CHAPTER

13

INFORMATION MANAGEMENT STRATEGY

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Learning Objectives

After reading this chapter, you should be able to do the following:

- Name the key features of an information management strategy.
- Describe the types of data in a healthcare organization.
- Understand the relationship between operating model and information strategy.
- Explain how information management strategy can guide investments and decisions.

Key Concepts

- Data principles
- Information facets
- Reference data architecture
- Data governance
- Master data and reference data
- Binding

Introduction

An **information management strategy** is an organization's plan to acquire, manage, use, and deliver information through products and services to internal and external customers. Information management is a poorly recognized topic in many healthcare organizations, both big and small. When asked about an information management strategy, healthcare leaders may offer responses such as "We are using Cerner for our electronic medical record," "We use a single medical record number for all our patients," and "We use Oracle databases to manage our data." Although these responses reflect aspects of an information

Information management strategy
Plan to acquire, manage, use, and deliver information through products or services to internal or external customers

management strategy, they represent an incomplete and narrow understanding of this strategy.

An information management strategy is often considered a component of an information technology (IT) strategy—an organization's broad, long-term plan for its IT system and other use of technology. Healthcare administrators and senior leaders are increasingly confronted with health information technology (HIT) investment choices that provide new capabilities for care delivery, business (e.g., revenue cycle), and regulatory compliance and reporting (e.g., from the Centers for Medicare & Medicaid Services [CMS]) processes. They also face myriad IT-related decisions, such as replacing an antiquated system and purchasing a new electronic solution for a clinical service. Often, they think of an IT investment in terms of its functionality or ability to perform a task, but rarely do they consider its value or the value of data or information being collected.

This chapter explores the many aspects of information management strategy to help healthcare leaders appreciate the value of their IT investments from a data and information perspective. Many healthcare organizations have already upgraded to an electronic health record (EHR) system, and its use is at an all-time high thanks to the mandates and incentives in the Health Information Technology for Economic and Clinical Health Act and the Federal Health IT Strategic Plan (Office of the National Coordinator for Health Information Technology 2015; US Department of Health and Human Services 2017). As organizations become more efficient and proficient with EHRs, they will naturally turn their attention to other data and information needs. Without a formal information management strategy, organizations could make IT investment decisions that do not further their goals or that lead to costly, mistake-riddled implementation. An information management strategy specifies the organization's key data assets and their value, as well as the organization's data usage.

Data as Assets

Shouldn't healthcare organizations focus on healthcare delivery rather than HIT? Why do organizations need to think about data? Why does an information management strategy matter?

Healthcare delivery is the main focus of healthcare organizations, but data and information are their assets. Whether we realize it or not, healthcare is data intensive. At the most basic level, physicians and other health professionals do two things: perform clinical procedures and manage clinical information. The amount of information that needs to be collected and stored—from medical condition, history, and maintenance to procedures, billing, payment, test results, and care plans—is immense and continues to grow. In addition, the amount of medical knowledge is expected to double every 73 days (Densen 2011). Clearly, health professionals use and process information in healthcare delivery. The first step in developing an information management strategy, therefore, is to acknowledge that data are an asset and must be treated as such. Assets have value, are maintained, and are kept operational. They need to be replaced and upgraded as their useful life is met. Recognizing this fundamental tenet is critical to an effective information management strategy.

Quantifying Value

The value of data may be hard to quantify. The patient record has value, specifically from a security perspective (e.g., the value of a person's identity on the black market). Fines and mitigations are imposed in the event of Health Insurance Portability and Accountability Act (HIPAA) privacy violation for improper disclosure of protected health information (PHI). In addition, managing or collecting data cannot just be altruistic (i.e., keeping data for the greater good of human kind). The value of data is more direct. Having the right data to perform a function, using data to improve a clinical function or process, or combining data to gain new insights are all part of the value proposition.

The value of data increases when linked or combined with other data. Often, data may be used in a primary function—for example, maintaining the patient's current residential address for correspondence and billing purposes. However, the broader use of this information may not be recognized by the primary function but is incredibly important for secondary uses. Maintaining an address history is valuable in epidemiology for understanding the geographic aspects of disease or continuity-of-care patterns based on where patients have lived.

The demand for data is both a blessing and a curse. As healthcare consumerism grows, patients expect and want to share more information about their health status or medical condition. They also want information by which to measure their own dietary intake, exercise routines, vitals, sleep patterns, and other health-related "performance," which enables a state of being known as the *quantified self*. Countless consumer-grade devices and wearables are available for monitoring one's functioning and guiding health behaviors and performance. Direct-to-consumer genetic testing kits provide not only ancestry information but also potential disease risk data, which often cause patients to turn to their physicians for interpretation and explanation. On the patient care side, more data exist—whether documented in electronic or paper records and flowsheets, supplied by patients, or automatically collected through physiological monitoring and diagnostic procedures. All of these data increase the expectation that physicians and other care providers are using them to inform and improve their decision making.

