Making ERP Succeed:
Turning Fear Into Promise

No one ever said enterprise resource planning was easy. Here's how to make it work — on time and under budget.

By Scott Buckhout, Edward Frey and Joseph Nemec Jr.

THE FOXMEYER CORPORATION used to be one of the largest wholesale drug distribution companies in the United States, with more than $5 billion in annual revenues. Attempting to improve its competitive position and prepare for growth, the company decided to use a popular enterprise resource planning (ERP) system, a group of software programs designed to tie together disparate company functions to create more efficient operations in areas such as the assembly or delivery of products.

FoxMeyer became an early believer in the potential merits of ERP systems and installed one with the help of one of the most reputable system integrators. Yet, by 1997, after FoxMeyer had invested two and a half years of effort and more than $100 million, the company could only process 2.4 percent of the overnight orders that it had with ancient legacy systems — and even that small percentage suffered from information errors. The company fell into bankruptcy and was acquired for a mere $80 million. Its trustees are now suing its system suppliers, blaming the ERP implementation for its business failure.

Is this an extreme case? Clearly. Is this unusual? Sadly, no.

Implementations of ERP systems are struggling throughout the world. They take too long, cost too much and fail to deliver the promised benefits of competitive advantage and cost reduction. Despite the promise and the high investment required to implement ERP systems, statistics show that more than 70 percent of ERP implementations, whether self-created or designed by established ERP software vendors, fail to achieve their corporate goals.

In a landmark study, the Standish Group, a market research company

Scott Buckhout is a senior associate at Booz-Allen & Hamilton based in San Francisco. He specializes in helping companies develop business strategies and improve production capabilities. Mr. Buckhout earned his B.S. in aerospace engineering from Texas A&M University. He also holds an M.B.A. from the J.L. Kellogg Graduate School of Management at Northwestern University. **Edward Frey** is a vice president of Booz-Allen based in San Francisco. He specializes in improving innovation and production capabilities for clients making aerospace and other highly engineered products. Mr. Frey earned his B.S. and M.S. in materials science from the Massachusetts Institute of Technology. He also holds an M.B.A. from Harvard University. **Joseph Nemec Jr**. is a senior vice president of Booz-Allen and the leader of its global information technology group. During his 29 years with Booz-Allen, he has focused on helping Fortune 20 multinationals develop strategy and manage changes in organization, processes, culture and systems. Dr. Nemec earned his B.S., M.S. and Ph.D. from the Massachusetts Institute of Technology and is a member of the 81st Advanced Management Program at Harvard Business School.

specializing in software and electronic commerce, looked at implementations in companies with more than $500 million in revenues. The study found that the average cost overrun was 178 percent; the average schedule overrun was 230 percent of original expectations, and the average slide in functional improvements was an astonishing 59 percent deficit. (See Exhibit I.)

Still, such aggregate statistics hide real, and specific, horror stories about companies such as FoxMeyer Drug and the Dell Computer Corporation that have tried the systems. Dell publicly canceled its ERP system after two grueling years and an expenditure that exceeded $200 million. The company could tell it would not get the results for which it had paid so dearly and switched to a combined system/process solution that has redefined the industry.

Despite the horror stories, more than 20,000 companies worldwide paid in excess of $10 billion to adopt ERP systems in 1997 alone. Why do companies persist in trying? Some believe ERP systems will reduce the complexity inherent with using multiple data sources and systems that plague growth in global enterprises. Others hope ERP systems will solve the problem of legacy systems that inhibit re-engineering projects or the unknown difficulties that will arrive on Jan.1, 2000. Still others consider ERP systems the strategic weapons of the 21st century.

In fact, ERP systems have delivered for some companies. For example, use of such a system helped the Chevron Corporation cut purchasing costs by 15 percent and promises an additional 10 percent in the near future. International Business Machines Storage Products reduced the time required to update pricing data from as much as 80 days to five minutes. Autodesk Inc. saved enough from inventory reductions alone to pay for the entire implementation.

