

What we need to look at are those systems referred to as transformational; that are going to give us an even greater capability in the future. But you cannot get the transformation if you try to do everything ... you are going to have to make some choices.

—David Keith (Dave) McCurdy

contemporary issues

Effects-Based Performance: Bridging the Gap Between Fighter Operations and Maintenance Effect of Enterprise Resource Planning on Organizational Productivity

Contemporary Issues in this edition presents two articles: “Effects-Based Performance: Bridging the Gap Between Fighter Operations and Maintenance” and “Effect of Enterprise Resource Planning on Organizational Productivity.”

In “Effects-Based Performance: Bridging the Gap Between Fighter Operations and Maintenance” Major Shamsher S. Mann, USAF, examines how effects-based operations (EBO) techniques might provide a more correct measure of both operations and maintenance performance. EBO advocates actions based on the desired effects over arbitrary metrics.

Traditionally, both operations and maintenance have focused on a myriad of statistics as a sole means to assess performance. While necessary, these metrics have become the final product in performance assessment and have taken on a life of their own. Drawing on the lessons from effects based operations, Mann believes there is significant room for improvement in how operations and maintenance in fighter squadrons assess themselves.

Major Julie S. Newlin, in “Effect of Enterprise Resource Planning on Organizational Productivity” provides an overview and discusses the effects of implementing enterprise resource planning (ERP) systems within an organization. ERPs are comprehensive packaged software solutions which aim for total integration of all business processes and functions.

According to Newlin, if time is spent on choosing the correct tool and ensuring the data is good, many benefits stand to be realized. However, there are stages to an implementation, and productivity may decline before it begins to improve. Discounting one study’s negative findings (Shin) on the impact on productivity, findings are positive. Studies found that productivity improves after an initial decline, at worst returning to pre-implementation levels. Measurable implementation milestones should be set so that organizations can track their progress and quantifiably state productivity levels. Finally, managers need to be careful in defining success and manage each stage of the implementation to ensure overall, long-term improved productivity.



Effect of Enterprise Resource Planning Implementation on Organizational Productivity

Julie S. Newlin, Major, USAF

Introduction

Enterprise Resource Planning (ERP) systems are comprehensive packaged software solutions which aim for total integration of all business processes and functions.¹ The Center for Digital Government (CDG)² defines ERP as “business applications used by enterprises to manage and integrate best practice business, financial, administrative, and operational processes across multiple divisions and organizational boundaries.” The CDG adds that these applications act as the backbone of the enterprise and are designed to support and automate the processes of an organization. ERP systems have become so widely diffused that they are now commonly described as the *de facto* standard for replacement of legacy systems in medium- and large-sized organizations, and it is said that some companies find it impossible to work without one.³

Organizations choose to implement ERP systems for many reasons, ranging from the fear of what might happen if they don’t implement to the reward for maximizing

technological opportunities in their operations and the resulting increased efficiencies, effectiveness, and potential profit. One study indicated that firms typically provide one of six reasons for implementing ERP—the number one reason was the need for a common information technology (IT) platform.⁴ Parr and Shanks also point out that organizations justify ERP implementations based on the desire for process improvement, data visibility, operating cost reductions, and increased responsiveness to customers through improvements in strategic decisionmaking.⁵ Another study by Deloitte Consulting found that motivations for ERP implementation fell into one of two broad categories: a resolution of technological problems and a vehicle for solving operational problems such as noncompetitive business performance and ineffective business processes.^{6,7} Others choose to implement ERP because of the seamless integration of all information flows.

ERPs evolve as they make their way through a life cycle, usually starting with conception and ending with a new way of doing business. Ross and Vitale⁸ suggest the life cycle begins with the design phase where decisions regarding process change and process integration are made. This is followed with implementation, when employees start using the system. Next is stabilization where processes are cleaned up and organizations attempt to adjust to the new environment. Continuous improvement follows and is defined by adding *bolt-ons*, which are specialized applications that augment the ERP system, and engaging

Article Acronyms

CDG – Center for Digital Government
ERP – Enterprise Resource Planning
IGT – International Game Technology
IT – Information Technology
KPI – Key Performance Indicators



in process redesign to implement new structures and roles to leverage the system. Finally, the organization enters transformation, where use of the new system is part of everyday operations. There is no longer management emphasis on using the system, it is simply used. Organizational personnel have accepted the system and processes have been modified to match the information system if necessary. A visual representation of their model is provided at Figure 1. Note that the line represents productivity during the implementation. There are other models representing ERP life cycles,^{9, 10} but they depict the same basic journey.

