Enterprise Architecture: Driving Business Benefits from IT

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Driving Business Benefits from IT**

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CISR Working Paper 359

Title: **Enterprise Architecture: Driving Business Benefits from IT**

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Abstract: Enterprise architecture is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the firm's operating model. CISR research has found that firms go through 4 stages of architecture maturity as they learn to enhance the strategic capabilities of IT. Recognizing the learning acquired in each of the architecture stages can help firms invest wisely and maximize benefits ranging from faster IT response times to increased strategic impact from IT.

Keywords: Enterprise architecture, IT infrastructure, operating model, architecture maturity

15 Pages

FORGET STRATEGY:
FOCUS IT ON YOUR OPERATING MODEL

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Most companies try to maximize value from IT investments by aligning IT and IT-enabled business processes with business strategy. But business strategy is multi-faceted, encompassing decisions as to which markets to compete in, how to position the company in each market, and which capabilities to develop and leverage. In addition, strategic priorities can shift as companies respond to competitor initiatives or seize new opportunities. As a result, strategy rarely offers sufficiently clear direction for development of stable IT and business process capabilities. IT is left to align with individual strategic initiatives—after they are announced. Thus, IT becomes a persistent bottleneck.

To make IT a proactive—rather than reactive—force in creating business value, companies should define an operating model. An operating model is *the necessary level of business process integration and standardization for delivering goods and services to customers.* By identifying integration and standardization requirements an operating model defines critical IT and business process capabilities. This briefing explores how a company's operating model guides IT investment and enhances business agility.[1]

Four Alternative Operating Models

Companies make two important choices in the design of their operations: (1) how standardized their business processes should be across operational units (business units, region, function, market segment) and (2) how integrated their business processes should be across those units. In making these two choices, company management is targeting one of four operating models (as shown in Figure 1):

- Diversification (low standardization, low integration)
- Unification (high standardization, high integration)
- Coordination (low standardization, high integration)
- Replication (high standardization, low integration)

All four operating models represent viable alternatives for delivering goods and services to a company's customers.

The *Diversification* model is a decentralized organizational design. Business units pursue different markets with different products and services, and benefit from local autonomy in deciding how to address customer demands. Carlson, a $20B company of related but autonomous hospitality businesses, is an example of a Diversification model.

The *Unification* model describes a centralized organizational design. The company pursues the need for reliability, predictability and low cost by standardizing business processes and sharing data across business units to create an end-to-end view of operations and a single face to the customer. Delta Air Lines' standardized global business is an example of Unification.

The *Coordination* model focuses on integration. A Coordination model company creates a single face to its customers or a transparent supply chain without forcing specific process standards on its operating units. Toyota Europe, for example, shares product data across country business units so they can rapidly exchange automobiles and parts to meet customer needs.

The *Replication* model focuses on process standardization. Operating units perform tasks the same way using the same systems so that they can generate global efficiencies and brand recognition. However, operating units rarely interact. As an example, Marriott replicates systems and processes related to a wide range of processes, including reservations, frequent guest rewards, wake-up calls and revenue planning in each of its independently managed hotels.

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[1] This briefing expands on concepts originally described in "Aligning IT Architecture with Organizational Realities," CISR Research Briefing Vol. III, No. 1A, March 2003.

Implications for IT Investment

By identifying the intended level of business process integration and standardization, the operating model determines priorities for development of digital capabilities and thus IT investment. Accordingly, IT investments not only address immediate business needs, they digitize key business capabilities, thereby building a foundation for future business initiatives.

For example, CEMEX, a Replication company, has built a foundation based on process standardization. CEMEX has standardized eight key business processes: commercial (customer facing and cement logistics), ready mix manufacturing, accounting, planning and budgeting, operations, procurement, finance, and HR. Although the businesses reuse processes, they do not typically share data—each business is run autonomously. CEMEX has leveraged its IT-enabled standardized processes in assimilating acquisitions. For example, in 2000, CEMEX acquired Southland, the U.S.'s second largest cement manufacturer, and completed assimilation in four months. Subsequent acquisitions have been assimilated in as little as two months.[2]

While CEMEX has built standardized processes, Merrill Lynch's Global Private Client (GPC) business has built a foundation of digitized processes to support a Coordination model. GPC's business objective is to provide a wide range of investment products to wealthy clients across a variety of channels (e.g. interactions with a financial advisor, online access, telephone access).[3] To meet this objective, GPC developed integrated product data and standardized customer interfaces on its Total Merrill[SM] platform. But GPC does not typically standardize business processes across the globe. GPC leverages these IT capabilities every time it introduces a new investment product or creates a new channel for accessing its products. As a result of GPC's standard technology platform and access to shared business data, the company has the best revenue per advisor, earnings per advisor and assets per advisor in the industry.[4]

As a Unification company, Dow Chemical seeks both integration and standardization to achieve efficiencies and meet the demands of global customers. Dow uses a single instance of SAP to support highly standardized core processes (e.g., manufacturing, finance, logistics) while creating a global supply chain. Dow has leveraged these capabilities to grow profitably both organically and through acquisitions. From 1994 to 2004, despite a downturn in the market, Dow nearly doubled its revenues while growing its employee base less than 10%—a productivity improvement of eight percent per year.[5]

By purposely not creating shared digital capabilities, the Diversification model encourages organic growth of individual business units and poses unlimited opportunities for growth through acquisition. But because Diversification leverages fewer capabilities than the other models, companies need to find synergies to create shareholder value. Some Diversification companies are introducing shared services to gain economies of scale; others are diversifying into closely related businesses to feed a core business. For example, with its package delivery business at its core (a Unification model), UPS has diversified into a set of smaller, growth oriented businesses such as UPS Supply Chain Solutions, UPS Capital Corporation, UPS Consulting, The UPS Store, and UPS Professional Services. These new businesses cannot reuse the existing IT and business process foundation because they operate differently, but they have become profitable in their own right while adding value by feeding the core business. As a result, UPS has continued to grow while boasting an operating margin nearly three times the industry average.

Choosing an Operating Model

Although most companies can identify processes fitting every operating model, they need to select a single operating model to guide management thinking and system implementations. Management can then organize business unit and IT responsibilities based on principles about how the company will operate most of the time. One way companies respond to conflicting demands is to adopt different operating models at different organizational levels.

For example, Johnson & Johnson has long operated in the Diversification quadrant.[6] But J&J's U.S.

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[2] Rebecca Chung, Donald Marchand and William Kettinger, "The CEMEX Way: The right balance between local business flexibility and global standardization," IMD – International Institute for Management 2005. IMD-3-1341.

[3] V. Kastori Rangan and Marie Bell, "Merrill Lynch: Integrated Choice," Harvard Business School case 9-500-090, March 2001.

[4] Merrill Lynch 2004 Annual Report.

[5] Jeanne W. Ross and Cynthia M. Beath, *The Federated Broker Model at The Dow Chemical Company: Blending World Class Internal and External Capabilities,* MIT Sloan CISR Working Paper No. 355, July 2005.

