

# CHAPTER 1

## Defining Information and Communication Technology Infrastructure

**T**his chapter sets the context for the rest of this book by introducing the terms and concepts that will be used throughout. This book covers the methods for understanding the business imperatives for building information and communication technology (ICT) infrastructure. Assessing the value of ICT infrastructure is both important and difficult. It is important because an organization needs to understand how ICT can bring value to its bottom line. It is difficult because ICT value has traditionally been paradoxical. That paradox is evident in the contradiction between the rapid increase in the speed of desktop computers over the last few decades and the slow growth in productivity and economic measures caused by computers during the same time. In other words, that paradox is the discrepancy between investment in ICT and output at the national level.<sup>1</sup> This book will provide the tools with which to assess the effect of ICT investment. This

*chapter provides an introduction to the concepts of value management, ICT value, and the business-driven infrastructure design cycle.*

## ICT AND BUSINESS INTELLIGENCE

*Business intelligence* (BI) is a set of techniques that takes business data and creates information from those data so that managers can make decisions. In that way, organizations create business intelligence. We see many vendors offering BI solutions, which come in many varieties, including stand-alone solutions and solutions that are additions to larger suites of business applications. What is common across all BI solutions is that they utilize business data to support ad hoc and planned reporting and thus managerial decision making. Analyzing sales trends and customer buying patterns are just two examples of analysis that can be done using BI software. Another defining attribute of all BI software solutions is that they need ICT to enable them.

It is difficult for organizations to determine when and why ICT infrastructure should be built, and creating BI is just one reason to do so. The ICT value proposition is elusive, and, ironically, an organization needs to create business intelligence in order to understand when and why ICT infrastructure should be built. This book offers tools for organizations to use to determine ICT value to support the organizational value proposition. These tools include methods for creating BI.

When deciding *when and why* to build an ICT infrastructure, an organization should proceed in a planned way. Personnel with skills in a number of areas are required, and in fact the chief information officer (CIO), chief marketing officer (CMO), chief financial officer (CFO), chief operating officer (COO), and the chief executive officer (CEO) are but a few of the individuals who must be involved in determining when and why an ICT infrastructure should be built. ICT infrastructure is built to do everything, from supporting transaction processing to creating BI reports, and many other things in between.

All organizations have a number of projects, both ICT-oriented and nontechnology projects, in which they can expend their resources. That necessitates that all organizations have a structured

way to determine which projects will get funding and which will not. That is referred to as value management.

## ICT VALUE MANAGEMENT

Before discussing ways to assess a specific ICT value proposition, it is important to determine if your organization has a culture that views ICT as a value-producing resource. In order to maximize the benefit of ICT, your organization must believe that ICT resources are not only used to support a business's internal processes but should also be dedicated to projects that create value (e.g., that increase market share, enhance customer relationships, and create the perception of value for customers).

Gone are the days when the information technology (IT) department can ask, "What is my budget this year?" Rather, the question must be "How can we use ICT to support the organization's value proposition(s), and how much is the organization willing to spend on ICT to do so?" Things have changed; we no longer build ICT using a "field of dreams" approach—if we built it, they will use it.<sup>2</sup> Rather, we must use a decided approach to expending an organization's scarce resources on ICT projects. The projects selected for funding must support the organization's value proposition.<sup>3</sup>

## Challenges to Value Management

The first step is to ascertain whether your organization is ready to adopt a value management approach to allocating resources for ICT projects. Organizations often face challenges when considering ICT projects as value-creating entities. The following are several of the more common challenges:

- *Problems with delivering technical capabilities.* Often an enterprise's delivery processes and competencies within its ICT function are not mature enough to effectively and efficiently deliver the technology capabilities needed to support business operations and enable business change. This challenge highlights the need to improve ICT governance and

management processes along with the introduction of value management practices.