Understanding Informatics and Information

Informatics is a simple word that is fraught with many meanings. In its basic form, it means people plus process plus technology. This definition is informative but lacks any aspect of information or data. Thus, informatics could be viewed as people plus process plus technology plus information, recognizing the role of data in health services delivery. Often, technology (the shiny object) distracts us from the people, process, and information aspects, but remember that technology is ever-changing and so is its value, whereas people, process, and information were important in the paper records era and will continue to be important in the digital era and beyond.

Information is universal, unlimited, timeless, and even omnipotent. How it is used by people in processes (e.g., clinical workflows) and decision making (e.g., medication orders) is made possible by informatics. Informatics (technology) enables people to use the information or data in the right context (process) at the right time.

Predicting Volumes in the Emergency Department

Lakes Central Regional Hospital, located in a large metropolitan area, provides emergency medicine services. The emergency department (ED) administrator has noted wide fluctuations in patient demand, resulting in long ED wait times and low patient satisfaction. Currently, the ED department uses a software package for managing patients through the workflow from admission to discharge; the hospital itself uses an EHR. In conversations with peers at a recent conference, the administrator learns about a new software that predicts ED demand and begins to read more about it, including its pilot results. The administrator's proposal to buy the software is approved, but during contract negotiations with the vendor, the administrator learns that the software is offered only as a software-as-a-service (SaaS). This arrangement requires the ED department to provide data several times per day to the external system.

Questions

1. What are some questions related to ED data and information that the administrator should discuss with the vendor?
2. What would be the best way to evaluate the (nonfinancial) return on investment from this software?
3. What terms or conditions in the license agreement or software contract should the administrator consider?

Discussion

Many vendors want to sell the solution first—in this case, the SaaS—and then figure out what it can do later. Thus, the ED administrator, with guidance from the vendor, must determine what data are required to make the SaaS perform optimally. Are the data available electronically to be delivered to the SaaS? If not, the ED will likely

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Determining the Data Facets

Identifying the current state of data, the maturity of data, and other data facets is a key component of an information management strategy (and is discussed later). Organizations use data in different ways. For example, a physician practice that recently adopted an electronic medical record (EMR) may use the system to generate patient bills, whereas a hospital may use it to integrate patient and business data from its inpatient and outpatient units. The predominant use for an EMR is to support day-to-day patient care activities.

Understanding today's data environment is a related consideration. As the healthcare industry becomes more digitized, second-generation software and HIT companies are now flooding the market. Choosing among these products is not just about technology but also about financial value. Which solutions and vendors can provide the capability and functionality that the organization needs? The answer must be determined before money and other resources are invested. (See the sidebar for an example.)

An information management strategy encourages a disciplined approach to understanding the current data state, data purpose, and data solutions and vendors and then fitting the details together to serve the organization for both the short and long term.

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need to implement new workflows or data capture methods, all of which require changes to clinical practice and clinical processes. Other questions the administrator should consider include the following: How does the SaaS protect the data submitted? Does the vendor provide any security attestation for the protection of the data? Does the vendor have secondary or derivative rights to use the data for other purposes? (This question may seem like a minor detail, but data have intrinsic value and software vendors may derive new value through improved products or new product capabilities.) How does the ED access the software output? Are the prediction results integrated into the current operations? How do users authenticate access to the software? (Again, these are simple questions but bear including because they are often overlooked. Not understanding the basic data requirements and data usage leads to integration or usability issues in the clinical workflow.) Does any of the SaaS functionality already exist in the current ED software? Does the current software have a product road map that may include this capability? (These last two questions touch on the redundancy of the SaaS functionality and its cost to implement.) Systems and data interactions become complex quickly, but an information management strategy creates some order and transparency for these interactions.

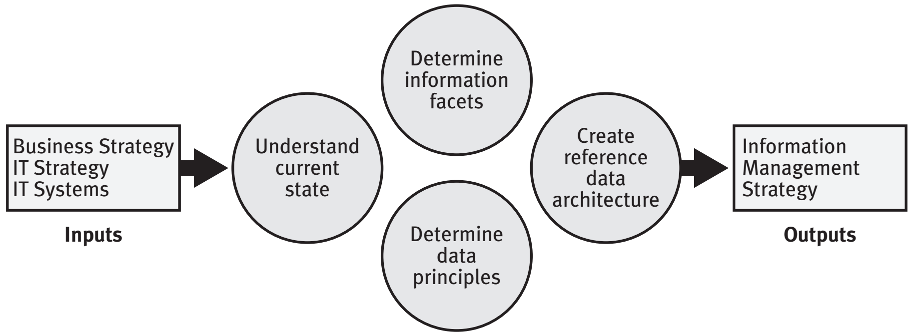
Steps in Strategy Development

An organization's information management strategy must be developed in the context of its business and IT strategies. An inventory of the major IT systems used is also important to include as input to understanding the current state. Next, formalizing information constructs and principles helps advise the data architecture. Exhibit 13.1 shows the process for developing an information management strategy.