[6] See Jeanne W. Ross, *Johnson & Johnson: Building an Infrastructure to Support Global Operations,* MIT Sloan CISR Working Paper No. 283, September 1995.

pharmaceutical group applies a Coordination model to present a single face to health care professionals. In Europe, Janssen Pharmaceutical Products applies a Replication model providing low-cost, standardized processes for drug marketing, delivery and monitoring. Targeting different operating models at different organizational levels allows J&J to meet the multiple objectives of a large, complex company, while keeping organizational design reasonably simple at the individual operating company level.

Our research has found a strong preference across companies and industries for the Unification model. Data collected at 103 companies in 2004 indicated that 63% of companies were targeting Unification. Only nine percent were targeting Diversification; 17% were targeting Coordination; and 11% were targeting Replication operating models. The appeal of the Unification model is that it provides a thick foundation of digital capabilities to leverage in future business initiatives. However, implementing that foundation requires a great deal of time, money and management focus.

In contrast, the off-diagonal operating models (Coordination and Replication) require less time for building capabilities before companies can start reusing them. These off-diagonal models abandon the centralization-decentralization tradeoffs by allocating different decision rights to the center and the business units. In a Replication model, local managers must accept enterprise-wide process standards, but they have the autonomy to manage customer relationships locally. In a Coordination model, local managers accept enterprise-wide data standards and customer interfaces, but they have the autonomy to develop products and processes to achieve local business objectives. Companies should recognize that each operating model creates opportunities—but also creates limitations.

Making a Commitment

The operating model concept requires that management put a stake in the ground and declare which business processes will distinguish a company from its competitors. A poor choice of operating model—one that is not viable in a given market—will have dire consequences. But not choosing an operating model is just as risky. Without a clear operating model, management careens from one market opportunity to the next, not leveraging reusable capabilities.

In adopting an operating model a company benefits from a paradox: standardization leads to flexibility. By building a foundation of standardized technology, data and/or processes, our research shows a company achieves more business agility and responds to new market opportunities faster than its competitors. Admittedly, most companies will need to regularly experiment with initiatives that do not leverage their foundation. But an operating model provides needed direction for building a reusable foundation for business execution. IT becomes an asset instead of a bottleneck.

Figure 1: Characteristics of Four Operating Models

Business Process Integration		**Coordination** ■ Shared customers, products or suppliers ■ Impact on other business unit transactions ■ Operationally unique business units or functions ■ Autonomous business management ■ Business unit control over business process design ■ Shared customer/supplier/product data ■ Consensus processes for designing IT infrastructure services; IT application decisions are made in business units	**Unification** ■ Customers and suppliers may be local or global ■ Globally integrated business processes often with support of enterprise systems ■ Business units with similar or overlapping operations ■ Centralized management often applying functional/process/business unit matrices ■ High-level process owners design standardized process ■ Centrally mandated databases ■ IT decisions made centrally
	High		
	Low	**Diversification** ■ Few, if any, shared customers or suppliers ■ Independent transactions ■ Operationally unique business units ■ Autonomous business management ■ Business unit control over business process design ■ Few data standards across business units ■ Most IT decisions made within business units.	**Replication** ■ Few, if any, shared customers ■ Independent transactions aggregated at a high level ■ Operationally similar business units ■ Autonomous business unit leaders with limited discretion over processes ■ Centralized (or federal) control over business process design ■ Standardized data definitions but data locally owned with some aggregation at corporate ■ Centrally mandated IT services
		Low	**High**

Business Process Standardization

ENTERPRISE ARCHITECTURE: DEPICTING A VISION OF THE FIRM

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As IT units build solutions, they create the legacy that defines a firm's IT capability. Intentionally or not, the resulting capability locks in assumptions about internal and external relationships and process definitions. But whose assumptions are being locked in? What business capabilities are these platforms enabling and what possibilities are they constraining? In this briefing we describe the concept of enterprise architecture on one page. We have observed that this tool can coordinate project decisions and facilitate discussions between business and IT management to clarify options for a firm's IT capability—and then communicate the vision.

Defining Enterprise Architecture at Delta Air Lines

In 1997 when Leo Mullin became CEO of Delta Air Lines, he quickly learned that he had acquired an IT capability resulting from a failed outsourcing effort. Unhappy with the outsourcer's services, each of Delta's 17 functional units had effectively built its own IT capability. The firm had as many IT platforms as it had functions, and those platforms were not capable of communicating with one another. The predictable outcome was that Delta's ticket agents, reservation agents, gate agents, baggage handlers, and others often lacked the information they needed to do their jobs—frustrating both customers and employees.

Mullin brought in Charlie Feld as CIO to help the firm survive Y2k and start to build an enterprise-wide IT capability. Feld started by working with the leadership team to clarify the vision for how the firm would do business going forward. The leadership team described an as-is and a to-be state as follows:

AS-IS	TO-BE
17 functional silos	Process view of the firm
17 IT units	Standardized IT environment
17 major platforms	Focus on the customer
17 answers to a single question	Corporate IT infrastructure to support cross-functional process

The to-be state outlined guiding principles for the firm's enterprise architecture. As a first step in adopting a process view of the firm, the management team defined four core processes: customer experience, operational pipeline, business reflexes, and employee relationship management. The customer experience identified all the ways Delta touched its customers. The operational pipeline was concerned with loading, moving, unloading and maintaining planes. Business reflexes included scheduling, pricing, accounting and related administrative functions. Employee relationship management encompassed all the processes involved in meeting the needs of Delta's highly mobile workforce.

Once the team came to agreement on the core processes, they iteratively developed an enterprise architecture graphic capturing the processes, data, and interfaces constituting the essence of the operating model at Delta (Figure 1). At the heart of the model was the Delta Nervous System, which provided real-time access to, and updates of, Delta's core data. The Delta Nervous System was designed to make data available to customers and employees on a need to know basis through multiple interfaces, including (but not limited to) PDAs, gate readers, laptops, cell phones, reservation systems and others. The software was event-driven in that some changes in data initiated automatic notification to specified applications and individuals.

CIO Feld, who led the development of the enterprise architecture, estimated that the management team needed about 60 iterations before everyone agreed on Delta's enterprise architecture graphic. IT and business management's shared understanding of the architecture helped establish development priorities and kept senior management focused on generating benefits from new IT capabilities. Delta focused on building a long-term IT capability while addressing its Y2k crisis and initial process improvement goals. Delta's enterprise architecture has not saved the firm from the competitive challenges facing hub and spoke airlines or industry downturns, but it has given Delta a reliable, cost-effective IT foundation from which the firm can expand into new products, services or markets.

