CHAPTER

12

HEALTH INFORMATION TECHNOLOGY VALUE ANALYSIS

Learning Objectives

1. Specify why making health information technology (HIT) investment decisions on the basis of realized value rather than on "anecdote, inference, and opinion" leads to better outcomes.
2. Describe five changes that make today's HIT investment decisions more challenging than in the past.
3. Provide examples of HIT costs and outcomes changes that will "always" be adopted and examples that will "never" be adopted.
4. Analyze how the major techniques used for evaluation of an HIT investment differ.
5. List the eight key steps in cost evaluation.
6. Discuss why certain types of HIT applications are less likely to be performed.
7. Describe value realization and total cost of ownership methodologies.

Overview

Up to this point in the book, the discussions surrounding health information technology (HIT) have explicitly recognized that the organization, financing, and delivery of healthcare services are different from those of other goods and services. While we consider this to be fundamentally true, some aspects of healthcare, especially HIT, should adhere to core business processes. HIT can be considered an input into the "production" process, just as inputs of nursing time, allied health staff, medical supplies, and physician services. In that context, the decisions regarding how much and what type of HIT inputs to use should fall under a valuation paradigm. Johnston, Pan, and Middleton (2002) made this point strongly, years ago, in their argument for finding value from HIT.

Firmly establishing value in many healthcare investments has proven to be a challenge, however. Clinical technologies have increasingly been subject to critical valuation, the weighing of benefits received relative to costs

incurred, and this notion has taken hold for HIT as well (Buntin et al. 2011; Kark 2018; Rudin et al. 2014; Sanyal et al. 2018; Wiley and Daniel 2006; Wimble and Leroy 2018). Issues related to data collection, methodology, and application make the realization of value from and widespread use of evidence-based management a challenge. The health economics literature is replete with methodologies of cost, cost–benefit, and cost-effectiveness analyses and quality-adjusted life years (e.g., CADTH 2017; Chaudhry et al. 2006; Cusack et al. 2009; Rahimi and Vimarlund 2007; Simon and Simon 2006; Southern California Evidence-Based Practice Center 2006). Most of these studies involve developing the methodology for assessing complex medical applications, and until recently, only a few are applied. Surprisingly, only a few studies look specifically at methods applied to HIT interventions (e.g., Chaudhry et al. 2006; Featherly et al. 2007; Rahimi and Vimarlund 2007; Simon and Simon 2006; Southern California Evidence-Based Practice Center 2006).

Because of the complexity of the problem and the lack of comprehensive data, healthcare executives have largely been forced to make decisions about HIT investments on the basis of cursory evidence at best and instinct or hope at worst. In the words of Johnston, Pan, and Middleton (2002), HIT decisions are often based on "anecdote, inference, and opinion." Inevitably, this approach produces decisions that may not yield the hoped-for benefits. As a result, HIT may fall short in addressing the problems plaguing healthcare. The discipline is making progress, however, with the effectiveness of the technology and improved prospects for future value (Wimble and Leroy 2018).

This is not totally unexpected, however. A host of problems arise from performing these analyses, including the following:

- The need for complex (econometric) techniques rather than straightforward finance and accounting techniques to find meaningful results (Attema, Brouwer, and Claxton 2018; Meyer and Degoulet 2008)
- Indirect measurement of benefits because of the interdependent nature of the production process and because benefits are found in areas not expected (Bower 2005; Encinosa and Bae 2011; Featherly et al. 2007; King et al. 2014)
- Physician and other clinicians' resistance to change once cost data are delivered (Asch 2003; Krousel-Wood et al. 2018; Stammen et al. 2015)
- Indication from the market that some portions of HIT investments are not appropriate (if people do not realize the value, why should we force them to use it? [Loomis et al. 2002])

As organizations struggle to meet patient and community health needs and improve quality with tight budgets, performing a strict value assessment of all investments has become even more important. To give some idea of the magnitude of the issue, healthcare organizations spent approximately $74 billion in 2018 on healthcare technology, up about 10 percent from the prior year. While that seems like a substantial amount in the aggregate, it represents only about 2.8 percent of total revenue for healthcare organizations in 2018. This is a small number, in that context, and it is less than 2014's 3.1 percent (Kass 2017). For 2019, data projections indicate that 71 percent of executives expect spending on healthcare IT to increase by 10 percent or more, while only 8 percent expect a decline. Further, 29 percent of respondents expected a 20 percent increase in spending or more for the year (Padmanabhan 2019). Data from Deloitte suggest that across industries, firms spend about 3.3 percent of revenue on information technology (IT) (Kark 2018).

