

MANAGEMENT

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MANAGEMENT ACCOUNTING GUIDELINE

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# Evaluating Performance in Information Technology

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## EVALUATING PERFORMANCE IN INFORMATION TECHNOLOGY

### INTRODUCTION

While some of the recent publications on information technology question the value creating role of IT in today's business environments (Carr, 2003 and 2004), others assert that, with the economic recovery in many parts of the world, innovation — especially in information technology — is becoming even more critical to growth and high performance.

With respect to the first, doubts about the potential payoffs of IT investments can be traced to numerous IT projects made without the rigor of measurement of either the benefits or costs of such

investments. Decisions were made based on compelling arguments and keeping up with competitors resulting in billions of dollars of wasted corporate assets. France Telecom, for example, announced that they spent 700 million euros on external IT services in 2003 which is after slashing 138 million euros from the IT spending of the prior year (838 million euros). Almost every organization has stories about unfulfilled promises about the benefits of new ERP or IT systems. In the United States alone, annual expenditure on IT now runs into trillions of dollars, and approaches 50 percent of new capital investment for most organizations with little evidence to

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		This Guideline will develop an IT performance measurement framework, articulate specific measures, describe the causal relationship between various drivers and measures, and through examples, illustrate how companies can identify and measure the payoffs of IT investments.

suggest that this expenditure has generated a satisfactory return (Murphy, 2002, Davenport and Prusak, 1997). Typically, the costs of technology are much higher than anticipated, the cost of conversion is also higher, whereas the benefits are far lower and harder to achieve than expected. In addition, this ignores the very significant costs related to employee time wasted and the disruption to personnel, operations, and the revenue stream of the organization. While the claim that some organizations collapsed because of ineffective IT policies may be an exaggeration, many Chief Executive Officers (CEOs) and business unit leaders view IT as a value destroyer or a cost rather than a value creator implying its corroding impact on the organization's competitive advantage.

On the other hand, the advocates of the bold and comprehensive new vision of how organizations can use information technology to create value believe IT matters more than ever, yet in a different way. By moving from an era of technology to an era of technology capability, the focus has shifted from individual technologies to the benefits that can be created with them. Because of this focus on technology capabilities, innovation is emerging not just from technologists, but from the users of the technology components who understand how to use IT to deliver higher levels of organizational performance. By filling the gap between the rate of technology innovation and people's understanding and ability to use and implement the technology, organizations can use these innovations to lead to substantial improvements in their performance. Even for organizations that were actually quietly making a big difference in their markets by leveraging IT, it was still often difficult for these Chief Information Officers (CIOs) to quantify those results, and prove the benefits. Then, when earnings declined, IT was an easy target for cost cutting.

A primary reason for doubts about the potential value organizations can derive from existing and future investments in IT is related to the absence of a proper methodology to evaluate the payoffs of IT investments. So far, there has been little guidance of how to design or implement an appropriate IT performance evaluation system, i.e. how to identify and document the contribution of information technology to high-performance organizations. Historically, organizations were driven by

enthusiastic managers who were over relying on technology and did not demand development of the needed skills and the measures to complete these analyses. Today, the financial managers and other decision makers want the IT requests to be framed in a ROI or shareholder value format so that they can be effectively compared with alternative potential company investments. According to the Forrester Report, 90% of executives make the IT funding decisions based on the financial impact of IT initiatives; however, the top challenge in selecting which IT project to fund is the lack of objective data (Cameron *et al.*, 2000). Senior IT managers are convinced that they do create value and believe that, if measured properly and with adequate support, they would be significant profit centers for their organizations. But without adequate performance evaluation systems, they have difficulties proving the value adding role of IT and find themselves continually fighting for and justifying the resources that are needed. CEOs and CFOs lack information to make well informed decisions on the payoffs of these investments and, as a consequence, corporate goals seem to focus on reduction of the costs of IT rather than maximizing IT value creation activities.

## OBJECTIVES AND TARGET AUDIENCE

As IT managers must show the payoffs of IT investment to convince key executives that they should be strong supporters of IT efforts, a framework for evaluation of IT performance is a significant need. Few things are more convincing to top executives than measurable results. When a new project is proposed, additional funding is typically based solely on the results anticipated from the project. Currently, IT executives do not have proper tools to measure the payoffs of IT. Even financial managers that have expertise in management control and performance measurement, have not focused on the benefits of IT and have not developed the appropriate measures. Consequently, the payoffs of IT are not measured, ROI is not calculated, and IT investments are not evaluated with the same rigor as other corporate investments. The purpose of this guideline is to provide a model and a selection of measures for evaluating performance in information technology in both for-profit and

not-for-profit organizations to help CIOs better justify and evaluate their initiatives and aid CEOs and CFOs in making better resource allocation decisions.

This Management Accounting Guideline's **objectives** are as follows:

- To develop a general model of key factors for organizational success in IT integration (IT Contribution Model) that includes four dimensions: the critical inputs and processes that lead to success in IT outputs and ultimately to overall organizational success (outcome).
- To articulate each of the key factors (antecedents and consequences of IT success) as objectives to facilitate further operationalization of the model.
- To outline the specific drivers of IT success based on the objectives related to inputs, processes, outputs, and outcomes, and identify the causal relationships between the drivers.
- To provide the specific measures of IT performance. Following the cause-and-effect relationships between the drivers of IT success, measures are developed to track performance of IT initiatives along the four dimensions. The metrics can be used for both IT project justification prior to its start (planning) as well as for evaluation after completion (performance measurement).
- To provide examples of how to assign monetary values to non-financial IT outputs (benefits). Although some benefits do not always easily translate into short term profits, they should ultimately lead to either cost savings or increased revenues.
- To provide an example of how to calculate the IT payoffs. Here, the guideline specifically recognizes the importance of measuring both the total costs of an IT initiative — including a range of different disruption costs — as well as the benefits, and additionally considers the risks associated with IT investments.
- To show how the IT Contribution Model is consistent with other measurement frameworks such as the Balanced Scorecard and Shareholder Value Analysis.

The **target audience** of this guideline is the accounting and finance professionals that deal with the challenges of performance measurement and control in IT. Presented in a

systematic format, the guideline is also intended to help CIOs, Chief Training Officers (CTOs) and senior IT managers better understand how information technology contributes to higher levels of corporate performance, more easily evaluate the profitability of IT investments, and make better resource allocation decisions. In addition, it is also helpful for the CEOs, CFOs, and other decision makers that struggle to identify, document, measure, and communicate the short-term results and long-term impacts of IT investments. This includes both cost savings and value creation, and thus provides arguments for additional IT resources when appropriate.

## ENSURING ACCOUNTABILITY IN INFORMATION TECHNOLOGY

Typical large IT investments, E-commerce investments, and very large ERP system implementations are all faced with the same challenges of demonstrating the value of the investment and historical difficulties in estimating both the revenues and total costs. This typically falls on senior corporate and senior financial managers to evaluate the payoffs and make recommendations on resource allocation — which are typically significant. But it is not only growing budgets that make IT an important expenditure. The consequences of improper and ineffective IT initiatives can be significant if we consider the integration of the IT department into the mainstream functions of the organization. Also, IT infrastructure upgrades provide vast potential to contain costs, enhance productivity, improve quality, spur innovation, and satisfy and retain customers.

With CEOs and CFOs demanding accountability for the tremendous investment in information technology, IT managers are required to ensure accountability, calculate the return on investment, develop a value-added approach, and make a bottom-line contribution. At the heart of accountability is measurement and evaluation. IT managers faced with the challenge to demonstrate the validity of IT initiatives to the business must find ways to measure and communicate the contribution of IT so that viable existing initiatives are managed appropriately, new projects are only approved where there is satisfactory return, and marginal or ineffective projects are revised or eliminated. To properly assess the payoffs of investments in IT, organizations must implement comprehensive systems to evaluate the impact of IT initiatives on financial performance and the

trade-offs that ultimately must be made when there are competing organizational constraints and numerous barriers to implementation.

However, with larger and more complex IT solutions and with business process changes typically enabled by or driven by information technology, IT projects should be viewed as business change projects with IT components rather than stand-alone IT projects. That is, change management constitutes an important part of IT projects and the business value of any IT investment must be clearly stated.

Business value is created through a combination of IT tools and business processes, thus, there must be a clear distinction between IT and business accountabilities. IT managers are accountable primarily for successfully delivering the appropriate technologies, infrastructure, and technical support, while accountability for delivering business results rests jointly with the IT function, the relevant business managers, and performance measurement professionals. The benefit realization process usually transcends departmental boundaries, and when designing an appropriate IT evaluation model, this should be considered.

### **IDENTIFYING THE OBJECTIVES AND DRIVERS OF SUCCESSFUL INFORMATION TECHNOLOGY INVESTMENTS**

The identification and measurement of the impacts of IT investments are particularly difficult as they are often linked to long time-horizons, a high level of uncertainty, and impacts that cannot be easily quantified. But, measurement and evaluation systems can be simplified and implemented with manageable cost through early planning, and a change in philosophy and attitude of both the IT staff and those it serves.

In recent years, organizations have placed increasing importance on the development of performance metrics to better measure and manage IT programs and projects; however, few specific metrics have been proposed. With the high costs that are often associated with IT investments and the seemingly small percentage of IT projects that pay off, the impression is often that the projects are flawed whereas it may be that it is the performance measures that are flawed. Worse, the lack of performance metrics may

have also led in part to the lack of both actual and perceived accountability for IT operations to its various stakeholders.

### ***New IT performance measurement models***

There have been some recent attempts to measure the value of IT. One author developed a ratio called Information Productivity (IP) which is simply the ratio of the Economic Value-Added (EVA) to the total cost of information management (Strassmann, 1999). With information technology being one of the fastest growing components of the cost of information management this metric is designed to reflect an organization's success at converting the cost of information management into profit.

Another proposal is to expand conventional financial measurement, like return on investment and payback period, to an eBusiness context which is a whole-view measurement of business performance across both internal and external constituents (Cameron *et al.*, 2000). By setting weighted eBusiness objectives relating to end-customer success, hyper-partnering efficiency, and multi-organization financial performance and applying quantitative and qualitative impact metrics, organizations can track a project's impact on a given eBusiness objective.

In yet another approach, Intel has developed a Business Value Index (BVI) (Intel, 2003b, Curley, 2004). BVI is a component index of factors that impact the value of an IT investment. It evaluates IT investments along three vectors: IT business value, impact on the IT efficiency, and the financial attractiveness of the investment. All three factors use a predetermined set of defining criteria that includes customer need, business and technical risks, strategic fit, revenue potential, level of required investment, and the amount of innovation and learning generated. Each criterion is weighted, and project managers or program owners score their projects against these criteria to produce total scores for each of the three vectors. By graphically depicting the three indices for each project, BVI methodology provides some decision support to managers to compare and contrast investments, and then determine the investments that align best with their business priorities.

Though all of these approaches are helpful, specific tools for identification and

measurement are necessary. (Additional relevant approaches can be found in Tardugno *et al.* 2000, Remenyi *et al.* 2000, Murphy 2000, Devaraj and Kohli 2002, Lutchen 2004, Weill and Ross 2004, Curley 2004 and Schubert 2004). This guideline attempts to provide a format so that organizations can identify and measure the costs and benefits of IT. It provides a useful model and specific metrics that will help organizations measure the inputs, and processes, as well as the benefits and value resulting from IT initiatives. As most contemporary approaches to performance measurement emphasize the alignment between strategic objectives and measures — since it is difficult to measure performance unless it is clear what an organization is trying to achieve — we begin with the necessary alignment between information technology and the corporate strategy.