Defining Enterprise Architecture at MetLife

Although IT leaders recognize the importance of senior management leadership in defining IT principles, many business leaders do not enthusiastically embrace a role

in defining how IT will contribute to business strategy. The enterprise architecture graphic can force a discussion exposing executives' assumptions about IT capabilities. Unlike Delta, where the senior management team drew the enterprise architecture graphic, MetLife's IT unit drew up an enterprise architecture to capture the IT unit's understanding of the role of IT in achieving strategic objectives. (See Figure 2.)

As an outgrowth of several large mergers, much data at MetLife is locked into individual IT applications. Nonetheless, MetLife's current strategic initiatives are focused on more integrated customer service. MetLife's enterprise architecture graphic reflects the firm's need for shared data. The integration hub pictured in the enterprise architecture graphic recognizes that it will take some time to extract data from applications and create a fully populated centralized data store. In the meantime, the integrated hub will hold reusable code that accesses data embedded in legacy applications. Stakeholders gain access to the data using a standardized portal architecture, shown on the left-hand side of the diagram.

MetLife architects use their drawing to communicate with senior managers and business partners the underlying logic for IT development at MetLife. The enterprise architecture guides new application development by explaining how IT will deliver on the firm's IT principles. For example, MetLife's enterprise architecture embodies principles of reuse in its portal architecture—every application will apply the same standards for output to stakeholders. In addition to providing a common customer view, the centralized data stores and integration engine enhance information integrity by reducing redundancy. Thus, the enterprise architecture translates IT principles into a clear vision of how IT will enable business objectives.

A high-level architecture graphic captures decisions resulting from debates on where shared infrastructure stops and applications begin. The MetLife architecture shows that the channels, portal, data stores and integration engine are all shared across applications. The presentation and business logic applications are thus distinguished from infrastructure. Communicating where infrastructure stops and applications begin simplifies future infrastructure and applications decisions and promotes shared understanding of IT capabilities in the enterprise.

Using the Architecture Graphic to Recognize the Need for Change

As long as a firm does not change its basic operating model, the enterprise architecture graphic should guide development of business applications and infra-

structure. Management may tweak the architecture as new technologies or changing market conditions introduce new opportunities. But the value of the architecture graphic is that it supports management efforts to identify ways to leverage IT in the firm.

On the other hand, if a firm fundamentally changes its approach to the market, management will want to rethink the design of the IT capabilities—and perhaps redraw the enterprise architecture. For example, Schneider National, a large US trucking firm had a highly effective enterprise architecture in the early nineties. The firm had built mainframe-based systems accessing shared data and providing that data to mostly centralized staff. When Schneider became the first trucking firm to introduce satellite systems to track its tractors, the firm's existing architecture allowed it to convert the satellite data into enhanced customer service. But when Schneider management determined that intense price competition in the trucking industry made it difficult to grow profitably, the firm expanded into logistics. Management noted immediately that the logistics business demanded a very different architecture—one with powerful desktop capabilities located at customer sites and allowing for segmented data bases. Rather than try to force fit the existing architecture, Schneider designed a new architecture for the logistics business. Starting from scratch and therefore having the freedom to deploy newer technologies allowed Schneider to move rapidly into the logistics business. Schneider management's understanding of its enterprise architecture helped the firm recognize when it was time to start over just as clearly as it had helped identify opportunities to capitalize on the capability in place.

Getting Value from an Enterprise Architecture Graphic

Experiences at Delta, MetLife, Schneider and other firms suggest 4 steps for generating value from an enterprise architecture graphic:

1. Start by defining the core enterprise-level business processes and the data they depend on.
2. Iterate the graphic until senior business executives agree on the vision of how the firm will operate.
3. Use the graphic to facilitate communication between business and IT managers about the role of IT in the firm.
4. Use top-level understanding of the enterprise architecture to secure a commitment to exploring the impact of all IT-related projects on the enterprise architecture.
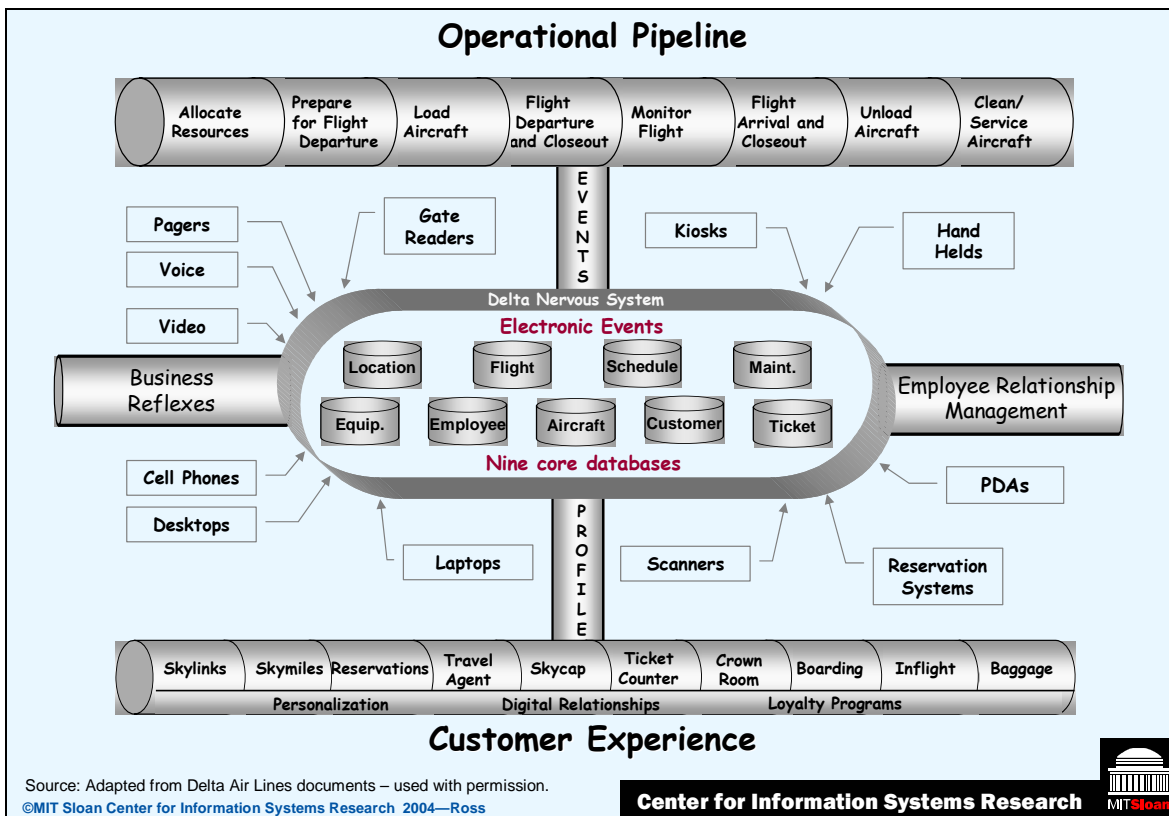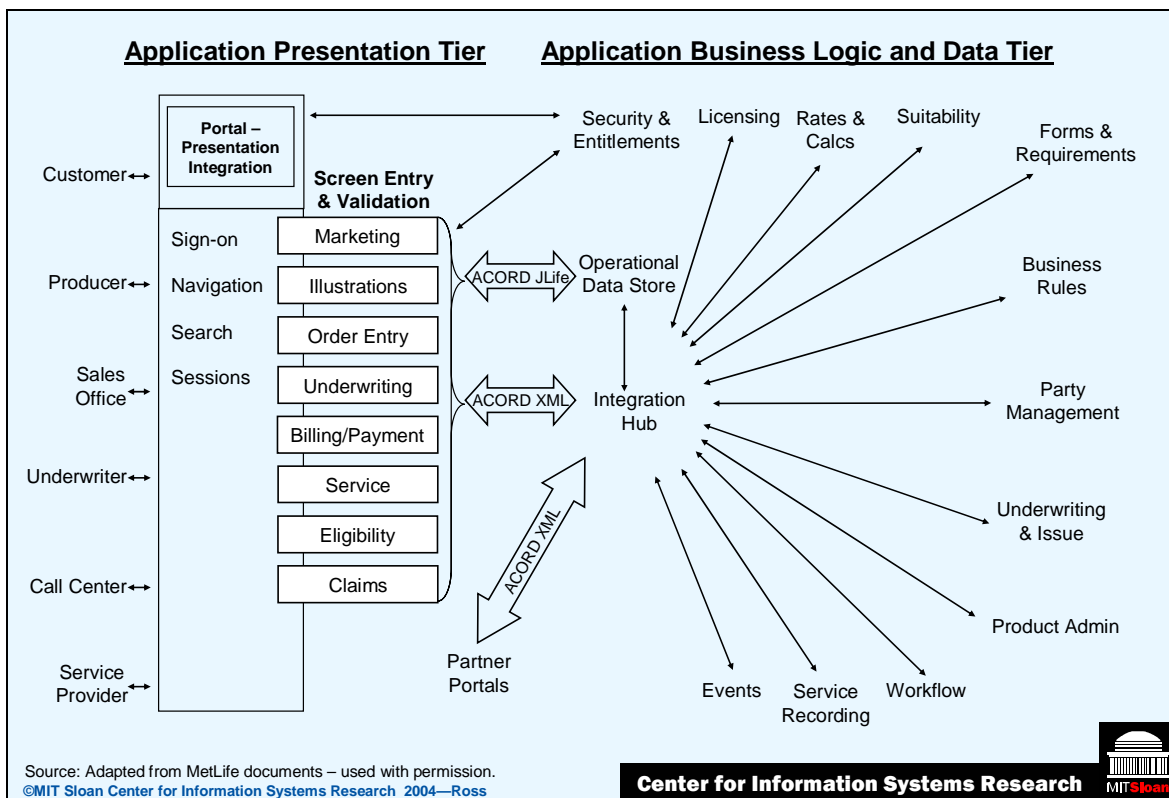
Figure 1: Delta's Enterprise Architecture

