Total Cost of Ownership: A Strategic Tool for ERP Planning and Implementation

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Overview

The late Senator Everett Dirkson of Illinois was fond of saying about congressional spending, “a million here, a million there, and pretty soon you’re talking about real money.” The same might be said about spending for information technology, particularly if it is treated as a cost center rather than as a strategic investment for promoting individual and organizational efficiencies. The purchase price for IT products and services is only the beginning; the “real money” may lie in the life-cycle costs associated with the total cost of ownership, or TCO. CIOs and others interested in making the case for IT investment must change the terms of the discussion, and the management tool known as TCO offers one means for doing so.

This research bulletin examines TCO in the context of higher education spending for large-scale administrative systems known as enterprise resource planning (ERP) systems. Typically, ERP system projects span many years; are very costly; carry important political and human resource challenges; and either consolidate or completely replace the institution’s financial, human resource, and student administration and class scheduling systems.

The research bulletin will:

- Identify the major cost factors that can influence TCO in ERP projects.
- Identify cost containment tactics and management strategies that can help lower overall TCO in an ERP project.
- Discuss some of the unique features of an academic environment that must be taken into account when applying ERP best practices.
- Emphasize the business value of IT and the benefits associated with ERP life-cycle implementation.

Highlights of TCO for ERP Planning and Implementation

By definition, ERP refers to the implementation of administrative software systems that are organization-wide. These systems usually are quite expensive and have long-term consequences for the financial, human resource, and student administration functions of the university. Careful planning up front is critical, long before implementation begins and even before purchase decisions are made. Above all, ERP can be a very risky undertaking, and a TCO analysis can help mitigate that risk.

Enterprise resource planning (ERP) is a software solution that integrates information and business processes to enable information entered once into the system to be shared throughout an organization.
TCO begins with an estimate of all direct and indirect costs that might be associated with the life-cycle stages of an ERP project, including its implementation, operation, and eventual replacement. This always involves making some assumptions about the future, and then simulating various scenarios to arrive at alternative cost estimates. The goal of TCO is to support wise decisions about all costs in the beginning of an ERP project, and then to anticipate and manage those costs during its life cycle.

Perhaps the chief means for controlling TCO in ERP projects is to minimize the number and degree of changes that are permitted to the baseline software. Customization and upgrades are costly, and the decision to hold the line should be made at the beginning of implementation and revisited only under the most extreme circumstances. Similarly, the institution should be prepared at the outset to modify its business practices to conform to the demands of the new applications; delay in doing so can only increase the TCO over time.

The theoretical frameworks and much of the data surrounding TCO are drawn from studies by the Gartner Group research and consulting firm. Gartner originated the TCO concept about 15 years ago and has been the leading advocate for its use in IT, as well as a major developer of TCO methodological tools and a contributor to the research literature on the topic. This bulletin draws heavily from the Gartner research database and from its seminars on TCO which, at this point, have become a standard part of the IT and business lexicon.

One major distinction is worth noting. Most of the Gartner research on TCO focuses on cost containment of the technologies themselves. That is not the concern of an ERP implementation. Rather, ERP cost savings are derived from a disciplined, best-practices approach to software deployment, which in turn produces institution-wide benefits in the form of quality improvement and change management. Thus, TCO can be an important component in overall ERP success.

**Measuring TCO**

If there is one cardinal precept underlying the relationship between ERP projects and TCO, it is this: you cannot manage what you do not measure. Gartner’s software modeling tool known as TCO Manager is the industry standard framework and methodology for cost management. It uses standards from generally accepted accounting principles; identifies the ERP costs that should be measured, compared, and monitored; compares expenditures, staffing levels, and service levels to other organizations similar in technology, size, and mission; measures performance and user satisfaction in addition to costs; and highlights strengths and weaknesses in an institution’s TCO. It also simulates TCO targets reflecting asset changes and adoption of best practices for an unlimited set of “what if” scenarios. Most of the simulations run for three to five years and are based on benchmarking data by industry that are continually updated.

Gartner suggests that measuring, managing, and controlling costs are three separate disciplines. Each has a different objective, using TCO as a fundamental element. Measurement is a stake in the ground to determine where an enterprise is today.
Management is communication and the attainment of a commitment to action. Control is the execution of these actions and the monitoring of key cost elements to maintain alignment with the goals of the enterprise. But it all starts with an institutional commitment to and a culture of empirical evidence.

**Applying TCO**

**Life-Cycle Costs:** There are five major ERP life-cycle components of TCO analysis: acquisition, implementation, operations, maintenance, and replacement (Figure 1). The most important cost drivers within each of those categories are: the nature of the organization (for example, a large, public, multi-campus system versus a small, private institution); the quantity and types of technologies (for example, mainframe versus client-server system); and management practices (centralized versus decentralized IT operation). The life cycle of the technologies themselves is another critical component. For example, desktop hardware may last two to five years, applications software 10 to 15 years, and wiring 20 to 25 years, compared to 30-plus years for the physical plant and an annual cycle for personnel and support costs.