So what is the problem with ERP systems? Is it a question, as some academic observers suggest, of poor corporate organization? Or is it, as some technicians believe, due to a real corporate inability to make the tough decisions necessary for a profitable implementation?

After more than five years of helping chief executive officers and general managers implement ERP systems, we believe neither of these reasons explains the gap between corporate expectations and results. Our experience shows ERP difficulties stem from two issues:

- The company has not made the strategic choices needed to configure the systems and processes.
- The implementation process spins out of business control naturally. This is inherent in the ERP implementation process.

## ISSUE NO. 1: Getting strategic choices made

ERP systems integrate key data and communications on planning, scheduling, purchasing, forecasting and finance for companies across regions, products, divisions and functions. Popular extensions can broaden this reach to sales, marketing, human resources and other functions. Many of the examples we will use will draw from the core ERP functionality, but the issue of strategic choices becomes even more important for a more comprehensive system. The system can provide management

EXHIBIT I
FEW ERP IMPLEMENTATIONS HIT TARGETS
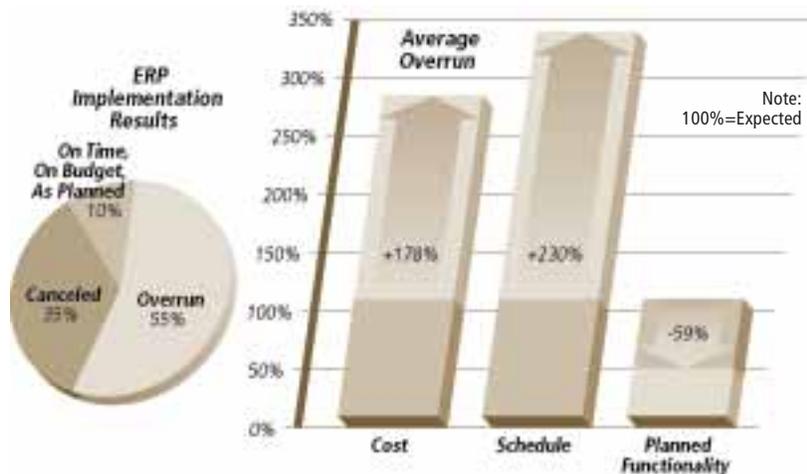
Source: Standish Group

EXHIBIT II
A PRODUCT-ALIGNED PROCESS FLOW
LOWERS SYSTEM REQUIREMENTS
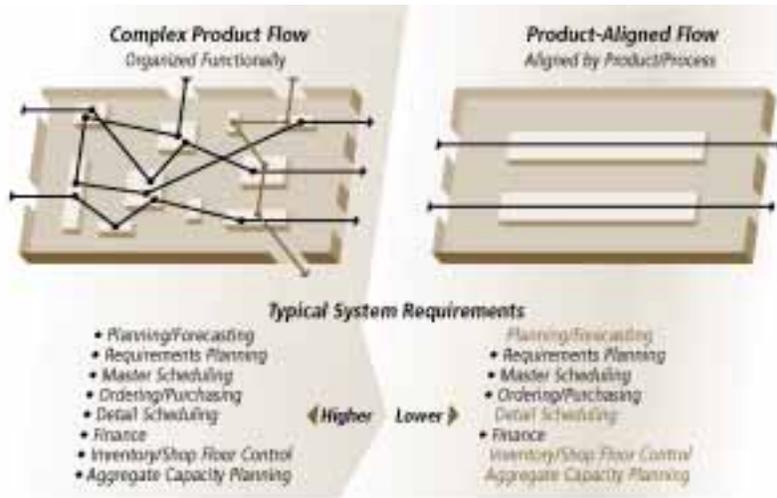
Source: Booz-Allen & Hamilton

detailed insight into the operations of the business. For example, for a manufacturing company, an ERP system can show how much raw-material inventory is on hand; how much it costs to manufacture each product, and where each order is on the shop floor.

While an ERP system can provide this information, the key question is, Should it?