Source: Adapted from Delta Air Lines documents – used with permission.
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Figure 2: MetLife's Enterprise Architecture

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MATURITY MATTERS:
HOW FIRMS GENERATE VALUE FROM ENTERPRISE ARCHITECTURE

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In order to better serve their customers and to cut operating costs, firms are instituting enterprise-wide efforts to leverage synergies and reap economies of scale. Initiatives such as "One State Street," "One DuPont," and JPMorgan Chase's "one firm—one team" place IT in the role of strategic enabler. CISR research indicates, however, that firms can't just decide to use IT strategically, write a slogan, and then reap the rewards. Rather they must **learn** how to make IT a strategic competency.

A firm's learning about the strategic role of IT can be represented in four stages of enterprise architecture maturity. A firm's enterprise architecture is *the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the firm's operating model.*

In a recent survey of 103 firms, we acquired specific data on investment patterns and management practices associated with the four stages of architecture maturity. In this study, firms achieving greater architectural maturity reported lower IT costs, shorter IT development times, greater discipline in their business processes, and more strategic benefits (e.g., customer intimacy, product leadership, and strategic agility) from IT. In this briefing we describe how firms capture and formalize the learning from each architectural stage so that they can benefit from the current stage and, if appropriate, migrate toward later stages.

IT Investment Patterns

As firms learn to apply IT more strategically, they evolve their IT investment patterns. For example, firms in the first stage—Business Silos—invest heavily in local applications. In some cases this investment pattern represents a strategic choice. Holding companies, for example, may choose to be stage 1 firms. Most companies, however, have been (or still are) in stage 1 by virtue of historical investment patterns that focused on business cases addressing local business needs.

As shown in Figure 1, firms shift their investments away from local applications and into shared resources as they move through the second and third stages. In the second stage, firms are developing shared infrastructure services. Firms like State Street and Carlson migrated to this stage in an attempt to generate cost savings through technology standardization and consolidation.

By the third stage—Optimized Core—firms are sharing data and standardizing business processes. Firms like Air Products and MeadWestvaco moved into this stage through an investment in an ERP, while Delta Air Lines focused on developing shared data to enhance customer service and airline operations.

Finally, in the fourth stage, firms' investment patterns are focused on smaller, reusable application and process components to support a more modular operating model. Firms like ING Direct and Marriott create standard business application modules that can be used by any of their business units. Firms apply reusable application modules in new business units or purchase modules from vendors.

In addition to the variation in investment patterns, we found that IT spending levels varied from stage to stage (see Figure 1). IT budgets in the first stage are high because firms have limited opportunities for enterprise-wide purchase agreements, sharing of technical expertise, and consolidation of data centers. Not surprisingly, IT spending decreases as firms introduce first hardware and then software, process, and data standards. Late in the third stage the IT spending pattern appears to reverse itself. By stage 4, firms in our study were spending more on IT than stage 1 firms. While this finding may discourage firms from moving into later stages of architecture maturity, it is important to recognize that firms are gaining greater strategic benefits from IT and thus will find it easier to justify IT expenditures. In addition, we don't know if the experiences of early adopters will prove representative of the experiences of all firms.[1]

IT Governance and Management Patterns

As firms' investment patterns change, they also start to generate different kinds of value (see Figure 1). But getting value from IT demands far more than investment

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[1] The very small representation of stage 4 firms is consistent with our impression that few firms have reached that stage. Thus, findings should be viewed cautiously.

in building out the technical requirements of the architecture. We have learned that when IT units build enabling IT capabilities, firms may—or may not—drive value from them. Managers must introduce new management practices to formalize organizational learning about how to manage IT investments and generate IT value. They will not achieve increased value from simply changing investment patterns.

Management Practices Key to Stage 1

In our study respondents rated the value they received from a set of IT management practices, and we determined statistically which practices generated greater value as architecture matured (see Figure 2).[2] For example, in stage 1, key practices supporting firms' efforts to generate value from application silos were:

- well-designed business cases,
- a standardized project methodology.