- *Limited or no understanding of ICT expenditures.* Rarely do executives enjoy a sufficiently transparent view of ICT expenditures and ICT investments across all ICT services, assets, and other resources. This means that often decision makers can only estimate how much they are investing. The benefits of an ICT expense and the full business rationale for the commitment can be elusive. This may be caused by ICT expenditures being sourced from many different uncoordinated budgets, resulting in significant duplication and unreconciled conflicts in demand for resources (i.e., “the right hand does not know what the left hand is doing”).
- *Business abdication of decision making to the ICT function.* The roles, responsibilities, and accountabilities of the ICT function and other business functions are often unclear. In this state of unclarity, the ICT function tends to usurp the driver’s seat, determining which ICT-enabled business investments should be pursued. This results in the ICT function prioritizing business investments based on the ICT function’s limited insights, and thus inappropriately relieving the business of its responsibility to define and defend the business rationale for every ICT investment decision.
- *Communication gaps between the ICT function and the business.* Close collaboration between the ICT function and other business functions is crucial to value creation. When such a partnership is absent, communication suffers, inefficiencies mount, synergies fail to emerge, and the work environment tends to devolve into a culture of blame. In some cases, the ICT function is relegated to the role of follower instead of innovator and is engaged in investment proposals too late in the decision-making process to contribute significant value. In other cases, the ICT function is blamed for not delivering value from ICT investments—value that only other business functions, in partnership with the ICT function, can deliver.
- *Questions about the value of ICT.* Ironically, while most enterprises continue to invest more and more in technology, many

of their key executive decision makers continue to question whether value is actually realized from these investments. Frequently, the dominant focus is merely on managing ICT costs rather than understanding, managing, and leveraging ICT's role in the process of creating concrete business value. Since ICT investments increasingly involve significant organizational change, the failure to shift the focus from cost to value will continue to be a major constraint to realizing value from these ICT-enabled investments.

- *Major investment failure.* When ICT projects stumble, the business costs can be enormous and highly visible. Project cancellations can trigger unexpected effects across the business. Delays can use up a substantial portion of an organization's annual budget, and budget overruns can starve other projects of crucial resources. Among the most common examples of ICT investment failures are poorly planned enterprise resource planning (ERP) and customer relationship management (CRM) initiatives. In fact, Gartner, a leading information technology research think tank, estimates that these large-scale IT debacles represent the largest major cause of value leakage.<sup>4</sup> Exacerbating this issue is the fact that in many cases, problems are ignored until it is much too late to take any corrective action.
- *Changes in funding.* Sometimes available funding for ICT-related projects change. This may be due to an organization not meeting its expected revenue targets and/or due to economic changes in the marketplace. Whatever the cause, changes in funding represent challenges that investment management must be ready for.

### Value Management Best Practices

Organizations must position themselves so they can maximize their investment in ICT projects. This book provides tools to aid in the analysis of challenges faced by companies and suggests ways to analyze them. These tools will aid staff in the quest to recommend and deploy ICT resources that support the value propositions of the

organization, and they will aid the managers (right up through C-suite members) in the analysis of the viability of ICT projects. The tools given in this book are helpful to the ICT professional who is trying to propose a project to management, and they are useful for management in determining how to assess whether ICT solutions align with the value propositions of the organization. Value management includes several best practices that occur in organizations that are successful in the deployment of ICT resources to support their strategy and create value. These value management best practices include the following:

- *Awareness and communications.* In an organization that is aware of and communicating about the value of ICT investments, the ICT function is trusted because it generally delivers what it promises. Executives, managers, and staff understand ICT value management and have adopted a culture of investing in ICT projects and investment decision making that aims to support the organization's value propositions. Decision makers understand and accept that value management practices, when in place, enhance competitive positioning and, when absent, erode it.
- *Responsibility and accountability.* Key personnel (e.g., C-suite members, business analysts, and staff) must identify attractive opportunities for ICT investments, while investment decision makers pick and actively support the ICT projects most likely to benefit the organization's value propositions. The ICT project manager should be tasked with detecting and dealing early with ICT projects that do not deliver the promised or expected value. Business units, rather than the ICT staff, drive investment decision making and monitoring the benefit-resource balance. Executive management becomes involved in monitoring ICT projects based on objective data and not on internal politics. The business case for each ICT investment has a fully committed business sponsor from a specified business function. Well-defined accountabilities exist for the business sponsor and project manager for each investment. Collaboration—supported by clear roles, responsibilities, and processes—helps to avoid

organizational gaps and overlaps by defining what the business requires and how ICT will provide it. Key issues such as investment criteria, payback periods, and the selection of the individual investments to be funded are decided at the C-suite and/or board level, supported by input from the heads of the business units.