Barriers to adoption have shifted in recent times. Murphy (2016) reports that factors such as insufficient information technology (IT) transparency, lack of robust interoperability, overt data blocking, and data security needs are the primary faults. In 2012, however, 14 percent of HIT leaders participating in the annual Healthcare Information and Management Systems Society (HIMSS) survey cited financial factors as a barrier to implementing HIT in their organization, a concern second only to adequate staffing—cited by 22 percent of respondents as the top barrier. Both vendor ability to deliver and difficulty in end-user acceptance were named significant barriers as well, selected by 12 percent and 9 percent of respondents, respectively (HIMSS 2012, 24). In recent years, HIMSS leadership surveys do not report comparable data regarding barriers (HIMSS 2018, 2019).

Even as the government and competitive pressures induce healthcare delivery organizations to implement interoperable electronic health records (EHRs) that enable the exchange of information within and across institutions, these organizations must still focus on value creation in addition to the implementation challenges. Providers have come to expect some sort of electronic health information exchange (HIE) as a business necessity. They work in healthcare delivery teams consisting of physicians, nurses, pharmacists, therapists, and others who require a real-time exchange of information. Hospitals have made gains in the interoperability domains of sending and receiving information, but integration of information among providers remains elusive (Holmgren, Patel, and Adler-Milstein 2017). The Health Information Technology for Health and Clinical Health (HITECH) Act established significant incentives to providers that fully implement an HIE, but insufficient data have accumulated to make robust estimates of value.

Supported by the health reform legislation, consumers seek new delivery modes for their care and expect coordination of care across provider

segments. Consequently, the ability to assess value will be crucial for the HIT leader of the future, and IT will play a vital role in that value delivery.

This chapter first outlines why the evaluation problem is more complex today because of the systems nature of healthcare delivery. Then, it presents what is known about how HIT investments are analyzed and provides the steps for conducting these analyses. Next, it details value realization as a method to implement evaluation. Last, it presents selected findings from cost-evaluation studies.

Systems Challenges

Despite its costs, HIT is essential in the provision of high-quality care in today's environment. However, technology acquisition is not an all-or-nothing proposition. Questions of scale, scope, application, integration, and timing must be addressed, all of which make the decision complex. Do you wait another year? Do you purchase and install some applications and not others? How do you ensure that the appropriate mix of information technologies is selected? Furthermore, once that set of decisions is made, how do you implement so that costs stay at the expected level and the benefits promised are actually realized? In the face of these questions, some have come to challenge the wisdom of assumed value and even the benefits of HIT investments (e.g., Carayon, Wetterneck Cartmill et al. 2017; Carr 2003; Koppel 2005; Wears and Berg 2005).

If these considerations did not make this problem difficult enough, the interdependence of providers in a healthcare "system" complicates the decision further. As detailed in chapter 2, problems of cost, quality, and access plague those responsible for healthcare delivery. In a general discussion regarding the transformation of the US healthcare system, Adams and colleagues (2006) identify the following five features that make today's challenges different from challenges in the past:

1. Globalization
2. Consumerism
3. Aging and overweight populations
4. Diseases that are more expensive to treat
5. New medical technologies and treatments

To respond successfully to these challenges, Adams and colleagues argue that value decisions must extend beyond an individual organization's considerations to the perspective of society as a whole. For example, medical

EXHIBIT 12.1 Cost of Select Procedures in Four Countries (USD), 2015

Procedure	US ($)	UK ($)	Switzerland ($)	Australia ($)
Appendectomy	15,930	8,009	6,040	3,814
Angioplasty	31,620	7,264	10,066	11,164
Heart bypass	78,318	24,059	34,224	28,888
Hip replacement	29,067	16,335	17,112	19,484
Knee replacement	28,184	18,451	20,132	15,941
Colonoscopy	1,301	3,059	604	372
MRI	1,119	788	503	215
Cesarean section	16,106	NA	9,965	7,901
Normal delivery	10,808	NA	7,751	5,312

