3-01-15 Transforming Information Management into an Effective Business Enabler

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Payoff

A strategic information management function should facilitate the business mission of the enterprise through managed information, managed processes, and managed information technology. This article reviews the role of IS and data in the transformed IM function and concludes with practical steps to making the transformation a reality.

Introduction

The role information systems and data plays in the information age of the twenty-first century will be different than it is today. Enterprisewide trends emphasizing business processes, teamwork, reduced time to market, and customer service are transforming IS. Information systems must do more than automate processes; they must empower and “informate” knowledge workers—described by Shoshana Zuboff in *In the Age of the Smart Machine* (New York: Basic Books, 1988) as providing workers with relevant data they can turn into useful information. The failure of IS to make this transformation may jeopardize the enterprise itself. This article reviews the role of IS and data in the transformed IM function and concludes with practical steps to making the transformation a reality.

Redefining IM

Information management (IM) applies sound management principles (e.g., planning, organizing and staffing, directing, and controlling) to information as a key enterprise resource. It includes three components: Data Resource Management, process management (i.e., business activities that collect or present information to knowledge workers), and information technology management.

The premise underlying these components is that the value of data is optimized when data is managed to be shared by many applications and knowledge workers, processes are managed to maximize value-adding activities and eliminate non-value-adding activities, and technology is exploited to enable just-in-time delivery of information. This synchrony requires a cross-functional approach.

IM's mission is simple: to enable the fulfillment of the business mission of the enterprise through managed information, managed processes, and managed information technology.

Evolution of Data Resource Management

Data resource management (DRM) applies management principles to the data and information leg of the IM triangle. Data Resource Management has three components: data management, data base management, and data technology management.
From Data Administration to Data Management

Data administration developed as a function to address the problem of unintegrated application data bases. As such, data administrators developed common data models and data definitions using data standards, eliminated unnecessary redundancy and managed required redundancy, improved data integrity, and increased data access and sharability. Studies conducted by the author revealed that a small minority of enterprises have achieved phenomenal success with their data administration implementation, but the vast majority of organizations have had only limited success. The common thread in the most effective organizations is that they manage data and develop applications from a horizontal and integrated, business-centric resource approach.

Data administration must evolve into a true data management and leadership role. Rather than simply taking data definitions from an applications development scope, data management must facilitate common data architectures with data definitions and domains that support the entire enterprise. Data management coordinates information stewardship throughout the enterprise.

Information stewardship in turn supports business process reengineering and Total Quality Management because it establishes single definition across the business value chain and information accountability. Data management enables the creation of a common business chart of facts that becomes the enterprise's everyday language. It introduces quality programs for the information product along with metrics to measure data quality and ensure the reliability needed by knowledge workers.

From Data Base Administration to Data Base Management

Data base administration arose in the 1970s to manage data stored in so-called sharable data bases. However, applications defined by functional areas, using a systems approach, generally resulted in application-specific data bases not usable by other functional areas. As a result, the number of nonshared sharable data bases proliferated, and data base systems management became an expensive access method. The most significant benefits of data base technology—reusability, sharability, minimal redundancy—were mostly unrealized.

Data base administration must evolve into a true data base management role that maximizes the sharability of the data stored in the enterprise data bases. Data bases that contain data stored redundantly, whether owing to distribution, client/server replication or download, or an information warehouse, must be designed with a common format and definition that supports the information requirements of all knowledge workers and eliminates the need for interfaces.

From Data Technology Administration to Data Technology Management

Data technology management establishes a minimalist suite of data management technologies such as data modeling, repository, data base management, object data base management, and data quality management tools. Repository or data dictionary management lets knowledge workers and data producers access the definition of data and the data needed to perform their jobs.

