Benefits

The data governance process will enable the organization to decide how best to manage data, realize value, minimize complexity, manage risk, and ensure compliance with legal and regulatory requirements. In all cases, for complex organizations, leadership will not always make resilient and appropriate decisions without the guidance of a data governance plan. The plan provides guidance for developing effective rules that are then followed to address a range of exceptions that may arise.

Representation and Decision Rights

A full understanding of the representation and decision rights in an organization involve addressing five key issues derived primarily from the Data Governance Institute (2020a).

Issue 1: Data Governance Participants

All data stakeholders should be involved in data governance. In healthcare organizations, clinical areas, finance, planning, human resources, and operations should collaborate with IT because they all have a direct interest in how data are created, collected, processed and manipulated, stored, made available for use, or retired. In reality, stakeholders delegate routine implementation activities essential for data governance to data management teams. However, sometimes these decisions require groups of stakeholders to engage through an established process, as discussed in the section on Accountability.

Issue 2: Data Governance Definitions

Data governance means "the exercise of decision-making and authority for data-related matters." More specifically, data governance is "a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods" (Data Governance Institute 2020c).

When people refer to data governance, however, they might be talking about

- organizational bodies;
- rules;
- decision rights (how we "decide how to decide");
- accountabilities; or
- monitoring, controls, and other enforcement methods.

Data governance programs can differ significantly, depending on their primary focus, but every program will have essentially the same three-part mission.

Specifically, the program should be designed to make, collect, and align rules; to resolve issues; and to monitor and enforce compliance while providing ongoing support to data stakeholders.

Issue 3: Need for Data Governance

Organizations can survive with informal data governance when they are small, systems are not complicated, horizontally functioning groups do not need an enterprise perspective, and regulation and contractual requirements do not call for formal governance. Few organizations fall into these categories, and thus a formal data governance structure is called for. The framework for data governance enables stakeholders to think and communicate about highly complex and sometimes ambiguous concepts. Management makes better decisions with the full stakeholder participation that a formal framework supports rather than organizational placement.

Issue 4: Location of Data Governance Programs

Each organization has a choice of the best place to locate the data governance team. Options include business operations, IT, compliance and privacy, or data management. Success relies upon senior-level commitment and support and full engagement by major stakeholder groups.

Issue 5: Operations of Data Governance

As mentioned earlier in the chapter, the process of building data governance has a number of steps, including setting priorities for focus; developing a set of value statements; establishing a roadmap for action; obtaining buy-in from stakeholders; implementing the roadmap; and setting up processes to monitor, measure, and report findings. These steps sound easy, but experience indicates that it is best to focus initially on discrete issues to achieve some success, then expand the scale and scope of activities through cycles of effort.

These five steps, culled from the Data Governance Institute (2020a) framework, provide a broad overview of the process. They beg questions of how much governance is required for a particular organization and how to determine the organization's readiness to begin the process. Generally, the extent should be as little as needed to meet stated goals, but professionals charged with this task should realize that the size and complexity of the organization will expand over time. Having a robust governance process in place should enable you to function effectively in that future world. Readiness will be come apparent, should business units or senior management not become fully involved. These elements are essential to moving forward.

Accountability

Data or rights to data governance do not reside with individuals or particular groups, but with the organization as a whole. Having said that, accountability requires you to establish a clear assignment of responsibilities to implement data governance processes. Further, accountability must be assigned and maintained at different levels. At the implementation level, a formal office assigned the primary tasks of driving data governance programs must be defined and charged. Within the data governance structure, a number of key individuals have responsibility and accountability for specific aspects of data governance.

The Data Governance Office

While many methods can accomplish this balance between ownership and responsibility, most suggest establishment of a data governance office (DGO). If a formal DGO structure is not developed, there must be individuals assigned to and responsible for all of the DGO functions. (For an interesting summary of the DGO in the context of the University of Pittsburgh Medical Center, see the case study from the Advisory Board [Aranow 2014]).

The central role of the DGO demonstrates its value to organizing and implementing your data governance plan. Among other functions, the DGO does the following:

- Manages your data governance activities
- Keeps track of data stakeholders and data stewards
- Coordinates other key disciplines (compliance, privacy, security, architecture, data quality)
- Collects and aligns policies, standards, and guidelines from key stakeholder groups
- Facilitates and coordinates data analysis and issue analysis projects
- Collects metrics and success measures and reports on them to data stakeholders
- Provides centralized communications for governance-led and data-related matters
- Maintains governance records

Couture (2018) provides a clear testimonial to the role of the DGO: "A data governance office is a great area to coordinate and ensure the continuation of a data quality management process. . . . Without a data governance program, it's difficult to find anyone to 'own' the ongoing process to ensure continued high-quality data."