Source: Data from Kamal and Cox (2018).

tourism may become common as the financial incentives for care delivered outside of the United States could eventually drive select care overseas (see exhibit 12.1). Identifying this competition and constructing apples-to-apples data will be necessary for senior management to make value decisions. Kaiser Family Foundation has done a credible job of compiling and presenting this and other price- and cost-related international comparisons (Kamal and Cox 2018).

Adams and colleagues' recommendations for successful transformation of the healthcare system include many features, but most important, they argue that there will be different perspectives on value. The US healthcare system will transform from one that emphasizes individual value and cost containment to one with an emphasis on balancing "stakeholder value across dimensions (cost, quality, access, and choice)" (Adams et al. 2006, 42). The latter emphasis will usher in a transformation from the current state of data management to electronic, evidence-based, standard, shared, and interoperable information. This transformation is related to the previously discussed emphasis on population health (Kindig and Stodart 2003).

In the early 2000s, Enthoven and Tollen (2005) recommended addressing cost and quality concerns, rather than introducing competition to the healthcare market. They proposed that healthcare organizations should move away from market changes that foster independent competing business units. In their opinion, to capture potential cost savings and quality improvements, the US government should offer incentives for local and regional markets to form "integrated delivery systems, to provide coordinated, efficient, evidence-based care, supported by state-of-the-art information technology" (Enthoven and Tollen 2005, 420). The expectation

was that integrated delivery systems would prove to be a more sustainable delivery model and would address issues of fragmentation (Enthoven 2009). These proposed integrated delivery systems are today's reality, but models are still evolving, and they were not the panacea envisioned, as full interoperability of information exchange and longitudinal health records are yet to be achieved.

Evaluation Problem

At the most fundamental level, business decisions faced by the chief information officer (CIO), and indirectly by the CEO and board of trustees, come down to a challenge of deciding among competing alternatives. The questions they must ask are as follows: Does the investment in HIT increase, have no effect on, or decrease organizational outcomes? Does it increase, have no effect on, or decrease the costs to the organization?

Exhibit 12.2 presents a simple paradigm that can effectively support HIT decisions. The matrix consists of nine cells or potential outcome and cost combinations, and, in some cells, the decision to adopt the technology or not to is straightforward. For example, if adopting the technology results in a reduction in outcomes and an increase in costs (cell 3), most CIOs will not adopt (never). Similarly, if outcomes improve with the new technology and costs are reduced (scenario 7), the decision to adopt is straightforward (always). Combinations of costs and outcomes that place the organization in scenarios 2, 3, or 6 are *never* adopted. Similarly, combinations of costs and outcomes that place the organization in scenarios 4, 7, or 8 are *always* adopted.

The interesting cases involve combinations of costs and outcomes that place the organization on the diagonal in scenarios 1, 5, or 9. For these cases, a methodology must be put in place to more rigorously measure the magnitude of the changes in outcomes and the magnitude of the changes in costs. Formal benefit–cost or cost-effectiveness analyses need to be applied to assess the relative changes for these three cases: both outcomes and costs increase, neither benefits nor costs change, and both benefits and costs decrease.

EXHIBIT 12.2 Technology Cost and Outcome Effect Decision Matrix

	Outcome Effect		
Cost Effect	**Improve**	**No Change**	**Worsen**
Increase	1 ?????	2 Never	3 Never
No change	4 Always	5 ?????	6 Never
Decrease	7 Always	8 Always	9 ?????

Benefit–Cost and Cost-Effectiveness Analyses

A number of studies have documented the use of conventional benefit–cost, cost-effectiveness, or cost–utility analysis in healthcare (Rudin et al. 2014). The discussions that follow are not significantly concerned with differentiating these techniques, as a full history of the concepts is beyond the scope of this book. In simple terms, *benefit–cost analyses* are applied when all aspects of the costs related to a technology and benefits of that technology are measured in monetary terms. The outcome from these analyses might be presented as $3 in benefits for every $1 in cost ($3/$1). The decision calculus then enables leadership to select among alternatives that have the highest ratio.