***Designing the IT Contribution Model — convergence of corporate strategy and technology***

Information technology increasingly serves as the engine of innovation and the foundation of growth for organizations worldwide. Virtually no organization can generate new products and services, manage its investments, communicate with suppliers, buyers, or employees, and extend its markets without IT. Business and IT are inseparable, with few decisions resting entirely in the domain of either business or IT. The decision-making process surrounding IT investments, thus, must seek to expand IT capabilities to satisfy future business needs as well as current needs. Investment decisions must consider the strategic perspective if they are to be effective. In fact, the alignment between the corporate and IT strategy is crucial for two reasons:

- A proper incorporation of IT strategy into the corporate strategic plan allows for sufficient capital and human resources to fund IT projects and programs;
- Carefully planned and implemented IT initiatives significantly contribute to successful execution of the corporate strategy.

The strategic alignment thus refers to the alignment of IT investment strategy with the achievement of the organization's strategic goals and objectives. The question to be asked is 'Will this IT investment help us achieve our corporate strategic goals?'

In a recent survey, researchers found that the

state of IT and business alignment has improved over the past three years resulting in increased productivity, cost savings, and customer satisfaction (Russell, 2004). On the other hand, two critical issues were underlined: IT budgets are poorly aligned with the corporate strategy, implying there is a risk that mid-cycle budget changes may derail planned activities, and, the larger goal of successful execution of corporate strategy remains elusive.

The deficit in strategic effectiveness may largely be attributed to poor communication and understanding of strategy at lower levels in organizations. Few organizations actually have a strategy that is communicated to those who are expected to execute it. If IT is an important contributor to strategic success, then a lack of understanding as to how IT resources are being used to execute strategy represents a missed opportunity for IT/strategy alignment. It is important to identify how IT can help make corporate strategy execution possible and here, an active involvement of the CIO in the planning and execution of corporate strategies is crucial. In addition, IT managers, financial managers, and heads of Strategic Business Units (SBUs) need to cooperate throughout the entire implementation process. While budget practices may obstruct IT alignment with corporate strategic goals, a systematic IT contribution model can be used to show how discretionary IT spending can support strategic business initiatives. The purpose of discretionary spending is to achieve strategic alignment and enable sufficient flexibility to respond to new strategic challenges and opportunities that cannot wait until the next round of the formal budgetary process. As a relatively large portion of all IT spending is discretionary, the lack of a well-structured method for communicating the strategic role of IT is a serious handicap for the organization. Without the benefit of a well understood analytical and communication tool, IT is left to defend its budget with little more than a reference to poorly measured project-level ROI analysis.

Value creation depends on accomplishing strategic change: to exploit new opportunities and existing capabilities, to defend against competitive threats, and to overcome deficiencies. Since every change involves new, enhanced, or changed information technology, strategy execution cannot be accomplished without IT. How the organization spends the IT resources can thus significantly affect the

organization's ability to create value. In particular, the organization and financing of the IT function are potentially significant drivers of IT alignment and effectiveness.

**The IT Contribution Model — inputs, processes, outputs, and outcomes**

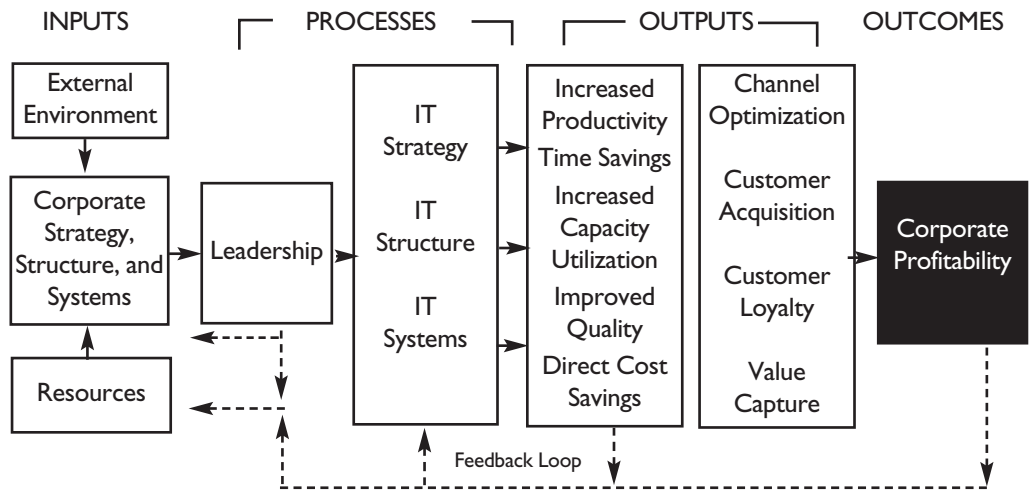
Exhibit 1 describes the key factors for corporate success in IT integration. It includes the critical inputs and processes organizations need that lead to success in IT outputs (internal and external). However, IT success ultimately must be measured by its contribution to overall organizational success (such as profitability or shareholder value) that is the ultimate outcome and measure of success. The IT Contribution Model can be equally applied to both for-profit as well as not-for-profit organizations.

well as *external outputs* such as channel optimization, customer acquisition, satisfaction, and loyalty, and overall value capture. If the IT strategy formulation and implementation is successful, these outputs should ultimately be realized in improved overall corporate profitability (**outcome**).

In Exhibit 2, inputs, processes, internal and external outputs, as well as outcomes of IT activities are further articulated as IT objectives.

After having identified specific IT objectives along all four dimensions, the drivers of IT success (see Exhibit 3) must be determined and the relevant measures developed. Critical drivers specify more precisely the keys to IT success and the actions that managers must take to improve the success of IT activities that will ultimately impact on overall

**Exhibit 1: IT Contribution Model: Antecedents and Consequences of IT Success**



An organization's IT success is dependent on various **inputs**. This includes its existing corporate strategy, structure, and systems that provide both opportunities and constraints on IT initiatives. These, along with available resources and the external environment, are critical inputs that affect choices in the formulation and implementation of IT strategies. Other factors, such as leadership and IT strategy, IT structure, and IT systems (**processes**) also significantly impact the performance and success of IT initiatives. Both the inputs and processes impact on various IT **outputs** that can be classified as either *internal outputs* such as improvement in productivity, time savings, increased utilization of capacities, improved quality, overall cost reduction, as

organizational success. In practice, there are numerous drivers of IT success and the ones outlined in this guideline do not attempt to cover all choices. Various elements should be considered when developing IT strategy and specific IT programs, and several managerial actions such as the use of management control levers, performance measurement and management systems should be employed to assure their successful implementation.

A careful and clear articulation of the most influential drivers of IT success help determine the **causal relationships** leading from the inputs to the processes and then flowing to the desired outputs and outcomes. Causal relationships between drivers within each of the four dimensions as well as between drivers



**Exhibit 2: IT Contribution Model: IT Performance Objectives**

<b>Outcomes</b>	Long-term Corporate Profitability/Organizational Success Short-term Corporate Profitability/Organizational Success
<b>Outputs:</b>	Value Capture: Increased IT profits
o <b>External</b>	Customer Loyalty and Retention: Increased sales from existing customers Customer Acquisition: Increased sales from new customers Channel Optimization: Increased site traffic and sales
o <b>Internal</b>	Direct Cost Savings: Reduced IT costs and other direct costs Improved Quality: Reliable information, less inspections, lower cost of quality Increased Capacity Utilization: Optimal use of existing resources Time Savings: Shortened process cycles Increased Productivity: Improvements in operational productivity
<b>Processes</b>	IT Systems: Appropriate processes for effective implementation IT Structure: Integration into business unit structure IT Strategy: Coherent and aligned strategy Leadership: Commitment and focus on IT initiatives
<b>Inputs</b>	Resources: Adequate capital & people Corporate Systems: Suitable training, information, processes, and culture Corporate Structure: Appropriate corporate organizational structure Corporate Strategy: Alignment with type of products offered, customers served, technology used, and competitive positioning External Environment: Adapted to external forces

in different dimensions are based on hypothetical assumptions of causes and effects, i.e. leading and lagging elements. In practice, the notion of leading vs. lagging elements should be thought of as a continuum, as, for example, customer loyalty leads to increased financial performance, but at the same time lags the quality of products or services. These hypothesized relationships may neither be a perfect description of actual relationships that are underlying the IT strategy nor are they supposed to be constant through time. On the contrary, they need to be continuously tested and revised. A clear understanding of the causal relationships underlying the primary drivers of value is one of the most important determinants of the model's effectiveness.

The causal linkage map of drivers is useful and important as it helps ensure all actions necessary to achieve success are taken, that unnecessary actions are not taken, and that all employees understand their critical role in the success of the IT activities. Exhibit 3 illustrates a

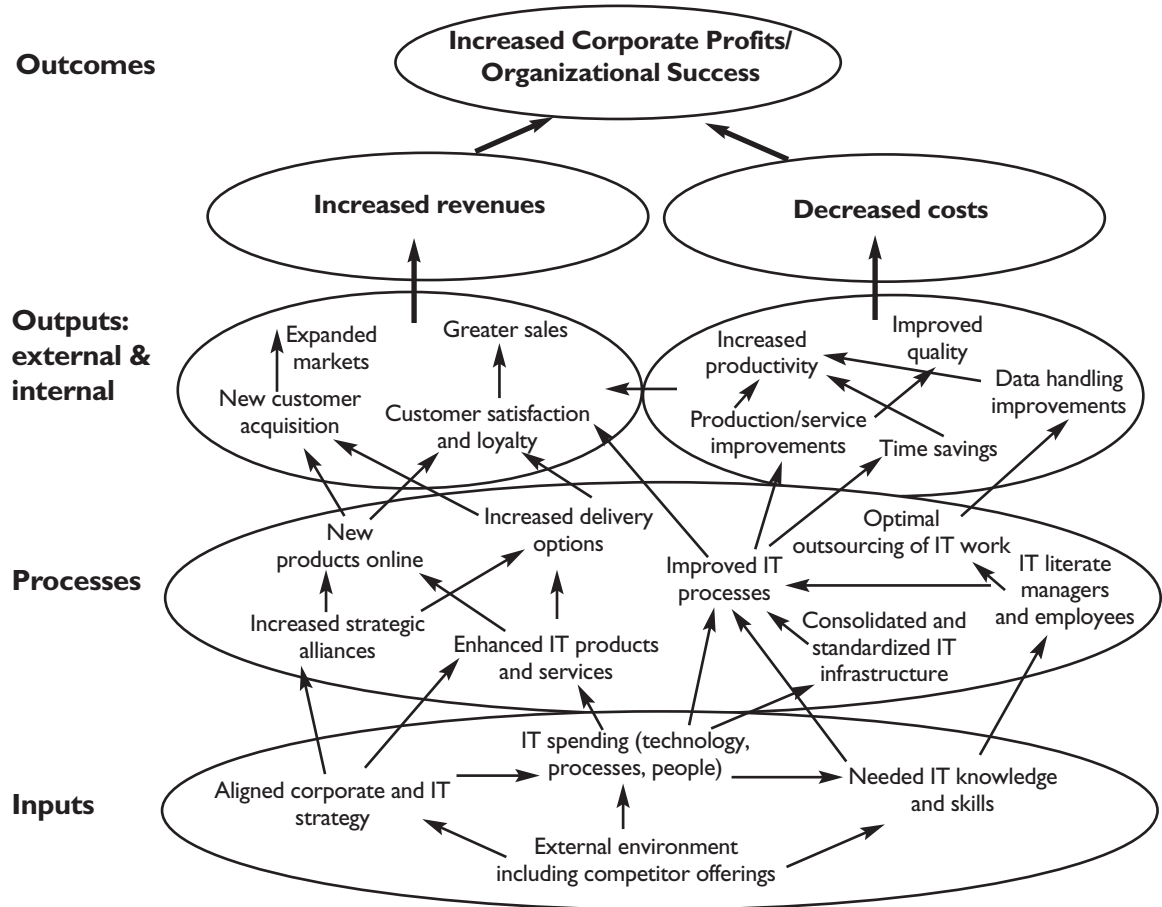
comprehensive example of IT performance drivers and the many causal relationships between them. In practice, there should be fewer critical IT performance drivers and the illustration of the causality of IT performance drivers less complex.