These two practices encapsulate the requirements for generating value from local applications. They can help firms generate value at any stage, but firms that acquire the learning associated with these practices at an early stage are better positioned to generate value from subsequent IT investments.

Management Practices Key to Stage 2

Practices that were associated with greater IT value in stage 2 included three mechanisms facilitating more centralized IT funding:

- an IT steering committee,
- an infrastructure renewal process, and
- centralized funding of enterprise applications.

These funding initiatives help firms support enterprise-wide initiatives and are important to the migration from stage 1—where firms think about optimizing local business needs—to stage 2, where firms focus on maximizing the benefits of standardized technologies across the firm. The other three mechanisms of particular value in stage 2 are all related to managing a standardized technology environment:

- architects on project teams,
- an architecture exception process, and
- formal architecture compliance process,
- a centralized standards team.

Together, the seven practices important to stage 2 reflect the growing need for IT governance to address the challenges of using IT as an enterprise-wide, rather than business unit or functional, asset.

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[2] The practices listed in Figure 2 were statistically significantly related to architecture maturity. We identified the stage at which each practice emerged as most important by comparing the means and determining the stage at which the value of the practice demonstrated its largest increase in mean value.

Management Practices Key to Stage 3

Following on technology standardization in stage 2, key management practices in the third stage help firms adjust to process integration and standardization. While technology standardization has its challenges, process standardization will surely confound and irritate business unit leaders. Practices emerging as important in stage 3 emphasize the increased role of senior management in setting direction and defining enterprise-wide processes. These include:

- enterprise-wide process owners,
- a statement of enterprise architecture guiding principles,
- business leadership of project teams,
- senior executive oversight of architecture initiatives,
- IT program managers

These five practices highlight the need for senior management to articulate business direction, and to implement IT-enabled processes to fulfill the business vision.

Management Practices Key to Stage 4

Finally, in the fourth stage, firms were implementing practices for communicating and assessing IT. These included:

- a one-page graphic for communicating an enterprise vision,
- post-implementation assessment,
- a formal research and adoption process, and
- a full-time enterprise architecture team.

These four practices could seemingly add value at any stage, but their delayed importance to firms in this study and our prior experiences studying IT management practices suggest that firms are failing to take advantage of these tools at an earlier stage. They are valued by firms in stage 4 because these firms have generally benefited from good IT management practices. The survey instrument did not collect behaviors such as developing directories of reusable process components, but we anticipate that the ability to create and reuse application components is critical to the fourth stage.

All Management Practices Support Business Value

What is important to note about the management practices listed in Figure 2 is that they are cumulative. Practices key to value in stage 1 are still important in stage 2—in fact, they are more important. Thus, if firms do not acquire good practices in early stages, they reduce the odds that they will be able to generate significant value from their IT initiatives in later stages. Long lists of failed ERP and CRM implementations, lightly used data warehouses, and abandoned workflow management systems highlight the potential for wasting money on IT. We interpret these findings to mean that firms embarking on an enterprise architecture journey

should plan for steady increases in IT value through gradual enhancements in IT management. We have found no shortcuts to business value from IT.
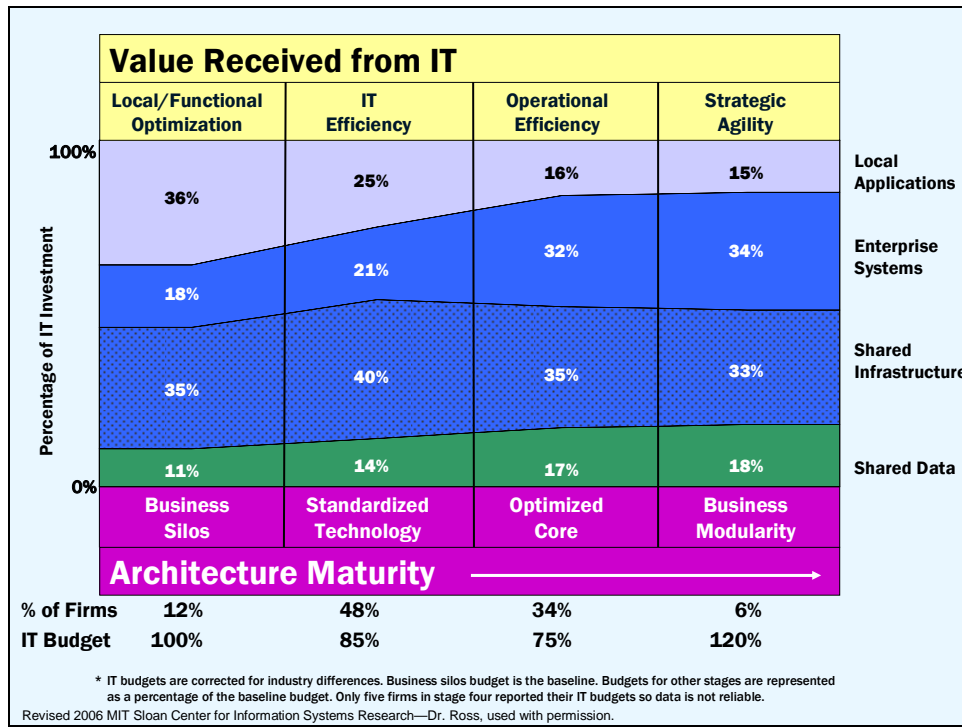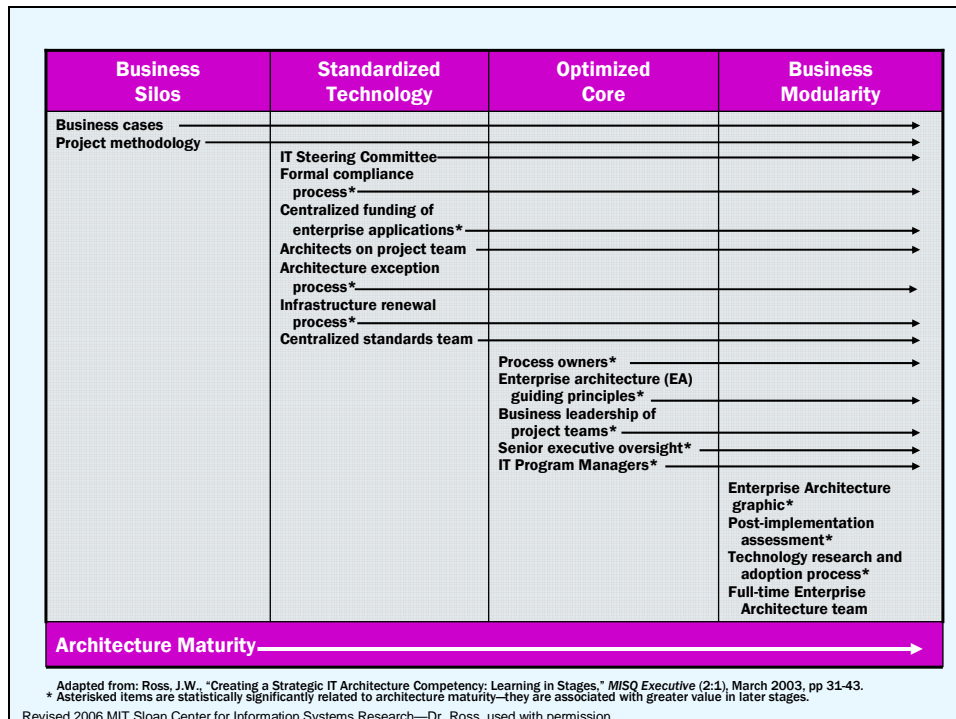
Figure 1: Architecture Maturity Stages