Understand the Current State

During this step, the most important task is to determine the organization's business strategy. Over the years, healthcare has continued to evolve through new types of healthcare delivery, mergers and acquisitions, and extended healthcare models for home health care. The size of healthcare organizations ranges from small group practices to mid-sized specialty clinics to large academic medical centers. Several models can be used to define the current state. Which model to apply is not important, but the process is necessary to structure and define the business.

EXHIBIT 13.1 Process for Developing an Information Management Strategy



The operating model (how an organization delivers value to its customers) can be measured against the level of standardization or integration in the organization. As integration and standardization increase, business and IT decisions will become more coordinated and centralized. Products, services, and customers will begin to share common data and use common systems. Recognize whether the organization will be changing its operating model and adapting new strategies, and remember that no one model is better than another. The current model often reflects the organization's primary goals. Nationally, with greater incentives for achieving meaningful use and standards and incentives for sharing data electronically, the US healthcare industry is naturally increasing its integration and standardization. This trend is also reflected in the adoption of data standards for coding, exchange, and transactions that enable better data sharing and portability across organizations. Even though a national patient identifier is not used, a National Provider Identifier, mandated implementation of new diagnosis codes (e.g., *International Statistical Classification of Diseases, 10th Revision*), and other data representation standards have been adopted.

Determine Information Facets

Fundamental information management facets are often described in the strategy. Even when operations are distributed and governance is federated, these facets still apply and influence the type of work that has to be performed.

Master data are common business data intended to be shared across the organization. In healthcare, several types of master data exist, including patient, patient care provider (employee), location, and service. Master data drive the linking of data across the organization. Without master data, sharing any kind of data becomes difficult. The master data's maturity, quality, and role in clinical operations are basic requirements to be described in the current state. Does your organization use a common medical record number/master patient index? Where are clinical services delivered (city, address, building, or floor)? What clinical services are performed? Addressing these questions is the start of the information inventory.

Systems of record describe the organization's information systems used for collecting *core data*—data that support the different operations necessary to run the business, such as financial accounting, human resources, supply chain, EMR, and revenue cycle. Systems of record are often referred to as the gold source of data—where data are created, maintained, and managed—and organizations usually have more than one such system. Small organizations may have one or two key systems of record, whereas large organizations may have multiple systems of record or multiple *instances* (two or more systems running the same software) of systems of record for a geographic region or site.

Operational data are used to run the organization. Security logs, access logs, and audit logs are all examples of this kind of information. Operational data may be required for regulatory purposes or used for improving operations. They can be voluminous and may require organizations to develop data retention policies if not already stated by regulations. They also can easily grow to many times the size of core data.

Reference data provide a set of permissible values that can be used in business operations. Although reference data are different from master data, the two are often confused with each other. Both types have value, and their use is important. Common types of reference data include billing code descriptions, laboratory test catalog codes and descriptions, and clinical problems and diagnoses. Reference data used consistently throughout the organization allow core data to be shared and more easily integrated.

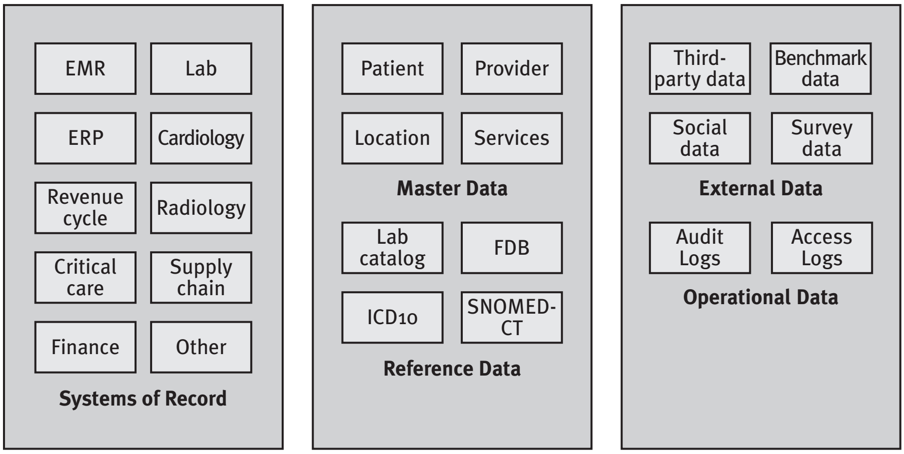
Third-party data are used or obtained from outside the organization. This type of data may be related to payer information, socioeconomic status, or pharmacy benefit management. Third-party data can be in the public domain (see http://catalog.data.gov) or licensed from another organization, and they are often used to enrich and gain additional insights from core data. These data need to be managed carefully because data use agreements can be easily breached if broader access is given to users when it is not allowed.

Benchmark data are used for comparison purposes and are often provided in aggregate or by key measures. They may be obtained by organizations through participation in a quality program. The American College of Surgeons (ACS 2018) National Surgical Quality Improvement Program is a well-known program that provides data collection guidelines, measures, and benchmarking for participating organizations.