For example, if organizations align the corporate and IT strategy, then they will potentially obtain more resources to spend on IT technology. More resources spent on IT technology can enable them to consolidate and standardize IT infrastructure leading to improved IT processes, increased productivity and quality, and decreased costs. Similarly, if organizations devote more resources to enhance IT products and services, they can increase delivery options leading to higher customer satisfaction, sales, and revenues.

#### **Identifying the inputs — objectives and drivers**

When revising existing IT strategy or developing a new one, senior managers need to fully

Exhibit 3: IT Contribution Model: Causality of IT Performance Drivers



evaluate the external environment and the corporate resources, strategies, structures, and systems to determine whether the IT strategic initiative fits well with the organization’s existing internal and external environment and predict its likelihood of success.

**External environment** represents the least controllable of all input variables. The external environment may include changes in the economy, technological forces, political-legal forces, socio-cultural forces as well as the industry — competitors, customers, suppliers, and so forth — within which the organization operates. Thus, even though organizations may have coherent strategies, structures, and systems as well as adequate corporate capital and labor resources for IT investments, changes in the external environment can importantly influence corporate decisions regarding the IT organization and its success. CIOs, CTOs and IT managers should be constantly engaged in environmental scanning

by monitoring for weak and strong signals, specifically in the field of technological development, as well as examining the most important stakeholder groups both internal and external to the organization.

**Corporate resources** that are most critical for IT success relate to capital (financial resources) and people (employees). In many organizations, CEOs, and CFOs provide glowing remarks about IT’s important impact on the organization’s success, but when organizations are in financial difficulty, cutting the IT budget is one of the first moves. Some corporate level executives see IT’s share of enterprise revenue and expense growing at an alarming rate and while this growth typically reflects the advancing strategic role of technology, many believe IT spending is above its optimal level and pressure managers to reduce overall IT spending. Not surprisingly, in many IT departments project managers are multitask professionals as they serve simultaneously as business analysts, project

managers, and support managers — roles that each require specific skills, and techniques. Work overloading impacts on morale, project delivery, and customer satisfaction. Information technology and human capital are important ingredients for value creation. To support new or expanded IT operations, it is thus necessary to look at the people and capital that currently exist in the organization and assure sufficient funding for necessary training and education and new hires.

**Corporate strategy** and the alignment of information technology is a constantly recurring topic of interest within the IT community. Corporate strategic objectives drive the definition of business processes, but they also determine technology architecture, and the needed staff capabilities, so that information technology supports the underlying business processes. Although corporate strategy may actually be modified as a result of the development of IT, corporate strategy remains an important input to the formulation and implementation of IT strategy.

**Corporate structure** that an organization has plays a big part in determining the organization of IT operations within it. Whether an organization has a large number of strategic business units or networks across a wide geographical area will significantly impact on many IT activities. In organizations with more decentralized organizational structures and with independent business units, a more streamlined, standardized infrastructure is integral to the way applications, business processes and services are delivered. The technology infrastructure must be able to handle enormous volumes of data from inside and outside the firewall. It must accommodate data from a range of new sources and in a variety of formats, and it must gather, store, and transmit information dynamically to accommodate the fast-paced decision making. Corporate structure thus represents an important input to the IT strategy, structure, systems, and leadership necessary for IT success.

**Corporate systems** relating to the flow of information, human resources, compensation, management control, performance measurement, and organizational culture will impact the choice of IT strategy and implementation. Often, there are no formalized communication channels for infrastructure and systems support, and lack of a disciplined process for coaching and feedback. Also, performance of IT departments is

largely undocumented. This can often be traced to poor HR policies and management control practices. An organization's corporate systems are thus highly relevant in improving the implementation of newly developed IT strategies.

### ***Identifying the processes — objectives and drivers***

Once the viability of IT initiatives is estimated through proper evaluation of the external environment and inputs available in the organization, senior managers responsible for planning and developing IT strategies and programs can focus on the processes necessary to drive superior IT performance. Both the careful examination of inputs as well as effective use of processes will determine the outputs and outcomes.

**Leadership** of the organization must be knowledgeable about IT, committed to IT initiatives, and aware of the impacts on existing organizational culture and behavioral patterns that may act as impediments to effective implementation of new IT initiatives. Senior managers must provide full support to IT programs and projects and communicate that these are supported widely throughout the organization. They must help employees to understand the importance of IT initiatives, foresee the potential benefits of specific IT programs and projects, and willingly embrace the notion that IT initiatives will ultimately benefit them as well as the organization as a whole. If unable to secure strong support for IT programs at the corporate level, though an IT program may be installed effectively by technical staff or consultants, it is unlikely to reach its potential and success is improbable.

**IT strategy** must be consistent and aligned with corporate strategy, structure, and systems and supported by IT structure and systems. The organization's choice of markets, customer expectations, products and services as well as the pricing policy will importantly influence IT decisions. IT strategy is about acquiring, allocating, and managing the use of limited IT resources so that IT can deliver high value through increased revenues, decreased costs and facilitated transactions. For example, AFLAC, a Georgia-based insurance company, achieved a true competitive advantage and dominant position in Japan by handling most of its business online. The company's early investments in Internet technology enabled it to communicate

with, sell to, and service Japanese companies and their employees. Technology enabled the company to settle and process product claims without costly agents and claims processors. As a result, AFLAC's cost to acquire and process a new customer is \$72 versus \$120 for its Japanese competitors (Suh, 2004). Thus, IT investment decisions should be strategic in that they can create business value in the near term and prevent the risk of making bad decisions in the long term. By having a clearly formulated strategy, IT managers can resist pressure from individual business units to include ad hoc components to meet their special IT requirements.

**IT structure** will be impacted by several critical factors, such as the level of outsourcing appropriate for the organization, the relationships the organization wants to develop with its partners, the existing corporate organizational structure, and the level of desired IT integration, consolidation, and standardization. They all impact on the organization of the IT department and impact decisions related to software coordination, maintenance of legacy systems, and the centralization or decentralization of the IT function. Partnering with other companies in their supply chain significantly impacts IT structure and creates powerful value propositions. Eniro, for example, Northern Europe's largest yellow pages company, collaborated closely with Microsoft and created a product development tool with the potential to reduce Eniro's product development lead time dramatically (Mesøy and Arlebäck, 2004). In recent years, many IT infrastructures have evolved and grown in a haphazard fashion either through systems included in mergers and acquisitions or in response to the needs of a specific business unit. As a consequence, these infrastructures are often poorly integrated and inflexible, complex and underutilized. Instead, IT structures should evolve as a result of the careful examination of a comprehensive infrastructure strategy. Sainsbury's, one of the United Kingdom's largest grocery retailers, for instance, faced with fierce competition and declining operating profits, sought to reduce the complexity and improve the effectiveness of its IT infrastructure. Based on a program of standardization and consolidation across a range of hardware, database, communications, and applications systems, IT service levels have

been improved dramatically while associated costs have been reduced (Kasamis and Nunn, 2004). Choices about how an organization decides to design and implement its IT structure and organize its IT function are key issues that organizations must address. Specifically, a broader understanding of what the core organizational processes are and a careful analysis of both the short-term and potential long-term benefits is needed to justify all new IT alliances including outsourcing.

It is essential that **IT systems** such as specialized HR practices for IT departments, IT training, performance measurement, and management control are part of the processes pertinent to IT. In many organizations, the gap between the rate of technology innovation and employees' skills and knowledge to productively use these new innovations is growing preventing IT efforts to realize its full potential. It is important to improve employee IT literacy, employees' understanding and ability to use these new innovations, measure improvements based on implemented innovations, and establish proper compensation policies to stimulate employees to deploy the use of IT. Consequently, results may extend far beyond items such as lower costs, and timelier customer service, to heightened productivity, and greater sales. Cisco, for example, a leading producer of routers and other packages to help control traffic and information on intranets and on the internet, has found great benefits from hiring online, including faster filling of positions, and higher competence of people employed (Epstein, 2004).

#### **Identifying the outputs — objectives and drivers**

If the IT initiatives are well designed and executed and the causal relationships properly specified, the identified inputs and processes should lead to improved performance in outputs, and ultimately to increased corporate financial performance. Objectives and drivers for internal and external outputs are specifically important as they foretell the critical key success factors and what results should be expected. A weak performance on the output metrics should signal a need to reexamine the inputs and processes and determine whether they have been wrongly specified, improperly placed in the causal relationship scheme, or just poorly executed.

As already mentioned, the overall outputs of IT initiatives can be divided in two categories:

- **Internal outputs** relating to increased productivity, time savings, increased capacity utilization, improved quality, and direct cost savings;
- **External outputs** that cover a broad array of results with respect to channel optimization, customer acquisition, loyalty, and retention, and overall value capture.

**Increased productivity** is one of the expected immediate benefits of new IT programs and projects. Improvements in information technology infrastructure, for example, in terms of fully integrated application systems allows for better access to databases, faster exchange of information, reduced operating cycles, and so forth. Also, the standardization of IT work processes, segmentation of the work, and global dispersion for greatest efficiency permit numerous improvements. These include reuse of applications and technical architectures, automation of much of the delivery process, and codification of methodologies so that they can be repeated, which all greatly increases productivity. Intel (2003c), for example, reports on the effects of wireless mobile technology on employee productivity. Employees who were upgraded to wireless notebook computers realized a productivity gain of more than two hours per week, which exceeds the cost of the upgrades in the first year. In addition, wireless mobility rapidly changed the way employees worked. For example, employees were able to make productive use of formerly wasted slices of time between larger tasks, as they could redistribute their working time around professional and personal obligations.

**Time savings** are another potential immediate internal output of new information technologies. When improved information systems integrate the new product development process, the investment payoff results in reduced time to market. By replacing existing production methods and logistics with an enhanced IT support system, throughput time can be significantly reduced. Also, improvements through online processes assist in activities such as ordering, invoicing, tracking, payment, and delivery. Critical business processes such as procurement, sales, and customer relationship management can be increasingly automated, creating both time savings and, consequently, cost savings through reduced paper handling and

requirements for human intervention in administration. Pirelli, a manufacturer of automobile tires, cables, and systems, for example, integrated its IT systems with those of its global customers and dealers, and was able to significantly reduce administrative activities, save time, and reduce costs (Hill *et al.*, 2004). In a 2002 study, Intel found that it could save its employees at least 60 hours per year on ten common office application tasks by upgrading IT software. According to Intel, these gains directly support their ability to remain competitive by enabling employees to make decisions quicker, execute faster, add value, and respond to internal and external customers more quickly. (Intel, 2003a)

Infrastructure enhancement can also enable organizations to optimize the use of existing resources. **Increased capacity utilization** can result from investments in operations applications, and telemetry. One company, for example, is investing in telemetry to improve control over the large private rail fleet that transports its products. The solution involves the use of satellite communications; GPS; and weight, temperature and impact sensors. This company launched its own tests, which revealed large benefits through increased turns (journeys from the production facilities to the customers and back) on its rail cars (Kasamis and Nunn, 2004).