For many healthcare applications, some of the outcomes or benefits may be difficult or objectionable to put into financial terms. Loss of life, for example, can be quantified in financial terms (Viscusi 2004), but not everyone is comfortable with making those assessments. *Cost-effectiveness analyses* were developed for technologies and resulted in outcomes that could not be quantified (Weinstein and Stason 1977). For example, one might estimate the costs associated with extending life for an additional year. The outcome from these analyses might be presented as $10,000 cost per life year saved ($10,000/life year). In this case, considering alternative technologies, leadership would adopt the technology with the *lowest* cost per life year saved.

Cost–utility analysis extends this measurement challenge even further by recognizing that the quality of life year extended might not always be the same. That realization led to a host of attempts to adjust the life years saved by some notion of the utility, value, or quality of that life (e.g., the findings on the Centers for Disease Control and Prevention's Health-Related Quality of Life website at www.cdc.gov/hrqol/index.htm). For example, if the outcome is an additional year of life, but the patient spends that year in pain or confined to a nursing home bed, the value of that life year might not be as great as nine months of pain-free or fully functional extended life. The key to using any of these formal methods of cost evaluation is to follow some version of the following eight steps (Centers for Disease Control and Prevention 2019; Gold et al. 1996; Rudin et al. 2014).

Steps in Using Cost-Evaluation Methods

Step 1: Identify Study Objectives

While this step may be obvious to many, clearly identifying study objectives may be the most important step in the analysis. Without knowing precisely what the organization desires or what the proposed HIT application or technology is designed to do, the outcomes of the evaluation are meaningless. Essentially, the decision comes down to whether the organization is looking narrowly at the financial benefits and costs associated with the decision or considering broader organizational or social benefits and costs. From the

perspective of IT, social costs include those incurred by physicians or others who are not employees of the organization but whose opinions matter to decision makers. An otherwise strong HIT system may fail if the burden on the users is not fully measured.

Step 2: Specify the Alternatives

The relevant alternatives to the proposed technology must be clearly articulated; otherwise, a valid decision cannot be attained. Make the decision relative to the best alternative to ensure that the optimal choice is made. Not using credible alternatives in judging the proposed technology invites the risk of participants losing faith in the outcomes. A common error is to compare a proposed HIT solution with the status quo; the status quo is often not relevant when adopting an EHR, for example. Comparisons should be required among alternative vendors rather than with the current state of health record management.

Step 3: Develop a Framework for Analysis

The analysis framework is often called the *theoretical framework* or *theoretical model*, and one might have a tendency to ignore this step. Developing the framework is important, however, because it puts the technology into the broader systems context and defines how the inputs to the technology are related and how the outcomes are used by the system. It also forces an understanding of how the technology affects the total healthcare delivery system so that the direct and indirect (unintended consequences) costs and benefits to the system can be clearly identified and measured (Han et al. 2005). Returning to the EHR example, the theoretical framework forces a full understanding of how the information flows from the bedside or the physician's office to the electronic record; how that information is stored, catalogued, and retrieved from the record; and what the information's end uses are designed to be. Without that full understanding, crucial components of costs and benefits might be ignored or shortchanged.

Step 4: Measure Costs

Cost assessment is essential to the benefit–cost analysis. The identification and measurement of costs is relatively straightforward for big-ticket items such as direct labor, equipment, and supplies, but fully identifying indirect or opportunity costs associated with the intervention takes more time. The concept of total cost of ownership is an operational device designed to aid in defining and collecting relevant start-up (one time) and recurring costs (Hickman and Kusche 2006; Smaltz and Berner 2007). The EHR might shift some of the burden of data collection, analysis, and reporting. Unless that added burden results in easily measurable increases in time or supply use, it can often be overlooked. Management, in particular, can easily be affected

by added data availability. The electronic record facilitates more analysis in an attempt to make better evidence-based decisions. While this may result in benefits associated with better decision-making, it may also result in added time spent understanding the data that are generated. Managers may find they spend more time preparing and poring over reports at the expense of other tasks.

