

## **A Holistic Approach to Understanding Information Technology (IT) Costs** **Arlene F. Minkiewicz**

### **Abstract**

*When we talk to Information Technology (IT) leaders about better defining, selecting and managing their IT projects, they are quick to inform us that the projects represent less than 1/3 of their budget. Most of the IT budget goes toward paying existing people and supporting existing datacenters. What's needed is an approach that uses activity based models of the current state of an IT operation combined with an activity based analysis of Total Cost of Ownership (TCO). This will facilitate a determination of both cost savings and additional costs associated with new projects and emerging technologies. High performing IT organizations take a "holistic approach" to understand and model IT costs. They optimize their portfolios based on ROI, where the "I" (investment) is TCO, including hardware, software implementation, software maintenance and operations costs. This paper discusses methods to assess as-is and future state IT operations to facilitate business case analyses for technology adoption and new projects.*

### **Introduction**

IT project failures are not news. There is certainly no dearth of stories available detailing such failures. Read the newspaper, watch the news or search on the Internet for IT project failures and you will satisfy any desire you might harbor to bask in another's failure. In an article entitled "Lessons Learned: IT's Biggest Project Failures" [1] we find all of the 'usual suspects' when it comes to reasons for IT Project failures: unmanaged expectations, unrealistic expectations of market need, poor project management, unrealistic and aggressive timelines, and scope creep to name a few.

We also find allusions to IT project consequences beyond application development failures. In the 1990's the state of Washington was working to improve the services the department of Motor Vehicles provided to the citizens of that state with a License Application Mitigation Project (LAMP). This project was estimated to cost \$16 million over five years with the anticipated result of automation of the state's vehicle registration and license renewal. Over time, as the actual and projected costs increased dramatically, the project was not cancelled. The program was continued, even with the cost overruns, until it was determined that once the software was implemented the cost to run the system would be six times as much as the cost to run the system it was replacing. If only they had thought through the whole project and all its implications before they started implementation – the state could have saved over \$40 million.

Application Development tragedies happen all the time. It's important that we understand what makes them happen and take action to mitigate future failures. Equally important is a comprehensive understanding of all of the factors that impact an organization's IT health. Each on-going and proposed IT project

needs to be examined in light of these factors so that IT organizations make the best decisions about what projects to pursue and which projects may reap disaster. This paper provides a holistic view on IT cost estimation – going beyond the traditional estimation tasks associated with application development to examine activities and cost drivers associated with the comprehensive set of capabilities IT delivers to an organization.

### IT – What’s really in there?

Application development projects can represent significant expense to an organization and tend to be the riskier items in the IT budgets. But it is important to recognize that they represent only a small part of most organizations IT budgets. According to Gartner’s “IT Spending and Staffing Report 2008”, [2] on average organizations spend about 20% of their IT budgets on application development. The rest of their budget is spent on hardware, software, networking, maintenance, as well as data center and help desk activities. Figure 1 shows the breakout of IT costs for the average organization in 2008 as reported by [2].