*Figure 1. Applying TCO to the ERP Life Cycle*

Too often, acquisition costs drive decisions concerning ERP deployment; this forces attention to up-front, direct, and budgeted costs. Focusing on the total cost picture, on the other hand, leads us to consider the indirect, unbudgeted, and contingency costs of implementation and operations that can haunt an ERP project downstream. As Figure 1 suggests, most of the life-cycle costs of an ERP system are centered in operations and maintenance. Controlling software modifications and centralizing operations can have significant effects on overall costs.
TCO is a means for understanding and controlling the risks associated with implementing an ERP system. As Figure 2 suggests, change has to be assimilated into the organization in steps. Proper change management maximizes the political, fiscal, and organizational benefits over the life cycle of the ERP system while minimizing risks. In the early stages of an ERP project, political and process factors are very important. Achieving early wins and optimizing user buy-in can pave the way for controlling both political and fiscal costs down the road and increase the chances of delivering product on time and on budget.

**Figure 2. Applying TCO to an ERP Implementation**

Direct and Indirect Costs: The identification and measurement of direct and indirect costs is a critical requirement of TCO analysis. Direct or budgeted costs include all expenditures related to clients, servers, peripherals, and networks, including capital, fees, and labor in each area. Indirect or non-budgeted costs include downtime and services to end users. These costs often are hidden and difficult to identify or measure. While direct costs usually relate to tangible assets, indirect costs are found in time and productivity losses due to downtime in technology or among staff. They tend to be process and people oriented and contribute heavily to overall TCO. Few things are as difficult to fund and to conduct as end-user training and support, yet that is where most indirect costs reside and where most direct costs get shifted. Understanding indirect costs is one of the big lessons of TCO analysis.

Once the direct and indirect costs are known, the basic strategy is to conduct what-if simulations of various implementation scenarios to see which yields the best TCO. All of these calculations obviously rely on making good assumptions as a basis for evaluating the TCO comparisons.
Managing ERP Costs

Assuming that the major life-cycle costs can be identified and measured, the issue is then one of instituting cost-containment tactics and management strategies to lower overall TCO in an ERP project. Gartner has identified two broad categories of cost management enablers: technology and process. The technology factors include platform standardization, automated asset management, hardware inventory, client remote control, and automated software distribution.

The process-related factors include end-user training, IT professional staff training, a stable IT organization, capacity planning and management, benchmarking of current operations, centralized procurement, and vendor standardization. The relative efficacy of any cost-reduction strategy usually depends heavily on the technology itself. However, the cumulative effect of implementing a combination of these technology and process factors can be expected to lower TCO in both direct and indirect costs.

The long-term goals of an ERP project deserve the most sustained attention; short-term, tactical cost reductions should not impede achievement of long-term goals and priorities. Budgetary downturns can be a direct threat to expensive ERP projects, which is where strategic cost management comes in to play.

Standard cost-containment strategies usually include the following:

- Control institution expenditures in the form of caps, across-the-board cuts, deferred purchases, and reductions in discretionary spending.
- Manage reductions in targeted areas based on program reviews.
- Achieve productivity improvements through process redesign.
- Outsource operational and capital costs through strategic sourcing.
- Renegotiate contracts to receive better rates or extended payments.
- Streamline strategic goals and expectations for the institution through a comprehensive mission review.

These practices make sense, but are essentially defensive in nature. A more proactive approach might include the following:

- Manage risk—TCO is as much about risk management as cost containment. It is a good idea to conduct a formal readiness assessment on a campus prior to beginning an ERP implementation.
- Set a management strategy and philosophy and stick to it.
- Reengineer work processes as a means for controlling costs, especially if it enhances service levels.
- Develop a detailed understanding of the relationships between ERP life cycles and TCO (again, the lesson of Figure 1).
Limitations of TCO

Bill Kirwin, the creator and leading proponent of TCO analysis in IT, suggests that at least five myths surround the use of TCO:  

1. **TCO is about cutting costs.** Rather, it is about providing appropriate services at appropriate costs.

2. **TCO is about technology first and foremost.** Instead, the ultimate concern is process improvement, efficiency of operations, user satisfaction, and effectiveness of services.

3. **Gartner’s TCO numbers are the benchmark.** False, because Gartner numbers are based on computer models and case studies. The only valid TCO numbers are those specific to a particular institution that may not share the assumptions in Gartner models. An institution should always ask, “How are we different?”

4. **The IT platform with the lowest TCO is the best choice.** TCO is only part of the total policy-making process, and other factors may be weighted more heavily.