Exhibit 13.2 depicts a sample map of all these data types.

The type of data to be included in the information management strategy depends on the goals of the organization. For example, if an organization has a goal to expand its patient base and integrate into a larger health system

EXHIBIT 13.2
Sample Data Map of an Organization



Note: EMR = electronic medical record; ERP = enterprise resource planning; FDB = First Databank; ICD10 = *International Classification of Diseases, 10th Revision*; SNOMED CT = Systematized Nomenclature of Medicine—Clinical Terms.

through mergers and acquisitions, then understanding master data and core data is paramount to enable the integration and sharing of data across organizations. If a specialty care–based organization is developing a network with primary care clinics for new referrals or more complex care, then the master data about patients and providers may be the most useful.

As organizations increase the integration and standardization of business processes for clinical care and operations, the importance of shared data also increases. Shared data require common approaches to master data, reference data, and often systems of record (core data). Understanding the degree of operational convergence and where it is heading influences the type of information management strategy required to make the best use of data.

Determine Data Principles

Establishing data principles is an important part of developing an information management strategy. Treating data as an asset is the right frame of reference when developing data principles. As a first principle, all data have value.

Value must exceed the relevant level of investment to be worthwhile. Data collected and archived but never again accessed have limited value. Putting data into action for decision making increases the value, and so does linking data with other data. This principle is important to understand not only in one's own organization but also in the broader healthcare ecosystem. Integrating third-party data or aggregating shared data is increasing where the health ecosystem goes beyond the traditional healthcare delivery system. No matter its size, no single organization has enough data to further its value and advance its decision making. Awareness of this fact has grown and is reflected in the existence of national disease registries, multisite clinical trials, and quality measures and reporting across organizations.

Data principles generally reflect fundamental truths. Organizations do not need to develop more than 10 or 20 data principles. Data policies or data standards further refine and operationalize data principles and will be greater in number. The following represent common data principles that inform the data architecture, policy, and standards of the organization:

- *Data are an asset.* As an asset, data have a tangible value. Data need to be inventoried, managed, and maintained. Because assets have value, they need to be protected. Usage of data must be appropriate and in the best interest of the organization.
- *Data are governed.* Data governance implies active ownership, management, and importance. Active ownership may be at the institution or department level and can be contentious. As part of data governance, defining the level or role of ownership is critical. Data ownership at the institution level provides broader flexibility in managing data.
- *Data are fluid.* Data fluidity emphasizes movement and accessibility to data, for both primary and secondary uses. Accessibility should be provided through multiple, easy-to-use methods. Methods reflect the technical ways to access data for both transactional and analytical uses.
- *Data are mobile.* Mobility is the ability to support the use, acquisition, and distribution of data regardless of where the data were generated. Data come from many different places, and more and more are provided directly by patients (e.g., from wearable devices or remote monitoring). Patients expect data related to their care to be accessible through multiple channels.
- *Data are current.* Currency defines the timeliness of data and varies depending on the purpose for use. Direct patient care needs real-time data for clinical decision making. Clinical analytics requires timely access to data to support better business decisions. Monthly financial statements require weekly or monthly accessibility.
- *Data are categorized and inventoried.* Data inventory and classification enable the organizational assets to be visible. A robust inventory greatly improves this visibility and decision making because it reduces the chances of redundancy and duplication of data assets. Categorization helps manage the different types of assets and shows the types of security controls that may be required. For example, reference data have different data access controls than do core data (PHI).

- *Data are interoperable.* Interoperability provides a predefined level of syntax and semantics that improves consistency and comparability of data from different systems. Often, interoperability is accomplished through the use of external data standards (e.g., Fast Healthcare Interoperability Resources) or internal standards (e.g., data interface). Interoperability can be improved by using reference data in the form of coding standards. For example, use LOINC (Logical Observation Identifiers Names and Codes) for mapping laboratory observations or SNOMED CT (Systematized Nomenclature of Medicine Clinical Terms) for mapping clinical problems.
- *Data are secure.* Security is the provision of the right level of access to the right person at the right time. Data security requirements have changed dramatically over the past ten years because of regulations and laws (e.g., HIPAA Privacy Rules) and external security threats (e.g., ransomware). Often, least-privilege access is expected, whereby the minimum appropriate access to data is given to enable the performance of a job function. Organizations need to categorize data as the bases of security classification (The Open Group 2018) if data are considered public, protected, and special access. This categorization serves as the type of controls required to adequately protect data.
- *Data are designed.* Data design fundamentally formalizes the data architecture. Data architecture is the design of the data and data relationships across the organization.

Create Reference Data Architecture

Understanding how to construct and manage data is the next step. Many types of architecture are used in IT design. The Open Group Architecture Framework (TOGAF) is modeled on business architecture, application architecture, data architecture, or technology architecture (The Open Group 2018).