Stepping back from the ERP system — looking at the information, communication and control functions it can provide — it becomes clear that the amount of control over a company's operations that needs to be provided by the ERP system depends on the design of the flow of products and services in the company.

A complex flow requires much system control. A well-designed value chain (e.g., "Product-Aligned Flow," in which the product flows using visual

signals and well-defined routes) can embed many of the controls and other functions in the business process simply and far less expensively than the ERP system possibly could. (See Exhibit II.) The legacy processes that are being replaced, by necessity, embedded much of the communication and control in the business processes, and years of learning made this set of business processes very efficient and effective. Most implementations do not recognize and therefore do not capture this organizational efficiency.

Another celebrated version of the information, communications and control choices that companies miss is exemplified by the famous Japanese lean production systems. In these, much of the communication and control are designed right into the production system — and the computer has a very small role. (A

Japanese visitor, after thoroughly examining a new ERP system in a United States automobile company, said, "This is a very impressive system. Of course, we'd have one too if we needed one.")

Lean production systems deliver low cost, low overhead, highly effective communication and control. How? For example, when a production process using Japanese kanban visual signals needs more raw material from a supplier, production workers pull a card and send it to the supplier. No computers, no orders, no overhead needed. The communication and control are built into the process design. Yet United States companies that are implementing ERP and lean production techniques often put a firewall between the two, not recognizing that this undermines both. The right answer is to recognize the decision the company is facing and make the decision explicit for all the company's efforts.

What can go wrong? At one company, the implementation team installed the detailed capacity-planning module of the ERP system, assuming that the company needed to understand and control capacity in detail (for example, per shift). In the legacy environment, detailed capacity planning had not been an option because the system was incapable of delivering it, so shop management got by with aggregate capacity planning as needed for staffing and capital decisions (which were made annually or quarterly). When implemented, the detailed capacity planning processes added overhead costs to do work no

one had needed before. Tragically, the level of granularity required in the data (e.g., detailed, accurate setup and run times, scrap factors, machine downtimes) to develop the detailed capacity estimates accurately was impossible to achieve, so the capacity profiles created were useless. Nobody bothered to ask if the company in fact needed detailed capacity planning, and senior management saw the decision only when it was too late.

Judy Johnson, program director for the Integrated Systems Solutions Company, a subsidiary of the International Business Machines Corporation, put it this way: "This [is] not a decision to simply buy an I.T. tool — it [is] a decision on how to shape [the] business."

The reality is that an ERP system locks in the operating principles and processes for the corporation. Once the ERP system is installed, the odds of being able or willing to pay for modifications are close to zero. The cost; complexity; investment of time and staff, and implications and politics of untangling such an expensive investment prohibit most companies from tackling this issue. Consequently, it is important that ERP systems be implemented in a business-driven, cost-effective fashion from the start.

Management needs to translate the business strategy/key future competitive advantages into factors for the implementation. This often requires non-system actions to develop the physical or business resources to support the simpler system needs. For example, in a manufacturing company, lean manufacturing or al-ternative supplier relationship initiatives may be needed to eliminate the system-ordering functionality that adds so much cost and complexity. The result, of course, is a more efficient overall delivery process as the production or other delivery process embeds low cost communication and control.

Fortunately, only a limited number of critical business decisions require continuing top-management ownership. For example, in a manufacturing environment, senior management only has to focus on eight key areas to determine what actions should be inside or outside the system. (See Exhibit III.)

ERP systems often provide a backbone of information, communication and control for a company, but managers seldom ask: "Which information? What communication? Where should control reside?" Even if they do ask and answer these questions, it is sometimes difficult to keep the decisions intact because the implementation process takes over and the decisions get recast on the basis of the system, not the business.

ISSUE NO. 2: How to keep the implementation process from spinning out of control — put the C.E.O. in charge

The new ERP commandment for senior management is "Put the chief executive officer in charge." We hasten to add that we are not referring to the usual "first commandment" of getting support from the top. Putting the chief executive officer in charge defines a different level of involve-ment in the implementation process.