- *Goal setting and measurement.* The organization routinely practices goal setting and measurement of projects to ensure the alignment of investments with corporate strategy and the delivery of promised value. Projects are funded only after clear goals and measurements are set that exhibit an alignment between the resource expenditure and the organization's strategy. The organization must undertake a measurement program that monitors the ICT project, ensures that it delivers as promised, and continues the alignment between the project and the organization's strategy. This should make returns from investments more stable and increasingly predictable. All ICT expenditures must contribute to the enterprise's strategy in a demonstrable and internally auditable manner. ICT's role in the creation of value and ICT costs should not be a source of executive concern, because they are transparent and predictable and therefore manageable. This results in a significant increase in the percentage of successful investments, measured in terms of benefit realization and contribution to value. A regular review of investment in projects measures benefit realization, strategic alignment, costs, and risks. The review also monitors the progress toward value creation. Management information and forecasts are consistent, relevant, accurate, and timely and are made available on a regular basis. The total cost of ownership of ICT investments is understood, and all direct and indirect costs (including maintenance costs) are included in the operating costs. Key indicators have been established to assess the level of maturity of value management processes and practices.
- *Policies, standards, and procedures.* The process of ICT project (as well as non-ICT project) investment planning begins with

a consideration of the business benefits being targeted rather than the existing resource constraints. This type of value management must be “business as usual.” The relationship between the business benefits sought and the resources needed to achieve them is known and actively managed. All business case rationales are required to include cost-benefit justification based on the total cost of all changes required to realize the benefits, including changes to areas such as business models and processes, people skills and competencies, organizational structure, and technology. A clear distinction is made between onetime investment expenditures and ongoing operational costs; both are considered throughout the full economic life cycle of the investment, creating a total cost of ownership estimate for the project. ICT investments are categorized to distinguish between mandatory and discretionary investments. Investment decisions are made using objective criteria that are measurable, verifiable, and repeatable. The portfolio of all business change investment projects is continually reviewed and updated, based on the needs of the enterprise as a whole, rather than on those of the individual business unit, in order to exploit synergies, avoid duplication of effort, and avoid double counting of business benefits. There is a formal process for retiring investment programs when expected benefits have been realized or when it is determined that no further benefits are achievable.

- *Skills and expertise.* Effective program and project management processes are in place and are recognized as essential management practices for value creation. Portfolio management practices and structures are applied across different investment types, including those that are and are not based on ICT.
- *Tools and automation.* Standard tools are engaged across the enterprise to evaluate investments, detect exceptions, and identify positive trends, as well as to evaluate and communicate the performance of individual investments and the overall portfolio. Examples of these tools are covered in the remainder of this book.



This list of best practices might be a bit overwhelming, but it sets targets for creating an organization that objectively creates and understands ICT value creation. Creating an organization that adopts this list will often require a culture shift. Most organizations do not manage the ICT resource as one that produces value, but rather treat it as a required part of the organization's infrastructure. An organization should search to create value through ICT and become an enterprise that adopts a culture that recognizes value. In order to determine if your organization sees ICT as a value-producing resource, it is often helpful to do a self-assessment. The value management quick self-assessment (see Exhibit 1.1) is one

LEVEL OF MANAGEMENT AWARENESS FOR THE PRACTICE	SCORE
Management is unaware of the need for the practice.	0
Management is aware and committed to adopt the practice.	1
Implementation of the practice has begun.	2
Implementation of the practice is well underway.	3
The practice is adopted and achievement monitored.	4
The practice is embedded in the enterprise's way of working.	5

MANAGEMENT PRACTICES	Write Score Below
ICT-enabled investments are managed as a portfolio of investments.	
ICT-enabled investments include the full scope of activities required to achieve business value.	
ICT-enabled investments are managed through their full economic life cycle.	
Value delivery practices recognize that there are different categories of investments that are evaluated and managed differently.	
Value delivery practices define and monitor key metrics and respond quickly to any changes or deviations.	
Value delivery practices engage all stakeholders and assign appropriate accountability for the delivery of capabilities and the realization of business benefits.	
Value delivery practices are continually monitored, evaluated, and improved.	
TOTAL SCORE	

A TOTAL SCORE of zero indicates an organization that is totally unaware of ICT as a value-producing resource, whereas a score of 25 indicates an organization that is aware and embraces the notion that ICT is a value-producing resource in your organization.