An *enterprise architecture / business architecture* can provide enormous value in formalizing an information management strategy and data architecture. Business architecture defines the business strategy and business capabilities of the organization, improving the recognition and connection to data assets. A *reference architecture* provides a blueprint that can describe both a current state and a future state. An easy way to think about reference data architecture is to imagine building a city from an empty piece of land (think SimCity). Having forethought of the city's design allows you to make important decisions about how you will build, organize, and grow the city. This metaphor of city planning can use zoning and other ordinances that govern construction and land use. Imagine erecting a large commercial building in a residential zone. Imagine constructing a city park in an industrial zone.

These design concepts apply to architecture and can be extended to how corporate data can be positioned and managed. Going back to the data principles, managing systems of record is different from managing master data. Secondary uses of data for analytics—compared with direct patient care—require different levels of fidelity and data quality. In addition, in building a city, roadways to connect zones, a communication infrastructure, utilities, and transportation and other public services are needed. Similarly, in data architecture building, how data are acquired, moved, managed, and delivered must be defined. For certain business purposes, daily batch processing is sufficient, whereas other uses of data may require more immediate access. Some areas of the data architecture allow more fungible data or data from a third party. It may be best to stage these data in a certain area of the data architecture.

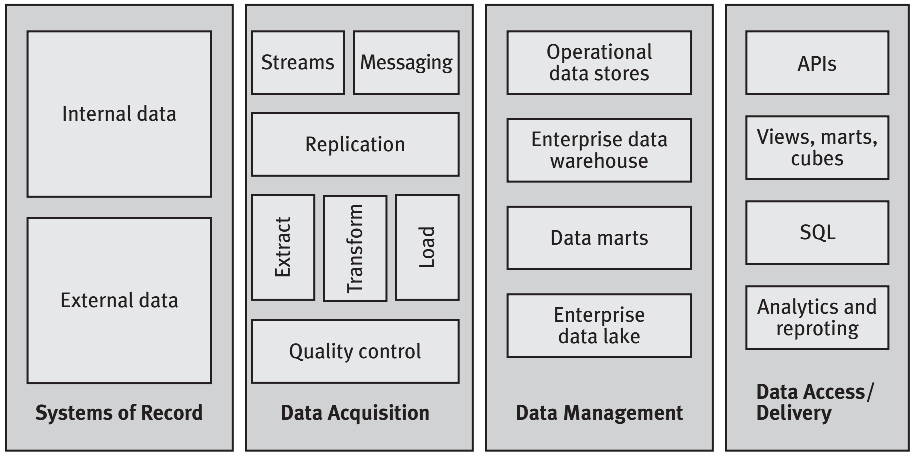
In city planning, zoning and ordinances change, and the same can be said in data architecture building. Areas will need to evolve, be rebuilt, or be rezoned to accommodate new directions of the business strategy. Without a data architecture, organizations tend to invest in a specific capability or function but may not know if such capability already exists or if similar information is already being captured in a separate system. Once the new capability is implemented, the function may fall short of expectations by requiring further work—for example, to integrate data from other systems. This can lead to unnecessary duplication of data and increases the risk the data will become out of sync with the systems of record. With proper design, data replication is a valid approach to supporting IT systems but needs to be controlled and managed to maintain integrity and limit costs to the support system.

Integration still remains a key challenge for organizations. Countless enterprise data warehousing initiatives have been launched only to fail because of the challenges of data integration. Data standardization requires an organization to establish strong data governance roles and responsibilities. Without such governance, creating common definitions and standards remains almost impossible—not technically but from a business acceptance perspective. Without common definitions, there will be variability in mapping or translating data, which often results in incomplete or incorrectly mapped data. Exhibit 13.3 depicts a sample reference architecture that provides a view of systems of record, data acquisition and movement, and data management supporting different data delivery methods.

Technology Aspects

Beyond corporate data principles, a reference data architecture needs to reflect and support the data requirements of the organization. Technologies continually change and improve, so focusing on data requirements helps maintain consistency across technology changes. Too often, decisions are based on technology and not data requirements, which may not advance or support the organization's information management goals. For example, changing from one database to another may be an improvement in technology but may not advance the organization's data capabilities.

EXHIBIT 13.3
Sample Reference Data Architecture



Note: APIs = application programming interfaces; SQL = Structured Query Language.

Data Movement

Three of the data principles described earlier relate to data movement—currency, fluidity, and mobility. An aspect of data architecture is data movement—how data flow between systems—which is like the technical plumbing that moves data through different stages of data collection, acquisition, management, and delivery. Data movement influences the design of the data architecture. Systems of record generally support real-time access to data. In many organizations, there may be several systems of record, some of which require data from one another to be effective. The need for data movement continues to grow in an environment teeming with biomedical devices, sensors, and applications. Several data technologies support real-time capture and movement of data between systems, such as interface engine, enterprise service bus, and database replication. Each of these technologies supports different types of data movement and provides options for receiving systems to best obtain the data.