Some organizations, as they elevate the scope and business impact of data resource management, have changed the function's name. Weyerhaeuser, the forest and paper company of Federal Way WA, calls its data resource management program “Information Excellence.”
Evolution of Process Management

The information age challenges the systems approach paradigm. Although the systems approach has many benefits, it also has a spectacular weakness. By breaking problems into smaller, isolated components, it fragments business processes into nonintegratable parts. An organization has only to examine its own portfolio of applications to discover hundreds, perhaps thousands, of interface programs that copy data from one database and transform it into a format usable by another system. Billions of dollars have been spent on so-called systems integration, signaling that something is badly wrong with the systems development process. Outsourcing as a solution is a further sign that the processes used to build systems and manage data have not worked.

One major corporation discovered that 40% of its applications development staff was dedicated to developing and maintaining redundant data create/update programs (capturing data that existed elsewhere) and interface programs. An insurance company discovered that one of its core business facts was captured and entered in 43 different application programs by 43 different businesspeople who stored it in 43 different databases. Any Total Quality Management program or business process reengineering methodology will confirm that interface programs and redundant data create programs do not add business value. Rather, they add cost, virtually guarantee the creation of a significant potential source of error, and create information float, which delays timely access to information.

The systems approach fails to understand the real product of a system. It focuses on the functions the application is automating and sees the applications system as the product. The information age demands a resource management approach that sees the products of applications development as managed information and informed and empowered knowledge workers.

From a Systems Approach to a Resource Approach

In the information age, applications development must balance the processes automated with the information product created or managed and the people being empowered. As such, the information systems process must emphasize a resource approach to the life cycle of the information product.

The resource approach applies the management principles used in human and financial resources to information. Exhibit 1 and Exhibit 2 compare the similarities of the resource life cycle of the human resource and the information resource. A managed resource life cycle comprises five basic processes required to minimize the resource's cost and maximize its value. They are:

- Planning.
- Acquisition.
- Maintenance.
- Disposition
- Application.
Resource Life Cycle of the Human Resource

Resource Life Cycle of the Information Resource

The first four resource processes constitute the cost basis of the resource. The economic feasibility of an enterprise directly correlates to its ability to apply (the fifth resource process) a resource in a way that generates value greater than the resource's costs. The enterprise must apply its human resources by assigning workers to roles that use their skills in ways that provide value greater than the cost of planning, hiring, compensating, and retiring or terminating them.

Information has a similar resource life cycle. To accomplish the objectives of the enterprise, planning must include what the enterprise needs to know to carry out its strategic initiatives.

This strategic planning yields enterprise information, process and application, and technology models that are integrated with business objectives. Tactical planning results in reengineered processes, operational applications, and populated data bases.

The information model reflects the enterprise’s knowledge base organized around the enterprise's fundamental resources, called subject areas, and the fundamental entity types about which the enterprise must know information. The information model must be as understandable to the business executive as the organization chart, which models the organization of human resources, and the chart of accounts, which models financial resources in the form of sources of revenue and expense.

The process and application models reflect the fundamental business value chains and are integrated through shared information commonly defined. Developing applications from a common model reduces the costs of developing similar nonintegratable applications and interfaces.

Acquisition of the information resource occurs through applications that create occurrences of each entity type. Maintenance updates occurrences of each entity type, either in the form of changing values over time, such as customer addresses, or changing states of existence, such as when a placed order is verified for credit worthiness and becomes a validated order. Disposition occurs when knowledge workers no longer need to know the data; for example, when an order is paid, it is deleted.

These processes represent the cost basis of the information resource. As with other resources, the application of information—the retrieve processes—provides the value basis of the information resource. Data derives its value when it is retrieved by knowledge workers and used intelligently to accomplish business objectives, perform business processes, support business decisions, and create competitive advantage.

Managing information as a business resource represents a 180-degree shift from the systems approach. Rather than building data around the processes, the resource approach builds the processes around the data, as illustrated in Exhibit 3. This is the basis for the object paradigm that encapsulates processes, called methods, around data types.

A Comparison of the Systems Approach and Resource Approach to Information
Development methodologies must provide for cross-functional modeling and definition of the information resource. Those that do not will add unnecessary cost to applications development and maintenance and will not maximize the information resource's value. Today's explosion of prototyping tools and rapid development products and methodologies have the potential to be misused; they may further the proliferation of redundant data create/update programs and the fragmentation of applications and information.