The business case for implementing an ERP system is invariably built around significant cost reductions and improved capabilities. The cost savings are based on reduced legacy information technology costs as well as decreased indirect labor, direct labor and inventory costs. Improved capabilities often include world-class processes, tighter control and reduced cycle time.

Once the business case is closed, companies often focus on software and not business objectives — with an implicit assumption that the benefits will follow. At this time, senior executives typically relegate too much responsibility to technical experts. They mistakenly view the endeavor as an information-technology project, not a business project. Once management abdicates its responsibility for control, the working team is forced to make critical decisions by default.

Under this scenario, it is not long before the implementation begins to go off track. Well-intentioned people add "nice to have" functionality that can exponentially increase the level of complexity. Just getting to system cutover is a major accomplishment. Further complications are inevitable; it is common for an implementation to extend months beyond cutover because of unexpected problems such as missing data, slow response times or poorly trained staff. Jim Johnson, chairman of the Standish Group, estimates that at least 90 percent of ERP implementations end up late, over budget or both. "Once you hit $10 million, the chances of a project coming in on time

**EXHIBIT III
FOCUS ON KEY BUSINESS DECISIONS**

Business-Critical ERP Decisions

Typical ERP Approach	Critical Business Issue	Alternative
• Frequently run Manufacturing Resource Planning (MRP) to generate planned production orders — Explode multiple layers in the Bill of Material — Schedule with detailed multistep routings for end part number	• How will we know which parts to build and when?	• Build to rate for basic and stable parts • Cycle schedule for "Option" oriented parts
• Print work instructions every time an order is produced	• How will the mechanics know how to build each part?	• Use resident work instructions that leverage process stability in part families
• Run Capacity Requirement Planning module to build up capacity for each machine based on individual part setup and run time	• How will capacity requirements be estimated?	• Estimate capacity requirements based on aggregate demand on the bottleneck machine
• "Wand" each operation "complete" in the system for every order as it is moved between machines on the shop floor—indicating the exact location of every order	• How will we know the location of each order on the shop floor?	• Co-locate machines in cells; minimize work in progress; track orders with visual controls
• Run MRP system to generate start time for every operation on every order • Sort through queue in front of each machine to find next "hottest" job	• How will each mechanic know which order to work next?	• Work orders on a "first in-first worked" basis — no system information required
• "Wand" orders into system, which generates specific location in warehouse for every order received • Use system to allocate raw material to specific production orders and "debit" from available stock	• How will we know where to store raw material and how much is available?	• Store inventory in a dedicated "static" location • Replenish inventory when level reaches visual reorder point (based on required lead time)
• Run MRP to generate purchase orders based on reorder lead times • Create individual purchase orders for every required shipment for raw material • Close every purchase order for each shipment received and pay upon delivery	• How will we know when to order raw material when it has been received?	• "Blanket" purchase orders that cover multiple shipments • Base shipments on cycle schedules or production rate • Base periodic payment on production rates (payment adjusted for exceptions)
• Use system to build up overall cost from each order: (1) Setup and run time for each required operation (2) Actual material consumption based on inventory allocations to each production order	• How will we compute product costs?	• Periodically compute costs based on aggregate production (by part family) and aggregate resources consumed
Defaults to "Just-in-Case," Most Complex Solution	**Focuses on Business Needs**	**Opens Up Simpler Alternatives**

Source: Booz-Allen & Hamilton

and on budget are statistically zero."

Project managers sensing that [budget] schedules will soon far exceed original estimates try to get back on track by eliminating the redesign of certain business and physical processes. Implementation teams frantically tailor the new software to fit existing business practices. This rarely works.

As a result, the organization, having lost sight of any business objective, implements a crippled system, one that is overloaded with unnecessary functionality. Whether the ERP system does not have enough capacity or has too much, the company now has a system that needs to be fixed. The process of upgrading or reworking is not only expensive; it is also almost as complicated to implement.