Step 5: Measure Benefits

As with cost identification, good evaluation requires clear identification of all benefits associated with the technology. Ignoring key benefits can clearly lead to underestimating the net effect of technology. Johnston, Pan, and Middleton (2002) argue that many researchers take a narrow view of benefits, or, in their term, *HIT value*. They argue that one should consider organizational, financial, and clinical benefits. Identifying these benefits is facilitated if the framework for analysis is done correctly. A related issue with regard to benefits is that they must be realized and not necessarily speculative, assumed, or hypothetical.

Step 6: Factor in Life Cycle and Discounting

Most HIT projects have a pattern of costs and benefits that varies over the product's life cycle. Typically, costs are incurred early in a project cycle as resources are expended to purchase equipment and hire and train staff. Conversely, the benefits or value to the organization accrue over time. Understanding that cycle with respect to the organization's technology is important for making valid comparisons. Although the CIO or HIT decision-maker may not be as concerned with the timing issue as others in the healthcare organization, the timing of incurred benefits and costs cannot be ignored. In fact, considering alternatives with the same net costs and benefits, one should select that project with the distribution of costs skewed toward the future rather than that project with the distribution of benefits skewed toward the present.

Step 7: Deal with Uncertainty

By the nature of HIT investments, uncertainty exists regarding the estimates of both their costs and their value or benefits. Despite leadership's best efforts, they may find that these estimates are inaccurate. For example, with the EHR, physicians may not readily adopt the new technologies and systems as planned. In these cases, the costs of developing and implementing the system are the same, but the measured benefits are much lower. One never assumes exceedingly high levels of avoidance by the medical staff. If physicians do not adopt, the evaluation of the EHR most likely appears unsatisfactory. To deal with uncertainty, most look at the estimates being used and develop a best-case scenario and a worst-case scenario. For example, in the

EHR example, assume benefits with 80 percent of the medical staff fully participating. To test the best case, estimate benefits with 90 percent medical staff participation (base estimate + 10 percent). To test the worst case, estimate benefits with 70 percent medical staff participation (base estimate – 10 percent). This process is often called *sensitivity analysis*. If performing a sensitivity analysis yields estimates that do not change the overall evaluation of the technology, then confidence has been added to the decision. If, at extreme values, the overall evaluation of the technology changes, return to the framework and assumptions to be certain they are accurate.

Step 8: Consider Equity

This step has its origins in the federal government's use of benefit–cost analysis for evaluating alternative government interventions. However, it has application to individual healthcare organizations as well. Equity considerations require examination of not just what the costs and benefits are for the organization but also who receives those benefits and costs. Again, in the case of the EHR, if the benefits accrue to the institution, its employees, and its patients, but the costs are largely borne by those involved in using the technology (physicians), the EHR strategy is likely to fail (Landro 2003). For social investment decisions, consider compensating those who bear the costs from the gains made in the use of the technology. Healthcare organizations have no way to compensate cost bearers, and legal restrictions may limit their compensation.

Challenges to Evaluation

Despite the prevalence of HIT mechanisms in place in healthcare organizations, much evidence exists that HIT value is not easy to attain or ensure. Early assessments of the "state of the art" (Glandon and Shapiro 1988) suggested that more work was needed in this area. High-profile failures occurred, such as at Cedars-Sinai Medical Center in Los Angeles, which ended its effort to convert to a computerized physician order entry (CPOE) system in January 2003 (Ornstein 2003). The cause of this extreme failure is uncertain. Failure most probably occurs at the implementation stage, although failure of that magnitude may have had many causes.

In the late 1980s, some key findings on reasons for poor evaluations of technology suggested why HIT value did not always ensue from these significant investments. First, much of the technology was selected for the wrong reasons, such as keeping up with the competition. While there might be good reasons to adopt the technology that the competition is using, that alone is not sufficient reason to implement an HIT system or application. Second, knowledge, time, and money prohibited adequate evaluation. The CIO and their managers might have been too busy to spend the time conducting evaluations to determine value from the investment. Third, in many cases, the technology

in place was determined to be a poor decision, which might help in future decisions but has no impact on the original decision going forward. This "water under the bridge" argument might keep leaders who are living in the past from investigating prior failures seriously (Glandon and Shapiro 1988).