Assigned Roles

As previously mentioned, designating roles and responsibilities is an essential part of any data governance strategy. There are many ways to configure this and many roles to consider. At a minimum, you need four primary roles (Walton 2013):

1. *Data owner:* This person should be a director or executive with full accountability for one or more types of data. They formulate appropriate solutions to data quality issues using advice from both business and technical data stewards.
2. *Business data steward:* As the key individual with deep content knowledge in their domain, this person determines optimal solutions and is responsible for determining strategies for data quality, data definitions, and business rules regarding data quality transformation and aggregation.
3. *Technical data steward:* This role uses data profiling tools to identify data quality issues and develops and implements fixes. They act with the oversight and approval of the data owner.
4. *Gatekeeper:* This individual ensures that identified data quality issues are logged, assigned, and tracked until resolved.

While everyone agrees that accountability is a vital element, there are multiple mechanisms for achieving this outcome. The management of data and data governance processes can be assigned formally or distributed. Assigned responsibility gives individual or specific teams that level of ownership. In fact, they can be termed *data owners*. This strategy is particularly useful for compliance and access management purposes. These data owners are given the right to decide who can have access to enterprise data. This approach works as long as the creation-to-acquisition-to-collection paths of data elements are uncomplicated.

More likely, however, a process with distributed control proves more effective. Because data flows throughout the organization and may impact many business and technical processes, it appears in large numbers of reports, data feeds, and information products. The distributed approach has a number of vital steps. The path that the data takes from intake to use needs to be documented. After documentation, data stewards or content experts become accountable for a set of these elements. The complex system has significant hurdles, including effort expended to document data flow, overwork resulting from accountabilities assigned, and the time and effort devoted to management and coordination of the many responsible individuals. Also, the process often requires a more seasoned person to intervene with challenges

as they arise. Employees may feel that needless complexity has been added, but the overall outcome is improved.

Organizing a Health Information Technology Strategic Planning Effort

The development of information systems in a modern healthcare organization is a complex task involving major capital expenditures and significant staff commitments if the systems are to function properly. Developing a consistent, integrated master plan for information systems is essential. To exclude this critical planning activity would be analogous to beginning a trip without knowing precisely the destination, the method of transportation, the route or directions to the destination, the time frame of arrival or departure, and the budget or allowance for the trip. While we would not do this as individuals, organizations continue to move directly into the acquisition of computer systems without any kind of master plan. This section provides guidelines for organizations that have yet to create, organize for, or implement an HIT strategic plan or for anyone hoping to update their current plan. While there is content specific to HIT, the broad strategic planning effort forms the core. With the general planning background in place, HIT strategic planning is the process of identifying and assigning priorities for the application of IT as an organization executes its business plans and achieves its strategic goals and objectives. This historical definition, which might have been seen as many as ten years ago, does not sound much different from the definition of HIT governance. Despite the similarities between the two definitions, there are subtle differences in regard to the importance of the external focus of HIT orientation. Many have analyzed HIT governance issues from theoretical and applied perspectives, and much conceptual work has been done, as discussed in the earlier sections titled Governance for Leadership and Governance Plan.

The importance of HIT strategic planning has increased as healthcare organizations have grown in size and complexity and IT has become increasingly sophisticated. Aside from assigning management to coordinate an orderly planning process, HIT governance also requires managers to expand their reach beyond HIT operations to ensure that IT is used to support the strategic priorities of the organization effectively (Herman, Scalzi, and Kropf 2011; Kloss 2013; Menning and Carpenter 2005; Weill and Ross 2004). For example, discussions among and about CIOs often center on topics such as mergers, acquisitions and divestitures, and other strategic options for the organization (as opposed to internal operational issues and new technology).

In 2001, Gabler pointed out that governing boards and senior managers of healthcare organizations were increasingly concerned about the business value of investments in IT and wanted assurances that information

systems would deliver strategic benefits to the enterprise. Today, as a continuing response to demands that emerged two decades earlier, HIT strategic planning has assumed a higher priority. Fortunately, the federal government has provided some resources to assist. These resources include an overview of the process and a toolkit to evaluate your progress toward planning objectives (ONCHIT 2020a, 2020b, 2020c).