Given the investment required to implement ERP systems, are senior managers not more involved? Our experience suggests that chief executive officers and managers are simply unsure of the role they should play. Top executives and senior managers focus on demand and issues, while systems people focus on processes. Neither would ask the right questions of

In a typical job, the chief executive will say, "ERP costs me half a billion dollars — give me some status, some sense of the results." The experts, always beyond budget and be-

hind schedule, overwhelm senior managers with technical detail. Senior executives realize they cannot manage what they do not really understand and/or cannot translate into outcomes. As a result, they withdraw into pre-project boundaries, announcing that — despite the experience with systems implementation over the past 20 years — they will control the ERP installation with budgets and schedules.

Only when management realizes that an ERP implementation is a complex undertaking can management set out to make the right choices about what the company's ERP system should do and what it should not. Then, it can create a process of planning and implementation that will be effective. When the technologists make the technological decisions and senior management makes the strategic and business ones, the implementation meets its objectives, budgets and schedules.

Involvement by the chief executive officer on a small set of issues will greatly improve the likelihood of an implementation that is on budget and on schedule and that has the capabilities that support the corporate vision. The chief executive should get involved in three ways: by clearly outlining the organization's strategic priorities; by involving the organization at the appropriate level, and by linking management controls and incentives to project success.

C.E.O. ACTION ITEM NO. 1: Outline strategic priorities

The C.E.O. must take charge of the planning step for the ERP system. It becomes the most important and the most neglected step in making sure that the ERP system does what it is supposed to do. Without a strategic connection, the ERP system does what the technicians believe it should do — and not what is necessarily best for the company.

The key is to translate the company's vision, and the strategy that results from that vision, into concrete priorities, and then decide exactly how the ERP implementation will help the company deliver some, but not all, of these priorities.

What are the top priorities? How do they fit in with the industry's evolution? How do they resolve competitive issues? Which measures of operating performance are expected to improve and at what rate?

This front-end process is time-consuming, and, in some respects, irritating to most managers who want to get on with the implementation. Yet, without it, no ERP system will work. Some senior executives counter this argument by saying, "We did articulate strategic goals, yet the ERP implementation is still a nightmare." When questioned more closely, we find that these goals, such as "improve customer service" or "standardize our processes," are too generic. With such objectives, middle management and staff do not have a framework for making decisions, and they generally allow the technologists to make them. As a result, system priorities remain out of line with corporate vision and senior managers complain that their ERP system has unnecessary capabilities, locked-in complexity and no strategic value.

In a very successful ERP implementation, Bay Networks developed four strategic objectives to communicate to its organization and implementation team:

- Growth: Future business growth will not be hindered by information-system capacity.
- Global Order Administration: Accept customer orders from any location into one system; assign shipment dates to available products in real time; schedule future ship dates for products not in stock, and check order status at any time.
- Financial Reporting: Have the ability to run profit and loss queries at any time on any day.
- Process Redesign: Focus re-engineering efforts on processes in which Bay derives its competitive advantage. The key here is to focus on priorities.

In two other very successful ERP implementations (at Owens Corning and the Compaq Computer Corporation) senior managers made the decision to modify the basic ERP software to match strategic goals. Both companies devoted significant time and expense to embed in the software key capabilities that were considered competitive advantages. Owens Corning, for example, needed to incorporate individualized distribution costs in their quotes. Compaq changed its manufacturing strategy from "build-to-stock," which calls for manufacturing to keep warehouses full, to "build-to-order," which runs plants only to fill consumers' orders. Compaq adapted

its production processes and modified the generic ERP software to make that shift happen.

By creating this framework of strategic priorities, the chief executive focuses the implementation on exactly what is critical to the company's vision. In essence, this narrows the scope and prioritizes the business objectives within that scope; it creates absolute necessities. This alone simplifies the implementation and increases the likelihood of success. The chief executive, who has the required strategic insight and vision, is the only person who can take control at this level. Chief executives understand the industry's evolution, the company's competitive position and the next levers for growth.