5. **Soft costs do not count.** Instead, the indirect, “off the books” cost of operations are among the most significant factors in total TCO.

TCO models borrowed from the corporate sector can be helpful as long as allowances are made for some of the unique features of an academic environment. The categories of analysis may be similar between industry and academe, but the assumptions and many of the costs associated with ERP projects may be quite different.

It is no accident that words like stability, automation, standardization, and, by implication, centralization, appear in most discussions of ERP and TCO. And it is true that networks permit (but do not mandate) these processes. The ultimate issue is whether such processes and values are compatible with the institutional culture. They may be for things like network infrastructure buildouts and backroom administrative systems. Applying TCO principles and tools to academic uses of technology may require a somewhat different terminology. In the final analysis, TCO best practices may have important but limited utility in higher education. The distributed nature of IT resources on the academic side of the institution makes it difficult both to mount ERP-type projects and to institute TCO controls. On the administrative side, however, both are possible.

What It Means to Higher Education

Much if not most of the data on TCO are drawn from the private, corporate sector. The management, purchasing, and other processes of the nonprofit, academic culture may be quite different. If the university is also a public institution, then you have two massive layers of bureaucracy—academic and public—that may share few similarities with the corporate, profit culture, despite the surface similarities in technology.
For example, pricing decisions in the private sector can be fairly straightforward—the best price for the best value where the only stakeholder is the corporation itself. The stakeholders in universities, especially public universities, are more diverse, and their interests may conflict. The university may want the best value, while the state government may require the lowest bid. The constant challenge in any ERP or IT investment generally is demonstrating its business value and its overall institutional benefits.

**Establishing Value**

TCO begs a question beyond costs, namely, what are the measurable institutional benefits of an ERP implementation? There may be costs with few or no benefits, but it is unlikely that there can be benefits without costs. IT investment involves tangible assets, so the costs are often direct and immediate. The benefits may be more qualitative, indirect, and long term, and therefore more difficult to identify and measure. Value is in the eye of the beholder. Something beyond rewards is at stake here, so it makes sense to pay systematic attention to the benefit side of the equation. Any TCO model should assess, predict, and manage the cost impact of changes in ERP technology, implementation, and support strategies. However, the benefits of ERP may lie more in the process itself than in a particular outcome.

For example, consider the following change-management cycle. The items shown in Figure 3 constitute the key elements for making the change process work. It begins with measurement and process mapping, moves to improvement targets and action plans, and concludes with assessment and rewards—and then the process begins anew. The net result is quality improvement in the form of procedural best practices, user satisfaction, productivity, and increased collaboration across functional divisions.

**Figure 3. Key Elements of Successful Change Management**

![Building the Change Cycle](image-url)
Following are a few tactics for demonstrating the business value of IT generally and ERP specifically. Almost all require disciplined analytical work in order to be useful. Building decision support is particularly important. TCO can be a tool not only for anticipating and controlling the costs of an ERP project but also for justifying it in the first place. At a minimum, CIOs or those that serve in similar roles should:

- Integrate the IT strategic plan within the institution’s financial strategy, not the reverse. Develop an ERP business case emphasizing the values, language, and metrics of the financial division (for example, benchmarking, TCO, return on investment, and risk management), not those of the IT division.  

- Make technological innovation and adoption a core institutional process and a core cultural value. ERP should not be something out of the mainstream, but an expression of institutional values.

- Demonstrate the far-reaching value of investments in knowledge capital and the specific contributions of computing, software, and networks to that asset, even for administrative purposes. Expand the perception of IT as a utility function to also being a core-mission function and asset.

- Present ERP as a routine infrastructure investment similar to the capital plant. In that sense, few will question its value or why it is needed. Although IT infrastructure alone has little inherent value, the applications it supports do.

- Position ERP as a factor in promoting institutional competitiveness and productivity.

- Point out how the university would conduct business without an ERP—this is one of the best ways to demonstrate its value. Surveys, monitoring systems, and case studies can demonstrate how a technology infrastructure, in all of its components, is a prerequisite for promoting the academic mission and conducting the administrative functions of the institution.

Consider two caveats. Once implemented, the value of ERP initiatives becomes imbedded in processes that are difficult to measure. Support costs for the initiatives, on the other hand, are visible and easy to document. Accordingly, unless pre- and post-implementation metrics are clearly defined, it may be impossible to measure and report the value of a new IT acquisition or application.

Second, many utility applications are considered overhead and contribute to the perception of IT as a cost center rather than as a benefit to students, faculty, and staff. Accordingly, IT departments should deliver high reliability and low cost in functional areas that are not mission critical, and ERP falls largely into that category.