**Improved quality** specifically relates to IT initiatives aimed at enhancing TQM activities that ultimately result in lower preventive and appraisal cost of quality, reduced demand for rework, and increased customer satisfaction. Also, the electronic information tends to be more accurate due to fewer transcription errors and contribute to higher reliability and quality of data.

**Direct cost savings** relate primarily to the reduced IT expenses originating from the consolidation, standardization, and integration of IT applications, from the increased IT systems' security, and from the replacement of old IT systems that require high maintenance. A large telecommunications company, for example, consolidated and standardized its entire global IT enterprise — from the workplace to the underlying network, including data, applications and servers. The effort generated significant cost savings and reduced annual IT expenses by 40 percent (Kasamis and Nunn, 2004). The same source reports of a large financial services company which had been operating on a country-based franchise model. By standardizing,

consolidating, and building out a central infrastructure services organization with its own P&L responsibility, savings of nearly 20 percent were realized. Direct cost savings may also originate from enhanced IT systems security. For example, the trucking industry suffers heavy losses from truck and cargo theft. By placing computers in the trucks, GPS installations, and biometric identification systems, the truck, its contents, and all personnel can be tracked and verified (Ferguson and Taylor, 2004). Similarly, insurance organizations currently spend hundreds of millions of dollars to gather and analyze information on how customers operate their vehicles. Then they use this information to help them manage risk and offer appropriate, targeted policy coverage. Using telemetry to supply insurance providers with this information saves time and reduces costs (Osman, 2003).

The financial consequences of improvements in internal outputs are reflected in cost savings or, potentially, in increased sales. The external outputs, on the other hand, relate to achievements realized in the market.

**Channel optimization** can be accomplished and exhibited through an array of items that vary from increased site traffic to informational gains and improvements in demand and supply chain relationships. By encouraging suppliers and customers to use the channels that provide the highest revenues and lowest cost, the enhanced information technology outputs are evident and the impact on corporate profitability becomes clear. Nordstrom, for instance, a high-end retailer, was an early mover in luxury retailing online. The company used e-commerce as a cost-cutting strategy, replacing the need to send out expensive catalogs to potential customers. Offering products that need to be examined in person before the sale is complete, Nordstrom provided particularly generous return policies to overcome the hesitation to purchase products online (Epstein, 2004).

**Customer acquisition** can significantly be increased by creating and using new channels that provide customers with products and services. Organizations, for example, that move more commerce to the Web can accomplish expanded global coverage and exposure with a relatively minimal investment. Through online activities, organizations can offer existing and new products and services

directly to their customers, thus approaching segments whose buying interests otherwise may not be as easily aroused.

**Customer loyalty** can be seen through repeat customers and is a consequence of overall satisfaction levels. Customer satisfaction may originate from an array of items, such as improved product and service quality (products with correct specifications, deliveries to the right locations), delivery speed (on-time deliveries, time between order taken and delivery effected), as well as lower prices. Information technology can significantly impact on all of these. The internet, for example, permits organizations to connect with their customers, partners, and suppliers in a virtual environment permitting increased communication and a greater ability to intertwine the organization's operations with the external stakeholders' needs. IT applications supporting e-commerce activities can provide an important opportunity to improve customer service levels and relationships leading to increased customer satisfaction, loyalty and repeat purchases. Amazon, for example, has designed most of its own functions, including the search system, customer accounts system, and IT infrastructure. The design of Amazon's site, characterized by its personalization technology, greatly contributes to its high repeat customer rate (Epstein, 2004).

**Value creation** is at the core of business objectives. As customers are better able to compare the products and services offered to them through internet, for example, they can more easily compare alternatives and competitor offerings in an expedient manner. Also, with IT impacting on the operating costs and sales cost, the opportunity to offer lower prices to customers is greatly increased leading to the ability to be more competitive and drive increased revenues. Organizations can also create and capture additional value by providing additional services to their customers such as customization and personalization. Well-integrated IT infrastructures support organizations in these efforts by securely storing large amounts of data.

For organizations seeking to achieve high performance, the role of information technology has never been more vital. The extraordinary abundance and easy accessibility of information, the tools and technologies used today to gather and share information,

cheaper computing power and data storage, all give organizations an unprecedented opportunity to use IT to create business value.

### ***Identifying the outcomes — objectives and drivers***

For IT initiatives to be of value, the intermediate outputs — both internal and external — must eventually pay off in increased **organizational success** (corporate profits). Viewed simply, increased profitability can only be achieved through reduced costs or improved revenues. Thus, in order to prove that IT investments in programs and projects were financially sound, the ultimate effect on corporate financial profitability must be determined and the payoffs clearly documented.

## **DEVELOPING THE APPROPRIATE METRICS**

To closely monitor the cause and effect relationships, appropriate metrics must be developed. These metrics must be consistent with and support the objectives and drivers of success. Metrics should be used to foster an understanding of corporate strategy and performance drivers that will enhance cooperation between business units and stimulate a forward-thinking approach to achieving relevant objectives.

The starting point for developing the appropriate metrics should be an overall agreement on the drivers that are critical to achieving the objectives in those areas in which the organization must excel in order to ensure

success. Some drivers, such as innovation, are more difficult to measure and the temptation is to avoid measurement. However, if they are considered to be crucial in demonstrating how IT can improve business success, they must be incorporated in the performance measurement system. It may be that non-financial performance measurement is more appropriate in such cases, but attempts should be made to measure as many drivers as possible with monetary values.

The same is true for outputs. For example, improvements in quality may well be measured by the percentage of high quality products, but it is more important to measure the dollars saved on less rework. Or, increased employee productivity can be measured by the percentage increase in production output per employee; by assigning monetary values, additional sales based on productivity improvements can be determined. Both the non-financial and financial measures, as long as they are expressed quantitatively, i.e. either in absolute or percentage terms, are useful and allow comparability and target setting. However, financial measurement is especially important as managers want to calculate ROI and demonstrate IT payoff.

The list of metrics presented in Exhibits 4, 5, 6, 7, and 8 is not meant to be a comprehensive set of IT performance measures. Rather, it is a selection of some metrics that may be appropriate. The right IT metrics are neither the same nor relevant for every organization, so, managers must select those that most closely fit their strategy, and adapt or develop others.

**Exhibit 4: IT Contribution Model: Metrics for IT Investments - Inputs**

<b>Inputs</b>	<b>Performance measures</b>
Corporate Strategy	<ul style="list-style-type: none"> <li>o Organization's competitive position (rating) within industry</li> <li>o Cost, development time, delivery time, quantity, price, and channels of products offered relative to the competitors'</li> <li>o % of planned change in annual IT budget</li> <li>o Number of IT projects approved in the strategic plan</li> <li>o Direction of IT projects approved in the strategic plan (integration, standardization, industrialization, innovation)</li> </ul>
Corporate Structure	<ul style="list-style-type: none"> <li>o Number of Strategic Business Units (SBUs)</li> <li>o Level of empowerment to SBU and functional managers</li> <li>o Geographic diversity of production and sales</li> </ul>
Corporate Systems	<ul style="list-style-type: none"> <li>o Employee stability index</li> <li>o % of employees compensated based on individual or group performance</li> <li>o % of business processes documented and measured</li> <li>o Dollars invested in training</li> </ul>
Resources	<ul style="list-style-type: none"> <li>o Growth rate of IT spend per growth rate of direct total spend</li> <li>o Dollars available for IT infrastructure investment</li> <li>o Total IT cost per employee</li> <li>o % of systems security budget to total IT budget</li> <li>o Dollars available for IT staff training and development</li> <li>o IT literacy of existing employees</li> <li>o Average years of IT experience</li> <li>o % growth of IT employees per % growth of total employees</li> <li>o Assessment of current organization technology and processes relative to the competitors'</li> </ul>
External Environment	<ul style="list-style-type: none"> <li>o Number of potential threats relating to IT from external environment</li> <li>o Assessment of competitor IT investments</li> <li>o Assessment of customer needs</li> <li>o Assessment of supplier needs and capabilities</li> </ul>



**Exhibit 5: IT Contribution Model: Metrics for IT Investments - Processes**

<b>Processes</b>	<b>Performance measures</b>
Leadership	<ul style="list-style-type: none"> <li>o % of senior executives' time dedicated to IT</li> <li>o % of annual budget allocated to IT initiatives</li> <li>o % of CIO's and IT managers' bonus linked to IT profitability</li> <li>o % of senior managers that are "IT literate"</li> <li>o % of senior managers and employees that understand objectives of IT initiatives</li> </ul>
Create & Execute Appropriate IT Strategies	<ul style="list-style-type: none"> <li>o Number, cost, price, and perception of products and services offered online relative to the competitors'</li> <li>o Availability and planning for IT security features</li> <li>o Planned cost of disruption of IT initiatives</li> <li>o Planned cost of risk related to IT projects</li> <li>o % of unplanned information system's downtime</li> <li>o % of discretionary spending decisions aligned with corporate and business unit strategy</li> <li>o Planned costs, benefits, and profitability of IT projects</li> </ul>
Design & Institute Proper IT Structure	<ul style="list-style-type: none"> <li>o % of IT expenses related to outsourcing</li> <li>o Number of IT-business partnership projects</li> <li>o Number of IT applications that are not fully integrated within the overall IT system</li> <li>o % of systems developed/maintained outside the organization</li> <li>o % of standardized hardware, databases, communications and applications systems</li> </ul>
Develop & Implement Appropriate IT Systems	<ul style="list-style-type: none"> <li>o Number of IT professionals per employee</li> <li>o Dollars invested in IT skills and knowledge</li> <li>o % of corporate-level performance measures and rewards aligned and linked to IT profitability</li> <li>o % IT employee turnover</li> <li>o % of IT staff with pay for performance compensation</li> <li>o % of projects' evaluations based on ROI metrics</li> <li>o Number of help desk incidents (by business unit)</li> <li>o Average help desk pick-up/resolution time</li> <li>o Level of abandoned calls</li> <li>o Break/fix maintenance response/resolution time</li> <li>o % of IT costs charged back to business units or functions</li> </ul>

**Exhibit 6: IT Contribution Model: Metrics for IT Investments - Internal Outputs**

<b>Internal outputs</b>	<b>Performance measures</b>
Increased Productivity	<ul style="list-style-type: none"> <li>o % increase in production output per employee</li> <li>o Dollar increase in sales based on productivity improvements</li> <li>o % increase in customer orders processed</li> </ul>
Time savings	<ul style="list-style-type: none"> <li>o Reduction in online response time</li> <li>o % reduction in operating cycle</li> <li>o % reduction in ordering, invoicing, tracking and payment</li> <li>o Average time required to fill and process customer order</li> <li>o Timeliness of resolution of rejected orders</li> <li>o Timeliness in order deliveries</li> <li>o Dollars saved based on time savings</li> </ul>
Increased Capacity Utilization	<ul style="list-style-type: none"> <li>o Fixed costs per unit of capacity</li> <li>o % increase in capacity utilization</li> <li>o % change in the number of turns (transportation)</li> <li>o % of utilization of databases</li> </ul>
Improved Quality	<ul style="list-style-type: none"> <li>o Dollars saved on prevention of poor quality</li> <li>o Dollars saved on waste and scrap</li> <li>o Dollars saved on less rework</li> <li>o Reduction in customer grievances</li> <li>o Dollars saved on cost of quality</li> </ul>
Direct Cost Savings	<ul style="list-style-type: none"> <li>o % reduction in IT mandatory expenses</li> <li>o % reduction in operating expenses</li> <li>o % reduction in marketing costs</li> <li>o Dollars saved on increased IT systems security (reduced IT systems' downtime, reduced incidence of frauds, etc.)</li> <li>o Time saved on disaster recovery/business continuity</li> </ul>



