3-01-70 Developing a Transnational IT Architecture: A Reengineering Approach

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Payoff

An organization's information technology architecture must provide a virtual representation of how information technology can be employed to enable specific business objectives, processes, and cross-functional operations. This strategic management article describes a reengineering-oriented approach to developing the IT architecture. IS management can use this approach as a road map and a context from which to analyze issues and base strategic decisions related to their organization's IT architecture.

Introduction

In the management of information technology (IT), factors ranging from leadership to reporting relationships to corporate attitude toward IT and internal management practices are varied and unique to each organization. However, one common denominator shared by virtually all organizations is an architecture for information technology, or its lack thereof. Many of the systems used by corporations today evolved without the benefit of a vision and blueprint of how they would be linked either technically or to the business. The systems are generally the result of the organization's satisfying a specific need (e.g., accounts payable or order entry) and possess a distinct departmental ownership orientation. These mission- or point-specific systems are transaction driven.

This design orientation may have been adequate in a business environment of mass markets, mass production, homogeneous products, and hierarchical organizational structures, but with the change to a global economy and a distinct and permanent shift to tailored offerings, specialized markets, global sourcing, transnational manufacturing, and downsizing, many corporations are finding that their existing systems cannot support cross-functional processes or the integration of functions, data, and key imperatives such as business process reengineering. In addition, these legacy systems are difficult and costly to maintain and detrimental to the transnational corporation of the 21st century.

Many organizations embark on systems integration projects in an effort to create more robust systems and capabilities, but these are shorter-term solutions to immediate needs rather than long-term positioning and reengineering for strategic benefits.

Transnational enterprises are quite different than those that are global, international, or geographically defined (see Exhibit 1). They represent the next level on the evolutionary path of business and have created a new cycle in information technology (see Exhibit 2). This wave is not a mere short-term trend, but a significant and permanent shift in direction that has its own momentum. The IT wave, combined with the changes in the business environment, necessitates a new model for developing the IT architecture. This article explains the issues and priorities that organizations and their IS management must evaluate when formulating an IT architecture strategy.

Comparison of Transnational, International, and Global Businesses
### Key Indicators of the IT Wave

#### Developing an Outward Focus

Many organizations have premised their IT architecture solely on technology or a vendor's product offerings. Traditional models focus on technology solutions such as UNIX, client/server computing, mainframes, or specific software solutions. Given the current business climate and technology dependencies, this orientation is relatively myopic and forces an inward focus that is technology driven (and constrained) rather than business enabling. Traditional approaches view application software and data narrowly in a transaction, mission-specific context rather than cross-functionally. Traditional methods of developing an IT architecture also tend to ignore the benefits of reengineering by concentrating on incremental gain or technology substitution.

Basing the architecture on technology substitution can rob a corporation of higher returns on investments for technology and improved competitive position. Usually the organization's internal IT group leads the architecture effort to migrate onto new platforms or into new operating systems. The results are that functionality remains unchanged or is only marginally improved.

Traditional models also demand an arduous effort to extract existing processes, information, and needs. This exercise requires the extensive flowcharting of activities, numerous interviews, the use of data collection forms, surveys, and a litany of other tools, all of which are designed to provide information about how things are done and what is needed at the moment. Lacking is the external perspective that is usually gained from best practices and benchmarking.
Defining the Architecture

Agreeing on the definition of IT architecture is sometimes as difficult as crafting one. To better clarify the concept of architecture, it is sometimes best to understand what it is not. Architecture is not a budget, nor is it a strategic plan. Architecture is not a schematic depicting disk drives, controllers, and Central Processing Unit. Architecture is not an operating plan or manual or a list of hardware and software. Architecture is not the latest technology, nor is it object-oriented code or data bases. All of the foregoing are components of architecture, but by themselves do not represent architecture.

Information technology architecture is analogous to a building's architecture. It provides a blueprint of how systems and technologies are constructed, linked, and integrated into a harmonious environment that is based on business perspective and needs. Information Technology Architecture is a conceptual relationship and representation of how technology serves the business and provides value to users, customers, and shareholders.

To be an effective tool, the architecture must address various business, organizational, and technology issues, including:

- The major strategic imperatives, business drivers, and technology needs of the enterprise.

- The technologies, capabilities, and systems that are subject to reengineering, scalability, and investment to support customer service requirements and new business processes.

- The most appropriate IT organizational structure to best support the logical consolidation of IT capabilities and resources while providing for the physical distribution of those resources.

- The business, IT, and global initiatives that other transnational organizations are pursuing.

The IT architecture is a virtual representation of how technology can be employed to enable specific business objectives, processes, and cross-functional operations of the enterprise. The architecture must embody five key values. The architecture must:

- Provide a long-range vision for the use of technology by the enterprise.

- Be used as a blueprint for ensuring technology is applied in a manner that best supports the business and optimizes resources.

- Provide a seamless link directly to the strategic and operational business goals of the organization.

- Be developed through a rigorous process that involves all significant business processes and organizational levels, external benchmarking, and consensus-building sessions.

