date.

The Late Majority Achieves Success by: *Applying Templates.* Our key lesson from Asea is that the late majority can save time and costs by applying templates. Consumer knew that its ERP standard for smaller country offices did not scale well. However, until the Asea project, it had also found SAP too costly for its small, but high-growth, end markets. The Asea project taught Consumer that having SAP templates tailored to regional business processes, along with access to internal ERP expertise within regional shared services organizations, was a recipe for success. It could implement one standard platform enterprise-wide with minimal corporate IS involvement and with low project risks and costs. At Consumer, internal knowledge was replicated. At other companies, the templates may be supplied by a third party; vendors, for example, provide industry-specific solutions.

Just as lessons from large, complex IT projects in the past were used to avoid some of the pitfalls in ERP projects, lessons learned from ERP projects over the past decade can be used to avoid pitfalls in the next wave of enterprise systems. Early adopters will still need to "learn by doing." They will need top management buy-in to satisficing solutions from the beginning, to take advantage of organizational learning

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Figure 1: Leveraging the Enterprise System Learning Curve
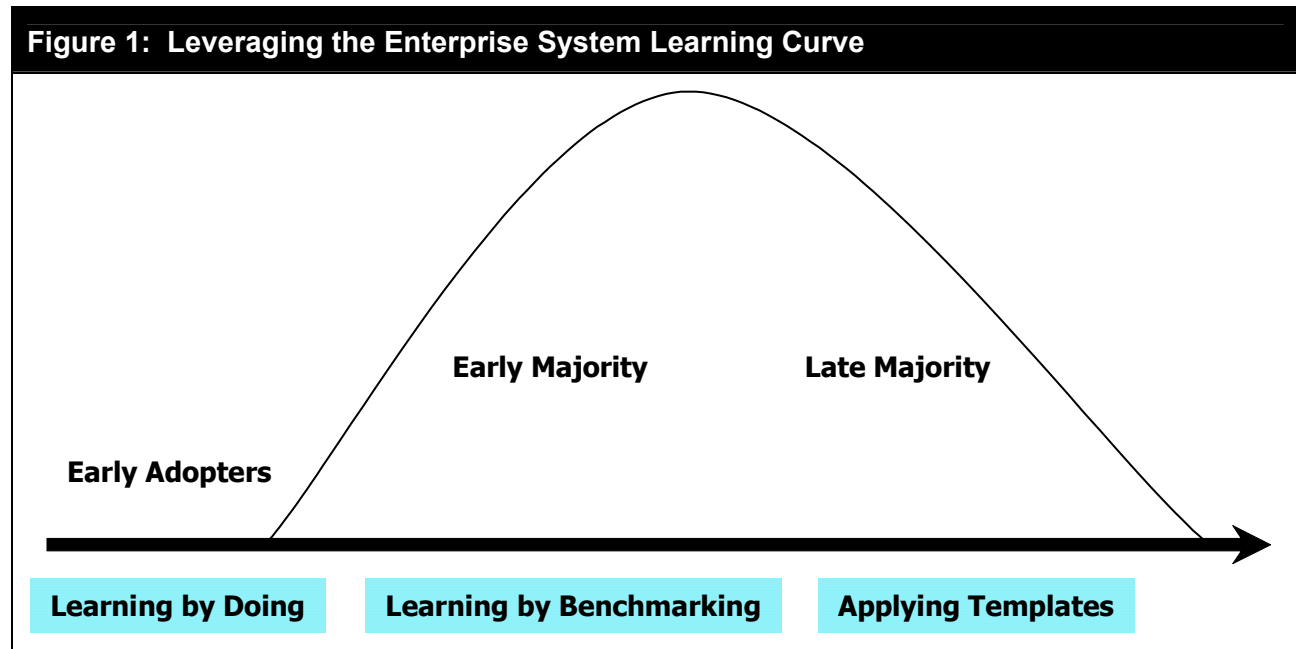
once the project is under way. Leaders of early majority projects, on the other hand, will be able to reduce their project risks and costs by benchmarking successful projects by early adopters. And late majority projects will be able to take advantage of existing templates that capture cross-functional, business-process expertise and industry-specific solutions from the early majority.

In conclusion, by understanding not only the success factors, but also how to leverage the enterprise system maturity curve, we believe that some of the high risks and costs of implementing the next wave of complex enterprise systems can be reduced.

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