<b>Exhibit 7: IT Contribution Model: Metrics for IT Investments - External Outputs</b>	
<b>External outputs</b>	<b>Performance measures</b>
Channel Optimization	<ul style="list-style-type: none"> <li>o Dollar value of activities completed through Web sites</li> <li>o Site traffic (number of visits) and functionality of Web site (click through rate, stickiness)</li> <li>o Hours of Web site downtime (in a year)</li> <li>o Partner and supplier satisfaction level ratings</li> </ul>
Customer Acquisition	<ul style="list-style-type: none"> <li>o Number of new customers gained through IT innovation</li> <li>o Sales from new customers</li> <li>o % of customers using Web sites exclusively</li> <li>o % of visitors to Web site who are also buyers (reach)</li> <li>o Number of new customers in other channels informed through Web site</li> <li>o Number of created customer partnerships</li> </ul>
Customer Loyalty	<ul style="list-style-type: none"> <li>o Average yearly sales per customer</li> <li>o Sales from retained customers versus new customers</li> <li>o Customer satisfaction with IT activities</li> <li>o Customer shopping cart abandonment rates</li> <li>o % of customer attrition</li> <li>o Ratio of new visitors to repeat visitors</li> <li>o Frequency of customer return visits to the Web site</li> </ul>
Value Capture	<ul style="list-style-type: none"> <li>o Profitability of IT projects</li> <li>o Revenues generated through IT initiative (total revenue, IT revenue, revenue per IT customer)</li> <li>o Average customer profitability</li> <li>o Cost and price indexes of selected products and services offered to customers relative to the competitors'</li> <li>o Average of prices paid by customers</li> <li>o Number of new IT products and services introduced</li> </ul>

<b>Exhibit 8: IT Contribution Model: Metrics for IT Investments - Outcomes</b>	
<b>Outcomes</b>	<b>Performance measures</b>
Long-term Corporate Profitability/ Organizational Success	<ul style="list-style-type: none"> <li>o % change in stock price attributable to IT initiatives</li> <li>o EVA</li> <li>o Earnings growth</li> <li>o ROI</li> <li>o ROA</li> </ul>
Short-term Corporate Profitability/ Organizational Success	<ul style="list-style-type: none"> <li>o Cash flow growth</li> <li>o Value added per employee</li> <li>o Revenue growth</li> <li>o % in overall cost reduction</li> </ul>

There is no precise rule for the right number of metrics to include in measurement systems; however, including too many tends to distract managers from pursuing focused IT initiatives. A system that is overly complex leads to bureaucracy and confusion. Recent developments in technology have meant that IT systems are now able to provide a plethora of statistics but, without care, this can lead to an overload of data with little meaningful information. For this reason, it is important to focus on the key indicators rather than introducing indicators for everything that can be measured. There is a need for prioritizing and discipline. Where a new issue arises and further indicators are developed, these should replace those that have become less important rather than adding to the existing set. Generally, a complete IT performance measurement system should include no more than twenty measures in total.

The measures should be controllable in that employees in the organization can actually influence improvement in the factor measured. Ideally, they should be complete in that the measure sums up in one number the contribution of all elements of performance that matter. For example, customer loyalty may be a summary measure of on-time delivery and customized product.

### **FURTHER SPECIFICITY ON CALCULATING BENEFITS (OUTPUTS) FROM IT INVESTMENTS**

The ultimate objective of almost all IT investments is to deliver business value. The IT Contribution Model incorporates both the drivers of business value (inputs and processes) as well as outputs and financial outcomes and the relevant metrics for evaluating IT success. Since most organizations have little experience in assigning monetary values to IT outputs and the measurement of IT payoffs, some additional examples and metrics might be useful.

In the early days of computing, investments were made almost exclusively on the basis of direct financial benefits and these generally related to direct cost savings. The opportunities for such direct savings have now been greatly reduced. However, they still do exist and

senior managers continue to look to this area of justification of IT investment. On the other hand, attempting to quantify longer term or indirect benefits through the use of non-financial measures of performance in the realm of end-user computing, particularly when it relates to managers, has always been a major challenge. And, as the role of IT changes, non-financial measures of long-term benefits have become significant. These include improved organizational agility and communications, enhanced employee performance such as empowerment, more flexible working conditions, safer environment, and higher job satisfaction. These longer term benefits may also stem from enhanced management performance through better and faster information, improved decision support capability, or reduction in the number of meetings due to better information. Integration of IT systems, enhanced security of IT systems, and improved supplier relationships are also drivers of more indirect, longer term benefits.

Although these benefits do not always clearly translate into short-term profits, they should ultimately lead to either cost savings or increased revenues. Sometimes, the direct relationship between a specific action or process, such as better and faster information, and business value creation isn't clear enough to provide an easy calculation of the benefit's monetary value. In such cases, additional inquiry in terms of 'How does this improvement specifically help you in your work?' should be undertaken. It may be that the system supports increased throughput per employee (increased productivity), saves time (time savings), helps optimize the use of existing resources (increased capacity utilization), or allows fewer mistakes (improved quality).

The transformation of these internal outputs to monetary terms is illustrated through a number of short examples in Exhibit 9. Specific IT initiatives are presented resulting in internal outputs and then the relevant calculations to capture the monetary value of realized benefits are provided.

Referring again to Intel's study of the productivity of employees who were upgraded to wireless notebook computers (Intel,


**Exhibit 9: Calculating monetary benefits from IT investment**

INTERNAL OUTPUTS	EXAMPLE	CALCULATION OF MONETARY BENEFITS
Increased Productivity	An IT infrastructure upgrade improves productivity of a manufacturing operator whose labor costs are tied to operating hours.	Calculate the unit labor cost of the operation. The increase in output multiplied by the unit labor cost is the added value of the IT upgrade.
Time Savings	IT project reduces labor involvement in IT programs.	Monetary savings are the hours saved multiplied by the labor cost per hour plus benefits.
	IT project eliminates production and delivery bottlenecks resulting in increased on-time deliveries.	If the result is reduction in grievances, the average cost per grievance provides a basis for estimating the benefits.
	Time savings (in processing a sales order, for example) can increase opportunity for profit by allowing more time for acquiring new clients.	Additional time for new clients should increase sales - benefits can be calculated as additional sales (realized within additional time) minus marginal sales expense.
Increased Capacity Utilization	Infrastructure enhancement (use of satellite communications) optimizes the use of existing resources (transportation vehicles).	Benefits arise out of increased turns (journeys from the production facility to the customer and back) and equal to additional sales minus direct variable costs.
Improved Quality	IT project enhances TQM results: <ul style="list-style-type: none"> <li>• lower preventative and appraisal cost of quality</li> <li>• less scrap and waste</li> <li>• less rework</li> <li>• lower customer dissatisfaction</li> </ul>	<ul style="list-style-type: none"> <li>• Benefits equal to the number of hours saved multiplied by the standard labor wage and adjusted with a benefits factor.</li> <li>• Benefits are related to savings in costs of defective products (total cost incurred at the point the mistake is identified minus the salvage value of a defective product).</li> <li>• Multiply labor hours saved by the labor cost per hour and add eliminated direct cost.</li> <li>• Benefits equal to money saved based on reduced reclamations.</li> </ul>
Direct Cost Savings	IT upgrade integrates purchasing and manufacturing applications resulting in reduced operating costs.	Benefits equal to the amount of the cost savings (costs of handling materials, financing stock, etc.).
	Integration of the organization IT systems with those of its global customers and dealers results in extended information and services to its customers and trading partners.	Benefits can be traced to reduction in administrative costs.
	An IT project designed to better integrate infrastructure allowing the organization to more securely store and move data at will.	Benefits arise from both the improved control over information (elimination of damage costs based on information abuse) and smooth information sharing (generating time savings).
	An IT initiative aiming to increase information system's security.	Benefits arise both from the reduced hours of system's downtime (multiply the hours saved by the average labor hour productivity) as well as from reduced fraud incidence (estimate the financial damage caused by frauds).
	A program of consolidation and standardization across a range of hardware, database, communications and applications systems reduces IT expenses.	Benefits equal to reduced IT expenses (cost of operating and maintaining the IT system).

2003c), the following approach to calculating the monetary benefits was taken. The financial value of increased worker productivity was evaluated from two perspectives: the cost of each employee's time, and the benefit to the corporation of its employees' output. The first perspective is a straightforward calculation where the productivity value equals the hours saved multiplied by employee cost. Based on the employee tasks they chose to evaluate, total time savings were then calculated amounting to 5% of a typical 40-hour week. Assuming that the benefit of upgrading workers to the faster configuration is 5% of the employee's total cost, a company with 25,000 employees and a per-employee total cost of 100,000 dollars would realize approximately 125 million dollars annual benefit from the upgrade. The annual benefit per employee would be 5,000 dollars. But for the company to be profitable, their return on investment in workers must exceed total employee cost. According to Intel, simply to value employees' time at their annual cost rate undervalues their true output and the return on the company's investment. Identifying the value of gained employee time from productivity increases is a better assessment of the true value of an upgrade's productivity enhancement. By that measure, upgrading to the faster, more powerful configuration would realize an annual increase of 2.5 million employee work hours. That is the equivalent of adding 1,250 employees to the payroll.

Generally, cost savings, traditionally applied primarily to staff displacement, can now be traced to employee overtime reduction, less need for specialized (and more expensive) staff, or reduced travel costs. All sources of time savings, such as less searching for information, fewer phone calls, fewer queries, reduced idle time, and reduced order turnaround time, lead to cost savings and then potentially to increased sales. Based on improved quality control, cost savings take indirect form by way of reduced reworking, fewer rejections at final inspection, fewer mistakes in invoicing and delivery, fewer customer returns, and reduced help desk requirements. Further, they originate from reduced capital and maintenance costs for new equipment, enhanced inventory control systems that lead to savings on cash flow, reduced inventory, floor space, and employee time.

With respect to additional revenues, some systems, for example, enable totally new products to be introduced, enable faster and more focused product development, or provide economic justification for so far unacceptable products. Improved asset utilization can also lead to potential increases in production and consequently in revenues.

External outputs — channel optimization, customer acquisition, customer loyalty, and value capture — on the other hand, are more directly related to or already incorporate business value creation. Thus, the translation of these benefits to monetary value shouldn't be a difficult task. However, with respect to customer satisfaction, acquisition, and loyalty, special importance needs to be placed on the metrics chosen. Customer approval ratings based on satisfaction surveys, for example, is more of a leading indicator of customer satisfaction and represents a customer wish list more than real requirements. Also, the new customer acquisition rate can be an important indicator, but organizations often need to focus more on retention than on acquisition. Thus, the best indicators of customer satisfaction may be the customer retention ratio, the ratio of serious customer complaints to quantity of services and products provided, or the level of increased spending per retained customer.

When measuring benefits, two more things should be addressed:

- It is often of significant importance to involve the constituents to help identify metrics that are important to them (Devaraj and Kohli, 2002). A good illustration is the case of a customer complaints system that greatly reduced the number of follow-up calls. This had the effect of reducing productivity, as measured by number of calls handled per operator, however, effectiveness in fact improved. Another example is an increase in market share that may actually imply the organization is getting customers the competition doesn't want. Reduction in customer complaints could also mean dissatisfied customers are not speaking up because they chose not to come back. Similarly, reduced reject rate may be related to more defective parts getting through. Thus, it is extremely important to carefully examine the underlying causes for

achieved outputs.