- Describe the long-term technical, application, data, and organizational structures necessary to support the enterprise, including priorities, needs, IT industry trends and directions, and relationships and linkages.
Creating the Information Technology Architecture: A New Model

There are four cornerstones to the Information Technology Architecture (see Exhibit 3). The technologies, systems, and personnel may change, but the cornerstones remain impervious yet adaptable.

Four Cornerstones to the Information Technology Architecture

Creating an enterprisewide IT architecture demands a dynamically balanced and methodical approach. Architectures that focus on a particular area, such as data modeling or application portfolio, may miss more meaningful business breakthrough opportunities that occur through viewing and developing the architecture by its four cornerstones. Most often, it is the infrastructure component of architecture that is overlooked. Information and data models may be built, but they can be inadequate without complementary process maps and IT organizational transformation.

Six-Phase Approach

Using the cornerstones as a basis, the development of the new model for IT architecture can be arranged into a six-phase approach (see Exhibit 4). The objective is to create an architecture that is a multidimensional component of the transnational's customer, organizational, and operational structure. The phases integrate all four cornerstones of the architecture into a process that ensures that an outwardly driven perspective is developed to deal with issues such as transbroader data flows, virtual markets, global sourcing, tailored offerings of standard products, and region-specific needs. The phases ensure that common requirements and emerging issues are identified, prioritized, and formulated in an enterprisewide business and technology context.

Six-Phase Approach to Creating the IT Architecture

The direct coupling of the architecture to the customer is one of the differentiating and significant attributes of this model. Developing the IT architecture under this new model requires the successful completion of 18 key processes shown in Exhibit 5. The model is constructed around the four cornerstones, the five values of the IT architecture, and the reengineering of the enterprise.

Eighteen Processes

Visioning.

Developing a future vision of the enterprise is a leadership process. Often the vision is lost among operating plans, budgets, immediate urgencies, the current period's financial performance, and novelty management slogans. Nonetheless, to succeed in the global arena, the enterprise must have a clear definition of what it is, what it wants to be, and how it is going to get there. This definition, or vision, serves as the rallying point and key attribute of corporate identity. Knowledge of and commitment to the vision are critical to
the enterprise and its ability to create breakthrough opportunities through reengineering and enabling technology. Failure to have an adequately articulated vision ultimately results in an incomplete or inadequate IT architecture and a disconnection between the architecture and the needs of the business.

**Driver Determination.**

Identifying the key trends, cultural influences, technology vulnerabilities, economic indicators, and best practices that drive change in the enterprise is another fundamentally important process in developing the IT architecture. This phase involves:

- Ascertaining and understanding best practices and their appropriateness to a specific enterprise.
- Identifying business process reengineering opportunities.
- Identifying specific process requirements and region-specific needs.
- Evaluating existing capabilities and resources.
- Defining customer needs.
- Understanding business partner needs.

Enterprises usually find that anywhere from 6 to 15 major influences drive the need for a new IT architecture. Some of the more common influences are customer demands, competitor and host country business practices, internal operational requirements, shareholder mandates, and changes in technology. These drivers determine the planning assumptions, strategic tenets, principles, and imperatives intrinsic to the IT architecture (see Exhibit 6).

**Business and Technology Drivers**

**Comparative Assessment.**

The purpose of the comparative assessment process is to prioritize and sequence the results of identifying drivers and to determine their influence on the information technology. During this process, gaps and disconnects are identified and reengineering opportunities evaluated and selectively initiated. Most organizations find that there are many disconnects and redundant projects where resources and efforts can be consolidated. They also learn of the major disparities that exist in the caliber and management of technology across multiple organizations, operating units, and divisions.

**Technology Continuum.**

A major factor in determining priorities and the enterprise's ability to transform itself through business process reengineering is the enterprise's position on the technology continuum. IT capabilities and organizations have distinct life cycles and characteristics associated with each phase of the technology continuum. The key issues are:
· Where the organization is in its IT evolution.

· Where the organization's information technology should be to support strategic and operational imperatives.

· Whether the enterprise can evolve naturally to the next level or leapfrog to another level.

Considerable research has been dedicated to the growth stages of IT organizations. In his 1979 Harvard Business Review article “Managing the Crisis in Data Processing,” Richard Nolan presented six stages of data processing growth. The original studies focused on the management and behavioral aspects of the DP organization and not necessarily on how technology was integrated and exploited by the organization. This model served as a working template for many years, but is no longer as useful in today's integrated environment as it was in the 1970s.

Contemporary findings indicate that there are four distinct phases of the technology continuum. These phases are not indicative of growth or management standards internal to data processing. Rather, they relate to the knowledge, sophistication, level of integration of information technology and its organization to the business, and the ability of the IT organization to provide enabling solutions in a cost-effective and timely manner (see Exhibit 7).

**Four Phases of the Technology Continuum**

There are five characteristics that define these phases. Although the characteristics are common to each phase, each has its own attributes that define specific behavioral properties. In total, there are more than 100 individual attributes and properties that define the organization's position in the technology continuum. The five defining characteristics include:

· State of technology.