*This exhibit shows the value management quick self-assessment. This tool is useful for evaluating where management is regarding the value-based approach to managing ICT projects as a portfolio of investments.*

**Exhibit 1.1** Value Management Quick Self-Assessment. *Adapted from the IT Governance Institute*

such self-assessment. This tool allows an organization to understand where it is today and where it needs improvement. Administering this tool to the staff, managers, and executives in your organization will allow the organization to understand its culture and where it needs to change so ICT becomes a value-creating entity.

### Approaches to Attain Value Management

In order to adopt a value management culture, organizations need to move from Level 0, “Management is unaware of the need for the practice,” to Level 5, “This practice is embedded in the enterprise’s way of working.” The target is to adopt the best practices listed previously. There are many ways to move an organization to Level 5. The approaches used to make that move depend on many factors, including the existing culture and management style. Some approaches to make this move are the following:

- *Build awareness and understanding of value management.* When the need to create value is not adequately appreciated by key decision makers and stakeholders in the enterprise, we should endeavor to build an understanding of value management. Management may not realize that value does not just naturally emerge from normal business plans or activities; it has to be actively created. The problem is that while the concepts of value management have been around for decades, the notion of value creation and preservation through business change (and ICT implementation) in the modern enterprise is usually treated as an implied principle and not a conscious and pervasive tenet to guide behavior. This presents a significant challenge: changing the organization to one that is aware and understands that value management must be pervasive throughout the organizational culture.

When an organization lacks understanding or awareness of value management, it usually does not possess a shared understanding of what constitutes value for the enterprise, what level of effort is required to realize it, or how to measure

value. As a result, opportunities to realize value are missed or fail in execution, and value is often eroded or destroyed.

For an organization to build awareness and make value management pervasive through the organization's culture, the organization must (1) establish a broad-based awareness of the need for value management, (2) nurture an understanding of what is involved in developing this capability, and (3) build a strong internal executive and management commitment to improving and sustaining value creation over time. Organizational and individual behavior must change to take a broader enterprise-wide view and a more disciplined, value-driven approach to decision making. The benefits of adopting a culture that is aware of value management, and one in which it is pervasive, includes an increased understanding and acceptance of the need for ICT and the other business functions to work together in partnership, supported by clear roles, responsibilities, and accountabilities related to value management, leading to increased value realization from ITC-enabled investments.

- *Implement or improve ICT governance organizational processes.* Processes, roles, responsibilities, and accountabilities related to realizing value from ICT investments need to be clearly defined and accepted. When they are not, the roles, responsibilities, and accountabilities of ICT and other business functions are unclear, intertwined, or sometimes lack definition. Sometimes business decisions are made by the ICT function and ICT decisions are made by the business. This confused management of resource deployment can create a culture of blame that predominates in the organization, with persistent confusion relating to project accountability, responsibility, and sponsorship.

In order to resolve this situation, the organization needs to (1) establish a governance framework with clearly defined roles, responsibilities, and accountabilities, (2) ensure that the governance framework is supported by strong and committed leadership, appropriate processes, organizational structures, and information, and (3) have a well-aligned

reward system in place. This will require a change in organizational and individual attitudes and behaviors that should evolve toward a broader, more strategic enterprise perspective. Executives and managers should take a more disciplined, value-driven approach to decision making and accountability.

- *Undertake an inventory of investments.* If your organization does not have an inventory of its ICT investments (projects), little if any visibility will exist into the number, scope, and cost of current and planned ICT investments. This includes little or no information about the resources either allocated or needed to support these investments. This can create a situation in which no consideration is given to the costs and benefits of each project, and thus it creates a challenge to balance those relative costs and benefits. Overall expenditures on ICT across the enterprise are often not known and may come from many different and uncoordinated budgets, with significant duplication, potentially creating extensive conflict in the demand for resources.