- Sometimes, it is difficult to correctly attribute benefits to individual IT initiatives, especially, when a number of different initiatives could have had an impact on the benefits gained. This is called business complexity noise. For example, sales might have increased in line with expectations following the introduction of a Web site, but other marketing initiatives (e.g. price reductions, advertising campaign) may also have been introduced around the same time, rendering difficult an accurate assessment of the Web site's contribution. In such case, it is important to explain the potential noise problems to those accountable for benefits realization and attempt to identify the contributing factors. Though often imprecise, identifying and measuring the monetary benefits from IT investments is critical for managerial decision making and resource allocation.

### **MONITORING THE STRATEGIC IT OBJECTIVES, DRIVERS AND PERFORMANCE MEASURES**

The implementation of a measurement system should not be seen as a threat to or imposition on staff, rather as a mechanism to enhance performance and corporate learning. A properly developed and implemented measurement system promotes productivity by focusing attention on the most important issues, tasks, and objectives of the organization.

However, performance measurement systems have to be modified as circumstances change in that strategic objectives are modified — according to the new strategy — drivers are revised and new causal linkages among drivers determined. As a consequence, performance measures should be adapted so that they remain relevant and continue to reflect the issues of importance to the business. All too often, organizations are implementing new measures to reflect new priorities but fail to discard measures reflecting old priorities resulting in uncorrelated and inconsistent measures. Ideally, organizations would implement systematic processes for managing the evolution of their measurement systems.

Performance measurement systems should also be dynamic in that performance measures that can be more easily manipulated or that lead to deviations from the planned results are replaced. For instance, an organization implementing a new

ERP system might set an on-time target improvement of 15%, encouraging prompt shipments, but possibly at the expense of more erroneous shipments that are not measured. Similarly, an organization, trying to justify a new ERP system may aim at achieving a 20% reduction in inventory carrying costs; but also cause a sharp increase in the number of short shipments. Such behavior may exist because performance measurement itself serves as a powerful motivation mechanism. Systems must be carefully designed to align strategy, performance measures, and incentives, so that the incentive pressures are not severe and the metrics are appropriate - multidimensional and balanced. Otherwise, dysfunctional behavior, such as gaming, can result.

Sometimes, it is just the annual targets and reward systems that tie compensation to performance that have to be changed to assure proper functioning of the performance measurement system. The problem of target setting is largely related to the lack of standards for judging the success of IT investments. Although most IT executives generally know when a measure represents acceptable performance, there have been only a few attempts to develop measures, standards, and indices. This obstacle can be minimized as more organizations adopt measurement and evaluation frameworks and metrics and report their results publicly or through benchmarking projects. Compensation systems and performance measures used to reward IT managers' and IT staff performance must be carefully selected. If the evaluation includes elements other than those they directly control, the reward system will often cause frustration and de-motivate staff rather than encourage better performance.

### **MEASURING THE DISRUPTION COSTS OF IT INITIATIVES**

It is increasingly recognized that the disruption costs associated with the adoption of IT can be more significant than the direct cost of the IT initiative. Yet, it is the elusive nature of these costs that make their identification and control difficult.

Disruption costs of IT initiatives are primarily caused by the transformation from old to new work practices, based on the impact of the new system. In the immediate pre- and post-implementation phases, productivity invariably declines for a period. On one hand, employees

may resist adapting to new procedures and guidelines; on the other, they go through a learning curve, while struggling to adapt to new ways of working and doing business. Often, too, productivity is inhibited as the staff is learning the new system while perhaps keeping the old one operational. The fall in productivity is also related to employees being trained and training others especially when IT training is provided during work hours. Disruption costs may also be associated with a decline in product and service quality. Frustration, lack of knowledge and skills, or merely the ignorance of the IT applications' potentials may increase mistakes in invoicing and delivery, increase order and delivery time and may lead to absenteeism. It may also be that the new IT systems or applications are not functioning properly, causing disruption in processes and demanding system support from vendors.

Disruption costs are not simply restricted to human factors but encompass organizational issues as well. Organizations with extensive infrastructures in place tend to change their organizational structures either by reducing the number of management levels, redefining the roles of management functions, or through business process re-engineering. While the planned ultimate result is increased efficiency and effectiveness of the organization, the redesign of organizational functions, processes, and reporting structures often causes technical disruptions and breakdowns in service. These disruption costs can be costly when coupled with employees that are resisting change. Similar to the way benefits are assigned monetary values as illustrated in Exhibit 9, disruption costs can be calculated by considering lost hours, decreased productivity, cost of impaired quality, or lost revenues.

In many cases, the disappointing results from IT can be traced to poor management of disruption costs. With every IT initiative, there will be a period of experimentation and exploration, followed by the productive phase. As with the introduction of breakthrough technological advances, benefits don't occur until the technology matures and the employees adapt work patterns and processes. Thus, those organizations that adapt faster will gain greater returns. So a key objective for every enterprise is to shorten the time it takes to achieve effective acquisition and deployment of IT investments.

## MANAGING IT INVESTMENT PROCESSES

In practice, the demand for technology in the organization always exceeds the capacity of the organization to deliver. Thus, some prospective IT opportunities cannot be funded and only those opportunities that yield the greatest benefits can be selected. The IT Contribution Model requires continuous reconsideration of whether the underlying assumptions of the model actually work when applied to a specific IT initiative. As soon as there are indices implying that the results (outputs and outcomes) may not be achieved, the IT initiative should be reconsidered and the project eventually cancelled. Too often, organizations have become psychologically and financially committed to prior investments and find it hard to terminate projects with substantial front end and operational investments. Instead, businesslike thinking must drive both the implementation of new IT initiatives and the management of IT projects in place. The focus should be on delivering high-quality IT services and optimizing business value.

Managing the IT investment process thus includes several issues:

- Managing IT investment processes typically operate on the basis of stated objectives, which are achieved over a given time frame, with costs and deliverables identified at various stages. One should continually question the assumptions on which the original investments are justified. This means using analysis not just to review performance against plans, but to question the validity of those plans based on this knowledge and to revise the estimates. Eventually, if the likelihood of realizing expected benefits is low, for example, because the product being developed is no longer demanded in the organization, discontinuing the funding for the program should be considered. Alternatively, under uncertainty, the project can be postponed until the risks are lower, or the scope and funding of the program can be reduced.
- IT management should have a plan to periodically conduct risk assessments covering the organization's use of information technology, including internal systems and processes, outsourced services, and the use of third-party communications and services.



- Results from an IT evaluation and measurement process should be widely communicated throughout the organization. In a well-executed IT initiative, most units of the organization will have some involvement. The evaluation and measurement of the IT program will be less successful if the results are not disseminated throughout the organization to the many disparate areas that both affect and are affected by it. The methodology of evaluating performance in IT as well as results should be monitored regularly to identify areas of weakness, challenge the framework and IT plans and systems in place, and develop new initiatives and metrics.

### **RECOGNIZING THE RISK ASSOCIATED WITH IT INVESTMENTS**

With respect to the risk associated with IT investments, there are two important questions:

- How to address the risks related to actual or potential IT investment in a balanced and complete way?
- To address the dilemma of over- or lack of IT investment, the question is whether to invest or not and if so, how much?

Given the extent of IT project failure and disappointment, it is hardly necessary to emphasize the need to include risk as an important determinant of IT success. There are several areas of risk; however, organizational risks, project risks, staff risks and risks from the external environment are among the most important (Murphy, 2002). Organizational risks include the risk of the project not being aligned with business objectives, being incompatible with existing organizational structures and systems, or lacking management support. Project risks relate to critical project management skills, size, complexity and duration of the project, imprecise or incomplete definition of the business problem and/or the proposed business solution, hardware and vendor related risk, and more. Staff risks comprise the level of user commitment as well as user capabilities to exploit IT applications, and IT staff stability. With respect to the external environment, competitors' actions, government legislation and overall economic performance can impact the IT implementation and potential payoffs. Certainly, the number of potential risk elements is even greater.

With respect to project risks, the failure to

carefully estimate the full costs of IT implementation represents one of the most prominent risks. Most organizations take considerable care in quantifying the direct financial implications such as the costs for hardware and software, installation and configuration costs, overhead, and training costs, and maintenance costs. However, these are primarily front-end costs, which, over time, bear increasingly little resemblance to the real operating costs that can exceed by orders of magnitude the up-front expenditure. The full costs of IT implementation, often referred to as the total cost of ownership, include both the direct cost that can be attributed to the implementation and operation of new technology, as well as indirect human and organizational costs. As hardware prices continue to fall, IT related human and organizational costs are rising. At the US Department of Defense, for every \$1 spent on IT and associated equipment, a further \$7 was spent on 'softer' human and organizational issues (Strassmann, 1997). Human and organizational costs are often three to four times as high as 'direct' project costs. Unfortunately, these costs are rarely fully budgeted for in IT investment proposals, which may partially explain the 'cost creep'. Better estimates of both long-term costs and benefits are necessary.

One of the largest indirect human costs is that of management time spent on integrating new systems into current work practices, and the related resources used for investigating the potential of IT and experimenting with new information flows and modified reporting structures. Other indirect human costs are related to employee motivation, employee time, and system support costs. Typical lifetime support costs are at least 400% of the original purchase price (Remenyi *et al.*, 2000). It may even be that developing new employee skills and increasing their flexibility and their overall contribution towards the organization may increase pay scales and associated costs.

Indirect organizational costs, on the other hand, relate to the disruption costs, i.e. temporary loss in employee productivity and to the consequent fall in product and service quality. Indirect organizational costs may also occur when management attempts to capitalize on the wider potential of the system, organizational restructuring, or business process re-engineering. In the survey of 175 organizations worldwide, only 35 percent of respondents

agreed they effectively managed the risk associated with business change (Baxter, 2004). To successfully invest in IT and manage subsequent risks one needs to undertake a structured approach, such as presented here, encompassing all potential risks and including the full costs and benefits of IT implementation.

The other perspective of looking at risk associated with the IT investment is how much funding should be committed to technology innovation. Funding may be used both to provide access to information securely, balancing protection against business need, as well as to create value. Studies offer a range of numbers, which are determined primarily by how an organization defines innovation and technology. As a general guideline, however, top performing innovative organizations routinely invest about 40% of their discretionary IT funds into upgrading existing technologies as well as into building new systems and technology capabilities. Maintaining a consistent level of funding for technology innovation is critical for success. It is also critical to attracting and retaining high quality IT professionals.

The most successful organizations do not leave IT innovations to chance. It is important to set up a formal procedure that would smooth the way for the introduction and implementation of emerging technologies. With a model incorporating IT inputs, processes, and outputs that lead to overall IT payoff and improved corporate profitability, organizations will likely rely less on a reactive approach to adoption of new technologies or risk making costly, personality-driven choices. Forging IT-business partnerships with engineers and IT professionals collaborating with the organization's leaders, managers, and management accounting professionals is important.

### **ALIGNMENT OF THE IT CONTRIBUTION MODEL WITH THE BALANCED SCORECARD, SHAREHOLDER VALUE ANALYSIS AND ROI**

The IT Contribution Model can be adapted into any management system that an organization utilizes. It is compatible with measurement and management frameworks such as the Balanced Scorecard and Shareholder Value Analysis that focus on a

better understanding of the causal relationships and linkages within organizations and the actions managers can implement to improve both customer and corporate profitability and drive increased value. Specifically, it can help determine, articulate, and measure the items in the Balanced Scorecard. In fact, many new frameworks and techniques have been developed in performance measurement in the last 10 years. Improved measures of the payoffs of IT can be successfully utilized with any performance measurement or management system.