General Approach

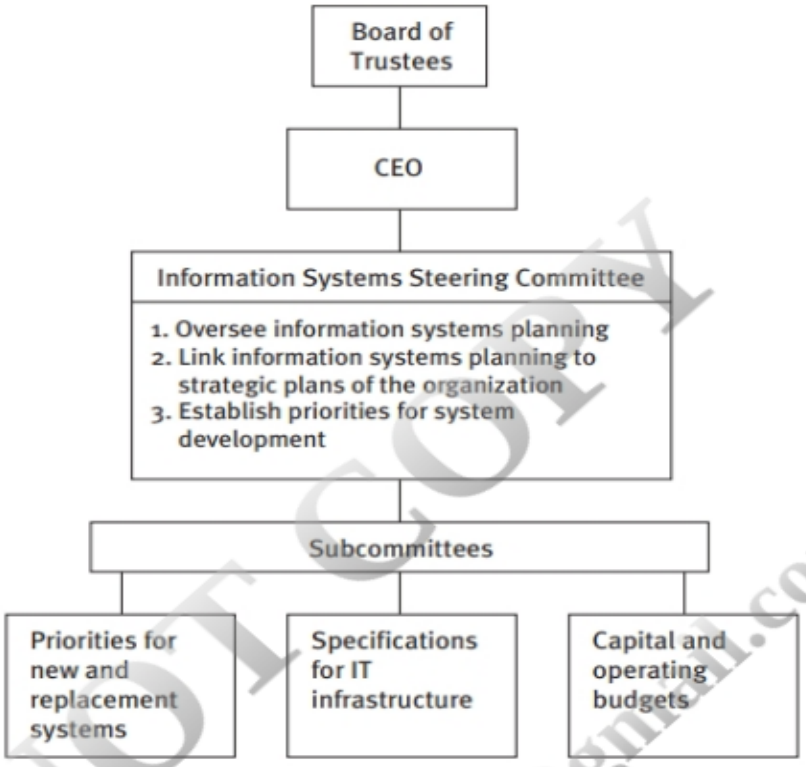
The CEO should take direct responsibility for organizing the planning effort. As discussed, appropriate governance creates an environment in which the board of trustees assigns responsibility, authority, and accountability to the CEO—thus, the impetus for action rests with the CEO. Many structures have been proposed for this planning effort, ranging from highly centralized to informal (Menning and Carpenter 2005). Naturally, the level of sophistication of this structure depends on the size and complexity of the organization and the nature of the environment in which it operates.

Because the CEO often does not have the expertise or time to develop the HIT plan, an HIT steering committee should be formed with representatives from major units of the organization that contribute to and benefit from HIT functions (see Watts 2017). This committee should include representatives from senior management, the medical staff, nursing, finance, human resources, planning and marketing, facilities, clinical support services, and IT. The steering committee needs to be driven by a mission with authority and scope of activity defined, a charter defining the roadmap of action, appropriate staffing, and a focus on collaboration and communication (i.t.Toolkit 2020).

The committee should be directed by a senior manager—preferably the CIO if such a position has been established. HIT strategic planning is primarily a managerial, not a technical, duty. A suggested organizational chart for the planning effort is shown in exhibit 4.2. The HIT steering committee usually has subcommittees that manage discrete aspects of the steering committee's responsibilities. Specific tasks of subcommittees differ according to local needs, but the following are the three components that subcommittees typically address:

1. *Priorities for new and replacement systems.* The identification and planning for new and, importantly, replacement applications serve to determine the scope of user needs.
2. *Specifications for IT infrastructure.* Technology infrastructure specifications must be created by the most technically proficient members of the steering committee.
3. *Capital and operating budgeting.* The budget group is essential to keeping the scale and scope of technology needs under control.

EXHIBIT 4.2 Suggested Organizational Chart for HIT Strategic Planning



Steering committee composition includes senior staff in HIT as well as representatives from the key constituencies across the organization. Additional personnel from the organization and technical consultants can be appointed members of specific subcommittees as needed. The chairs of the subcommittees usually come from the steering committee.

Consideration also should be given to use of outside consultants if additional technical expertise is needed in the planning process. Except for the largest, most organizations cannot employ all of the specialized technical expertise necessary to make quality, informed decisions about IT. Consequently, hiring these experts is a necessity, but consultants should be chosen carefully. In general terms, an IT consultant should have the characteristics of any consultant hired in a business (White and White 2014). These characteristics include character, solid experience, creative problem-solving skills, communication skills, and interpersonal skills.

They should possess technical knowledge of systems analysis and computer systems and should be well informed about healthcare organizations. Consultants must be independent practitioners—not associated with any

equipment manufacturer or firm that sells software. When hiring independent consultants, executives must be sure that the consultants have no bias or stand to benefit from the decisions made, especially in cases when the organization lacks the in-house expertise to validate consultants' recommendations. Finally, consultants should be familiar with the latest technological developments but must be able to resist the temptation to push for applications that are too close to the leading edge.

Lohman (1996) suggested that the following factors be considered in selecting an information systems consultant; this advice is still valid more than 15 years after publication:

- *Independence and objectivity.* The consultant should exclusively focus on the interests of the client.
- *Healthcare expertise.* The consultant should have an understanding of healthcare business and clinical issues.
- *Resources.* The consultant should have sufficient breadth and depth of resources to complete the assignment without "on-the-job training."
- *Effective personality.* The consultant should have an appropriate mix of character traits and skills.

Kushan (2016) recommends healthcare leaders assess the potential consultant in the following dimensions:

- Relevant Experience. Make sure that your consultant is not just an experienced consultant but has particular expertise for the applications you are pursuing.
- Cultural Fit. The consultant must work closely with staff and senior leadership to determine if the cultural fit is strong for your candidate.
- Communication Skills. The consultant must demonstrate the ability to communicate in oral and written forms to all levels of staff and to senior leadership.