In his book *Enterprise Engineering*, James Martin illustrates that both data bases and applications must not be modeled and built within the scope of functional business areas. Rather, both data and process must be designed to support cross-functional value streams (e.g., business processes or value chains), “end-to-end collections of activities that create a result for a customer.” The cross-functional value stream or process becomes the basis for modeling the data; that is, data is modeled, defined, and built in a way that supports all processes requiring it.

The resource approach identifies the point (e.g., business event, business activity, and data producer) at which a fact of information becomes known and develops the create application. Business events that change occurrences of those entity types have update applications; new data is not created elsewhere. Information management places the create and update applications as close to the source (data producers) and time (process of origination) as is feasible, eliminating information float and enabling just-in-time information.

The resource approach defines data so that every entity type and every attribute have a common and consistent meaning across the enterprise. Common data definition is required so that all knowledge workers interacting with a given fact of information have a common understanding of its meaning.

**From Process Automation to Process Management**

The role of applications development must evolve into a true process engineering and management function. This function applies management principles to the process leg of information management. It includes process evaluation as well as process and applications design that includes the creation, updating, and presentation of information. Process management has three components:

- Process engineering.
- Process development and human factor design.
- Process technology management.

Process management establishes process and applications architectures and develops common definitions for reusable processes. It assesses and evaluates processes based on value-adding versus cost-adding criteria. It develops an applications architecture against the business value chains that places create applications at the process of original point-of-data capture.

Applications design must be based on an assemble-to-order philosophy that minimizes duplication of code around common processes. Applications are designed and implemented within a business value chain and integrated across functions. They operate

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on commonly defined shared data and therefore require minimal interface programs. Interface programs are used only for temporary coexistence with existing legacy systems until such time as they can be completely replaced. Permanent interface programs are used only to interface required software data base packages that are commodities and when no competitive advantage would be gained by internal development. (Of course, organizations may have a significant portfolio of legacy systems that cannot be replaced in the short run, if at all. Although some legacy systems contain data of significant value to a business, others may be so ill-defined as to cost far more than their value to the organization. Techniques do exist that allow for an architectural approach to the new development of enterprise models with a phased, and temporary, interface to obsolete legacy applications and data bases.)

Object technology (OT) and, more important, object methods are radically changing how applications are developed. Object Technology is the Copernican technology that literally forces code (process) to be written around data types (the resource). However, the technology is not the solution. The solution is making the paradigm shift to a resource approach to development processes that will realize the potential benefits of using OT.

Applications software packages are evaluated against the enterprise data architecture as well as on functional requirements. Costs of packages are reduced when a minimum of translation is needed in the required interfaces.

User interface design (i.e., screen layouts and reports) must evolve into human factor design, which includes designing the work processes, dialog, and presentation of information in human-machine interactions.

Evolution of Information Technology Management

Information technology support must evolve into an information technology management role. This role applies management principles to information technology to develop a common IT architecture with a minimally set of tightly interoperable technology components. It must establish guidelines for the evaluation of IT across the enterprise to prevent unnecessary duplication of disparate technologies that provide the same basic functions and drive up the support and technology interface costs without adding value. Information technology management increases the value of information technology through maximum use with minimum support costs.

Organizational Structure of the New IM

Just as the larger business enterprise is reshaping itself around its business processes with flattened, more horizontal organizations, so too must the new information management (IM) organization reconfigure itself. As depicted in Exhibit 4, in this new organization, multifunctional teams manage the IM processes.

The Redesigned IM Organization

At center stage, conducting the IM organization, is the chief executive officer (CEO), with the chief information officer (CIO) as section leader. Architecture development, the result of cross-functional architecture planning teams, provides the framework. The interaction between IM and the business occurs through multifunctional teams that cooperate with multifunctional business teams responsible for business value chains. As
data requirements are discovered in a business value chain, Data Resource Management identifies other interested knowledge workers and ensures that all significant business events affecting the entity types have been identified. Data definition supports all knowledge workers' views. Process management ensures that point-of-origin events and processes are discovered for the create applications along with all processes and events that change the state for update applications. Human factor design ensures efficient and ergonomic work design and information presentation.