### **Balanced Scorecard for Evaluating Performance of IT**

The Balanced Scorecard (Kaplan and Norton, 1996, Epstein and Birchard, 1999) was originally developed as an approach to performance measurement that combined traditional financial measures with non-financial measures to provide managers with richer and more relevant information about activities they were managing. Later it became a strategic management system to articulate, execute, and monitor strategy using a mix of financial, customer, internal business process, and learning and growth related measures. *Financial performance perspective* focuses on shareholders' interests and indicates whether an organization's strategy, implementation, and execution are contributing to bottom-line improvement. The *customer perspective* includes specific measures of the value propositions that the organization will deliver to customers in targeted market segments. In the *internal business process perspective*, executives identify the critical internal processes that will have the greatest impact on customer satisfaction and retention as well as achieving an organization's financial objectives. The *learning and growth perspective* identifies the infrastructure the organization must build to create long-term growth and improvement. Thus, the Balanced Scorecard brings together, in a single management report, many of the seemingly disparate elements of an organization's competitive agenda.

Further analyses of the relationships between the causes and effects of various managerial actions have been developed to specify the relationships and measures that lead to superior performance. These strategy maps (Kaplan and Norton, 2000 and 2004), or action-profit linkages (Epstein and Westbrook,

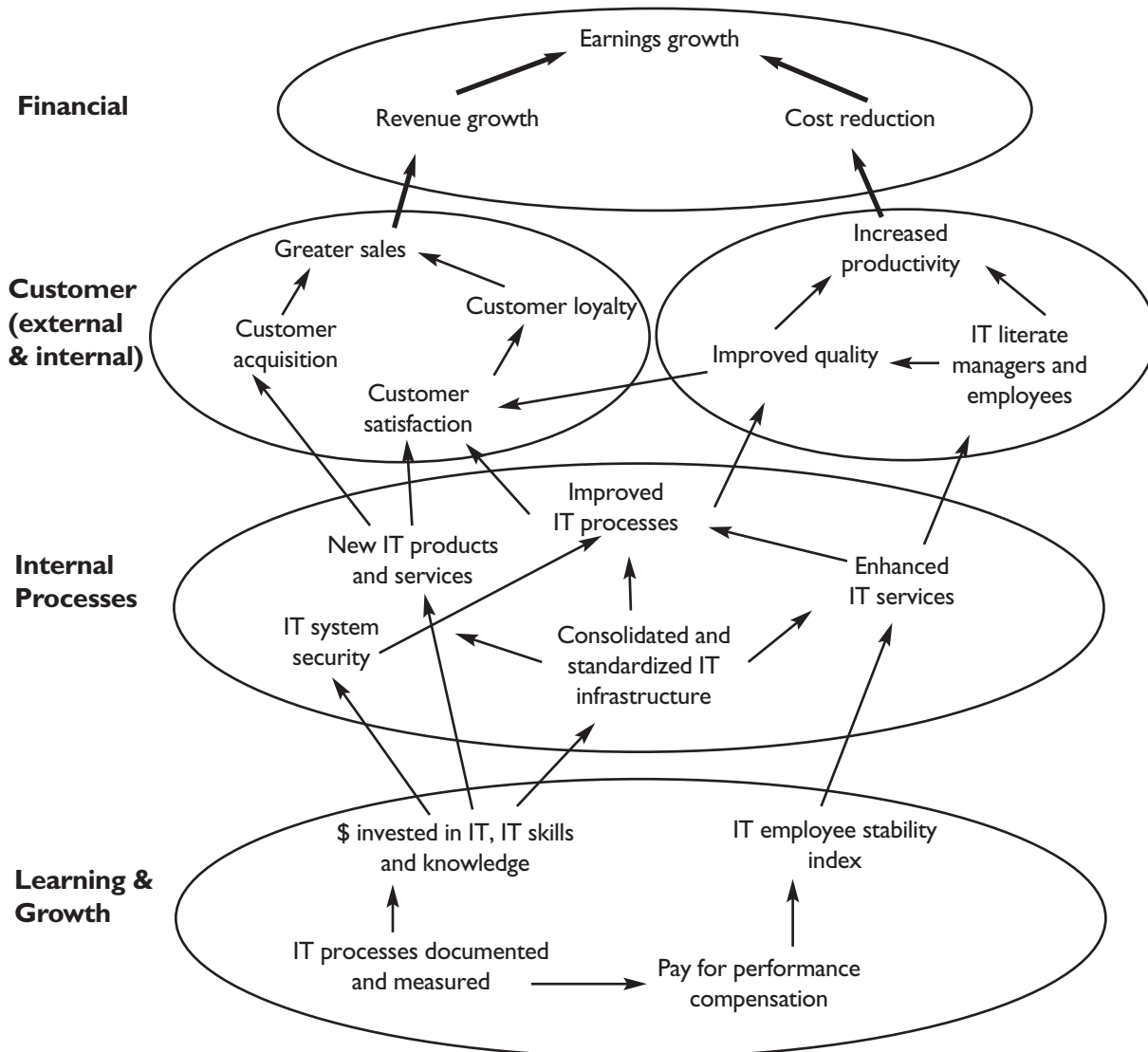
2001) articulate the causal relationships as seen in Exhibits 1 and 3. In this way and when used in a Balanced Scorecard, these chains of cause and effect linking across the learning and growth, internal processes, and customer perspectives to financial results for shareholders are given visual form. Since the concept was introduced in 1992, balanced scorecards have been implemented at corporate, strategic business unit, shared service functions, and even individual levels. Notably, it has also been adopted to evaluate board of directors' and individual board members' performance (Epstein and Roy, 2002).

Exhibit 10 displays the causal relationships

between different drivers of success in an IT Balanced Scorecard and can be compared to Exhibit 3 on the IT Contribution Model. Again, the illustration of IT performance drivers serves as an example and should be viewed as a template to build upon.

All four perspectives connect in a chain of cause and effect: IT innovation and growth improve internal business processes; internal business processes improve customer satisfaction, both internal and external, which in turn leads to improved financial performance. In other words, one category of measurement drives performance in the next. These drivers and

**Exhibit 10: The Causal Relationships in the IT Balanced Scorecard**



subsequent measures should reinforce each other, all contributing to measuring the impact of IT investments on the bottom line. The financial perspective relating to the outcomes of the IT initiatives helps managers keep score in the traditional sense. Many of the performance measures included in this perspective, such as overall cost reduction and revenue growth, will be the same from organization to organization. Proceeding further down the causal linkage model, drivers may differ greatly but should always clearly express the logic of if/then hypotheses. For example, if organizations document and measure IT processes, both in terms of resources allocated and results achieved, they will then have the necessary data to argue for

additional resources to be invested in IT technology, skills, and knowledge. As more financial resources are available for IT, organizations can introduce new IT products and services, leading to acquiring new customers and satisfying the existing ones and leading to increased sales and profits.

To closely monitor these cause-and-effect relationships, appropriate metrics must be developed. Exhibit 11 provides a list of metrics for the IT Balanced Scorecard along the four perspectives. Both the objectives and metrics are consistent with the IT Contribution Model. This demonstrates how the IT payoff can be applied for organizations that commonly utilize balanced scorecards.



<b>Exhibit 11: Objectives and Metrics for the IT Balanced Scorecard</b>	
<b>OBJECTIVES</b>	<b>MEASURES</b>
<b>Financial</b>	
Long-term Corporate Profitability/ Organizational Success	<ul style="list-style-type: none"> <li>o % change in stock price attributable to IT initiatives</li> <li>o EVA</li> </ul>
Short-term Corporate Profitability/ Organizational Success	<ul style="list-style-type: none"> <li>o Earnings growth</li> <li>o Revenue growth</li> <li>o % in overall cost reduction</li> </ul>
<b>Customers (external)</b>	
Value Capture	<ul style="list-style-type: none"> <li>o Average customer profitability</li> </ul>
Customer Loyalty	<ul style="list-style-type: none"> <li>o Profitability of IT projects</li> <li>o Customer satisfaction with IT activities</li> <li>o % of customer attrition</li> <li>o Ratio of new visitors to repeat visitors</li> </ul>
Customer Acquisition	<ul style="list-style-type: none"> <li>o Frequency of customer return visits to the Web site</li> <li>o Number of new customers gained through IT innovation</li> <li>o % of visitors to Web site who are also buyers (reach)</li> <li>o Number of created customer partnerships</li> </ul>
<b>Customers (internal)</b>	
Improved Quality	<ul style="list-style-type: none"> <li>o Dollars saved on less rework</li> <li>o Reduction in customer grievances</li> <li>o Dollars saved on costs of quality</li> </ul>
Increased Productivity	<ul style="list-style-type: none"> <li>o % increase in customer orders processed</li> <li>o % increase in production output per employee</li> </ul>
<b>Internal Processes</b>	
IT Processes, Products and Services	<ul style="list-style-type: none"> <li>o Number of new IT products and services introduced</li> <li>o Average time required to respond to customer service requests made through IT</li> <li>o Hours of Web site downtime (in a year)</li> </ul>
Chargeback on Actual Resource Usage	<ul style="list-style-type: none"> <li>o % of IT costs allocated back to business units or functions</li> </ul>
Increased Security	<ul style="list-style-type: none"> <li>o % of unplanned information system's downtime</li> </ul>
Consolidated, Standardized, and Streamlined IT Infrastructure	<ul style="list-style-type: none"> <li>o Number of IT applications that are not fully integrated within the overall IT system</li> <li>o % of standardized hardware, databases, communications and applications systems</li> </ul>
<b>Learning &amp; Growth</b>	
Performance Measurement	<ul style="list-style-type: none"> <li>o % of projects' evaluations based on ROI metrics</li> <li>o % of IT staff with pay for performance compensation</li> <li>o % of IT processes documented and measured</li> </ul>
Development of IT Skills and Knowledge	<ul style="list-style-type: none"> <li>o \$ invested in IT skills and knowledge</li> <li>o IT employee stability index</li> <li>o Number of IT professionals per employee</li> </ul>

**Shareholder Value Analysis**

IT's contribution to creating business value should pay off in increased shareholder value. Shareholder value analysis is used in many forms by numerous organizations for measuring shareholder value and draws on the principles of discounted cash flow analysis commonly used for purposes of investment appraisal. It takes an investment center approach by deducting the cost of capital from earnings for projects as well as organizations' or units' analysis. The analysis presented in this guideline is consistent with these approaches as it provides needed specificity to the identification and measurement of the payoffs of investments in information technology.

**Calculating the Return on Investment in IT**

In most organizations, the difficulty in calculating an IT return on investment (ROI) weakened the case for technology investment. The measures to complete the analyses had not been developed. What was needed was both a framework for the analysis and the measures of both the costs and benefits to effectively calculate a ROI. This guideline provides a model that articulates the drivers of ROI and the causal relationships between them. Specific metrics for IT inputs, processes, and outputs have also been developed to provide IT managers and financial managers with the necessary tools to calculate the return on investment in IT.

For the ROI calculation to be complete, both benefits and costs need to be carefully addressed. The challenge of calculating the IT ROI primarily lies in determining project benefits. Few organizations really assess the benefits of IT projects. A French study reports that only half of companies monitor the expected benefits (Monnoyer, 2004). Yet, the conversion of non-financial data to monetary units to obtain benefits expressed in monetary terms can and should be completed. Converting quantified data, such as output, quality, cost, and time is admittedly easier than converting soft data. Examples and subsequent discussion in this guideline have been provided to enhance this process. In many cases, subjective input is used to assign monetary values to benefits derived from projects. It is important to recognize that benefits will occur for a substantial time period subsequent to systems implementation.