C.E.O. ACTION ITEM NO. 2:
Get the organization involved

Certainly, no one expects a chief executive to design data entry screens, or a software developer to determine how the company should face the market. Yet, in a way, most companies' current approach to ERP implementation seems to require both. Companies need to establish guidelines for involvement — or "rules of engagement" for different levels in the organization — so team members understand how and where their skills will be utilized and, more importantly, what issues they should resolve and what issues they need to raise to the next level of management. In most ERP implementations, these rules are not clearly defined. As a result, key strategic decisions are often made by the implementation team, those least

equipped to make business decisions. A well-constructed implementation allows the people who best understand the issue to make the decision.

The chief executive manages the inevitable trade-offs among strategic priorities. Top operating management is accountable for the operational/tactical trade-offs. The first-line managers and implementation teams make the detailed design and execution trade-offs.

In one company with multiple divisions making different airplane subsystems, a corporate growth strategy was to extend past the traditional, original equipment manufacturer customers and serve new markets in service and maintenance. This would require that the divisions work together in new ways to provide one face to the new airline customer. The ERP "go" decision had been a division-level call, but the chief executive recognized that local division ERP implementations would complicate the servicing of new markets. He mandated that ERP implementation for these aviation subsystem divisions be done in concert with the new service strategy. This left the top operating management to make operational/tactical trade-offs and the implementation teams to focus on designing screens, data structures and detail steps.

In our approach, various levels of the organization engage in a series of dialogues, which help move the process along while aligning it with key strategic and operating priorities. The company translates the various choices that must be made during the implementation into the right lan-

guage so dialogue can occur throughout the organization. Fortunately, setting up the process of dialogue is not difficult. Unfortunately, most ERP methodologies never mention it.

A meaningful series of ongoing discussions has to start at the top, with the chief executive and top management. The conversation should focus on implementation issues that affect the achievement of strategic goals. The chief executive always keeps in mind the alignment between the implementation and the strategic vision, making certain that the top management team understands the strategic priorities in a very concrete way. They discuss the short- and long-term impact of each trade-off, and continually monitor how each will affect the way the company meets its priorities. This will only include the small set of critical issues.

Armed with a better understanding of the company's vision, top operating management then makes the tactical and operating decisions that will align the processes and the ERP system with these goals. In the same way operating management has an ongoing dialogue with the chief executive, it conducts discussions with the implementation teams, focusing on operational and tactical alternatives. The goal is to balance physical and business processes, as well as system roles. These decisions often drive where a new process or control will reside — inside or outside the system.

For example, the management of raw-material inventory can either be embedded in processes or designed into the system. If it is embedded in

Next Steps for ERP

The fundamental issue facing senior management is to insure that high — and in certain cases, very high — ERP investments generate full business benefits. The promise of the first wave of ERP installations has largely not been fulfilled. This is due not only to the problems in implementation described in this article, but also to the fact that many ERP installations were driven by the need to solve "year 2000" (or Y2K) compliance problems and/or were focused on fundamental financial applications.

Both of these areas of focus are by definition not going to generate major business benefits. One of the drivers of ERP investments has been the necessity to modernize systems due to Y2K. Obviously, the Y2K problem will either be resolved or systems will crash soon after Jan. 1, 2000. Thus, many installations were pressed by the Y2K schedule, and priorities were as simple as possible: a Y2K fix without the time to fundamentally rethink business processes to achieve step changes.

In the case of the financially focused applications, the installation of an ERP does not by itself generate much business value. Business value in financial areas is generated mainly by moving to shared server operations, which have been shown to generate savings of 30 percent to 40 percent.

So what is the next ERP opportunity? Simply stated, it lies in fundamental change in business operations focused on the "guts" of an enterprise: channel management, supply chain optimization, demand forecasting and other operations that can maximize customer service levels, minimize inventory levels and control other costs. These "guts" applications can be dramatically changed by examining overall business processes: Rethink organizational authority and responsibilities, and select and implement appropriate ERP applications to focus on these areas.