In a distributed or decentralized enterprise, depicted in Exhibit 5, additional multifunctional teams are required to manage the information and processes of the business value chains that cross multiple, autonomous business units.

IM in a Distributed Enterprise

Some organizations have organized to address strategically common information, process, and technology management. ITT Hartford Insurance Group has established an information strategy unit accountable for strategic initiatives to provide for common information architecture and management, process management and human factor design, technology architecture and management, and object management across business units.

Information Stewardship: The Business Role in IM

Strong business involvement in information management characterizes the information age. Unlike in the past, when all responsibility for information management was either intentionally or inadvertently delegated to IS departments, information can no longer be considered a technical resource of the organization. It is a business resource used by business personnel (i.e., data consumers or knowledge workers), created by business personnel (i.e., data producers), and defined and guided by business personnel (data definers or tactical and strategic information stewards).

Knowledge-Worker Steward: The Data Consumer.
The industrial-age organization holds workers accountable for the work they perform. This is true also for knowledge workers, who use information as a raw material in their work. Operational knowledge workers are on the front lines processing insurance claims or filling customer orders. Strategic and tactical knowledge workers make decisions such as determining customer satisfaction of existing products, analyze potential products, or determine new business directions.

Operational Information Steward: The Data Producer.
Knowledge workers who use information depend completely on the accuracy and quality of the information created by data producers. If the data is inaccurate (e.g., a diagnosis code or shipping address is incorrect), the knowledge worker's result may likewise be incorrect. Therefore, the information-age organization will empower and hold the data producer, or operational information steward, accountable for the accuracy and quality of the data produced. Furthermore, data producers may be called on to capture facts that may not be needed in their jobs or business units but are required by knowledge workers in downstream activities. Data intermediaries are data producers who simply transcribe data from one form to another, such as key data from a paper form into a data base, without adding value. The real data producer is the individual who first knows the facts. Capturing
data at this point of origin is a much more cost-efficient and reliable process than are downstream processes that attempt to rediscover or re-create the facts or transcribe them from some manual form.

Companies such as Cominco, Ltd., a mining company in British Columbia, Canada, have such data accountability written into the job descriptions of their miners. Because the safety of all miners depends on accurate information about drilling activities, the miners are accountable not just for how much ore they dig, but also for the accuracy of the information on their time sheets describing where they have drilled. If this information is incomplete or inaccurate, they do not get paid—regardless of whether they can read or write. This is an industrial company of the information age.

**Tactical Information Steward: The Business Manager or Process Owner.**
Every process owner or manager in an information age organization is a tactical information steward accountable for the data produced as a result of the business processes for which the manager is accountable. Managers' accountability also includes implementing and enforcing the information policies developed by the CIO and issued through senior management, and providing information quality training to data producers. In the information-age organization, this accountability is included in every manager's job description.

**Strategic Information Steward: The Business Information Domain Expert.**
Because data producers are held accountable for the accuracy of the information they produce, the definition of information must be clear and precise. While the Data Resource Management function is responsible for facilitating the development of information models and definition of information, the enterprise must identify the high-level business personnel with expertise in some business subject who will serve as strategic information stewards. Generally, this stewardship role is part-time. However, some organizations, such as Denver-based US West Communications, have full-time stewards in an information stewardship group in the business area.

Strategic information stewards verify or authenticate the definition of data in their scope of expertise, establish data quality levels, approve access to secured information, and resolve business issues and conflicts over data.

**Senior Business Management.**
Senior business management issues the information policy, establishes information accountability in the business, resolves issues concerning information sharing across business units, and sponsors and creates cross-functional organizational change with its new information-sharing culture.

**Transforming IM into a Business Enabler**
Preparation for the twenty-first century cannot happen tomorrow. It must occur now. The following steps will help IS managers exploit the power of both today's information technology and tomorrow's emerging technology and transform IS into a strategic information management function.

