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☑ Research Briefings: a collection of short executive summaries of key findings from research projects.

☐ Case Study: an in-depth description of a firm’s approach to an IT management issue (intended for MBA and executive education).

☐ Technical Research Report: a traditional academically rigorous research paper with detailed methodology, analysis, findings and references.

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- Business Models and IT Investments
- Governing IT for Different Performance Goals
- Managing Emerging Information Technologies for New Business Initiatives
- Infrastructure as Variable Cost
- Managing IT Related Risks
- NSF Project on IT Impacts

CISR has recently embarked upon a new phase of industry-sponsored research, under the leadership of Peter Weill. Peter comes to CISR from Melbourne Business School and brings a strong practical research background in IT portfolio and IT infrastructure management.

CISR is co-located with MIT Sloan’s e-Business@MIT initiative and the Center for Coordination Science to facilitate collaboration.

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CONTACT INFORMATION
Center for Information Systems Research
MIT Sloan School of Management
3 Cambridge Center, NE20-336
Cambridge, MA 02142
Telephone: 617/253-2348
Facsimile: 617/253-4424
http://web.mit.edu/cisr/www

Peter Weill, Director  pweill@mit.edu
David Fitzgerald, Asst. to the Dir.  dfitz@mit.edu
Jeanne Ross, Principal Res. Scientist  jross@mit.edu
George Westerman, Res. Scientist  georgew@mit.edu
Jack Rockart, Sr. Lecturer Emer.  jrockart@mit.edu
Chuck Gibson, Sr. Lecturer  cgebson@mit.edu
Chris Foglia, Admin. Officer  cfoglia@mit.edu
Julie Coiro, Admin. Assistant  julieh@mit.edu
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DISTINCTIVE STYLES OF IT ARCHITECTURE

Jeanne Ross, Principal Research Scientist
MIT Center for Information Systems Research

Peter Weill, Director
MIT Center for Information Systems Research

IT architecture should enable business strategy. Most firms, however, have experienced architecture as a constraint to business strategy. Globalization, process reengineering, and e-business all demanded re-architecting IT as an early, costly step to organizational change. As firms re-architect, they want new architectures to position them for change. How can firms design IT architectures that support rather than constrain change?

Even where firms have invested in building powerful, new IT architectures, they have experienced limitations. For example:

- Delta Air Lines built a “Nervous System” that provided a publish-and-subscribe environment for its airline operations and customer experience processes. The architecture ensured that everyone with a need to know had perfect information on the status of flights, crews, and passengers. This architecture, however, did not support revenue planning, a task critical to ensuring profitable pricing and resource allocation.

- Dow Corning successfully defined and implemented a full set of global supply chain processes, based upon a single global ERP instance. The ERP-based architecture is not suited, however, to R&D, a capability the firm considers essential for long-term competitiveness.

- Citibank Asia developed a highly efficient and effective architecture for consumer banking transactions such as check cashing and credit cards. The firm can literally drop the architecture into place as it initiates operations in new countries. The architecture was not designed, however, to meet the requirements of Internet banking, which is becoming increasingly important.

These firms have demonstrated that a powerful IT architecture is tied to core processes. Because firms have multiple core processes with varying information processing requirements, architectures built to support one key process or operation—regardless of how core that process is—will not support the information and transaction processing requirements of the entire firm.

Delta’s IT management addressed this limitation by defining a set of “architectural styles.” These styles distinguish the real-time processing requirements of airline operations from the decision support requirements of revenue planning and from the ERP environment that supports administrative processes. Based on Delta’s concept, we define an architectural style as a firm-wide definition of a technology and operating environment for a distinctive family of business processes. We have observed that the concept of architectural styles can be useful to any firm that is migrating its IT architecture from the applications-centric orientation of most legacies to a process-centric orientation.

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1 The authors would like to thank Pervez Kazmi and Shafeen Charania of Microsoft Corporation for their contribution to this research. A working paper on this topic will be available in Spring 2002.

2 We define IT architecture as the organizing logic for key information technology capabilities and the rules for preserving that logic. As such firm-wide architecture effectively specifies the firm’s strategic options.


We have studied IT architectures at eight global firms. Across the firms we have identified five architecture styles that capture most of their information processing requirements. Each style defines a generic set of information processing characteristics, business objectives, and operational demands for a set of processes. Figure 1 outlines some key characteristics for each of these styles. Examples of the types of processes that each style supports include:

- **High-volume transaction processing** architecture style is well suited to large batch processes, such as credit card and check processing, billing, lottery sales, auctions, and some POS transactions.
- **Real-time response** style is important to airline operations, logistics provisioning, brokerage, online catalog sales, and personal banking.
- **Analytical and decision support** style addresses the needs of commercial credit operations, production and inventory planning, airline revenue planning, and market segmentation.
- **Work group support** style is critical to collaborative environments, such as consulting, R&D, project management and publishing.
- **Enterprise systems** style utilizes purchased software packages such as ERP, CRM, and product data management systems. They support supply chain processes, call centers, financial reporting, human resource administration, and sales forecasting.

Recognizing and building a firm’s key architecture styles cannot eliminate the pain of organizational change, but it can enhance organizational flexibility in a number of ways.

First, in mapping a firm’s core processes to architecture styles, a firm defines its to-be architecture. By comparing the to-be architecture with the firm’s as-is architecture, senior IT and business executives can identify where the existing architecture imposes the most severe limits on organizational strategy. This establishes priorities for IT investment. Firms cannot afford to build infrastructures for all architectural styles at once, but they can map their investments in light of building out their most critical style or styles.

