**Abstract (Summary)**

Many companies have invested heavily in enterprise resource planning (ERP) software to seamlessly link themselves to their customers, suppliers, and partners. Although the goal was to optimize these relationships and boost operational performance, the results were often disappointing. The good news is that best practices have been revealed. Serving as a company's central nervous system, ERP systems orchestrate many functions, including order management, materials planning, warehouse management, payables, receivables, and general ledger. ERP implementations encounter a set of common challenges. Fortunately, there is also a defined set of best practices. These practices are: 1. Secure executive alignment for the broad-based ERP plan. 2. Establish the right governance model. 3. Emphasize business process transformation. 4. Ensure ongoing ERP support. 5. Address organizational needs head-on. 6. Keep the business mission top of mind. 7. Manage IT infrastructure relentlessly. To be effective, ERP systems require constant support and maintenance, not just by the IT department but by the business itself.

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Many companies have invested heavily in enterprise resource planning (ERP) software to seamlessly link themselves to their customers, suppliers, and partners. Although the goal was to optimize these relationships and boost operational performance, the results were often disappointing. The good news is that best practices have been revealed. Here is what works and what you need to do to reap the benefits of a fully integrated business.

Serving as a company's central nervous system, ERP systems orchestrate many functions, including order management, materials planning, warehouse management, payables, receivables, and general ledger. Staunchly believing in the ERP promise, companies have spent more than $70 billion worldwide on software licenses in the past 10 years. In addition, implementation resources cost them several times more than the license fees. Implementation time ranged from six months to four years, depending on the number of business units, functionality scope, and the configuration's complexity. From the time of the initial investment decision, it took medium-size to large companies at least five years to achieve steady-state performance levels and recoup their investment.

Companies can learn from lessons of past implementations. Many programs were overly focused on IT functionality at the expense of business process development. As a result, their expected benefits were compromised or delayed. Conversely, the best performers ensured that process management, governance, and other nontechnical issues were addressed properly.

ERP implementations encounter a set of common challenges (see Table 1). Fortunately, there's also a defined set of best practices, which we discuss in this article. They include:

1. Secure executive alignment for the broad-based ERP plan,

2. Establish the right governance model,

3. Emphasize business process transformation,

4. Ensure ongoing ERP support,

5. Address organizational needs head-on,

6. Keep the business mission top of mind, and

7. Manage IT infrastructure relentlessly.

These practices apply long after the ERP go-live event. When a management team takes a second look, it often uncovers issues that had been neglected before. In this "post-implementation" phase, companies work to realize the originally planned (but often underachieved) results by addressing business process management, adding new functionality upgrades, and driving continuous improvement.

1. SECURE EXECUTIVE ALIGNMENT FOR THE BROAD-BASED ERP PLAN

Top performers clearly articulate the planned changes and show how these changes will support the company's strategy. A well-engineered plan, with a robust, multiyear roadmap and measurable milestones, is a must for ensuring alignment throughout the ERP project and beyond. The executive team must commit to the initiative and ensure the organization understands what needs to change and when.

Even if the executives aren't on the same page at first, building a comprehensive ERP roadmap can help generate the necessary alignment. Consider a Midwestern medical device company (MMDC) that outgrew its original computer systems through its business success. IT expenditures were high, and users complained about functionality limitations and unnecessary constraints. The executive team agreed the time had come to upgrade to a high-end ERP system, but disagreements soon surfaced: Was the estimated $75 million investment worth it? Would corporate or business units fund it? Who should be accountable for achieving the benefits? How much ERP customization would be allowed by the business units? Which business unit should be the guinea pig by going live first?

To break the impasse, a cross-company team-representing each business unit, corporate management, and IT-developed a broad-based but rigorous ERP roadmap. This helped build consensus and guide the project's implementation. Here are some important success factors in achieving executive alignment:

\* A senior executive took charge of each improvement initiative to ensure focus and accountability, and bonuses were tied to achieving project goals.

\* The company used benchmarks to set aggressive yet achievable targets along with a multilevel dashboard that linked enterprise-level business results to detailed operational metrics.

\* Each initiative in the ERP portfolio was independent, with its own business case to prove adequate results. The development of each initiative proceeded through a gate review process to ensure interim milestones were met.