**Demonstrating Benefits**

For the past several years, the 23-campus California State University system has been implementing the largest ERP project in higher education. It is known as the Common Management System (CMS). The CMS project is replacing legacy financial, human resource, and student administration systems on the campuses with a PeopleSoft suite.
of applications, all managed through a single, consolidated data center. Recently, the CSU system hired the consulting firm of Cap Gemini Ernst & Young (CGE&Y) to perform a benefit study of the ERP implementation.

The study found that benefits to the campuses fell into four categories: cost savings, resource reallocation, productivity gains, and risk mitigation. While not all campuses experienced all of these benefits (they were in varying stages of CMS implementation), empirical examples for all four categories could be found throughout the system. As with the cost side of the equation, the critical factor seems to be the life cycle of the ERP implementation itself.

In December of 2002, the EDUCAUSE Center for Applied Research (ECAR) published a comprehensive research study on ERP implementations in higher education. This study drew on the ERP selection and implementation experience of more than 480 higher education institutions. The study found that immediately following an ERP implementation, 54 percent of the responding institutions experienced a drop in institutional productivity, as they adjusted to operating in the new environment. However, at the time they were surveyed, 70 percent of the institutions indicated that their productivity had improved. Nearly 80 percent of institutions reported that they did not achieve all of their desired outcomes immediately.

The findings from the ECAR ERP study on productivity, then, were not surprising. CGE&Y observed similar patterns in ERP implementations across industries, based on similar factors to those described above. The report states that:

> Most of ERP’s major benefits don’t come out of the box. To reap these benefits, institutions must redesign business processes to take advantage of the system’s capabilities and retrain their users in these new processes. Even for those institutions that perform these tasks well, achieving many of ERP’s benefits takes time. Users must become familiar with how to perform their daily tasks in the new system, learn about the system’s new capabilities, and the natural resistance to change found in most organizations must be overcome. Reports need to be built and deployed that take advantage of the new, more robust data sets available in ERP systems, and users must learn to understand and use the capabilities of new reporting tools in their jobs.⁷

The following diagram (Figure 4) depicts the typical life cycle of benefits derived from ERP implementations.
CGE&Y observed four major stages of benefits derived from a typical ERP implementation. These benefit stages begin at the time of initial go-live, and usually take several years to realize their full potential. Characteristics of each stage include:

- **Stage 1—ERP Go-Live**: User learning curves and business processes are severely challenged at this stage. Most of the “out-of-the-box” benefits are tactical and accrue to institutions with severely broken or limited legacy systems.

- **Stage 2—Incremental Improvement**: As users learn to perform their jobs using the new system, and any deficiencies in functionality vis-à-vis the organization’s legacy environment are corrected, the organization often is able to capture a number of incremental improvements through increased efficiencies or improved effectiveness. Many organizations state that they need to get through one full business cycle using the new system in order to reach this stage.

- **Stage 3—Extend Capabilities**: As users and organizations become more familiar with the capabilities of their new ERP system and as additional functionality not included in the initial go-live is rolled out, organizations often are able to achieve benefits by better aligning the capabilities of the ERP software with their business processes and goals.

- **Stage 4—Create New Capabilities**: The largest benefits derived from implementing ERP systems often come from utilizing the clean, integrated data
it provides to create new capabilities and services for the organization’s customers, staff, and management. By using ERP systems in such ways, organizations are able to make significant changes to the way they do business, removing many traditional constraints. This usually takes two years or more following full ERP implementation.

Both the costs and benefits of an ERP system, therefore, are strongly related to life-cycle factors. Policy makers as well as end users need to understand the implications of that fundamental fact.

**Key Questions to Ask**

- How can TCO analysis contribute to choosing a vendor or product for my institution’s ERP implementation?
- How will TCO help policy makers on my campus focus attention on the indirect and long-term costs of an ERP system as opposed to the initial purchase price?
- How can tracking the actual, comparative, projected, and targeted TCO of an ERP project keep its implementation on schedule and on budget?
- Will TCO analysis help control the indirect or hidden costs in ERP implementation, especially those associated with organizational processes and end-user training and support?
- Can TCO help in establishing the business value of an ERP project to the institution and win the support of policy makers?
- How can TCO analysis be linked to the benefit stages of typical ERP implementations?
- Can TCO be applied to other areas of major IT spending (for example, learning management system procurement or computer hardware)?

**Where to Learn More**

for Applied Research, Research Study, Volume 4, 2002),
<http://www.educause.edu/ecar/research/doclists.asp>

- Gartner Group publications (available through subscription). For member institutions, articles on TCO by B. Kirwin are most notable, such as “CIO Update: To Control TCO, It Must Be Measured and Managed,” Gartner Group Research Note (IGG-04162003-02), April 16, 2003; and “Management Update: Total Cost of Ownership Analysis Provides Many Benefits,” Gartner Group Research Note (IGG-08272003-01), August 27, 2003.

Endnotes

4. Redman, Kirwin, and Berg, op. cit.

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