The challenges facing senior management are concentrated in the development of the strategic vision, say for the supply chain of an aerospace component subsystem supplier serving multiple end-users (original equipment manufacturers, repair depots, airlines, etc.) from decentralized profit-and-loss-based business units where the supply chain must be managed above the P.&L. sites. This example illustrates the key business decisions and change issues. Once the business vision has been developed and agreed to, the next challenge is to select the most appropriate ERP modules and/or best of breed bolt-on applications (e.g., for supply-chain management or decision support).

When these decisions have been made, the challenges of ERP implementation remain. The approaches described in the article apply.

The end result of successful next-step ERP applications in the "guts" of a business have been shown to generate very significant benefits, such as a 40 percent reduction in inventory with a 30 percent improvement in customer service levels.

These central or "gut" ERP applications represent the real business value yet to be realized from the larger ERP system investments. SB

the physical process, visual cues such as empty bins can signal a need for more material. If it is controlled by ERP, the system tracks total available inventory. When the inventory levels reach the reorder point in the system, a purchase order is generated. The first alternative provides lower cost with control at an aggregate level, while the second provides detailed control, albeit at higher cost.

The pros and cons of each alternative must be weighed against the priorities of the business, and top managers are best informed to make these trade-offs. They understand both the operational details of a particular business unit, and the strategic priorities of the business. For example, if minimizing raw-material inventory is a strategic priority or if inventory costs must be tightly monitored because of fluctuating commodity prices, then the detailed control may be worth the higher cost. The cost/benefit trade is made specifically by those best qualified to make the decision, not by low-level systems implementers.

Within this overarching framework, the implementation teams and technologists make the detailed design decisions. Because they understand the system's technical aspects in great detail, as well as each unit's operating characteristics, they can design an optimal system. In a recent ERP implementation at Autodesk, for example, senior management decided that a rapidly changing business environment could make some of the ERP benefits disappear. As a result, management made speedy imple-

mentation a top priority. Aware of this goal, the implementation team focused solely on the core functionality the company needed, ignoring other "nice to have" features. The result was an implementation completed in just six months at the same time the company re-engineered 25 of its 40 business processes.

C.E.O. ACTION ITEM NO. 3:
Link management controls, incentives to project success

The chief executive can control the implementation by expressly linking key controls systems, performance measures and incentives to strategic priorities. In this way, the company:

- Prevents false declarations of success (the specific criteria are set up in advance).
- Helps implementation teams resist "scope creep" and focus on delivering results.
- Balances systems against business and physical processes, helping the company optimize overall business performance.

Following the successful Autodesk implementation, for example, Bill Kredel, the company's chief information officer, said, "Developing specific metrics to gauge project success and then tying those metrics directly to each executive's compensation played a major role in our success. Ten percent of the executive management's bonus and 20 percent of the implementation team's salary was tied to the success of the project." In a different approach, Bay Networks formed a risk-sharing partnership with the systems integrator,

paying the integrator on the basis of the system's success.

HOW TO KNOW IF YOU ARE ON TRACK

Once a company commits to an ERP investment, it spends a great deal of time and effort determining if the implementation is working. We have found that, even with our approach, a large-scale implementation has to take some senior management attention away from the business for a time. Problems always arise and organizational infighting can get out of hand.

Keeping the following in mind can assist in determining whether the implementation will succeed:

- Does top management understand the connection between the system implementation and the achievement of strategic goals well enough to describe the system's priorities in strategic terms?
- Is the implementation plan coherent, comprehensive and linked to corporate objectives and non-system-related capabilities?
- Does the process include dialogue and discussion about the hard choices necessary between the systems and other sources of control?
- Does the company buzz indicate the organization buys into the link between strategy and system implementation?

These are key indicators that will help determine whether an ERP system will create a delivery system that runs like a dream, or a nightmare such as that faced by FoxMeyer. *SB*