Organizations should establish portfolios of proposed and active investments. This includes ICT services, assets, and other resources—the organization should apply portfolio management to them. This might require that organizational and individual attitudes and behaviors change to take a broader enterprise view and embrace greater transparency. If this is successfully carried out, there will be an increased understanding of exactly what sums of money are being spent on which investments, in which areas of the business, and by whom. There is also a better identification of opportunities to increase value through improved allocation of funds, a reduction in the overall enterprise cost by eliminating redundancies, a more effective use of resources, and a reduction in risk from better understanding of the health of your organization's portfolio of proposed and current ICT investments.

- *Clarify the value of individual investments.* Organizations that do not clearly understand the value of each investment or do not have a consistently applied process for determining the value of potential or current investments do not take into account the total cost of ownership and the total derived benefits from ICT projects. This results in a persistent questioning of whether ICT investments have generated value. This often results in business cases (i.e., actual business uses as discovered through the value search models discussed in Chapter 4) for ICT investments being nonexistent or poorly prepared and usually considered merely as an administrative checklist required to secure funding. As a result, little if any preinvestment information exists on the costs or estimates of benefits or value. In addition, there are usually few or no metrics to enable the monitoring of what, if any, value is to be or has been created. In these scenarios, it is assumed that technology, or the ICT function, will magically deliver value.

It is essential that the organization establish a process to develop and update business cases for ICT investments, including all of the activities required to create value. The business case should be developed through a top-down approach, starting with a clear articulation of the desired business outcomes and progressing to a description of what actions need to be accomplished by whom (e.g., the gap analysis presented in Chapter 7). These business cases should be updated and used as an operational tool throughout the complete economic life cycle of the investment, from the proposal of the investment through the decommission of it. This requires that organizational and individual attitudes and behaviors change to put more effort into the planning of investments and the development and regular updating of business cases.

Clarifying the value of individual investments should result in a more objective assessment of business cases that enables an “apples-to-apples” comparison across different

types of investments. This will allow the organization to better weigh individual investments based on their relative value against other available investments and yield a stronger track record in selecting the best. In short, when the organization is better able to select investments, there will be less uncertainty and risk regarding the projected value.

- *Conduct investment evaluation, prioritization, and selection.* In some organizations, investment decisions are often highly political, and once a decision is made to proceed with an investment, it is rarely revisited (usually only when a crisis has occurred). Poorly performing investments are rarely remediated or canceled early enough to mitigate losses and, if canceled, are regarded as failures for which someone should be held accountable.

Organizations need processes for conducting an evaluation of proposed investments, setting priorities, and eventually selecting the ICT projects to invest in. There must be consistently applied processes for objectively evaluating the relative value of all proposed and current ICT investments, especially with respect to prioritization and selecting those investments with the highest potential value. Treating ICT investments as part of the overall project investment portfolio of the organization will require change; portfolio management means that ICT investments will need to be categorized according to their potential to create value alongside the non-ICT projects being considered. Rigorously applied criteria will need to be established to support consistent and comparable evaluation of all investments. This will require that organizational and individual attitudes and behaviors change to take a broader enterprise view and embrace greater transparency. The goal is to create value through selecting investments with the greatest potential to deliver value. However, just selecting the correct project is not sufficient; selection must be followed by active management of investments and early cancellation of investments when it is apparent that value cannot be realized.

All of the above approaches have merit and can be used in combination or separately to bring about a cultural shift within your organization toward value-based management of ICT investments. In order to create a culture in which Level 5 practices (“The practice is embedded in the enterprise’s way of working”) are embedded in your organization, it is necessary that your organization adopt tools and methods that embody ICT value management. This book provides tools that the organizations can implement in their search for the ICT value proposition. These tools (and others) need to be molded to your organization to realize value-driven ICT investments and should be part of an overall value management program.