Consultants should be used as sources of technical information and as facilitators of the planning process; they should not be employed to do the planning. Planning must be the responsibility of knowledgeable managers and users of information within the organization itself. Consultants can be of most assistance by advising those on the steering committee of the functionality specifications of the technology or systems being considered and the system-level consequences of an action or decision. Before using a consultant's "off-the-shelf" planning product, ensure that the planning methodology is compatible with the organization's culture and strategic priorities.

Boyd (2005) presents an interesting set of reasons for and against outsourcing HIT. Although his discussion is more in the context of outsourcing fundamental HIT functions, the reasoning applies in the case of hiring consultants to advise the steering committee. Simply put, organizations should outsource to take advantage of the capacity and expertise of the external resource and reduce the fixed costs of having added expertise in-house.

The CEO should ensure that staff members participating on the steering committee are provided sufficient release time from their normal duties so that they can participate fully in the planning efforts. Release time estimates should be drawn up in advance, and formal written notification of this time should be provided to all involved. Senior management and the board of trustees should be prepared to allow a significant number of the institution's staff to carry out this important task.

As stated, the CIO should chair the steering committee, if the CIO position has been established. Reporting directly to the CEO or chief operating officer, the CIO serves two important functions: (1) assisting the senior management team and governing board in using information to support strategic planning and management and (2) providing management oversight and coordination of information systems and telecommunications throughout the organization. See chapter 3 for a full description of the role of the CIO.

Elements of a Health Information Technology Strategic Plan

Exhibit 4.3 lists seven major elements that should be included in the HIT strategic plan, each of which is discussed in this section.

Statement of Corporate or Institutional Goals and Objectives

The HIT strategic plan should begin with a review and concise statement of major organizational goals and objectives for the three- to five-year planning period. HIT goals and objectives should be aligned with the strategic objectives of the organization. For example, if reduction of medical errors is a major priority, then this goal should be reflected in the priorities for HIT development, paying particular attention to medical records, clinical protocols, clinical decision support systems, and incident reporting. If diversification and expansion of the market service base are strategic objectives, then information systems should focus on utilization analysis and forecasting, analysis of changes in the demographic profile of the service market, and analysis of resource requirements for new service development. If an urban medical center has placed priority on expansion of ambulatory care services, but HIT priorities continue to focus on inpatient services, then the organization has a serious problem of goal displacement.

EXHIBIT 4.3
Elements of the HIT Strategic Plan

1. Statement of corporate/institutional goals and objectives
2. Statement of HIT goals and objectives
   a. Management information needs
   b. Critical success factors
   c. Information priorities
3. Priorities for the applications portfolio
   a. Clinical applications
   b. Management/administrative applications
   c. Electronic networking and e-health
   d. Strategic decision support
4. Specification of overall HIT architecture and infrastructure
   a. Level of distribution
   b. Network architecture
   c. Data location (from central data warehouse to total data distribution)
   d. Integration via internet
   e. Database security and control requirements
5. Software development plan
   a. Commercial packages
   b. In-house development
   c. Contract software development
   d. Application service providers
   e. Combinations of the above
6. HIT management and staffing plan
   a. Central information systems staffing and control
   b. Limited central staffing in support of department-level HIT staff
   c. Outsourcing
   d. Combinations of the above
7. Statement of resource requirements
   a. Capital budget (e.g., for hardware, software, network communication equipment)
   b. Operating budget (e.g., for personnel, supplies, consultants, training)

Critical success factors are often used in defining information requirements and HIT goals during the planning process (Rockart 1979; Ward and Griffiths 1996). Variations on the approach have been adopted. Kuperman and colleagues (2006) used a "requirements-driven" approach for quality improvement, identifying data warehousing and clinical encounter documentation as the critical factors that would lead to improved patient quality. Similarly, Johnson (2005) used a continuous cycle of assessment, prioritization, and scheduling to allocate scarce HIT resources optimally. Senior management must define these requirements for HIT, but executives often have difficulty with specifying needs for information. By pointing out the

critical areas in which things must go right for the organization to flourish, senior managers assist the HIT planning team in determining information requirements and setting priorities for system development. Formal analyses have demonstrated the alignment of goals of HIT usually related to quality improvement and even in primary care applications (Higgins et al. 2015). Further, strong evidence of impact on throughput and financial outcomes also exists (AlHazme et al. 2016). Effectively communicating goals among the C-suite officers of the organization is critical to success.