\* To understand the true financial impact, a project controller was appointed to diligently track project costs and benefits.

The roadmap provided the planning details and rigorous analysis the executive team needed, and it facilitated alignment among the respective stakeholders. Finally, the roadmap became a basis for evaluating progress and a constant reminder of the targets ahead.

2. ESTABLISH THE RIGHT GOVERNANCE MODEL

The shift from a functionally driven business with disparate information systems and limited visibility of business drivers to a cross-functional business with clear process owners and effective decision making requires a new governance model. Similarly, the shift from highly decentralized business units to a model with many standardized processes requires ongoing governance to allow both operational innovation and process harmonization. Process owners must have the accountability and authority to drive results. The cross-functional management team must make tough decisions that affect multiple business units or functions. Senior management must also visibly drive and support the new ways of working.

Consider a Midwest-based heavy construction equipment (HCE) corporation. HCE encouraged its business units to respond to competitive conditions in their particular markets and define their own IT requirements-using little or no coordination with the other business units.

To fix the shortcomings of its legacy systems and prepare for the Y2K deadline, HCE implemented SAP in the late 1990s. The initial implementation for the high-risk areas-sales, distribution, and finance-was completed on time and within budget. But after the implementation team disbanded, no one governed continuous improvement changes, and no plan existed for adding functionality. Over time, the fragmented infrastructure and disparate processes impaired the company's ability to operate as a unified global business, and operating performance suffered.

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| Table 1: Common ERP Challenges |

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Recognizing the need for ongoing governance in the post-implementation environment, HCE implemented a governance model to represent the different business units as well as corporate stakeholders. The ultimate purpose of this governance model was to sustain harmonization of business processes across all business units based on a single SAP instance. At the same time, the model would fail if it proved overly bureaucratic or ineffective in driving change. There were several important success factors.

Establishing the business case for harmonization. As a precursor to standardizing business processes, HCE, with help from a consulting firm, conducted a supply chain benchmark analysis that revealed many operating deficiencies caused by disparate versions of the ERP system. Standardization would result in more efficient inventory management, better order-fulfillment performance, and significant reduction of material costs.

Establishing an effective governing body. A Business Process Governing Board (BPGB), made up of business process owners from the business units, was formed to optimize all business processes.

Applying rigorous criteria for allowing exceptions. The BPGB reviews all business process change requests, and only a small number of circumstances qualify as local exceptions to a global process, such as differing country regulatory requirements.

Continuously prioritizing and tracking approved changes. Once the BPGB agrees on and prioritizes the global process solution, ERP analysts develop the blueprint, update the ERP global template, and roll out the new version to all business units. The BPGB regularly reviews the status of these changes. This process continues to this day and is even more important now than during the implementation phase.

This governance approach has allowed HCE's business units to continue with operational innovation initiatives while preserving the integrity of standardized processes across business units.

3. EMPHASIZE BUSINESS PROCESS TRANSFORMATION

Changes to business processes are what matter most in ERP implementations, and they must be managed before, during, and after implementation. The benefits from the ERP system can't be claimed until the underlying processes change. Since business units sometimes operate like independent fiefdoms, they must mandate that business processes in their respective regions match the company's standard processes.

As initial ERP deployment concludes, post-implementation begins, and a continuous improvement plan picks up where the initial roadmap left off. This plan must define specific performance metrics and targets for major processes, with appropriate phases and milestones for monitoring ongoing improvement against longer-term goals.

Business process management was critical for a global materials company (GMC) whose goal was to move away from local call centers and present a single face to the customer. Instead of making multiple calls to locations throughout the world, a customer can book and confirm an order in minutes instead of hours with a single phone call to a single regional call center. To implement this capability, the company chose a leading ERP system covering all supplier-to-customer processes. Analyses of each major business process indicated that the project would save more than $28 million annually, with a 30% inventory reduction. Important steps in GMC's business process transformation included:

Focusing on delivering new capabilities. GMC enabled a global available-to-promise (ATP) process for customer orders by using the new sales, production planning, quality management, and inventory processes in the ERP system. For the first time, a customer service representative in Europe could take an order from a customer in France for a product manufactured in Ohio and provide a confirmed delivery date-all in a single phone call.