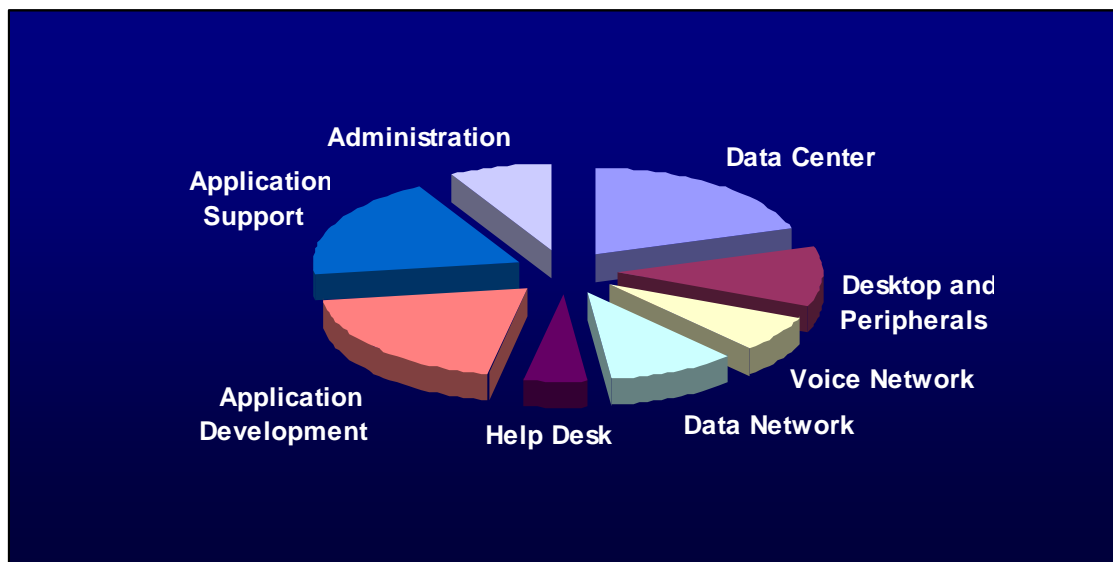
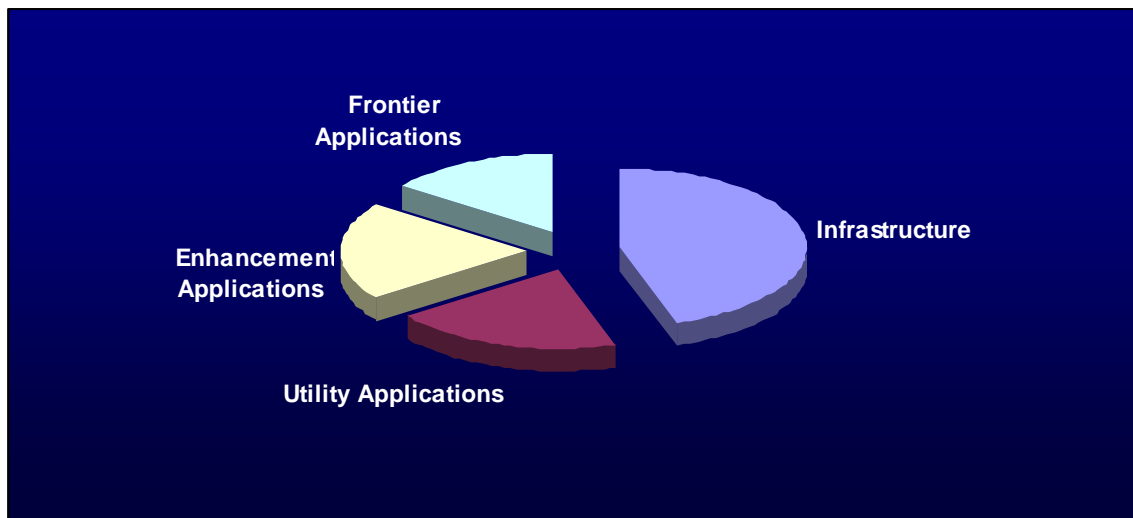


Figure 1: 2008 IT Spending

From this same report we see that over the last 7 years the distribution of investment dollars between on-going operation and growth and innovation has remained steady, with operational expenditures dominating. On average, organizations have spent 65% of their budgets to run the business, 21% to grow the business with a mere 14% of the budget left to transform the business.

Another Gartner report, “How to Use IT Cost Metrics Effectively” [3] confirms that it is typical for an organization to spend 30 – 35 % of their IT budget on growth and 65 - 70% on day to day expenditures. Figure 2 shows this breakout in terms of the areas where funding is concentrated. Infrastructure includes all the

essentials required for sustaining IT throughout the organization such as networks, desktops, laptops, servers, development tools, training and help desk. These items make it possible to keep all of the company's applications running. Utility applications such as HR or payroll are necessary for the success of the business but add nothing to the businesses ability to perform within their core competency. Enhancement applications improve the company's current performance in some significant way, through increases in speed or quality or decreases in costs. Frontier applications are applications that advance the state of the art of the business by making major changes in the way the business performs.



**Figure 2: Components of IT**

According to this, 30-35% of the IT budget is consumed with the development or composition of new software capability. The rest of the budget is consumed with purchasing and supporting infrastructure and off-the-shelf applications that support the business.

Traditional IT estimating capabilities focus primarily on the 30-35% while largely ignoring the 65-70% of cost required to keep an organization's IT function healthy. While this focus is justified to some extent by the fact that new software development is riskier than on-going maintenance, it introduces risks of its own. Businesses must decide every day which of the enhancement or frontier type applications they will undertake and which should be turned down, postponed or cancelled. Making this decision in an 'application development' vacuum without consideration of the Total Cost of Ownership (TCO) of each alternative may lead to undesirable outcomes. Businesses need an approach that uses activity based models of the current state of an IT operation combined with an activity based analysis of TCO.