Value Received from IT

	Local/Functional Optimization	IT Efficiency	Operational Efficiency	Strategic Agility	
100%	36%	25%	16%	15%	Local Applications
	18%	21%	32%	34%	Enterprise Systems
	35%	40%	35%	33%	Shared Infrastructure
0%	11%	14%	17%	18%	Shared Data
	Business Silos	**Standardized Technology**	**Optimized Core**	**Business Modularity**	

Percentage of IT Investment (y-axis)

Architecture Maturity →

% of Firms	12%	48%	34%	6%
IT Budget	100%	85%	75%	120%

* IT budgets are corrected for industry differences. Business silos budget is the baseline. Budgets for other stages are represented as a percentage of the baseline budget. Only five firms in stage four reported their IT budgets so data is not reliable.
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Figure 2: Evolving Management Practices for Designing and Protecting Architecture

Business Silos	Standardized Technology	Optimized Core	Business Modularity
Business cases			
Project methodology			
	IT Steering Committee		
	Formal compliance process*		
	Centralized funding of enterprise applications*		
	Architects on project team		
	Architecture exception process*		
	Infrastructure renewal process*		
	Centralized standards team		
		Process owners*	
		Enterprise architecture (EA) guiding principles*	
		Business leadership of project teams*	
		Senior executive oversight*	
		IT Program Managers*	
			Enterprise Architecture graphic*
			Post-implementation assessment*
			Technology research and adoption process*
			Full-time Enterprise Architecture team

Architecture Maturity →

Adapted from: Ross, J.W., "Creating a Strategic IT Architecture Competency: Learning in Stages," *MISQ Executive* (2:1), March 2003, pp 31-43.
* Asterisked items are statistically significantly related to architecture maturity—they are associated with greater value in later stages.
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Generating Strategic Benefits from Enterprise Architecture

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Firms usually justify enterprise architecture initiatives by identifying cost benefits. While cost benefits may be the easiest to measure, many other benefits of enterprise architecture have been reported, including reduced development time, decreased IT-related risks, and increased business discipline. But the grand prize, when it comes to enterprise architecture, is strategic business benefits. Indeed, we would argue that enterprise architecture is such a long, hard journey that firms shouldn't undertake it unless they can envision how enterprise architecture will change the way they operate. Our study of 103 firms suggests that a strategic focus pays off. Firms that were most effective in achieving strategic objectives through enterprise architecture initiatives had greater profitability relative to their competitors.[1]

Our research focused on 4 strategic benefits:

- *Operational Excellence*, low cost provider, emphasizing efficient, reliable and predictable operations;

- *Customer Intimacy,* extraordinary customer service, responsiveness, and relationships, based on deep customer knowledge;

- *Product/Service Innovation*, first to market with innovative products and services, usually dependent on rapid R&D to commercialization processes (e.g. market leader);

- *Strategic Agility,* the ability to respond rapidly to competitor initiatives and new market opportunities.

Since different firms have different strategic objectives, we computed a strategic effectiveness score for each of the 103 firms in our study, based on the contribution enterprise architecture was making to each of the above four objectives relative to the stated importance of that benefit. We found that firms who are most effective at generating strategic business benefits from enterprise architecture share three characteristics distinguishing them from firms generating fewer strategic benefits.[2] (See Figure 1.)

Greater senior management involvement. High performers on strategic effectiveness enjoy greater senior management involvement in enterprise architecture planning and implementation. In particular, respondents more often credited their senior management teams with explicitly stating the requirements for enterprise architecture. But senior management involvement did not stop at the planning stage. Senior managers in these high performers were more likely than their counterparts in other firms to be able to describe their firm's enterprise architecture. They also provided oversight on architecture initiatives.

Senior management involvement is typically built into well-designed governance processes. For example, ING Direct, the international direct banking unit of Dutch conglomerate ING, has a modular architecture that allows individual banks to introduce new products and processes by deploying reusable application modules. This modular architecture is a key strategic asset at ING Direct. The firm leverages its architecture by relying on its Information Technology and Operations Council (the CIOs and COOs of the regional banking units) to coordinate local business strategies with the firm's IT Plan. The outcomes of these meetings serve as input to the ING Direct Council, where international business strategy is discussed and defined. In this way ING Direct's senior management team regularly guides and reinforces enterprise architecture, allowing IT capabilities to influence business strategy just as business strategy influences IT.

Architecture built into project methodology. Firms realizing strategic benefits from enterprise architecture have project methodologies emphasizing the importance of architecture. These firms involve IT architects early in project design and typically demand that projects pass an architectural compliance review. The IT architect role is pivotal in these firms.

For example, at one financial services firm, an IT architect is assigned to every project. The architect

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[1] We found a statistically significant relationship between the firm's reported profitability relative to competitors and a computed strategic effectiveness score that weighted the reported enterprise architecture benefits relative to the firm's strategic objectives.

[2] We compared the top 25% of firms on the strategic effectiveness score with the other 75% of firms.

reviews requirements and identifies any needed capabilities that are inconsistent with architecture standards. The architect is authorized to take actions in the best interest of the company—which may involve forcing a compromise on functionality to maintain architectural integrity or, conversely, allowing an exception to standard to meet a unique business need. As in most firms that have established a key role for IT architects, the architects in this firm play the additional role of establishing architecture standards. This means identifying when standard technologies are outdated. It also means identifying the need for new infrastructure capabilities and defining a standard before a new project chooses one by default. Recently, the firm defined an IVR standard in anticipation of a set of initiatives that otherwise would each have sought their own solution.

Greater architecture maturity. In earlier research we identified four stages of architecture maturity.[3] As firms mature their architectures, they position themselves for greater strategic impact from IT because their focus shifts from technology standardization and integration to IT-enabled process standardization and integration. The process of maturing involves transitioning from systems and platforms that resemble "cold spaghetti," to modular architectures suited to a plug and play business model.

UPS CEO Mike Eskew notes that his firm's centralized package database and the set of well-defined IT-enabled processes that capture and access that data are highly standardized. As a result, the firm can use package information in creative ways. As the firm has turned its attention from operational excellence to increasingly focus on customer intimacy, IT leaders have regularly identified opportunities for new services based on existing IT capabilities. Eskew refers to the proposals from IT as "happy surprises." These happy surprises are a direct result of having a more mature enterprise architecture.