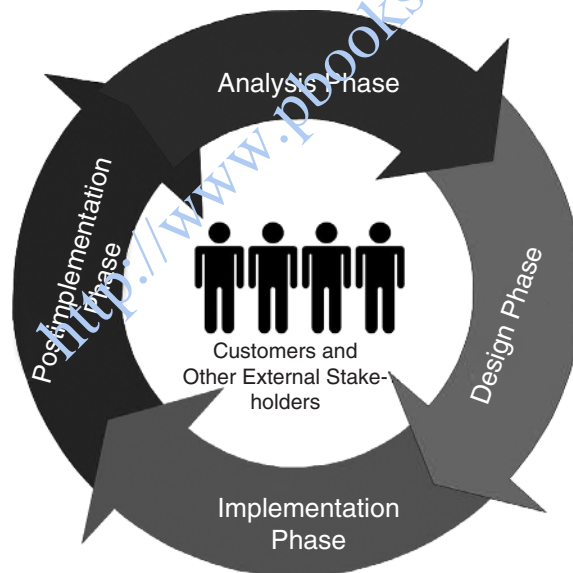
Organizations must strive to expend their existing resources in ways that will make it possible for those resources to create value. At a most basic level, organizational strategy must be set to create value (e.g., create new products that gain market share, attract more customers, and enhance customer perception of current products). The expenditure of resources should be aligned with organizational strategy—resources should be expended only when they create strategic benefit. For example, if the organization is a high-end hotel with excellent concierge services, its strategy might be to attract hotel guests who want an atmosphere where they feel catered to by the concierge staff. Should such an organization deploy a group of kiosks that provide more rapid access to dinner reservations at area restaurants, or should it hire additional staff members to provide more concierge services? This type of question is at the heart of understanding when and why to expend resources. Should an ICT project that deploys informational kiosks be funded, or should the concierge department be allowed to hire additional staff? Only by knowing what the customer wants and is willing to pay for can the hotel deploy its resources in the correct way. This is at the heart of value management and must be understood before a project is proposed, when it is considered for selection, while it is implemented, and when it is in operation. The value of the ICT project must be monitored and realized throughout the project’s economic life cycle.

## BUSINESS-DRIVEN INFRASTRUCTURE DESIGN

### AN INTRODUCTION TO BUSINESS-DRIVEN INFRASTRUCTURE DESIGN

While the topic of *business-driven infrastructure design* is covered in detail in Chapter 9, it is introduced here so the reader has a context for the remaining chapters.

Assuming that a particular project has been selected for funding, the concept of value management must be carried into the initial analysis phase, through the design and implementation phases, and into the postimplementation phase (see Exhibit 1.2). These phases



*This exhibit shows the customers' and other stakeholders' (e.g., suppliers' and business partners') view of the business-driven infrastructure design process. The four phases (analysis, design, implementation, and postimplementation) are both overlapping and cyclic. The phases are overlapping because sometimes information that becomes evident in one phase affects a previous one, which means going back and updating previous documentation. The phases are cyclic in the sense that once the ICT infrastructure is implemented, the postimplementation review is undertaken, and the analysis phase is again started because the competitive environment is always in a state of flux.*

**Exhibit 1.2** Value Management–Based ICT Creation Process



are summarized here and discussed in detail in Chapter 9. A value management–based approach to ICT infrastructure building consists of these phases:

- *Analysis phase.* This phase facilitates an understanding of the company and the industry for which the ICT infrastructure is being implemented, in effect setting the stage for ICT infrastructure integration with the organization's business strategy. The major outputs of the analysis phase include extensive research about the organization and its competitors, as well as a list of ICT-enabled objectives and a gap analysis. It is also critical to ensure during the analysis phase that the ICT resources being deployed fully support the strategic direction of the organization. A number of analytical documents, including value search models and the setting of project objectives, should be created during this phase; these documents will provide the basis for the actual design.
- *Design phase.* During this phase, all of the information gathered during the analysis phase is again reviewed, and the alignment with organizational strategy is confirmed. Business processes in need of innovation or improvement will be modeled during this stage, and the gap will be identified between where those processes are today and where they are to be moved after the project is implemented. Measurement plans, including targets, must be created. In addition, the infrastructure design will occur during this phase, which will require negotiation between the team that performed the analysis and the infrastructure engineers who will design the solution. A number of design diagrams and models should be created during this stage.
- *Implementation phase.* As part of this phase, site surveys are done. This includes a myriad of environmental, power, and other hardware issues. Once all installation areas are confirmed ready, infrastructure is deployed and adequately tested, and this is quickly followed by the installation of the software necessary to support the application. Installation

of hardware and software will next move to commission testing. The infrastructure is then ready to go live.