**Developing a Quick but Explicit Self-Assessment of the Organization's Information Health.**
Change will occur only when an organization can quantify the cost of the status quo and realize it is more expensive than the cost of change. IS managers should take a small set of
critical core business facts, such as customer address or product ID, through the following process:

- Counting the number of redundant data bases these facts are stored in; the number of redundant applications maintaining the facts; the number of interface programs copying the facts from one place to another; and the number of redundant data producers required to sustain duplicate data entry of these same facts.

- Estimating (if actual metrics are unavailable) the cost of developing all the redundant create, update, and interface applications and redundant data bases. The level of redundancy in all other areas should also be estimated and its total cost extrapolated.

- Conducting a data audit to identify some sample occurrences, such as a specific customer, then extracting the data values from the redundant data bases and comparing consistency. Customers should be called to see how accurate the data actually is, and the business costs of rework and lost business opportunity should be estimated.

**Developing a Vision.**
IS managers should develop strategic thinking about the business and about how technology can solve business problems, beginning with the business mission. Everything IM does must be geared toward enabling the realization of business objectives. Managers should mentally step out of the day-to-day role in IM and think of radically new ways that information and information technology can be used.

Today's information professionals must embrace the larger purpose of their work. Instead of thinking in terms of just defining data or building a data base, they should focus on enabling knowledge workers to be empowered and informed for competitive advantage.

**Developing Rapport with Senior Management.**
Senior managers are IM's most important customers. IS managers must earn their commitment by listening to their concerns, a process that includes identifying their strategic objectives and developing proposals that quantify cost savings and revenue generation in concrete terms. This puts senior managers' decision to commit to change in the form of an evaluation of return-on-investment rather than in the form of a request for additional expenditures.

**Enabling a Paradigm Shift.**
The transition to the information age requires two paradigm shifts. First, the business must transform from an industrial and hierarchical management style to an information-based and ensemble management style. Second, the IS function must transform itself from a procedural, function-driven systems approach to an event-driven information resource approach.

Paradigm shifts are usually created by outsiders, who see things in ways not clearly recognizable to those who have a vested interest in the status quo. Once a vision is established, it should be articulated to the managers who have the authority to create the paradigm shift. A vision has to be expressed in concrete terms that people can understand. This entails:

- Quantifying the cost of the status quo. The cost of applications development should be determined, as should the cost of maintaining create/update programs, interface
programs, and redundant data bases. The level of redundant create/update programs, interface programs, and data bases should also be determined. Finally, IS managers should quantify the cost of the development and maintenance of these redundant (i.e., non-value-adding) applications and their operational costs, including the cost of business personnel (i.e., data intermediaries) entering data that exists elsewhere.

- Identifying the benefits of the information resource approach. One benefit is that it eliminates redundant applications and data bases, inconsistency of redundant data bases, and non-value-adding information intermediary time. Another centers around improving information quality through point-of-origin information capture with stewardship accountability. The information resource approach is also useful in identifying new opportunities created by timely information (as a result of reduced or eliminated information float and reduction of lost business owing to inaccurate, out-of-date, or missing information) and new business opportunities enabled through integrated, shared information that can be combined and analyzed in new ways.

- Overcoming paradigm paralysis by providing continuous education that encourages new thinking and new behaviors among managers and IS professionals.

- Actively involving those whose habits are changing in the decision-making process and in the design of the new development methods. Managers should be sensitive to the needs of IS professionals whose applications development habits are changing and allow for risk taking and mistakes.

Analyzing Key Strengths and Weaknesses.
IS managers should identify the internal strengths and weaknesses of the IM function and its external opportunities and threats. This includes planning a course of action to neutralize weaknesses and threats, maximize strengths, and exploit opportunities.

Reviewing Current IM Processes to Identify and Define Core Processes.
IS managers should review current processes in terms of the value they add to the business, emphasizing those that contribute value. Processes discovered during the transition to the new business paradigm, with its new rules and regulations, should be integrated within the paradigm's framework.