· Application portfolio and degree of integration.

· Data bases and accessibility.

· Information technology organization and culture.

· Corporate culture, attitude, and views toward technology.

Understanding where the IT organization and the enterprise's use of technology is in this continuum is fundamental to developing the architecture and crafting the path for transformation.

**Strategy Formulation and Vision Validation.**

During this process, a cross-functional forward strategy for information technology is developed. This strategy is based on the four cornerstones of the IT architecture and is directly calibrated and refined against the five values for the architecture, business vision, and drivers. The validation process is critical to ensuring that the vision is attainable,
realistic, and properly aligned with the strategy, operational goals, organizational structure, and financial parameters of the enterprise.

**Blueprinting.**

Blueprinting is the actual process of developing the IT architecture for the four cornerstones: technology, data, organization, and applications. The blueprints are directly linked to business drivers, influences, trends, and reengineering efforts. The blueprints are conceptual representations and narratives of each of the four cornerstones of the IT architecture. Particular emphasis is directed to downsizing application systems and providing cross-functional applications.

In contrast to the virtually unchecked proliferation of systems and data for the user today, the new model for IT architecture must be structured to support enhanced productivity and key decision-making processes and enterprisewide analytical systems. Data should be normalized, rationalized, and readily accessible throughout the organization and housed in commonly defined data warehouses.

The applications blueprint must be constructed in a manner that demonstrates the clear linkages and relationships among users, business processes, data warehouses, supporting technology, and relative business and shareholder value. Under this new model, the resulting application architecture becomes:

- Demassed and scalable to region- and process-specific needs.
- Decoupled from the mainframe and cross-platform functional with processing on mainframes, midranges, and client/servers.
- Consolidated, using data warehousing and single sources of data.
- Cross-functional and shared among various business processes and constituencies.
- Transportable across geographical and organizational boundaries.
- Analytically oriented rather than transactions based.
- Built to common standards with emphasis on replication and reuse.

**Infrastructure Decisions.**

During the process of blueprinting, the technology infrastructure is addressed. The types of technologies, vendors, utilities, support products, productivity tools, and longevity of technologies are assessed in terms of how the technology can be leveraged to provide competitive advantage. Technology is selected to enable cross-functional business processes and application systems.

The technical architecture, network topology, and application systems need to be distributed but not necessarily decentralized. Decentralization frequently leads to duplication, redundancy, inconsistent and often conflicting standards, and a diminished return on investment. The goal is the logical consolidation of assets and capabilities while simultaneously providing for the physical distribution of computing resources.
There is no one single technical solution. Rather, there are a number of technologies and alternatives. Conceptually, the architecture has a diamond-shape design as opposed to the traditional hub-and-spoke or hierarchical designs and is composed of three tiers:

- Consolidating processors in the form of mainframes and midrange computers.
- Client/servers and local area networks.
- Individual workstations.

Common and mission-defined data warehouses integrated into the technology infrastructure ensure compatible operating standards and accessibility to information, common tools, and key applications. The major hallmarks of this architecture are connectivity, scalability, portability, maintainability, and adaptability (see Exhibit 8).

### Multitiered IT Architecture

#### IT Organization Structure.

Systems that are cross-functional demand IT skills with a distinct emphasis on business understanding rather than just technical proficiency. Performance is measured by business value generated, not just by projects managed, lines of code written, Central Processing Unit reliability, and response time.

The personnel, performance measures, and business skills needed must be identified and evaluated against existing resources. Reeducation, retraining, and replacement personnel issues must be addressed in developing the architecture. Critical personnel must be identified and used to ensure cross-functional connectivity and resource optimization.

The IT organization of the transnational enterprise should embody the attributes and properties of a Phase IV end-user enabled integrated organization (see Exhibit 7). This organization is proactive and incorporates Center Of Excellence work units. These highly specialized work units can include such functions as applications development or end-user computing and are organized to provide economies of scale by maintaining extensive resources.

#### Transformation.

The transformation phase of this new model provides for the development of the investment, organizational change, and implementation plans, schedules, and processes necessary to realize the vision and blueprints. Structural alignments, staffing needs, skill set requirements, and personnel placement are all addressed and weaved into the architecture. Financial requirements, internal and external resources, migration paths, and conversion issues are integrated into the architecture.

### Conclusion

Building a new IT architecture to support the dynamics of transnational business is an immensely challenging and costly process. Rather than attempting to fit an architecture to a set of business requirements, this new model requires a cross-functional process orientation. The approach is driven by business opportunities, reengineering, and the need
to provide enabling solutions that are built to a common standard, integrated, transportable, and scalable. Emphasis is on optimizing technology and eliminating duplicate IT environments, redundant systems, nonsynchronized data, and unnecessary layers of organization and personnel. Using this approach, organizations and their IS managers can define the business, organizational, and technology priorities that guide architecture decisions.

**Author Biographies**

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Repositioning of IT structures and technologies

Multiplatform integration

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Improving flexibility through standardization