Using a staged approach to Implement complex changes. After demonstrating benefits from the ATP capability, GMC launched an online sales portal. Customers can now place online orders, obtain immediate confirmations, and even evaluate tradeoffs such as getting products shipped from another region instead of having them made in the same region at a later date. Eventually, GMC added advanced planning functionality to drive operational improvements, such as the ability to vary inventory replenishment policies based on the frequency and volume of demand. But the company used this advanced systems functionality only after it mastered the global sales and operations planning process, which allowed it to balance its supply with global demand over a 12- to 36-month planning horizon.

Far too often, companies miss the opportunity to gain competitive advantage through process transformation during ERP implementation. The best performers develop a master plan for process transformation linked to ERP implementation. In the post-implementation phase, the same principle applies. Automating a mediocre process may provide some benefit, but fixing a mediocre process before automating it delivers stronger results.

4. ENSURE ONGOING ERP SUPPORT

Reaping maximum benefits also requires ongoing end-user support, master data maintenance, and plans for realizing additional value from the ERP system. These needs persist forever. HCE neglected to provide adequate postimplementation support and suffered the consequences when business users failed, refused to use, or were unable to fully leverage newly installed ERP capabilities.

Several years ago, HCE implemented a new procurement application with new functionality for spend analysis, supplier quality management, and strategic sourcing. The new application replaced an old system that generated only basic purchase agreements. Even though HCE provided some training, it didn't anticipate serious transition challenges such as employees struggling to adopt the new user interface with a range of new power tools, graphics, etc. The transition from repetitive processing of purchase agreements to providing business analysis also proved highly challenging. To compensate for high turnover and low user proficiency with the new tools, HCE had to add temporary personnel.

Learning from past mistakes, HCE later tackled the following issues:

Addressing multifaceted user readiness. When HCE reimplemented its ERP system, it used a multidimensional training program that required users to be fully ready before the go-live date. Users attended training on both system-level transactions and business processes so they could grasp the bigger picture of what was happening upstream and downstream and how their actions affected others. Users first learned about the planned changes throughout the company, then completed in-depth training and took certification tests. Only then could go-live occur.

Ensuring adequate end-user support. Whether implementing a new ERP system or resuscitating an underperforming one, companies should provide adequate support. Consistent user support and resources helped HCE sustain day-to-day operations in its ERP reimplementation. Specifically, HCE set up specialized help desks and cultivated local super users. To train both new and experienced end users appropriately, HCE provided a number of qualified, accountable trainers, even in the post-implementation phase.

Assigning accountability and resources to groom and polish master data. Data owners, not clerical staff, should maintain master data, such as customer information or supplier lead times. For example, the buyers within the purchasing team are the data owners for supplier lead times.

Planning for maintaining the ERP asset. Ongoing support includes not only systems upgrades and new software functionality but, most importantly, business process improvement. In its post-implementation phase, HCE dedicated a small number of experts and resources outside IT to plan and oversee this ongoing process.

Providing ongoing ERP support Is fundamental to realizing ERP benefits. Key focus areas include end-user support, master data maintenance, and ongoing functionality upgrades. This support should be built into the business plan along with appropriate resource assignments.

5. ADDRESS ORGANIZATIONAL NEEDS HEAD-ON

Implementing high-performing business processes usually requires making organizational adjustments. These changes are typically needed to better equip employees to fully leverage new tools, create entirely new roles, and fully operationalize new business capabilities. Key considerations for addressing organizational needs include:

Upgrading traditional roles. Successful post-implementation efforts often require enhancing traditional roles, including those of customer service representatives (CSRs), purchasing managers, and supply chain planners. CSRs require special training to use ATP methods for promising customer orders. They also must maintain and update master data, which should be measured as part of their overall performance evaluation.

Upgrading analytical skills and capabilities. Purchasing managers, for example, may need more sophisticated analytical skills to identify opportunities to consolidate spending. They may need advanced leadership and facilitation skills to forge joint initiatives across various business boundaries, for instance, to convince business units to reduce costs by giving up favorite suppliers to help reduce costs.