Eliminating Non-Value-Adding Processes.
IM processes that do not contribute or add value to the strategic business objectives should be reviewed and deleted.

Redefining the Applications Development Process.
IS managers should evaluate the development methodology from a resource perspective that includes:

- Developing information, process, and technology architectures to model the business.
- Identifying cross-functional business processes or business value chains.
- Identifying business events that trigger the process activities within the value chain.
· Applying business process reengineering principles to a process before automating the process.

· Defining data to support all business processes that use that data.

· Building data models and data bases with common data definitions that can be fully sharable or replicable to other server data bases.

· Developing a single create/update program for each discrete entity type and locating it at the process activity at the original source of create.

Using Multidisciplinary Teams for Development.
When development occurs, IS managers should ensure that representatives from Data Resource Management, process management, and technology management are appropriately involved at all levels of the process.

Investing In and Exploiting the Right Technologies.
Guidelines for evaluating and selecting information technology within the enterprise should be developed. IS managers should evaluate technology from a best-fit approach and choose a single type of technology (e.g., a DBMS, transaction application tool, decision-support application tool, or Object-Oriented Programming Language) for each class of business problem. Minimal-value tools and their support costs should be eliminated. All parties to be affected by a technology decision should be included in the evaluation of IT products.

Developing a Plan to Move to a Shared Information Resource.
IS managers must develop a high-level enterprise information model that identifies the business subject areas (i.e., business resources) and fundamental business entity types. They should use that model in planning and developing applications and data bases. Legacy data bases in which data currently resides should be identified. An orderly migration should be planned to eliminate unnecessary data bases and applications as new development supports the processes and data required by the legacy applications and data bases.

Managing Change Effectively.
IS managers must prepare for change and develop plans to institute change in a positive way. This includes identifying and soliciting support from the change sponsor, who can authorize change. Change agents should be chosen who can communicate with and involve the audience affected by the change. New procedures and standards should be prototyped in a way that encourages improvement. After standards and procedures are prototyped, they should be modified based on feedback from the pilot team, and thorough training to subsequent teams should be provided. Managers should continue to improve and solicit improvements to standards and procedures from the people who use them.

Changing Reward Mechanisms.
Changing reward mechanisms can solidify new habits. IS managers should reevaluate the reward mechanisms of the old paradigm, such as rewarding individuals, meeting target dates when scope is reduced and shortcuts are taken, and solving problems that are really symptoms of a larger problem that should have been prevented. They should then identify the reward mechanisms of the new paradigm: teamwork and meeting target dates without
compromising the architecture and with common cross-functional definition of data using customer satisfaction surveys.

**Conclusion**

There is no question that the successful enterprises of the early twenty-first century will look and behave differently than their counterparts of the late-twentieth century. Indeed, the transformations have already begun. The questions are: Who will make it and who will not? And who will be the catalysts for the successful enterprises?

This is the most exciting time to be a part of the information management field—the catalyst for society's transformation to the new economic paradigm of the information age. Although the information age was triggered in 1946 when the ENIAC computer came online, only now have the principles for successful use of information technology become clear. This is the decade of the maturing of the information age. As Peter Drucker advised, “Put your resources on tomorrow, where the results are—and not on yesterday, where the memories are.”

**Author Biographies**

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Larry P. English is president and principal of Information Impact International, Inc., in Brentwood TN. He is an internationally recognized speaker, teacher, consultant, and author in information management.
Plan
- Identify business strategies and plans
- Plan staff requirements
- Recruit

Apply
- Assign workers
- Employ skills

Acquire
- Hire
- Contract

Maintain
- Compensate
- Provide benefits
- Train

Dispose
- Retire
- Downsize
- Terminate
Plan
- Identify business objectives
- Develop information architecture
- Develop model and design

Apply
- Retrieve occurrence

Acquire
- Create occurrence

Dispose
- Delete occurrence

Maintain
- Update occurrence
The Systems Approach

Input → Process → Output

The Resource Approach

Create → Data → Delete

Retrieve → Processes → Update → Processes → Process