- *Postimplementation phase.* This phase is largely about measuring the project while it is in production to ensure that things are performing as promised, as well as making appropriate changes when needed. Those changes could entail recommending a new project to serve organizational or customer needs or modifying the existing one.

## ICT INFRASTRUCTURE DEFINED

It is easy to say that businesses need an ICT infrastructure to operate, but it is also important to know what is precisely included in that infrastructure. Business school programs often include a course in data communications, in which technical concepts are taught, but that course does not always offer a substantial business-driven focus. More technically oriented academic programs, like a networking and telecommunication program, usually offer only technical courses, with no business focus. The technical information taught in those courses is essential to students, especially since the Internet has emerged as the primary global communications medium. But managers today need to know when to build infrastructure, not just how, so a greater business-driven focus is needed—one that takes an encompassing view of the organization. This book fills in the gap between understanding the technical details of ICT and the business imperatives that drive ICT investment selection. This book gives a business focus to ICT infrastructure building, whether or not you have a technical background.

As just stated, data communications classes are necessary and can leave students with a thorough understanding of *how* to implement ICT infrastructure but little about *when* to implement that technology and *what* technology to implement to support organizational strategic objectives. The piece that is often lacking is the understanding of exactly which technologies to implement, and when to implement them to achieve maximal efficiency and sustained competitive advantage. You may have taken technically focused courses and therefore have a grasp of technical concepts but may still desire to

know more about when to implement ICT. This book fills the void left by technical courses.

The person in the organization who is responsible for keeping technology in sync with business strategy needs to understand technology's usefulness and when to implement technology to support the organization's strategies—in academic parlance this is called the *strategic alignment of IT*. That person could be a technology manager, business analyst, CIO, chief technology officer (CTO), or chief knowledge officer (CKO). The person's title does not matter; what matters is that the enterprise has someone responsible for ensuring that ICT resources are deployed to support competitive positioning. Linking technical knowledge with competitive positioning is essential to understanding how technology infrastructure and business strategy can and should complement each other.

ICT, software, and applications that support business strategy are grouped together as ICT infrastructure. This infrastructure is described in Exhibit 1.3, which includes everything within the networking and telecommunications system, as well as the actual software, hardware, and services necessary to sustain the business. In today's global technology and Internet-enabled era, ICT infrastructure is often the centerpiece of the competitive position for the enterprise. ICT infrastructure and its various components can be discussed in terms of how the user interacts with them. In fact, this

<b>ENTERPRISE-WIDE COMPONENTS</b> Enterprise-wide technologies, including ERP, e-commerce/e-business, document management, knowledge management, and any other enterprise-wide specialized applications/technologies	<b>User Components</b>	Items that directly interface with the user, including workstations, printers, scanners, associated software (especially desktop applications), and specialized applications
	<b>Service Components</b>	Those parts of the network that facilitate network operations and that the user may directly interface with, including printing services, inter- and intraoffice communications (i.e., telephone or fax), and network attached storage, database/application servers, security servers and appliances, and VPN technology
	<b>Network Components</b>	Those items that we traditionally think of as networking and telecommunications equipment, including network switching and routing hardware, media, outside vendor interconnects, and associated items
This exhibit describes the ICT infrastructure architecture. The exhibit gives the list of components within the infrastructure and a description of each. These components are described from the standpoint of the information and communication technology user.		

**Exhibit 1.3** Information and Computer Technology Infrastructure

book and the ICT infrastructure model take the user's view. The ICT infrastructure model includes the following:

- *Enterprise-wide components.* Users often interact with enterprise applications or systems, such as ERP, enterprise document management, enterprise content management, or knowledge management systems. These applications are a complicated set of ubiquitous software that supports business processes and cuts across the enterprise. While the user usually interacts with only a small part of each application or system (i.e., the front end), these systems are grouped into a category of components called enterprise-wide components. Enterprise-wide components cut across organizational departments, include front-end and back-office services, and operate together as one system or application. The majority of the application is often transparent to the user (e.g., the user does not directly interact with database and application servers), rather the user interacts with a small-footprint front end. Grouping organizationally ubiquitous applications or systems into enterprise-wide components makes understanding and implementing ICT technologies easier. It is easier to think about these components across the enterprise rather than by their constituent parts (e.g., servers, front-end software, or other ICT devices)
- *User components.* These include all of the components with which the user directly interacts, such as desktops and other user-accessed hardware and software. All user-accessed components like workstations, printers, scanners, desktop productivity software, and other specialized applications not included in other components are included in this category. User components are required for staff to accomplish their job functions. What defines these components is that they are under the direct, day-to-day control of the user.
- *Service components.* Network hardware and software that the user directly interacts with are included in this category. These items are under the management and control of the organization's ICT function, but the user accesses the items directly. For example, the network staff will configure