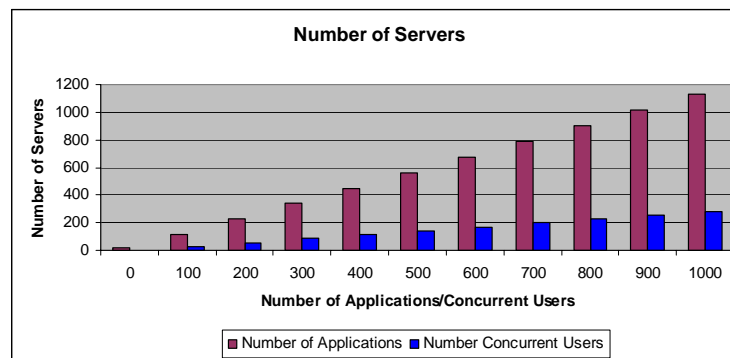
### What IT really costs

There are several different approaches one might take to perform an as-is analysis of the costs of an IT organization. The determination of which approach is most suitable depends on the current state of the IT organization, the reason for performing the analysis, the granularity of detail available and the amount of time available to perform the analysis. Bottoms up analyses are appropriate when the requirement is precision and there is a fair amount of granular data available with respect to the various hardware, software, network and communication devices in place. A more top down approach is appropriate when the organization is emergent, when the amount of detailed data is limited or the requirement is to produce an analysis quickly. This paper will focus on the top down approach as that is a more interesting solution.

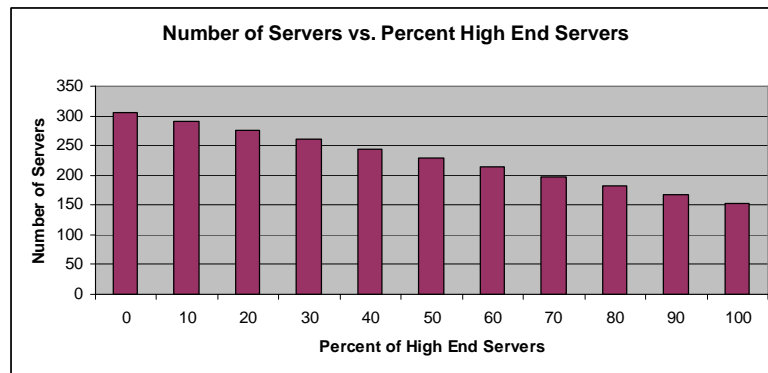
For the purposes of this paper we will focus on the total costs of ownership for the IT Infrastructure, as this is the oft neglected piece of the cost estimation puzzle. At a fairly high level there are three activities associated with the healthy life of the IT infrastructure.

### ***System Deployment and Networking***

This activity accounts for the process of standing up an IT Enterprise; associated costs include the costs of purchasing servers, desktops, notebooks, storage systems, networking capability and software. Also included are the costs of labor for IT and telecommunication professionals to deploy the infrastructure. Taking this top down approach requires that we identify the factors most likely to drive the costs. There are several cost factors for this activity that should be considered. One of the most significant cost drivers is the number of servers. Research and common sense indicates that the number of servers required will be a function of the number of applications and the number of concurrent users that need to be supported. This relationship will change with the number of high end servers that are employed. Figure 3 shows how Number of Servers required varies with Number of Applications and Number of Concurrent users. Figure 4 shows how this relationship changes as more powerful servers are included in the mix.

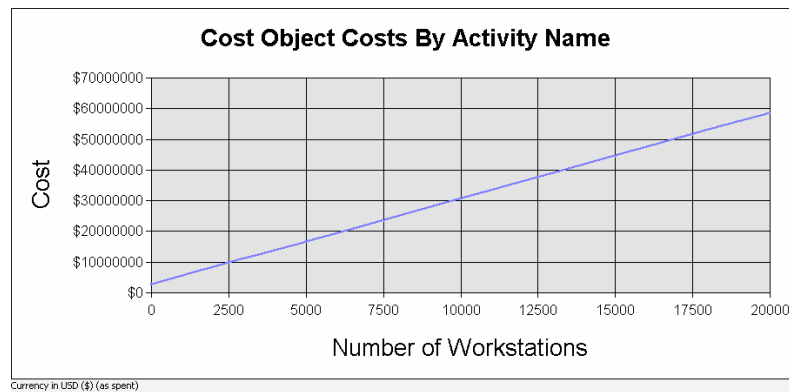


**Figure 3: Number Servers vs. Number of Applications**



**Figure 4: Number of Servers vs. Percent High End Servers**

Through their influence on number of servers, the number of concurrent users and number of applications becomes critical factors in the costs of the deployment and networking activity. The number of workstations is also a critical driver. This number is typically driven by the number of end users. Figure 5 indicates how Number of Workstations drives cost.