Three requirements have evolved since the first data warehouses. First, the most current data are now needed. No longer is it sufficient to operate on last week's or even yesterday's data. Data must be fluid to support real-time analytics and uses. Second, patient health and population health have merged. Much of direct patient care is based on one patient, but with population health methods, understanding how that patient compares with the population is equally important. This has raised expectations that transactional processing and analytics processing need to happen together. Anticipating this duality of data processing influences the design of the data architecture and use of technology. Third, patient data are no longer generated by just one organization. External data, such as external medical records, personal data, and other direct-to-consumer information, are growing.

The integration of external data requires new designs to accommodate this new type of information. EMR-to-EMR data are not new, but patients wanting to evaluate other types of data is a growing trend.

Data Representation

Data representation goes beyond the data structures and syntax of data to a more molecular level that includes semantics. Semantics attaches meaning to data and often is based on a standard that provides a common definition for sharing. The reference data architecture needs to anticipate additional semantics as part of data processing and data enrichment.

Big Data technology is a fundamentally new type of technology for storing and managing data. Big Data provides new capabilities of processing larger volumes, varieties, and velocities of data, which were previously limited with traditional database technologies. One of the features of Big Data is the ability to acquire enormous amounts of data. Data acquisition is important, but just piling data together may not be wise. Acquiring and storing data is like putting things in boxes, storing them in your garage, and waiting to sort them out later. Boxes accumulate in the garage, making it difficult for you to find anything when you need to. Without disciplined data acquisition, there is a risk of limiting the data's future use.

Interoperability Moment

When people say their data are "in the database," they often mean their data are in a spreadsheet like Excel. Nothing is wrong with using spreadsheets to store data. Spreadsheets give us a pleasing, user-friendly view of our data. However, by being stored originally in a spreadsheet, the data are "bound" to that pleasingly human view. How can this be a problem? Consider the approach to data by two different workgroups.

Group A has collected population data by county and year for a given state—say, Wisconsin. The data are nicely arranged in a spreadsheet like this:

Population by County and Year, Wisconsin

County	Population 1990	Population 2000	Population 2010
Randolph			
Milwaukee			
Racine			

Group B has collected data on the number of full-time physicians in various clinical specialties for each county in Wisconsin for the year 2000. The data are arranged in a spreadsheet like this:

Full-Time Equivalent Physicians 2000, by County and Specialty

Specialty	Randolph	Milwaukee	Racine
Cardiology			
Dermatology			
Endocrinology			
Family Practice			

After reviewing these spreadsheets, you may ask, "How many family practitioners were there in 2000 in the county with the lowest population?" How would you find the answer to that question? Suppose you had 100 such questions. Do you foresee any interoperability problems? Can you express your answer using the concept of late binding?

One of the promoted concepts in Big Data is late binding of data. *Late binding* is the ability to generate a data model or scheme on demand. One of the most time-consuming steps in data warehousing is modeling and transforming data per corporate and model definitions. A value of late binding is that it defers this step to when data are actually needed or used. The disadvantage is that for the data to be useful, the data still have to be appropriately structured and formatted. Performing modeling and integration up-front for all corporate data would never be feasible and requires so much time that the value of the data may never be realized. Performing no modeling or integration is also unwise. This forces every data consumer to assemble the data before they can be used. Thus, a balanced approach is important.

For secondary uses of data through an enterprise data warehouse or data lake, it is important to determine which corporate data are deemed high value. *High value* is a subjective term, but getting input from the business strategy and business areas can prioritize and focus the data for further structuring and standardization. This approach focuses the benefit on high-value data being consistent and comparable. A well-intended data initiative may provide easy access to data but still require considerable time for finding and preparing the data. Performing an analytics function can still be time-consuming; analysts spend 80 percent of their time pulling together, preparing, and normalizing data but less than 20 percent of their time doing analysis. Applying well-structured methods to high-value data will pay enormous dividends and allow analysts to focus on analytics and not on data preparation.

For some enterprise data warehousing, choosing or developing an enterprise data model can be a difficult exercise that requires multiple business areas to commit to and agree on definitions. The implementation of business definitions requires data models to represent the definitions. There will be debates and disagreements on which model is better. In healthcare, a number of data models already exist from standards or initiatives such as Health Level Seven International (HL7), Fast Healthcare Interoperability Resources (FHIR), Patient Center Outcome Research Network (PCORNet) Common Data Model, and Informatics for Integrating Biology and the Bedside (I2B2). Late binding recognizes that deciding which model to use is not as important as knowing when to apply the model. All data models have issues, but committing to one model and one approach to model creation is necessary for successful data representation.

Data Accessibility

Data accessibility is a critical part of an information management strategy. All the planning and designing undertaken to acquire, move, and manage data do not guarantee the data's consumption. The critical drivers of data consumption influence how data are delivered. The types of data consumers in the organization, the preferred methods for data delivery, and the critical functions that require data all must be examined. Based on this analysis, design considerations for reporting functions, data access methods, and self-service tools may emerge. Self-service tools and methods for reporting and analytics encourage greater diffusion in the organization. Understanding the people skills and preferred tools influences how to provide data access. Potential power analysts or clinical operations analysts may influence the data architecture to allow users to have access to data without relying on IT to retrieve and deliver the data.