Statement of Health Information Technology Goals and Objectives

Objectives should be as specific as possible and should flow from a review of strategic priorities and an analysis of deficiencies and gaps in current information processes. The CIO and other members of the steering committee should consult a good text or how-to book on strategic planning at this stage so that goals and objectives are well specified (Ginter, Duncan, and Swayne 2018). Avoid general statements of objectives such as "information systems for Metropolitan Health System should be designed to improve the quality of care and increase the efficiency of system operations." Such statements are self-evident and nonfunctional as far as planning is concerned. Rather, a detailed list of objectives should be established that will provide specific targets against which future progress can be measured and systems can be evaluated. Examples of specific objectives might include the following:

- Information systems for the health plan should be designed so that all records from the master patient index file are available online to all physicians in the plan.
- Information systems for the clinic should be designed so that all diagnostic test results are available online within two hours after the tests have been completed.
- Information systems should be designed so that information on inpatient and outpatient activity by major diagnostic categories is reported to corporate management on a monthly basis, with reports indicating the health system's share of the total services provided in the market area.
- Disease management protocols for the ten highest-volume chronic conditions should be available online and should be used to provide automatic reminders to all physicians practicing in the hospital.
- If the organization is a university-affiliated health system, information systems should expand the university's current infrastructure to meet optimally the ongoing needs of the institution in the areas of research, education, patient care, and community service.
- Support the institution's IT users through the formation of a service center.

These goals and objectives then provide the pool from which the organization must derive its set of key priorities.

Priorities for the Applications Portfolio

Healthcare organizations cannot acquire all the systems they need in any given year. The statements of corporate and HIT objectives aid the steering committee in preparing a priority list of applications to be acquired. The list, in turn, is essential in planning how limited resources can be used to have the greatest impact on strategic priorities. Chapter 9 provides a comprehensive discussion of application opportunities.

The applications list should consider the needs of all major functional areas of the healthcare organization, such as finance, human resources, resource utilization and scheduling, materials management, facilities and project management, and office automation. Both new and replacement systems should be considered, and the need for major changes to existing systems should be reviewed as well. Applications should be ranked in the recommended sequence for implementation, and items on the applications priority list should be linked to specific organizational strategies. If an HIT steering committee determines that financial control is the most pressing organizational problem, the development of a new financial information system might assume highest priority.

Many healthcare organizations have initiated programs of business process reengineering to achieve operational efficiency through dramatic improvement in core processes used in the organization. The pay-for-performance movement sponsored by government and business has heightened the urgency of process improvement (Rosenthal et al. 2006). This broad movement makes clear not only the importance of HIT but also the direct involvement of HIT applications in every aspect of delivery systems (Petersen et al. 2006). Many of these reengineering projects involve development of new information systems, and these should be considered by the HIT steering committee in developing the applications priority list.

After the priority list has been completed, the steering committee should report preliminary results back to the CEO and board of trustees. The statement of objectives and priority list should be carefully reviewed and modified as necessary to make sure that together they reflect the positions of senior management and the board.

Specification of Overall Health Information Technology Architecture and Infrastructure

Specification of overall systems architecture is a critical task in the planning process (see chapter 5). In short, the plan must specify an overall architecture and infrastructure, including the following:

1. *The degree to which computing is centralized or decentralized throughout the organization.* Opinions differ about the degree to which computing should be centralized or decentralized in healthcare organizations (DeFord and Porter 2005). Carr (2003) argues that HIT no longer matters in obtaining a competitive advantage for healthcare organizations because IT is such an integral part of all aspects of healthcare delivery that no one organization benefits more than its competitors. DeFord and Porter (2005) argue convincingly, however, that IT infrastructure as one part of overall HIT is still valuable and benefits from centralization. In their opinion, centralized information technology does the following:
   - Reduces variability
   - Improves security
   - Reduces human resource requirements
   - Enhances flexibility
   - Reduces procurement costs
   - Reduces total cost of ownership
   - Improves end-user satisfaction
   - More effectively and efficiently aligns HIT to business needs

   Proponents of decentralization, on the other hand, claim that decentralization places control of information systems back where it belongs—in the hands of users. It fosters innovation in system design and develops increased user interest and support. Local flexibility is maintained, and the frustrations of lengthy programming and processing backlogs at a central facility are avoided. Analysts often indicate that neither is best and the decision rests with the particulars of the organization (Staheli 2015). However, a consistent downside of centralization rests in the inability of individual units to control their own operations, especially those units that are strong financially and have the ability to work in a decentralized framework.
2. *The network architecture that specifies how computers and workstations are linked together through communication lines and network servers.* Chapter 5 includes a detailed description of alternative network architecture configurations. Data distribution plans help determine which type of network architecture should be employed by the healthcare organization. Alternatives range from creation of large, centralized (enterprise-wide) data warehouses to complete distribution of data in which each organizational unit on the network maintains its own database.
3. *The manner in which data are stored and distributed throughout the organization, including database security and control requirements.*

Many healthcare organizations, particularly IDSs, have moved toward a combination of approaches to data distribution. For example, the IDS might develop a centralized data warehouse containing a master patient index and computerized records for all patients in the system. Individual organizations in the IDS (e.g., hospitals, ambulatory care centers) might maintain their own data files for patient appointments, employee records, inventory control, budgeting, and financial management. The telecommunications network supporting the system is designed to facilitate electronic exchange of information so that patient records are accessible at all treatment sites and financial information can be transmitted to corporate offices on a periodic basis. In addition to describing the network architecture, the plan should specify how the infrastructure supports related activities such as audio, video, and wireless communications; document imaging; and radiographic imaging.