**Figure 5 Cost Vs. Number of Workstations**

Other factors that impact the deployment and networking costs for an IT Enterprise include the split between end user requirements for laptops and desktops, security considerations and the level of virtualization.

### ***Maintenance and Support***

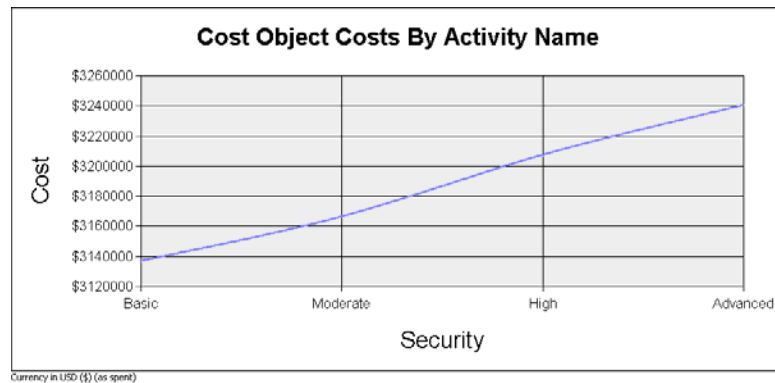
The costs associated with this activity include the monetary contributions to maintenance on hardware and software as well as the labor associated with this maintenance. Also included are costs for desktop management and security as well as end user costs due to troubleshooting or down time associated with IT related issues.

As with deployment and networking, primary cost drivers for maintenance and support include the number of servers, the number of workstations and the configurations of types of servers and workstations. These

numbers are driven by the number of applications and the number of concurrent users as shown in Figures 3 and 4. Other factors which will influence the maintenance and support costs include:

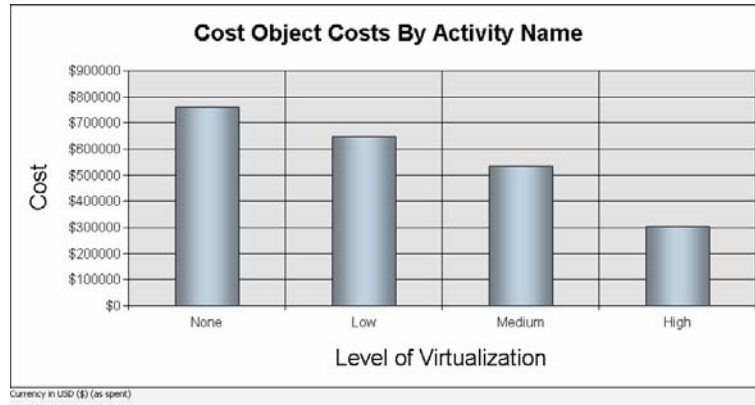
Desktop management – this refers to the amount of control and process that is flowed down from the IT group. In some organizations end users have free reign to install whatever software they like and change settings on their individual desktops or laptops at will. Other organizations completely lock down the settings and the applications that their users can have, enforcing strict usage policies. It is much less likely for end users and/or the network to experience breaches, difficulties, and failures when configurations can be changed in a completely ad hoc fashion. Increased process and control reduces maintenance costs.

Security also plays a key role in determination of maintenance and support costs. Figure 6 shows the impacts of Security on Cost as we move from Basic security characterized by no special security features, to a situation characterized by well defined and managed security policies and constant monitoring of the network



**Figure 6: Costs vs. Security Levels**

Another driver with significant impact on maintenance and support costs is the Level of Virtualization. Virtualization refers to the practice where one physical server is used to create multiple 'virtual' servers which appear to the user as though they are completely different servers. Figure 7 indicates the cost impact of virtualization as it progresses from none to a point where 80% of server capability is virtualized. The cost impact is a side effect of the fact that higher virtualization reduces the number of servers it is necessary to maintain and operate.