For larger organizations, there may be several ways to access data. Current EMRs possess a wealth of reporting and analytics capabilities, allowing much of the work to be performed by clinical users. For many organizations, analytics and reporting are diffused throughout different groups. The value of the data is often realized by those who know the operations and use data to make changes. For organizations that desire to improve their use of analytics, the concept of *center of excellence* is important. A center of excellence is a concentration of expertise that shares and develops best practices and furthers the maturity of analytics across the organization.

Other Considerations

The considerations in this section are not exhaustive but represent additional perspectives that may make the development of an information management strategy more successful.

Data Governance Program

Data governance should be seriously considered as part of an information management strategy. The corporate world has steadily recognized the value of having a chief data officer. A *chief data officer* is an emerging executive role that recognizes the value of data and provides strategic direction for the acquisition, use, governance, and quality of corporate data assets (Morgan 2016). However, an organization does not need to hire a chief data officer to start a data governance program. Data governance can be formalized in the organization in several ways, and entire books are dedicated to the topic. The important point is that a data governance program emphasizes corporate accountability, shared leadership, and organizational responsibility. Without this support, many aspects of the information management strategy may fail. Too often, a data project is considered an IT project, and data governance decisions are relegated to IT. Data decisions are then executed to complete the project, which engenders distrust in the data or data solution itself.

Data Quality Program

"Quality is job one" was a slogan of the Ford Motor Company in the 1980s. Data quality is important as well, but how is this quality applied? Batini and Scannapieca (2006) describe data quality according to dimensions of accuracy, completeness, currency, consistency, and accessibility. Executing a data quality program requires effort and attention. Proactively maintaining data quality at the source improves the downstream use of that data. Many elements of the information management strategy and data architecture provide a solid foundation to understand what can be done to support data quality. Master data are often a starting focal point for implementing a data quality program. For healthcare, this program would focus on patients, providers, addresses, and locations. Data quality methods would start at the source of data collection. Standard operating procedures dictate how to capture information about a patient, such as whether the patient is existing or new. Edit checks can prevent or limit data issues, such as wrong age or address and missing fields.

Data quality can be improved through human review and edit checks, but given the amount of data being generated, employing automated data monitoring is also needed. Data processing technology today permits continuous monitoring of data for any change that is not expected and notifies the appropriate data steward or operational area.

Data Value Protection

Because data have inherent value, they should be protected. Data protection largely focuses on information security and privacy. Aspects of data inventory, classification, and access are essential components of many information security standards and controls. However, securing access to data does not necessarily protect the data's intellectual property value. Many analytics companies are eager to access clinical data to create new products or to mine the data for new insights that can be commercialized. Data can be enriched, derived, or combined with other data to create new value, a fact that holds tremendous potential for some companies. Current security and privacy regulations, however, give technology companies and nonproviders limited access to data.

Data rights and sharing are further complicated by the increasing presence of software-as-a-service, whereby the system and capability are hosted externally by a vendor. The information management strategy needs to address how software contracts are written, clarifying access and usage rights by third parties and allowances for derivative data. Predictive models and other data mining can be performed on data and, once complete, can be leveraged in other products and services without having to use PHI.

Considerations for understanding data value should be viewed through these dimensions. Ironically, contracts can be created that allow a wide range of secondary uses, which organizations unwittingly do not recognize or understand as the potential value of their data. The following are measures by which to judge the data access allowable in a data use agreement with a vendor or partner:

- Amount or volume of data being shared (number of records)
- Breadth of data being shared (number of topics or kinds of data)
- Duration of data use (time limited or perpetual)
- Clinical density of data (simple structured data or detailed clinical notes and reports)
- Data rights and usage for secondary use or derivative works (direct and limited or open and unrestricted)

Perils and Pitfalls

Developing an information management strategy presents some common pitfalls. The cautions in this section may not be relevant for every organization but provide some counterpoints to forces that may influence the strategy.

One peril to watch out for is truth and beauty in data. As data projects push through implementation, leaders or physicians may expect, unrealistically, that the data will be pristine and correct. The nature of healthcare data is imperfect and, some would say, messy. Throughout the healthcare delivery process, assessments, differential diagnoses, tests, treatments, and further assessments go through a natural evolution. Often, the EMR or EHR has conflicting and discordant data, which reflect the natural process of healthcare. Data may be collected as unstructured text with an expectation that the data will be consistent and error free. Humans have an amazing ability when processing data to fill in missing information and automatically correct problems, whereas a computer can only use what is provided. Setting the expectation that healthcare data are incomplete, noisy, and conflicting will help prevent data investments from collapsing; perfection is the enemy of good enough.