Related to these items are the following two fundamental impediments to maximizing HIT value:

1. *Documentation.* The comprehensive, reliable data on the clinical or business outcomes related to the technology and the true, full costs associated with selecting, purchasing, and implementing it and with hiring staff and training staff—and so forth—are difficult to obtain, synthesize, and report. It takes time and money to determine whether the value from HIT investments actually exists. More on this issue, called the *total cost of ownership*, is presented in the next section.
2. *Interdependence.* Even if data have been defined and collected, the pervasive nature of the influence of many HIT investments across functional areas in the organization makes determination of value difficult at best. Many systems have both direct and indirect cost and outcome effects across a wide portion of the organization; thus, assigning value to a particular investment is a major undertaking.

Glandon and Buck (1994) identified fundamental challenges to maximizing value from HIT investments effectively. They developed a model of information systems that separates application and function (see exhibit 12.3) and suggests where more rigorous evaluation might exist.

EXHIBIT 12.3 Information Systems by Function and Information Requirement

Information Requirement	Function	
	Clinical	Business
External systems	Physician recruitment and retention Contracting	Legal actions Cost containment
Administrative systems	Case mix Care planning Patient scheduling	Absence and turnover control Revenue statistics Wage and salary planning Capital spending
Operational systems	Admission, discharge, and transfer Census reporting	Inventory control General ledger Accounts payable

Source: Glandon and Buck (1994). Adapted with permission from SAGE Publications, Thousand Oaks, California.

Assessing and ensuring value at the operational systems level has the greatest chance of success. Investments to improve admissions, discharge, and transfer (ADT) or general ledger applications have a greater chance of clearly linking the technology change to a measurable outcome. The well-defined and limited scope of such application reduces the severity of the measurement challenges. Outcomes at the operational level are generally characterized as intermediate compared with outcomes of the healthcare organization as a whole. For example, ADT outcomes might include time to admit a patient to a bed from the emergency department (ED) as an intermediate outcome. This outcome may depend on the ADT system, but ultimate outcome of patient mortality, morbidity, or satisfaction is less likely to be influenced by the ADT system.

Investments applied to administrative systems are less clear in terms of value assessment. These systems influence the efficiency and effectiveness of institutional operations and often contain some of the quantifiable elements inherent in operational systems. However, they often apply to cross-functional areas within the organization, making their impact more difficult to quantify. In administrative systems, then, it is less clear than in operational systems that outcomes, benefits, and costs are attributable to the new technology. Outcomes for administrative systems are generally intermediate, as are the outcomes for operational applications, but should apply more broadly than operational systems. This outcome has broader impact because medical staff, nursing, ancillary systems, and quality improvement and accreditation preparation all bear costs or benefit from changes in this outcome.

Finally, investments applied to strategic planning have the greatest difficulty with respect to value determination. All of the inputs used in these systems are cross-functional, which implies that data must be gathered from diverse units across the institution and often from outside of the institution. Outcomes are generally final from the perspective of the healthcare organization as a whole; thus, they are very difficult to measure, and attribution is always a challenge. For example, systems to support physician recruitment might be expected to lead to greater market share and improved physician retention. However, many external factors influence these outcomes, leading to greater uncertainty with respect to the value of this type of HIT investment. You might have improved physician recruitment by operating a well-functioning system. However, your market share and physician retention may suffer because a specialty hospital moved into your market and siphoned off key physicians and associated patients. The outcomes are poor from the organization's perspective.