As many IT projects over-run their cost projections, considerable care must also be given to estimation of costs. Amounts included in the cost estimates of an IT initiative should be based on the total lifetime costs of the project. The total program (project) costs consist of all related costs including planning the IT investment, forecasting potential risks, development, and implementation including employee training. This also must include operations consisting of maintenance costs and the necessary upgrades. In addition, disruption costs, both human and organizational, should be included in the calculation.

In general, the ROI calculation should be performed on a marginal-costing basis. Thus, only additional costs incurred by the new system should be included. In the instance of a new system, which can use available processing power, the investment cost may be calculated as a marginal cost of the processing power needed to run the additional application. Likewise only marginal benefits, i.e. new or additional benefits, should be compared to the costs. The ROI should be calculated prior to an IT project to estimate the potential cost effectiveness and after a project to measure the results achieved. As the benefits of the IT investment will increase with time, ROI should not be calculated just after the IT initiative is implemented but yearly throughout the lifetime of the project. It then aids in the budgeting, planning, and resource allocation processes along with fitting into a broad performance evaluation and reward system.

**THE APPLICABILITY OF THE IT CONTRIBUTION MODEL AND MEASURES TO OTHER BUSINESS FUNCTIONS**

Though it is important to focus this discussion on IT, it can be noted that the challenge in measuring performance in IT is similar to the problems in other business functions. Human resources managers, legal staff, environmental quality managers, and R&D managers also complain that they are unable to demonstrate the value creation benefits of their activities and are seen as cost centers rather than profit centers and often have difficulty obtaining resources. These functions have recently grown in importance and there is increased pressure for more accountability for resources used. Similar to the model and measures

proposed for IT, other business functions that produce benefits that have long time horizons and are often seen as difficult to measure, will find it useful to more carefully identify and measure the payoffs of their activities. This provides for improved resource allocations and improved organizational decisions.

### **GUIDANCE FOR MANAGERS**

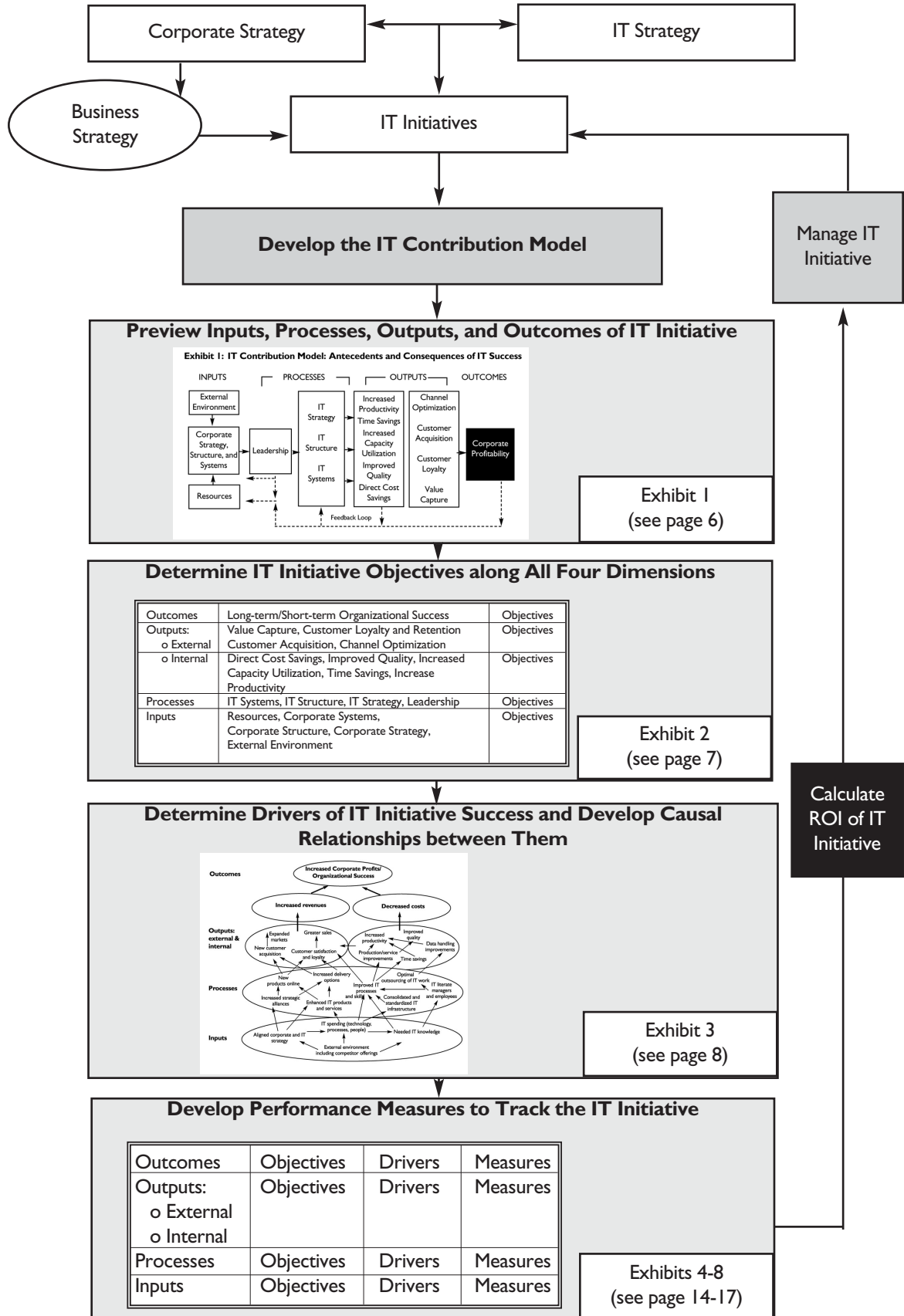
In too many organizations, decision makers overlook economic rationality in justifying IT expenditures and instead acquire the best and most recent technologies to outpace others regardless of the results achieved. However, the pressure to remain competitive in a dynamic, global economy has forced many organizations to consider the results-based approach where the question 'Will we see a return on investment?' is central. Instead of thinking only in terms of 'Can we afford not to do it?' organizations are seeking the answer to the question 'Can we afford to do it?'

Despite significant discussions in both the managerial and academic literature concerning

the importance of evaluating the payoffs of IT investments, so far, there has been little guidance of how to design or implement an appropriate IT performance evaluation system. On one hand, there was a shortage of relevant metrics. On the other, even approaches such as the Balanced Scorecard and Shareholder Value Analysis that do provide frameworks for analysis and management, were insufficient *per se*. Increased specificity was necessary to model, measure, and manage the organizational links that operationalize these approaches.

This guideline provides an IT Contribution Model for a comprehensive evaluation of IT performance. It describes the antecedents and consequences of IT initiatives, determines key IT related objectives, develops the drivers of IT success and the causal relationships between them, and provides numerous performance measures to track IT performance. Exhibit 12 provides a summary of how the IT Contribution Model is developed and applied. Exhibit 13 specifies more explicitly how an IT initiative ROI is calculated.

Exhibit 12: IT Contribution Model: Guidance to Implementation







**Exhibit 13: IT Contribution Model: Calculation of an IT Initiative ROI**

**1 Calculate the Monetary Value of IT Initiative Benefits**

Outputs	Benefits	Monetary Value
Increased Productivity	Increase in output (units produced, services offered)	\$.....
Time Savings	Labor hours saved, machine hours saved, increased on-time deliveries reducing cost of grievances, etc.	\$.....
Increased Capacity Utilization	Increase in output (units produced, services offered)	\$.....
Improved Quality	Labor hours saved, machine hours saved, cost of quality reduced, increased on-time deliveries reducing cost of grievances etc.	\$.....
Direct Cost Savings	Reduced IT expenses, reduced direct administrative and operating costs, reduced fraud incidence, reduced hours of IT downtime	\$.....
Channel Optimization, Customer Acquisition and Loyalty, Value Creation	Increased sales from existing and new customers	\$.....
<b>Total Benefits</b>		<b>\$.....</b>

**2 Calculate the Total Costs of IT Initiative**

Costs	Value	
Front-end Direct Costs of IT initiative	Hardware, software, installation and configuration costs, overhead, training costs \$.....	
Disruption Costs Related to Human Factors	Decline in labor productivity, hours lost because of IT training, decline in product and service quality, absenteeism, revenues lost \$.....	
Disruption Costs Related to Organizational Factors	Technical disruptions, breakdowns in service, costs of system support from vendors, organizational restructuring \$.....	
Costs of Risk Mitigation	Development and implementation of IT performance framework \$.....	
<b>Total Capital Costs</b>		<b>\$.....</b>
Operating Costs of IT Initiative	Direct IT operation costs, maintenance costs \$.....	
<b>Total Operating Costs</b>		<b>\$.....</b>

**3 Calculate the IT Initiative ROI**

$$ROI = \frac{\text{Total Benefits} - \text{Operating Costs}}{\text{Capital Costs (Investment)}} * 100$$

With the IT Contribution Model, managers can implement a performance measurement system to more effectively evaluate the effectiveness of IT investments, which can lead to dramatic improvements in decision making, corporate resource allocations, and performance. To enhance the effectiveness of the IT Contribution Model, the following issues need to be considered specifically:

- A careful identification of the actual drivers of IT success and a well elaborated scheme of causal relationships between them is critical for the development of key IT performance measures.
- Prior to the implementation of the model, baseline indicators for the specified performance measures need to be established. A lack of information on the initial status of the critical drivers of IT success prevents drawing conclusions about the actual benefits from IT initiatives after their completion. With more historical data from both within the organization as well as from other organizations, benchmarks can be established and used for the objective evaluation of results achieved.
- There is no precise rule for the right number of performance measures included in the model; however, the tendency should be to follow the pattern of critical drivers of success along inputs, processes, outputs, and outcomes, and minimize the number of indicators to measure them. With increased maturity of the implemented model and the organization's ability to use it effectively, the metrics may eventually increase in number.
- The IT Contribution Model is equally applicable to both large-sized as well as small-sized for-profit and not-for-profit organizations. However, smaller organizations with less complex inputs and processes and relationships between them should strive to delineate just the most critical drivers and thus develop a smaller number of performance measures.
- A precise identification and measurement of the present and future marginal costs and benefits of IT initiatives are fundamental for a comprehensive and objective calculation of ROI on IT initiatives. In particular, disruption costs associated with the adoption of IT initiatives require a thorough

evaluation as they are typically significant.

- To attain business value from an IT initiative, a structured and ongoing careful examination of costs, benefits, and risks from the initial feasibility through post-implementation is needed. Even when business value is achieved, there is no guarantee that this value will be maintained unless there is an ongoing attention to asset tracking, usage data, total cost of ownership, and IT performance measurement.
- Specifically important is the role of CIOs in ensuring that information technology contributes to helping their companies achieve high performance. CIOs must actively participate in the strategic planning process and focus the IT discussion on the role of IT in creating business value by increasing productivity, reducing cycle times, lowering risks, and creating growth.

A properly implemented IT Contribution Model yields several results:

- IT managers will be able to demonstrate the impact on corporate profitability and value creation from IT.
- It will assist IT managers as they evaluate the trade-offs and decide which IT project provides the largest net benefit to both short-term financial performance as well as the overall long-term success of the organization.
- It will help CIOs, CTOs, CFOs and other senior corporate and financial managers as they develop an IT strategy to make overall corporate resource allocations to support that strategy. They can rely on convincing evidence based on formal measurement and evaluation when making recommendations on these allocations. By having a clear picture of the IT cause and effect relationships they can monitor how the IT initiatives are progressing and more fairly evaluate their intermediate results.
- The IT staff will know better how well they are performing, correct any deficiencies, and by seeing the results of their work develop an important sense of personal satisfaction.

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