Five Key Management Mechanisms

The three characteristics distinguishing firms who receive the greatest strategic benefits from enterprise architecture result from multiple management mechanisms. We identified five specific management mechanisms statistically related to the strategic effectiveness of a firm's enterprise architecture. In Figure 2 we list these mechanisms in decreasing order of their impact on strategic effectiveness. We also note the relationships between the management mechanisms and the distinguishing characteristics of firms

[3] See Ross, Jeanne "Maturity Matters: How Firms Generate Value from Enterprise Architecture," MIT Sloan CISR Research Briefing, Vol. IV, No. 2B, July 2004.

generating strategic benefits from enterprise architecture.

The most important management mechanism for generating strategic benefits from enterprise architecture is a clear statement of *enterprise architecture guiding principles.* Although an obvious prerequisite for architecture benefits, many firms lack clarity in their principles, thus making it difficult to design stable IT and business process capabilities in support of the firm's operating model. Not surprisingly, effective principles are correlated with all three of the distinguishing characteristics of high performing firms. We expect that the impact between senior management involvement and enterprise architecture guiding principles is mutually reinforcing. Similarly, architecture compliance reviews, architects on project teams, and the architecture maturity process, by virtue of applying principles, likely force their clarification.

A second management mechanism predicting strategic effectiveness is the writing of *business cases for architecture investments.* The main impact of the business case is seen in the architectural compliance review. For architects to determine when an exception is in the best interests of a firm, they need to understand the business case for the project. Good business cases force project teams to identify, in advance, exactly what strategic benefits they expect to derive from an investment in architecture. Articulating and measuring the proposed outcome helps to ensure its realization.

The third management mechanism is an *IT steering committee.* The steering committee has an impact on strategic effectiveness by virtue of engaging senior management in architecture. Steering committees are sometimes composed of senior executive team members. More often, a steering committee comprises senior IT leaders—typically divisional CIOs—who represent both local business interests and global IT interests in their collaborations. The members of high level IT steering committees work closely with senior executives, and the steering committee itself usually has overlapping membership with the senior management team in the person of the CIO.

A *one-page graphic* depicting high-level architecture is another valuable management mechanism. The graphic articulates expectations defined in the guiding principles, thus forming the basis for senior business executive architecture oversight. The graphic also supports the architecture emphasis of the project methodology.

Finally, a *technology research and adoption process* enables project architects to do their job. Technology research and adoption processes are characteristic of firms in more mature architecture stages, which may

explain why they are valuable to senior managers with responsibility for architecture oversight.

Conclusion

To justify the resources required to design and implement enterprise architecture, firms need to ensure they generate strategic benefits from their architectures. We have found that generating strategic benefits demands a sustained commitment to growing management's ability to define, implement, and leverage architecture. Firms should seize useful IT management and governance mechanisms to help them on their journey.

Figure 1: Differentiating Characteristics on Strategic Effectiveness of Enterprise Architecture

Characteristic	Low strategic effectiveness (n=78 firms)	High strategic effectiveness (n=25 firms)
Senior management involvement		
▪ Senior management explicitly defined architecture requirements	**25%** (of firms)	**44%** (of firms)
▪ Senior management oversees architecture initiatives	**45%** (of firms)	**60%** (of firms)
▪ Percentage of senior managers who can describe high level architecture	**19%** (of mgrs)	**39%** (of mgrs)
Architecture built into project methodology		
▪ Percentage of project teams with architects assigned	**49%** (of projects)	**81%** (of projects)
▪ Percentage of projects subjected to architecture compliance review	**60%** (of projects)	**80%** (of projects)
Median Architecture Maturity stage (1−4**)**	2	3

Figure 2: Management Mechanisms Supporting Architecture Effectiveness

	Senior management defines requirements	Senior managers oversee architecture	Senior managers can describe architecture	Project teams have architects	Projects subject to architecture compliance review	Median Architecture maturity stage
Enterprise architecture guiding principles	*	*	*	*	*	*
Business cases for architecture investments					*	
IT steering committee	*		*	*		
One-page graphic		*		*	*	*
Technology research and adoption process		*		*		*

* Asterisks indicate statistically significant relationship.

UNDERSTANDING THE BENEFITS OF ENTERPRISE ARCHITECTURE

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An enterprise architecture provides the organizing logic for business processes and information technology. Enterprise architecture defines a firm's desired levels of integration and standardization. As firms build out their enterprise architecture, they should realize a number of technology and business related benefits. Based on a survey of 100 firms, this briefing describes enterprise architecture benefits and how firms attained those benefits incrementally as they matured their business process and IT capabilities.

Technology-Related Enterprise Architecture Benefits

Enterprise architecture forces discipline and standardization in the management and use of technology. Discipline and standardization, in turn, lead to three types of technology-related benefits:

IT Costs

As management eliminates non-value-adding variations in technologies and relies on a set of relatively stable technical competencies, a firm can reduce two kinds of IT costs:

- *IT operations unit costs:* the actual cost of services such as laptop provision and support, help desk, application support, access to enterprise data, network capacity and email. Use of these services grows over time, but the unit costs should decrease.

- *Applications maintenance costs:* the time and total cost for making changes to existing applications to reflect business and technology changes.

IT Responsiveness

In a standardized environment, IT and business leaders have fewer technology choices and thus spend less time making technology decisions or addressing unexpected technical problems. The result is *reduced development time,* including both the elapsed time and total development hours required to implement a new system.

Risk Management

Cleaning up IT infrastructure, shared data and enterprise applications provides a more manageable IT environment. Manageability contributes to at least four risk-related benefits:

- *Reduced business risk:* the extent to which systems are consistently and reliably up and running as needed to support the business.

- *Improved regulatory compliance:* accessibility of accurate data to respond to government requirements.

- *Increased disaster tolerance:* the ease and speed with which backup and recovery services are rendered to minimize business losses.

- *Reduced security breaches:* avoidance of computer viruses and inappropriate access (both internal and external) to private or confidential data.

Business-Related Enterprise Architecture Benefits

Partly as a result of the technology-related benefits and partly as a result of more disciplined and standardized business processes, firms also generate business benefits as a result of their enterprise architecture efforts. These benefits are as follows:

Shared Business Platforms

Data and process standardization when combined with integrating technologies generate two valuable outcomes:

- *greater data sharing:* accessibility of data to internal and external persons who do not capture data initially but have a need to know.

- *integrated process standards:* reliability and predictability of IT-enabled business processes across locations and business units.

Managerial Satisfaction

Satisfaction is a subjective measure, but it is important for generating enterprise-wide commitment to architectural improvements and the organizational changes those improvements enable. Satisfaction captures the confidence of non-IT executives in the ability of the IT unit to deliver business value:

- *Senior management satisfaction with IT* reflects reactions of corporate leaders.