4. *The manner by which individual applications are linked so that they can exchange information.* Interoperability is discussed fully in chapter 1, but briefly, it is a key strategic consideration that affects all clinical and administrative components of the delivery system.

Regardless of the approach followed for data distribution and system integration, data standards are required. Data security and protection of information confidentiality are discussed in chapter 5. The subcommittee that reviews HIT architecture and infrastructure must include competent technical staff or consultants working closely with representatives of management, the medical staff, and other major HIT users.

Software Development Plan

The HIT strategic plan should specify procedures for software development. In the early days of healthcare computing (1960s to 1980s), most hospitals and other healthcare organizations employed a staff of computer analysts and programmers to develop computer applications in-house. Today, most healthcare organizations rely primarily on software packages purchased from commercial vendors. A wide array of software products are available; see, for example, the annual resource guide published by the Healthcare Innovation Group (which is available online at www.hcinnovationgroup.com). This source presents a vast listing of companies, including a brief description of the company, its product categories, and contact information.

Use of application service providers (ASPs) is another alternative for software acquisition that has grown in popularity among healthcare organizations. An ASP is a vendor that contracts with a healthcare organization to provide access to and use of applications on a subscription basis on an off-site

server. Many large healthcare organizations and IDSs use combinations of these software development options. Commercial software may be combined with tailor-made programs developed by in-house staff, particularly programs that support database management and electronic communications across the network. ASPs may be used for selected applications by smaller units affiliated with the enterprise.

The ASP has been somewhat replaced or expanded through managed service providers (MSPs). This expanded service has evolved from the 1990s and now has a strong presence in middle-tier firms. Observers estimate that its market doubled between 2014 and 2019. Reasons to adopt are similar to those articulated for ASPs: to improve efficiency and reliability of IT operations (56 percent); to enhance security and compliance (38 percent); and to manage all IT infrastructure and services remotely (Hogan 2017).

Management and Staffing Plan

The HIT strategic plan should specify the management structure for information systems. Most healthcare organizations still employ an in-house staff for information system operation and management, even if all or most software is purchased from commercial vendors or leased from ASPs, or if services are outsourced to MSPs.

Decisions must be made on the extent to which technical personnel are centralized or distributed among the major user departments of the organization. An increasing number of organizations are outsourcing all or some of their information-processing functions to contractors who provide on-site system implementation and management services.

Centralized staffing offers the advantages of economies of scale and reduction in the number of technical personnel to be employed. Decentralized staffing brings systems management closer to the user and offers the potential for increased support and user involvement in system development and operation.

Outsourcing HIT functions allows the healthcare organization to get out of the IT business through contracting with experts in the field. However, the costs of outsourcing may be high and may tend to generate too much distance between users and technical systems specialists.

Statement of Resource Requirements

The final element of the HIT plan identifies the resources required to carry out the plan. The capital budget should include five- to ten-year projections for the cost of computer hardware, network and telecommunications equipment, and software. The operating budget includes costs for personnel, supplies and materials, consultants, training programs, and other recurring

expenses. Both budgets should be updated annually, and the timing of their preparation should be coordinated with the overall organizational budget cycle.

Although the IT budgets of healthcare organizations lag those of other information-intensive industries, the *23rd Annual HIMSS Leadership Survey* reported in 2012 that budgets increased in an attempt to keep pace with developing technology. Seventy-five percent of the survey respondents indicated that their budgets definitely or probably would increase in the current year, and only 7 percent expected their budgets to decrease (HIMSS 2012). Since this time, however, the outlook for IT budgets—at least for hospitals—appears to be declining. Data from the 2018 Annual HIMSS Leadership Survey (2018, 14) demonstrate that fewer respondents expect budgets to increase:

Year	Percent Increase	Percent Decrease	Percent Unchanged
2016	65%	7%	21%
2017	57%	18%	17%
2018	24%	43%	21%

Note: Some individuals did not respond or did not have an estimate.
Source: Adapted from HIMSS (2018).