Another pitfall is creating the "mother of all databases" for the organization. This pitfall may be exacerbated by Big Data technology, which promises that an enormous scale of data can be managed. You may hear, "If we just had access to data, or if we could put all of our data in one location, it would solve all of our problems." This type of thinking leads down one of two paths—the creation of a large data warehouse or the purchase of a software solution for data aggregation. Neither path is wrong, but both reflect magical thinking—that if we did this, our data problems will vanish. Often overlooked is the relative maturity of the organization and its ability to systemize and standardize master data or core data to bring them together. Even in a mature organization, these types of projects require effort. Integrating data and bringing value back to the organization are not easy and require commitment and patience that must be built in from the start. These kinds of investments imply an organizational commitment to some level of data governance. Data governance enforces the decision making required for a successful implementation. Active engagement from the clinical practice or business areas is vital to ensure their commitment and ownership of the finished product.

Beware of the marketing and hype behind data analytics that suggests organizations are achieving efficiencies and improved outcomes as well as gaining insights for competitive advantage. Purchasing an analytics solution to address a business problem should be approached with caution. The fuel in analytics is data. Not understanding the quality, completeness, and level of integration of data could quickly sink a well-intended analytics investment. Starting with an information management strategy and reference data architecture will lead to better-informed decisions about analytics solutions.

Data as a Competitive Advantage

An information management strategy executed with appropriate design and architecture enables organizations to be more agile in their ability to integrate, deliver, and share information. Better investment decisions can reduce overall IT expenses. Changes to the organization will be more easily executed with a cohesive strategy and design.

Medicine is a continuous learning system. Practice guidelines and best practices are often evidence based and developed over time. An organizational culture that relies on data for decision making builds on evidence and begins to increase the opportunities for continuous improvement and measurement. Organizations often have difficulty improving or managing what they cannot measure. Some improvements can be applied from the top down, but a data-driven culture needs to be enabled on the front line, where the right tools and data should be provided to enable better decision making.

In many organizations, commercial EMRs are maturing, along with improvements in fulfilling meaningful use and population health requirements. Today's EMRs are embedded with a wealth of reporting and analytics tools. Because many organizations have access to these tools, the competitive advantage is held by those organizations that use data regularly to make actual improvements in care delivery.

Conclusion

Healthcare is a data-intensive industry. An information management strategy is a key component of the larger IT strategy that supports the business strategy. Formalizing an information management strategy increases an organization's data intelligence and awareness of data assets and informs business decisions that may have an effect on data. The three main components of an information management strategy are information facets (types of data), data principles, and reference data architecture. The reference data architecture acts as the data blueprint, which informs technology choices.

Defining the role of data governance in the organization supports the development of an information management strategy. Understanding and implementing the right level of decision rights and governance will improve the successful execution of the strategy. Lastly, the data business is a messy business. Raising leadership's awareness of the challenges of data integration and use will help set and manage their expectations and guide the execution of IT projects and investments.

Chapter Discussion Questions

1. What are the basic components of an information management strategy? Is one component more important than the others? If so, which one and why?
2. How can an information management strategy reduce the costs of IT systems and investments?
3. If given a choice to implement an information management strategy or an analytics strategy, which would you perform first? Why?
4. What is IT's role in the context of an information management strategy?
5. Why is taking an inventory of information systems and their data important for an organization?

Case Study Guiding a Merger

James D. Buntrock

Lakes Central Regional Hospital recently entered discussions to acquire and merge with St. Vincent's Hospital, a hospital with 60 beds, and with Lake City Physician Practice, an affiliated outpatient medical practice of 30 physicians. This merger will capture more of the regional market, keeping care within the proposed merged facilities. St. Vincent's and Lake City use the same electronic medical record (EMR) software, but it is deployed as two separate systems—one for outpatients and one for inpatients. Both organizations have a small internal information technology (IT) department

(continued)

and staff who administer and maintain the software. Lakes Central uses a different EMR, and its leadership is interested in merging the EMRs as part of the acquisition, knowing the benefit of sharing data between inpatient and outpatient care as well as the cost savings from reducing the number of software licenses and amount of IT maintenance.

St. Vincent and Lake City use their EMR for care delivery, and the EMR has replaced most of their paper records. They have not explored the EMR's additional functionality or advanced analytics because of lack of time, lack of physician interest, and cost. Lakes Central was an early adopter of the EMR and electronic systems and has actively developed key performance indicators for the practice. Its use of the EMR, not just for patient care but for improving operational efficiency and patient outcomes, has earned the hospital high marks and enabled it to maintain a healthy operating margin.

As part of the planned merger, Lakes Central leadership has consulted its IT department about the effort involved in bringing together the EMRs.

Case Study Discussion Questions

1. Given that St. Vincent's and Lake City have different backgrounds and different levels of EMR adoption, how would an information management strategy help guide the system merger?
2. Which area of emphasis should be considered first? Why?
3. What are some of the risks of this type of merger, and how would these risks influence the information management strategy?

Additional Resources

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