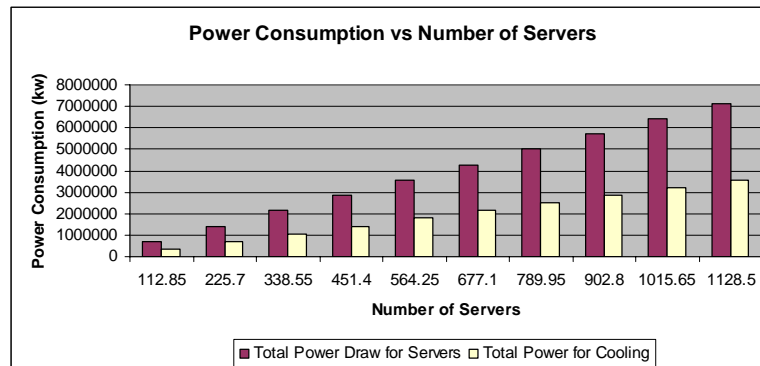


**Figure 7: Cost vs. Level of Virtualization**

***Operation and Administration***

Total ownership costs at the IT Enterprise level include acquisition and maintenance costs for hardware and software, IT labor costs for maintenance activities, and other costs the organization has to pay specifically driven by their unique requirements for IT. Costs associated with the Operation and Administration activity have to do with space required to house servers and data centers, the power consumed in the operation and cooling of this equipment and time spent by non-IT labor resources to fix or account for IT failures or requirements.

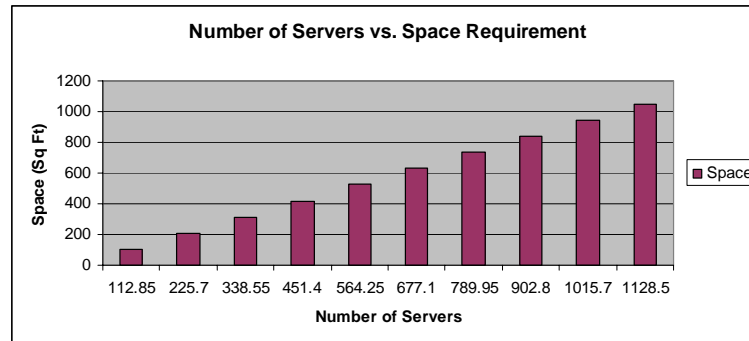
As with the other activities noted above, a significant cost driver for Operation and Administration is the Number of Servers necessary to deliver required capability. This value is influenced by number of concurrent users, number of applications and level of virtualization, as well as the configuration of high end and blade servers. Figure 8 shows how power requirements for cooling and operation are driven by number of servers



**Figure 8: Power Consumption vs. Number of Servers**

Space requirements are also a significant driver of Operations costs. Servers and other IT equipments take up room and often require special

accommodations. These too are a function of the number of servers necessary to support concurrent users and number of applications, as well as the geographical location where the data center is physically located. Figure 9 represents the relationship found between number of servers and space requirements.



**Figure 9: Number of Servers vs. Space Requirements**

### **Supporting Good Decisions with Total Ownership Costs**

Combining an understanding of what drives application development costs with knowledge of how other IT costs are influenced, businesses are in an excellent position to make well informed decisions about how to invest their IT dollars.

For a simple example, let's look at a fictitious on-line hardware store. Launched in 2006, Tools-on-Line was an instant success with the home improvement junkies, carrying hundreds of popular brands and promising same day delivery, eliminating the need for multiple trips to the hardware store in the middle of home improvement projects. By early 2009, Tools-on-Line is taking 150,000 orders a day but they're getting indications that business is being lost due to the poor performance of their existing infrastructure. The managing partners meet and decide that if they want to grow the business they need to act quickly, they authorize the IT department to spend \$1.5 million to provide a solution that will allow for a doubling of orders within the next four years.

The IT department began by looking at their anticipated operational costs for the next 5 years. Figure 10 shows the current situations. Note that the current configuration supports 2500 concurrent users.