- *Business unit leader satisfaction with IT* reflects attitudes of managers to the impact of IT on local business results (e.g., costs, business value, service levels, reliability).

Strategic Business Impacts

The enterprise architecture targets business needs, which vary by company, but enable four important strategic outcomes.[1]

- *Operational excellence:* low cost provider, emphasizing efficient, reliable and predictable operations.
- *Customer intimacy:* extraordinary customer service, responsiveness, and relationships, based on deep customer knowledge.
- *Product leadership:* first to market with innovative products and services, usually dependent on rapid R&D to commercialization processes (e.g., market leader).
- *Strategic agility:* the ability to respond rapidly to competitor initiatives and new market opportunities.

At most companies, concerns about IT costs drive the initial interest in enterprise architecture, but we found that as companies mature their enterprise architectures, they are remarkably successful in generating all six benefits described above. In earlier research we described four stages of architecture maturity: business silos, standardized technology, optimized core, and business modularity (see Table 1 for definitions).[2] Figure 1 shows the technical and business related benefits at each maturity stage.

Growing Benefits Through Architecture Maturity

IT executives give low ratings on all six benefits for Stage 1 (business silo) architectures (typically lower than 2 on a scale of 0–5, i.e., not achieved to fully achieved), a clear reflection of the impacts from ignoring enterprise needs when creating solutions to local business needs. Over time the accumulation of local solutions becomes expensive and hinders new business initiatives, particularly those that cross silos. But, as the graphs show, firms achieve increasing benefits as they mature their architectures.

Benefits from Stage 2 (Standardized Technology)

Managers' ratings increased by at least 25% from Stage 1 to Stage 2 on all the metrics. The biggest increase in executives' ratings is on IT development

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[1] The first three strategic impacts refer to the disciplines described by M. Treacy and F. Wiersema in *The Discipline of Market Leaders,* Perseus Press, 1995. We have added strategic agility because of its growing importance to companies.

[2] See Ross, J.W., *Creating a Strategic IT Architecture Competency: Learning in Stages,* MIT Sloan CISR Working Paper No. 335, April 2003 or Ross, J.W., *Maturity Matters: How Firms Generate Value from Enterprise Architecture,* MIT Sloan CISR Research Briefing, Vol. IV, No. 2B, July 2004.

time. Managerial satisfaction also takes a steep climb, testimony to the lower cost, improved business platforms, and related business impacts. But while business and IT outcomes are higher in the second stage than the first, they are still generally low (under 3 on a scale of 0–5). These low ratings are an indication that, for most companies, Stage 2 is an important but early step on the journey toward a foundation for execution.

Benefits from Stage 3 (Optimized Core)

Managers' ratings of architecture benefits in the third stage are all higher than in Stage 2. The biggest differences between Stages 2 and 3 are the ratings on standard business platform and managerial satisfaction. These results are not surprising, since the third stage emphasizes development of shared process and data platforms. The large increase in IT executives' ratings on data sharing and process standardization indicate that the objectives of Stage 3 are generally realized. The improved satisfaction ratings are a result of having a standardized business platform with lower costs and more consistent quality. Both senior management and business unit management satisfaction ratings increased over 25% from Stage 2 to Stage 3.

The increase in ratings on risk management, IT development time and strategic business impacts are relatively small, probably because enterprise architecture initiatives in Stage 3 demand large-scale business changes and those changes can be slow—and risky—to implement. Stage 3 involves major new enterprise-wide systems implementations and transformational change. Thus the average rating on risk management is still under 3 (on a 0–5 scale). Development time has a rating of 2.7—most likely because enterprise projects in this stage are large and both IT and business expertise on the systems are limited. Strategic impacts received a similar rating, perhaps because strategic benefits do not accrue until late in Stage 3, when new capabilities are in place and management has learned how to leverage them. While the challenges to moving to Stage 3 are compelling, our findings suggest that companies are securing expected benefits. Managers at companies like Dow Corning and MeadWestvaco, for example, have noted that major enterprise systems cause significant discomfort before they start delivering measurable business and IT benefits.

Stage 4 (Business Modularity) Benefits

The cost improvements in IT level out by Stage 4, possibly because few firms have reached this stage, and implementing process modules with standard interfaces may introduce some initial learning costs. The payback is much more evident in the strategic impact of enterprise architecture initiatives. Overall, executives rated strategic business impacts (operational

excellence, customer intimacy, product leadership and strategic agility) 40% higher in Stage 4 than Stage 3. These benefits come from having a set of well engineered business modules providing a platform for execution and agility at a more granular level than that for Stage 3. For example, Citibank Asia created a credit card processing module that reduced processing costs by more than 50% and then reused this module to quickly enter new markets in Asia and Eastern Europe.

Improvements in strategic business outcomes are generated, in part, by faster IT development time (average rating up 37% over Stage 3). Whereas the third stage involved large-scale projects, Stage 4 involves reusing or customizing smaller modules. Faster development time should be a key benefit of achieving Stage 4 architecture maturity based on reusable modules.

Risk management and managerial satisfaction ratings increase slightly from Stage 3 to Stage 4. However, the standard platform rating drops significantly. The lower standard platform rating reflects both a potential benefit and a potential risk of Stage 4. The good news

is that companies can be very selective about what they standardize when they have adopted business modularity. Stage 3 can force some uncomfortable uniformity (e.g., an ERP forces process standards globally that, in some cases, may not represent a good fit). A benefit of Stage 4 is that it allows selective standardization by module instead of larger-scale business processes. On the downside, carelessness in Stage 4 can lead to a loss of discipline—some things that ought to be globally standardized won't be.

Building a Case for Enterprise Architecture

Enterprise architecture initiatives can involve dismantling legacy systems or redesigning business processes. The benefits of such efforts can be elusive. Our research suggests that firms should establish baseline measures for each of six benefit categories so they can monitor the value of their enterprise architecture initiatives. Our findings show that an effective enterprise architecture typically leads to lower IT costs, more senior management satisfaction and ultimately improved business performance.

Table 1: Architecture Stages Definitions

Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT applications serving local business needs	Clearly articulated technical platforms limiting choices and increasing efficiency	Standardized data or processes increasing organizational discipline	Business process modules plug & play enabling business agility

Figure 1: Business & Technology Related Enterprise Architecture Benefits

Technology-Related Benefits — CIO Rating vs. Architecture Stage

Cost Impacts (1)
IT Responsiveness (2)
Risk Management (3)

(1) Unit operating costs and application maintenance cost.
(2) Development time.
(3) Business risk, security breaches and disaster tolerance.

Business-Related Benefits — CIO Rating vs. Architecture Stage

Shared Business Platforms (1)
Managerial Satisfaction (2)
Strategic Business Impacts (3)

(1) Data and process standardization.
(2) Senior management and business unit management satisfaction.
(3) Operational excellence, customer intimacy, product leadership and strategic agility.