Success of an ERP is defined in various ways, depending on who is defining it. Success may represent staying on time or under budget or it may represent improving the organization's share of the market as a result of improved IT.¹¹ Additionally, Markus, et al. states that success is measured in the phase following implementation (the stabilization phase in Figure 1) by three things:

- Short-term deterioration in key (business) performance indicators (KPI) such as process cycle times, inventory levels, and operation labor costs
- Length of time before KPIs and business impacts return to normal
- Short-term negative impacts on organization's suppliers and customers such as average time on hold, lost calls, lost sales, and customer satisfaction levels

When an organization moves into the final phase, it is measured by the following:

- Achievement of business results expected for the ERP project, such as reduced IT operating costs and reduced inventory carrying costs
- Ongoing business improvements after expected results have been achieved

Productivity

Productivity is a standard measure often used to assess organizational performance. The basic productivity equation is output divided by input, and is the backbone of all productivity

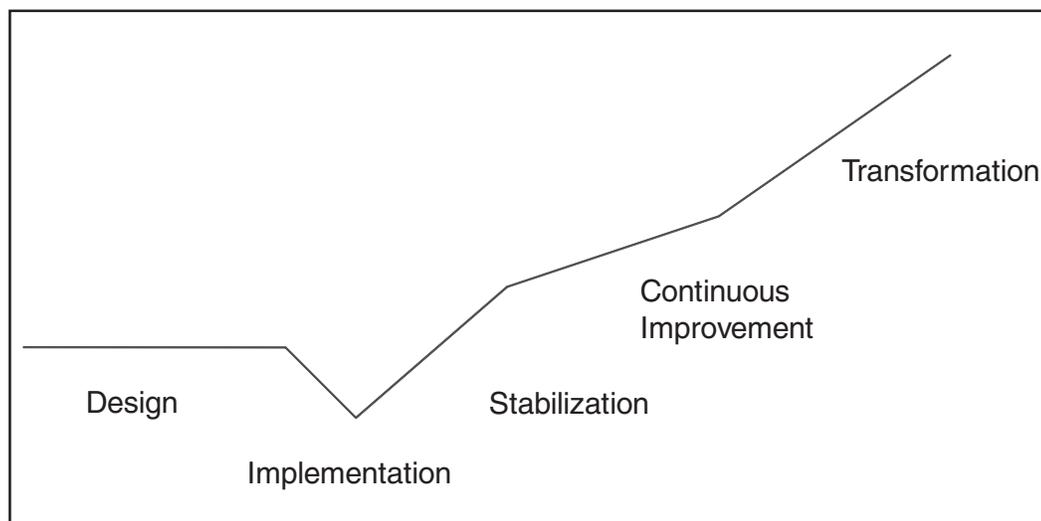


Figure 1. Stages in the ERP Journey

measurements and principles.¹² Slight variations are used when calculating labor, capital, and material productivity, but basically one finds the ratio of the real economic value of outputs in the general marketplace to the real economic value of inputs.¹³ Rosenbaum identified five methods for corporate management to improve productivity.

- Change in management policy
- Altering the mix or nature of inputs
- Adding new technology
- Adding new products
- Adding new markets

The implementation of an ERP obviously falls into the third category, but simply adding new technology does not automatically improve productivity. An organization may need to prepare for a decline in productivity before any improvements are recognized.

Productivity and ERP Implementation

There are many anecdotal examples of how ERP implementations have made an organization better. Rainer and Turban relay a story of how International Game Technology (IGT) spent 2 years implementing an ERP system that resulted in company-wide benefits.¹⁴ IGT integrated its three major business functions through a common information platform. This allowed operations workers on the plant floor to access manufacturing process details online at their workstations, more accurate inventory records, and improved turnaround time for rush orders. However, without empirically examining this situation, it is not clear exactly how much productivity actually improved (assuming it did) or exactly when the improvements were recognized. For this reason, it is necessary to review studies that have undergone a more rigorous process in arriving at conclusions regarding improved productivity.

How productivity is measured varies based on what was important to the organization being studied. For example, McAfee used order-response time and on-time completion of an order because they were two of the most important operational performance measures in the organization studied.¹⁵ However, as noted by Stensrud and Myrtveit, it is hard to find productivity indicators that allow one to compare apples to apples. Organizations typically use indicators that are easy to collect and count.¹⁶

Many companies may not see the benefits they expect until a year after implementation. Typically, performance problems are more likely to occur if the implementation is *big bang*.¹⁷ Ross and Vitale found that all firms experience an initial performance dip, with the typical stabilization period lasting 4 to 12 months with varying intensity and length.¹⁸

Gattiker and Goodhue tested organization task efficiency based on months since ERP *go-live* and found that performance improves over the first year, increasing year by year but at a decreasing rate.¹⁹ In the 111 manufacturing plants they studied, they found that, after clearing implementation hurdles, task efficiency, coordination improvements, and data quality led to improved overall plant level benefits.