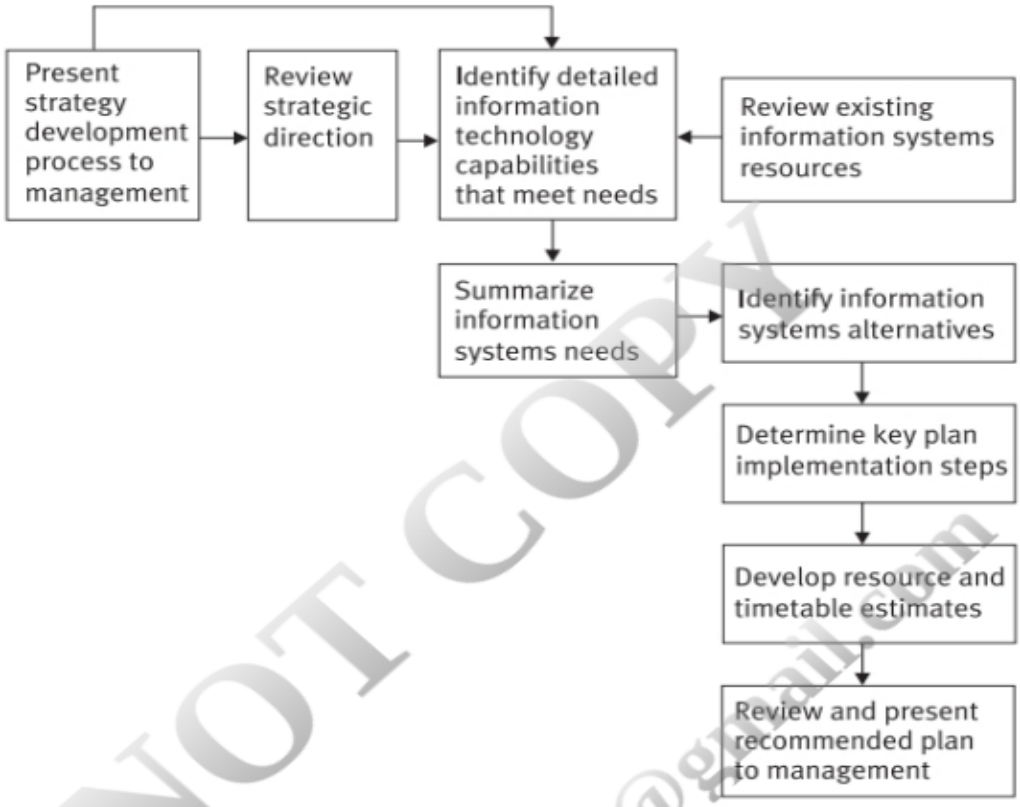
The planning process is the subject of many other books, but to round out our discussion here, we provide a generic planning methodology adapted from Glaser (2002) in exhibit 4.4. This plan starts with the necessary gathering of information to review existing organizational strategies with senior management and middle management. The goal is to identify information systems needs by contrasting existing resources with the requirements that will meet users' expressed needs. Glaser suggests that much of the information gathering should be done by external consultants.

Once the gap between needs and capabilities is determined, the next step is to delineate information systems alternatives. These alternatives will require key implementation steps to be specified, followed by estimates of resource requirements and timelines for implementation. Finally, the full plan with recommendations is presented to management.

Review and Approval of the Health Information Technology Strategic Plan

The HIT plan should include an overall schedule, detailing the target dates for implementation. Although cost estimates and target dates are preliminary at this point, they assist management and board members in evaluating the

EXHIBIT 4.4 Generic HIT Strategic Planning Methodology



Source: Glaser (2002). Adapted with permission of John Wiley & Sons, Hoboken, New Jersey.

magnitude of organizational commitments required to implement the recommended set of alternatives.

After the HIT steering committee has approved the plan, it should be presented to executive management and the governing board for their review and approval prior to implementation. The written plan should be submitted to management in advance of a formal presentation and discussion session.

As with any plan, the HIT strategic plan must be a dynamic instrument that is reviewed periodically and updated regularly. At least once a year, the steering committee should review progress in meeting the original criteria set forth in the plan, and the plan should be changed as necessary. This review process is essential for the steering committee to monitor progress in completing goals (or any related barriers) and to report that status to HIT leadership. If problems arise or should the environment change dramatically, the committee may put forward a suggestion that the organization change strategic direction.

End-User Computing

A problem that many healthcare organizations face is what to do about dissatisfaction among organizational units whose information systems needs are not identified as priorities in the HIT strategic plan. End-user computing strategies offer one potential solution to this problem.

Many employees have become sophisticated in their computer use. Powerful personal computers with user-friendly software and user-oriented programming tools have helped to facilitate end-user computing—some users no longer require the services or resources of the central HIT department.

End-user computing most often involves use of departmental software packages purchased from vendors (e.g., laboratory, pharmacy, radiology systems) or leased from an ASP. In some cases, computer-literate users may write programs to meet specialized needs in their departments. For example, end users at an outpatient clinic in a large medical center may create and maintain a database of companies that provide medical supplies for the clinic.