Recruiting for specialized roles. To exploit advanced supply chain planning tools, some companies have hired high-powered operations research experts or mathematics Ph.D.s to determine, for example, the best inventory stocking policies and select appropriate algorithms for reorder policies.

Adjusting job descriptions and pay scales. HCE's human resources team needed to revise job descriptions and compensation levels to ensure they could retain employees with valuable, newly acquired skills.

To be successful, the post-implementation organizational model needs to allow for upgrading traditional roles, creating new roles, applying change-management processes, and initial and ongoing training.

6. KEEP THE BUSINESS MISSION TOP OF MIND

Because of their complexity, ERP system projects are often fraught with IT configuration issues that, if unchecked, can confound the business mission. In post-implementation, individual business units often want to change their IT configurations or add instances that deviate from standard business processes. Customization, however, has a double cost: a one-time up-front implementation cost and the hidden costs when upgrading. In this case, customizations often have to be redone in the new version or discarded. Sticking to standard processes can prevent unnecessary complexity and mitigate later investments and support costs.

Consider MFG, a manufacturer of highly engineered products. MFG's business operations doubled in size through two acquisitions over two years. Even though its business units used the same ERP system, there were significant configuration differences that made it impossible to realize operational synergies. Two MFG divisions, A and B, represented configuration extremes. Division A had allowed its ERP system to be so heavily customized that an upgrade to the ERP software was nearly impossible, and a complete reimplementation was needed. In contrast, Division B allowed very little customization. While this approach met the aggressive implementation schedule, it led to numerous usability challenges. Over the years, hundreds of user-developed point applications were built in Microsoft Access or Excel, and many of them became critical components of business processes. Even though Division B's core ERP was highly standardized, the overall applications environment, including user-built applications, was far from standard and posed significant migration challenges.

Important steps to corralling IT configuration and preserving the business mission at MFG included:

Establishing guidelines for customization. MFG's ERP standardization team determined the best balance between usability and standardization. It considered many factors, including availability of new reporting tools, migration utilities for upgrades, and automated menus based on security profiles. Implementation guidelines were used for the ERP upgrade that achieved harmonization among the various business units. First, users could build their own reports from standardized data sources in a data warehouse, thus eliminating the need for hundreds of custom-programmed reports. Second, additional system configuration was allowed only if justified by a clear business need and if it didn't require the code to be modified. Finally, security profiles were designed to allow broader system use.

Enabling data mining. Users should have tools to manipulate rich and timely data offline so as not to limit their creativity or require special IT programming to create reports. Data mining and other creative uses of available ERP data typically are best done with a data warehouse application, which often isn't included in the core ERP. To help maximize value from the data warehouse, MFG trained end users and proactively recruited super users for this application.

Ensuring users have rights to needed data. While there may be valid reasons to limit access privileges, supply chain analysts, planners, and managers typically require broad-based access to supply chain performance data. For example, local pricing among global markets can be a sticky issue, but the need for global visibility regarding inventory levels and planned production is fundamental to an efficient supply chain.

The key to managing IT configuration complexity is to ensure that the right balance exists between the business driving the IT configuration and vice versa.

7. MANAGE IT INFRASTRUCTURE RELENTLESSLY

Robust infrastructure planning addresses network capacity planning for anticipated traffic volumes and how frequently the data is refreshed on computer servers. The goal is to ensure acceptable response times, uptime, and accessibility (to enable Web-based user access, for example). If the system disappoints or frustrates users, they're likely to become disenchanted and won't fully embrace the tools. In lay terms, even a highly tuned ERP engine will be unable to support users' needs if its pipes are too few or too small.

MFG, the engineer-to-order manufacturer, implemented an ERP system several years ago to achieve efficient inventory management, eliminate material shortages, and increase manufacturing capacity utilization. It cleaned up bills of materials (BOMs) and manufacturing routings and improved the processes for the master production schedule (MPS) and material requirements planning (MRP). Furthermore, inventory cycle counting was made more rigorous to improve inventory accuracy.