Probably the best example of this type of challenge is with the introduction of the EHR strategy. Smaltz and Berner (2007) outline the interrelated nature of benefits and challenges the EHR system faces. Because an EHR system is not a thing but a comprehensive strategy, it is difficult

EXHIBIT 12.4 Descriptions of EHR Benefits by Category: Demonstration of System Nature of EHR

Category	Subcategory	Example of Impact
Improve efficiency	*Improve efficiency of the clinical patient care–related processes*	
	Access to information	Getting information when and where it is needed
	Organization of the data	Patient data entered one time
	Claims processing	Clinical data drive billing processes
Improve monitoring	*Enables individual provider profiles of performance as well as aggregate profiles*	
Improve clinical processes	*Real-time clinical decision support*	
	Quality improvement	Clinical and financial outcomes can be more easily monitored and linked
	Disease management	Aggregate data across patients

Source: Smaltz and Berner (2007).

to value. It is an "organizational, cultural transformation project that just happens to have a technology component" (Smaltz and Berner 2007, 16). Examination of just the benefits section of an EHR strategy described by these authors reveals how investment in this process spans the organization and creates difficulties in financial documentation. The descriptions in exhibit 12.4 by major benefit category and subcategory demonstrate that benefits are not confined to a single operational unit.

Value Realization

The IT Governance Institute (2006, 5) developed a multipart initiative to support HIT value realization in response to a perceived need for "organizations to optimize the realization of value" from investments (see chapter 4 for more background on HIT governance). The comprehensive framework assists users in measuring, monitoring, and maximizing realized value from HIT investments. Rather than a straightforward, one-step-at-a-time approach, this framework employs a holistic approach to value realization. While not fundamentally different from the benefit–cost analysis and cost-effectiveness analysis methodologies described earlier, this framework is more attuned to HIT leadership's decision-making.

The IT Governance Institute approach starts by asking the following four questions, posed originally by Thorp (2003):

1. *Strategic question: Are we doing the right thing?* Is the investment aligned with a broader business vision, is it consistent with established principles, and does it contribute to the strategic objectives?
2. *Architecture question: Are we doing it the right way?* Is the investment aligned with existing information technology architecture and consistent with ongoing architecture principles?
3. *Value question: Are we getting the benefits?* Do you have a clear understanding of the expected benefits, and do you have a process for realizing the benefits?
4. *Delivery question: Are we getting it done the right way?* Do you have effective and disciplined management, delivery, and change management processes with technical and business resources to deliver the promise of the technology investment?

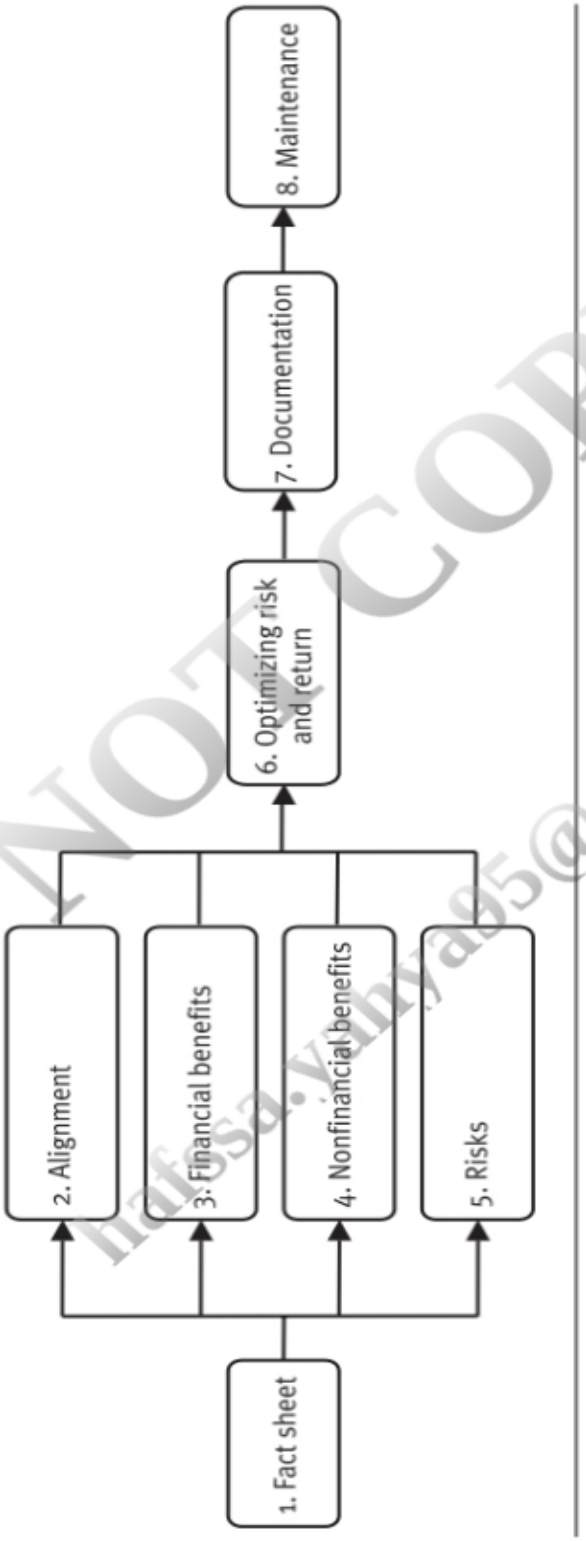
In the context of these four questions, the Governance Institute uses a three-part strategy to maximize return on HIT investment (the first two elements are described in chapters 4 and 10, and the third is discussed in the following section):