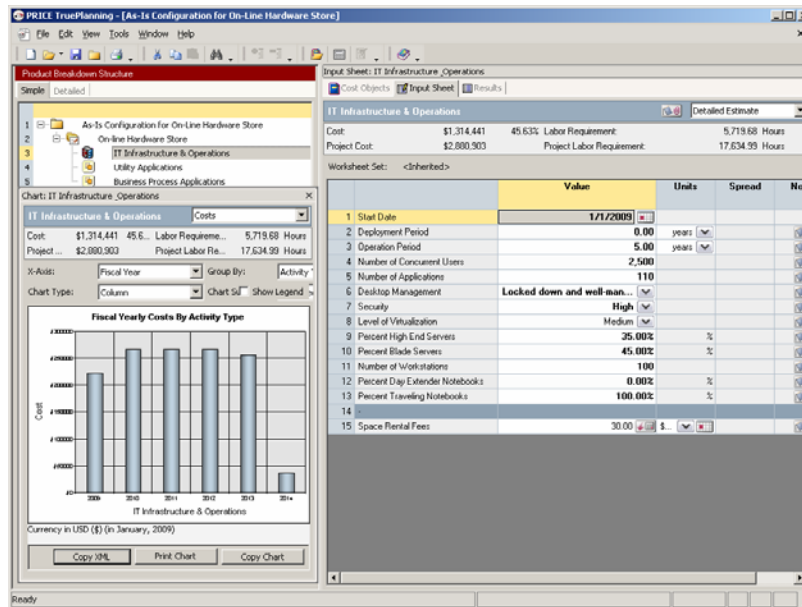
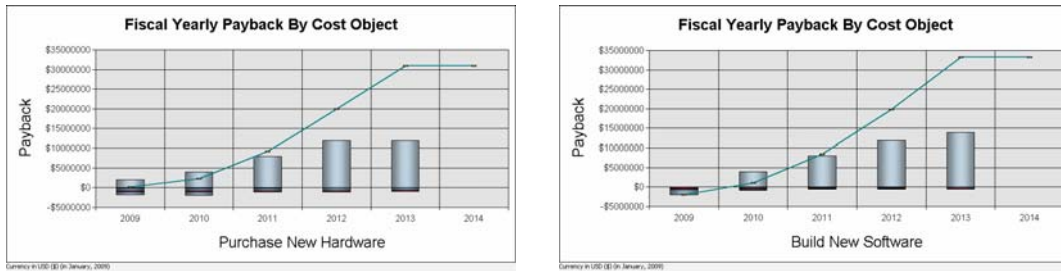


Figure 10: Current IT Configuration

After careful deliberation, the folks in the IT department developed a plan which involved purchasing enough additional servers in order to double the number of concurrent users who can access the system. Research indicated that this could be accomplished within the \$1.5 million budget authorized.

When the plan was presented to the managing partners, the first question that arose was “Where are you going to put all these servers?” Although On-Line-Tools did a good business, they did not currently have a lot of real estate. With the exception of their server room and a few small offices, they were a virtual company, with employees and agents spread across the country. They did a little more analysis and realized that while the cost for the servers met the \$1.5 million goal, the addition of these servers to their infrastructure increased operational costs from \$573K to \$1024K over the five year period they were examining.

The IT group went back to the drawing board to think about a software solution. After consultation with the marketing folks, they determined that most of their shoppers were no nonsense about their tool shopping. They knew exactly what they wanted and didn't do very much 'window shopping'. Armed with this knowledge and a little software development ingenuity, they crafted a plan to develop a software solution that would streamline the shopping process, cutting the time the average shopper would be on the system by more than %50. While the software solution takes longer to deploy, and longer to realize value, the payback over the five year period is significant. Figure 11 shows a side by side comparison of the projected payback of the two options.



**Figure 11: Payback Analysis of purchase vs. build solutions**

If the option to purchase new hardware had been pursued without a complete analysis of the impact of this decision on the long term operating expenses of the enterprise, On-Line Tools would have lost potential revenue.

### **Conclusion**

Many organizations focus lots of time and energy on predicting the cost and effort associated with application development projects. This is an excellent practice and should certainly be continued. At the same time many organizations fail to spend much time at all worrying about what drives costs for the other 75% of their IT budgets. Without proper knowledge of what factors drive costs for deploying, maintaining and operating the IT capabilities, businesses are likely to make decisions about procurements, enhancements or development projects that are going to deliver less than optimal return on investment.

Maintaining a holistic view of Information Technology costs can be a discriminator for any business. Rather than letting the tail wag the dog, these businesses can make informed decisions based on the far reaching implications of adding new equipment, increasing band width, creating new training requirements, developing new applications, adding new users to the network or creating or modifying help desk requirements. Applying an activity based approach to this analysis helps decision makers see the short and long term implications of starting new projects or deploying new technology.

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