While limited-scope pilot projects were successful, the full system go-live wasn't. Once the systems were fully populated with all production data, the MPS and MRP processes ran for days instead of hours, bringing the operations to a halt. Analysis showed that the IT architecture couldn't handle the massive workload caused by the company's deep, multilevel bills of materials, complex routings, and the magnitude of distinct part numbers. Important steps in reforming MFG's infrastructure included:

Addressing both technical and business drivers. During the subsequent three months, the IT team rearchitected the hardware setup, tuned databases, and increased network bandwidth among several facilities. In parallel, the business teams simplified some routings, flattened some bills of materials, and streamlined planning algorithms to eliminate cases of unnecessary complexity.

Designing and conducting meaningful testing. Comprehensive stress tests were used to ensure success of the second go-live event. This resulted in acceptable system performance and allowed users to achieve gains defined in the business case justification.

Deploying monitoring tools If network scale and complexity warrant them. Complex networks require capable monitoring tools to assess the network's health and performance over time. These tools are sophisticated computers that help pinpoint and solve network problems at the outset of any infrastructure program and throughout its life cycle.

Using objective and quantitative performance measures. Just as key performance metrics are essential for monitoring business operations, they're equally important for monitoring IT operations that support the business. Even if IT operations are outsourced, companies can use performance metrics-e.g., response time, uptime/availability performance, or help desk support-to hold the provider accountable.

In the planning phases, due diligence ensures that the ERP and its supporting network will have the required capacity and performance to keep pace with anticipated business needs. In the post-implementation phase, system performance should be monitored at all times, using well-defined metrics, such as response time and uptime. Sophisticated tools are available for troubleshooting and resolving problems. As a company adds more users and functionality over time, the network's capacity must also be scaled up to sustain desired performance levels.

PUTTING THE ERP TO WORK

The seven key challenges we addressed represent the cumulative experiences of hundreds of companies. The proposed solutions serve as a program guide for companies that are dissatisfied with their existing ERP implementations and are evaluating new ERP systems, replacements, or upgrades. Top-performing companies often have less software customization and complexity, but a higher level of harmonization between processes and systems (see "What Makes an ERP System Implementation Successful?" on p. 44).

To be effective, ERP systems require constant support and maintenance, not just by the IT department but by the business itself. Support must include the right processes and organizational models, backed by the appropriate governance and championed by the executive team. Clearly, an ERP system isn't simply another complex solution to hand off to the IT department and to a few tech-sawy business users. If the ERP system is to deliver a consistent performance advantage, it's also the responsibility of senior business leaders to see it through. By properly addressing these management issues, companies can finally realize the promises made by ERP systems-and ultimately surpass expectations.

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| **[Sidebar]** |
| What Makes an ERP System Implementation Successful? |
| A 2005 PRTM study of 60 companies showed that having an advanced ERP system won't necessarily lead to better results (Quadrant Il in Figure 1). In fact, advanced systems tend to magnify process deficiencies. And while mature business processes are necessary for achieving desired business results, they are in themselves insufficient (Quadrant IV). To achieve repeatable results, companies must master business process management and IT tools (both software and hardware), thus establishing themselves in Quadrant I (mature processes and mature systems). |
| Even without advanced ERP systems, companies with mature business practices are 38% more profitable, have 22% less inventory, and achieve 10% better delivery performance than companies with less-mature business processes. Companies combining mature business processes with advanced ERP systems achieve a further 27% profitability advantage and as much as a 40% gain in performance across the full range of supply chain metrics, including delivery performance and inventory. These results aren't surprising since, for example, it can take weeks to manually consolidate demand data, compared to hours for a fully functional ERP system. Clearly, companies that manually aggregate demand data are making business decisions with stale information. |
| On the systems side, PRTM found that most companies still use less-mature ERP system solutions. More than 65% use functionally oriented legacy systems, such as standalone material requirements planning (MRP) systems and, in some cases, Excel spreadsheets. Some use ERP modules implemented as point solutions that lack overall enterprise planning data visibility. Since most of the companies studied are executing mature planning processes without sophisticated enabling systems, they rely too heavily on spreadsheets and people. This puts them at risk of underperforming in all key metrics. |

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| Figure 1: ERP Maturity Framework |

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| Finally, top performers stay the course. For several years following implementation, these companies continued work to achieve process harmonization and fully integrate process and supply chain systems solutions. By contrast, below-average performers lost focus soon after ERP system implementation, assuming that harmonization and integration would occur naturally over time. |

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