End-user computing offers the potential to expand the base of HIT development and overcome issues that arise when a low priority is assigned to certain applications that are nevertheless viewed as important to units within the organization. End-user computing must be approached cautiously, however. Most activities in healthcare organizations are interrelated, and computer applications must be able to exchange information for efficient operations (see the next section on standards and policies). If a departmental system can stand alone, management might authorize acquisition, provided that department funds are available and the system is developed in accordance with the HIT strategic plan and enterprise-wide standards and policies. If the system needs to exchange information with other units of the organization, central control and planning are needed before the end-user department is authorized to acquire the system. *Data compatibility*—use of common codes and data definitions for electronic information exchange across the organization—should be mandatory (see the following section).

Health Information Technology Strategic Planning for Integrated Delivery Systems

IDSs must consider the need for integration of information systems across institutions as well as for individual organizational units. Such integration is particularly critical in vertically integrated organizations, where patients may progress and seek treatment at various organizational units such as clinics, surgical centers, acute care hospitals, substance abuse centers, and skilled nursing facilities. Information systems must be patient centered to aggregate data from the various medical care units and track patients throughout the healthcare delivery organization. At the same time, corporate system management must recognize that different types of facilities (e.g., hospitals,

ambulatory care centers and clinics, nursing homes, home health agencies) have their own distinct information requirements. Corporate policy must provide mechanisms for specialized information systems to meet the needs of individual units.

Information systems for an IDS must be able to provide comparative financial data for management to allocate resources efficiently to individual units. Such an ability is especially critical when healthcare costs are paid on a capitation basis. Corporate management will need to carefully monitor how patient care dollars are being spent across units for actuarial risk analysis. The IDS also needs special information for the purposes of market research and analysis of competitor services. Physician performance in various components of the system must be monitored as well.

At the technical level, information systems for an IDS may require standardization of coding and data definition for all organizational units—for example, a common chart of accounts for financial reporting. If such an approach is not feasible, then complex data conversion tables are required to facilitate electronic data exchange. To serve corporate management information needs and operational support requirements of each medical care unit, IDSs need to strike a balance between centralized data management and local control of data processing.

In recent years, hospitals have merged to form corporate systems, medical centers have acquired community hospitals and brought them into their organizations, and some corporate systems have sold or divested some of their existing facilities. These mergers and changes in ownership can create special problems with respect to information systems at the individual facilities.

If the corporate system has highly centralized information processing through a corporate data center and acquires a new facility, it needs to draft a special HIT plan to bring the new unit into the central system while allowing it to continue to use its current hardware and software to support ongoing operations. If computing in the corporate system is decentralized at the facility level, the newly acquired facility may not have compatible hardware and software. Conversion programs may be required to convert data from these legacy systems to meet corporate reporting requirements. Unique information-processing problems usually result from these mergers, acquisitions, and joint ventures. Management at both the corporate and institutional levels must be prepared to address these problems as the plans for organizational change are developed.

Data Warehouses

Many health systems are developing data warehouses to serve the needs of facilities in their systems. As has happened for many IT applications, industry experts provide guidelines for what works, in a practical sense, for developing

data warehouses ahead of formal research evidence. Johnson (2017) outlines a five-step approach to effective establishment of data warehouses in an organization that should look much like the steps to success for other processes, as well:

1. *Obtain leadership commitment to outcomes improvement.* While this sounds trivial, data warehouses require a sustained commitment of time and resources with limited payback in the short run. Key senior leaders and probably an outside vendor must clearly receive informed support.
2. *Build team.* The involvement of key data architects, business intelligence developers, and data stewards or content experts provides the breadth and depth of expertise to implement a workable system.
3. *Partner with IT.* The data warehouse team needs support from the organization's information systems department to implement the plan fully. This group of stakeholders includes systems administrators to manage software, operations programmers to maintain the network and servers, and a database administrator to support data infrastructure.
4. *Generate interest and buy-in.* Dashboards and education ensure that all potential users (especially clinical users) begin to understand the value and importance of the capacity being developed.
5. *Maintain support.* As the system develops, existing applications become routine, and conflicts among competing extensions can cause a decline in functionality.

Breen and Rodrigues (2001, 87) present an interesting case study on development of a data warehouse and conclude, "Successful implementation of a data warehouse involves a corporate treasure hunt—identifying and cataloging data. It involves data ownership, data integrity, and business process analysis to determine what the data are, who owns them, how reliable they are, and how they are processed."

The Cleveland Clinic, based in Ohio, has extended its efforts to report quality indicators by using its administrative and clinical data repository of patient data to aggregate and report physician indicators of quality. At the clinic's locations, advanced-practice nurses (APNs) provide primary care to patients in the ambulatory setting, but the data are traditionally linked to the primary care provider and not to the nurse. The extension is to link patient information assembled via its EHR to the APN managing the patient. In this way, quality outcomes can be reported for this vital provider group, demonstrating APNs' contribution to patient care (Kapoor et al. 2006).

Even the federal government has developed the data warehouse concept for collection, storage, and dissemination of the vast quantity of healthcare data it manages. For example, the website of the Department of