1. *Value governance.* Optimizes the value of an organization's information technology–enabled investments by establishing the governance, monitoring, and control framework; by providing strategic direction for the investments; and by defining the investment portfolio characteristics (see chapter 4).
2. *Portfolio management.* Ensures that an organization's overall portfolio of information technology–enabled investments is aligned with and contributing optimal value to its strategic objectives by establishing and managing resource profiles, defining investment thresholds, evaluating and prioritizing new investments, managing the overall portfolio, and monitoring and reporting on portfolio performance (see chapter 10).
3. *Investment management.* Ensures that HIT investments deliver outcomes at reasonable costs while also managing associated risk.

To accomplish the investment management aspect of obtaining a return on HIT investment, the IT Governance Institute proposes that the organization engage in an eight-step process. In this framework, implementing the investment management process requires detailed information gathering; assessment of benefits, costs, and risks; selection of the investment vehicle; and monitoring outcomes. This process is geared to the corporate environment, as opposed to the government or social perspective. These eight steps by the IT Governance Institute (2006) are outlined in exhibit 12.5 and detailed in the following sections.

EXHIBIT 12.5

Steps in Information Technology Business Case Development



Source: Enterprise Value: Governance of IT Investments, the Business Case, IT Governance Institute, © 2006. All rights reserved. Used by permission.

Step 1: Building the Fact Sheet

The first step in the process is to gather all of the information relevant for making the appropriate HIT business decision. The IT Governance Institute provides a model form for collecting the necessary data, but our experience suggests that each organization should implement a collection form that works in its environment. The key point is that no category of information can be ignored. At a minimum, the following categories need to be assembled (IT Governance Institute's equivalent terms are given in parentheses):

- *Congruence (alignment).* The investment must be consistent with documented business strategy (see chapter 4), current HIT management practices, and government regulatory constraints (current and anticipated).
- *Business outcomes.* The investment must deliver an organizational need to achieve intermediate and final outcomes. These outcomes need to be documented and measurable.
- *Financial benefits.* Input for financial benefits should document cost savings, revenue enhancements, capacity and volume growth, and risk mitigation from the investment decision. These include the tangible revenue enhancements or cost reductions in capital, operations, or risk.
- *Indirect benefits (nonfinancial benefits).* As in the benefit–cost assessment, some benefits are not easily quantified in financial terms but must be seriously considered nonetheless.
- *Costs (resources and expenditures).* All categories of equipment, human resources, supplies, consultants, and other resources necessary for the HIT investment must be documented.
- *Sensitivity (risk).* Alternatives that quantify the risk in the investment must be identified. Understanding the best-case and worst-case scenarios for the investment helps the organization select an investment that meets its tolerance for risk.
- *Model (assumptions and constraints).* Understanding how the HIT investment accomplishes the desired outcomes, with associated benefits and costs, helps to determine the reasonableness of the subsequent analyses. The logic of the empirical claims for outcomes, benefits, and costs depends crucially on the assumptions employed. These must be articulated clearly.

Step 2: Alignment Analysis

Investment alternatives abound, necessitating decision-making. The selected option needs to optimize net benefits from the scarce resources available. Alignment helps to ensure that the HIT-related investments support the organization's strategic business objectives. Alignment statements might