the virtual private network, but the user will use it and understand that it is necessary for accessing the enterprise network securely from off-site. There are many types of network services, including printing services, inter- and intraoffice communications via fax or IP telephony, network accessible storage, and other network-shared devices. What defines service components is that they are under the management of the ICT function but are directly utilized by the users.

- *Network components.* Components traditionally thought of as related to networking and telecommunications (or data communications) are grouped in this category. Network hardware and software, including switching and routing technologies, cabling and media, and any associated outsourcing for servers, outside vendor interconnects (e.g., DSL, leased lines, third-party value-added networks), security, and other network infrastructure items are included here. What defines these components is that they are under the direct control of the organization's ICT function and the user utilizes them, but they are largely transparent to the user.

Each component grouping of ICT is related to the others and must support business processes, enhance the company's operations, and somehow enhance competitive positioning. Technology infrastructure affects both internal operations and external interactions with suppliers, distributors, and customers and in those ways can enhance the organization. The internal effect on operations should yield increased efficiency within the enterprise and must have pay-back that occurs within periods acceptable to the organization. The same is true for externally focused ICT. All ICT infrastructures must also somehow sustain or enhance the competitive positioning of the enterprise through maintaining or increasing the efficiency of internal operations or providing enhanced services to customers.

## CONCLUSION

ICT projects must be managed as investments in the organization and support its competitive positioning. Organizations must know

how they manage their portfolio of projects and what to do when projects do not deliver as planned. There is no cookbook approach to value management or getting your organization to realize a return on its investment in ICT. Each project must be approached from a predefined investment management standpoint where the organization knows what it expects from its investments before funding them and has processes in place to ensure that the ICT projects continue to provide a return.

It is essential that today's competitively minded organization be prepared to take a high-level view of ICT and the organization, its business processes, its products, and the technologies needed to support its competitive positioning. Managers do not necessarily need to understand all of the subtle nuances of hardware and software, but they must understand the linkage among business strategy, ICT infrastructure, and organizational success in order to be a positive part of the team that drives strategic discussions within an enterprise. Hardware engineers are frequently making the decisions today about which technologies to use, whereas the *business analyst*—the person in the organization who is performing the analysis of ICT alternatives, whether the CTO, CIO, CKO, CMO, project manager, or business analyst—is ensuring that all the technologies fit together to support the business processes and products of the organization.

The business analyst needs to have an understanding of the technologies and their capabilities, although the subtleties of individual technologies often remain the purview of the engineer. The business analyst's job function is to specify what needs to be done at a macro level and determine how it is to be done using ICT from a business perspective, while the engineer handles the specifics of ICT design and implementation.

As you embark through the rest of this book, you will find a tool kit that you can select from in your organization's journey to find the value of ICT projects.

## Notes

1. James C. Wetherbe, Efraim Turban, Dorothy E. Leidner, and Ephraim R. McLean, *Information Technology for Management: Transforming Organizations in the Digital Economy*, 6th ed. (Hoboken, NJ: John Wiley & Sons, 2007).

2. The 1989 movie *Field of Dreams* is about someone who builds a baseball diamond with the belief that if it is built, it will be used.
3. The lists and the value management quick analysis in this section have been adapted from IT Governance Institute, *Enterprise Value: Governance of IT Investments; The Val IT Framework 2.0* (Rolling Meadows, IL: printed by author, 2008); and IT Governance Institute, *Enterprise Value: Governance of IT Investments; Getting Started with Value Management* (Rolling Meadows, IL: printed by author, 2009).
4. Nick Huber, "Gartner: Firms Waste £351bn Each Year on Ill-Conceived IT Projects," *ComputerWeekly* (UK), March 21, 2002.

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