McAfee found performance dips during ERP implementations mirrored those during introduction of advanced manufacturing technology.²⁰ Specifically, performance was significantly different before and after ERP was in place. In his study of a manufacturing firm, he found the production dip bottomed out at about 30 days and then began to improve. Data was only available for 250 days post implementation, but at that point improvements to pre-ERP numbers were evident. Performance had improved steadily at a decreasing rate since approximately

Markus, et al. found that all 16 companies in their study experienced moderate to severe business disruption when their ERP systems *went live*.²³ He found that the companies had difficulty diagnosing problems and then recovering from them. The companies sometimes achieved normal operations only by permanently increasing manning, then reducing their expectations about labor efficiency. Overall, the companies were unprepared physically and psychologically for the difficulties of the shakedown phase (shakedown refers to the period of time from *going live* until *normal operation* or *routine use* has been achieved). Several companies in the final stage could not say whether they had achieved business benefits from using ERP with any confidence because they had not set deliberate goals.²⁴

An interesting finding by Markus, et al. was that some companies who claimed implementation success could be considered failures later on.²⁵ They had implemented on time or

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the 30 day post-ERP time frame, although it was not clear if steady state, or transformation, had been reached. The smallest improvement was a 26.5 percent reduction in average daily lead time for orders without a computer and the largest was an 89.1 percent reduction in the late shipment rate for orders with a computer. Although factors unrelated to implementation could have contributed to this performance improvement, company personnel expressed the strong belief that the company could not have reached these performance levels without the new IT.²¹

Hitt, et al. used a Cobb-Douglas productivity function to measure productivity, performance ratio analysis, and stock market valuation across a broad section of organizations before, during, and after implementation.²² Their findings show that productivity during implementation was higher than before and that there was a dip immediately following the implementation. Further, performance is at least maintained and possibly improved following ERP implementation. The data also suggests higher performing firms tend to be the ones adopting ERP systems. Unfortunately, there was limited data for the years following the study and thus a limitation of their research.

within budget, but in doing so perhaps cut scope or did not reengineer business practices and later on did not realize the business benefits expected. The reverse also held true. An organization that was technically a failure after implementing only 15 percent of the planned ERP experienced substantial inventory reductions. This finding suggests that companies should be concerned with success at all stages of implementation.²⁶

Hendricks, et al. conducted a study to determine the impact of enterprise systems, including ERP, on corporate performance as measured by long-term stock price and profitability measures such as return on investment and return on sales.²⁷ By accessing public data on firms that had announced initiation or completion of an ERP, they tracked performance over a 5-year period—2 years of pre-implementation and 3 years of post-implementation. The findings revealed an improvement in profitability, but not in stock returns. Additionally, the improvement was most evident in early adopters of ERPs and there was no evidence of negative performance with any system.

Shin used a production function-based econometric model to study the business effects of enterprise applications, such as ERPs.²⁸ His research was focused on small businesses, with less than 300 employees, in Korea. Contrary to the previously discussed studies, he found ERP's effect on productivity was insignificant or even negative in some cases. However, as acknowledged by the author, the fact that his study covers only 2 years of data could be a factor in this result. Perhaps the real benefits take place several years from the adoption time, after organizational change, education, and business processes have been adjusted.²⁹

Summary

ERP is a comprehensive *standardized* software solution that uses industry best practices, ties an entire organization together, runs on a common database, and shares data in real time. Today, ERP implementation is so widespread that it has gotten to the point where businesses are afraid of the consequences if they don't adopt ERP. If time is spent on choosing the correct tool and ensuring the data is good, many benefits stand to be realized. However, there are stages to an implementation, and productivity may decline before it begins to improve. Discounting Shin's negative findings on the impact on productivity, findings are positive. Studies found that productivity improves after an initial decline, at worst returning to pre-implementation levels. Measurable implementation milestones should be set so that organizations can track their progress and quantifiably state productivity levels. Finally, managers need to be careful in defining success and manage each stage of the implementation to ensure overall, long-term improved productivity.

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The way to get started is to quit talking and begin doing.

—Walter E. (Walt) Disney

... nothing is impossible for the man who does not have to do it.

—Ancient strategic aphorism

An ounce of proactive engagement protection is cheaper than a pound of warfighting cure.

—Anonymous

The merit of an action lies in finishing it to the end.

—Genghis Khan