Second, defining styles and the processes they enable can help a firm identify parameters for shared infrastructure. The requirements of the different styles will lead to differing technology infrastructures, but some elements of technology can be shared across multiple—or even all—a firm’s styles. For example, at UPS, the high-volume transaction processing style that supports package delivery does not address the needs of UPS’ logistics operations. But the firm’s centralized operations facility and elements of its network and security infrastructure support its real-time response style.

Third, establishing a technology infrastructure for each style facilitates technical standardization and focuses development of technical expertise. Most firms have standards—usually multiple standards—and processes for considering exceptions to those standards. The architecture styles concept recognizes the need for multiple—but finite—numbers of technology standards. In implementing a new style, a firm recognizes the need to define a new platform. This reserves the exception process for unique needs within styles.

Finally, architecture styles highlight integration requirements and challenges. While some processes within an organization fall clearly into an architecture style, others present options. For example, firms with complex billing requirements could address them with either an ERP (enterprise system) or a high-volume transaction processing style. Call center operations can be supported with a CRM (enterprise system) or real-time response style. The choice will depend on which style(s) a firm has in place and how the firm defines its integration requirements. As a firm makes these choices, it also highlights the integration requirements across styles. In many cases, these requirements will define the need for data warehouses or middleware and will clarify the firm’s high-level architecture.

We believe that relying on architecture styles to help shape a firm’s architecture will also help firms define strategic options. Each style demands different technical and organizational competencies. A growth opportunity that leverages an existing style offers faster payback than a growth opportunity demanding a new style. In this way, IT architecture styles represent core competencies, specifying how a firm is flexible to change and how IT architecture will constrain future strategies.
Figure 1: Profiles of the Architecture Styles

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<th>Real-time Response</th>
<th>Analytical &amp; Decision Support</th>
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<th>Enterprise System</th>
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<td>Distinguishing Characteristics</td>
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<td>Integrating Technology</td>
<td>New code</td>
<td>Middleware</td>
<td>Data warehouse</td>
<td>Shared technology platform</td>
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VALUE CREATION IN MOBILE COMMERCE

Sirkka Jarvenpaa
Center for Business, Technology, and Law
University of Texas at Austin

M-business, or Mobile Internet, extends Internet-related business to the point where not only information, but also services, key business processes and structures are available anytime, anywhere, to anyone. So far, m-business services have been disappointing in terms of new value generation. The lack of value has been particularly disappointing because the early promises of mobile Internet included “billable” online content, improved efficiency of existing transactions, and the emergence of new peer-to-peer transactions. Perhaps at fault was the slow, unreliable, non-standard wireless technology, but a more serious problem was the limited conceptions of value drivers for mobile business investments. To understand the emerging business models, we must first understand the value drivers.

Value Drivers

We know from past IT successes that information technology can generate new value by

1. Increasing a firm’s efficiency;
2. Leveraging and exploiting pre-existing firm resources and capabilities via complementarity (e.g. cross-selling);
3. Creating “lock-ins” in buyer-supplier relationships; and
4. Introducing novel exchange mechanisms and transaction structures. The disappointment in mobile value creation is partially due to the lack of exploitation of more than one value driver.

One of the lessons learned from e-business research has been that substantial new value generation requires leveraging more than one driver. Our research on m-business so far suggests that the disappointment in mobile value creation is partially due to the lack of exploitation of more than one value driver.

Research Study

We examined the question of value drivers for mobile commerce through field and phone interviews with 20 companies that had launched mobile Internet services either within the firm or in customer environments. The firms represented a wide diversity of industries (content providers, service operators, intermediaries and infrastructure firms) and geographic locations (firms headquartered in the U.S., Hong Kong, Japan, Sweden and Finland). The interviewees held positions such as mobile commerce director, e-business manager, chief information officer, user line manager, senior consultant and chairman. The interview explored questions such as “What is your vision for mobile services? What is the value proposition of the service…revenues and other benefits each participant receives from this mobile service? How do you see this value proposition evolving?”

Key Findings

We analyzed the m-business applications through the value driver framework. The findings included:

1. Half of the m-business services relied on one value source—efficiency.
2. A quarter of the services relied on two sources—efficiency and complementarities.
3. The “lock-ins” required lock-in within a network, not just a service provider. Japan’s i-mode was the most vivid example.
4. Novelty in structures or governance of mobile services was yet to materialize (except the case of Japan’s NTT DoCoMo).

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1 This study was funded by Advanced Practices Council of Society for Information Management. Sirkka Jarvenpaa was a visiting professor at CISR in 2001.
As was the case with prior information technologies, initial m-business services were typically efficiency-driven. The services made mobile users more independent of time and place, facilitated faster decision-making and introduced new levels of flexibility between workers and their immediate work groups. Mobile services also made the information flows more efficient at the work group level, thus reducing time lags in critical business processes, and often leading to indirect positive effects such as improved customer service. For example, a mobile crew notification system at a major airline dramatically reduced time lags in the flow of information between the operations center and globally dispersed crew members. In another firm’s sales automation project, salespeople equipped with mobile devices spent less time in the office and more time in the field with customers. Contractors at another firm’s construction sites ordered electronic component parts without having to return to their offices.

Much of the initial impetus for these applications was the push of “new mobile technology advantages” or the pull of “always on and connected mindset” among users/customers. Since the content of information, the user roles or who owned the data or transaction remained largely unchanged by the mobile service offerings, mobile services had minimal impacts on business architecture. To minimize the architectural impacts, many firms initially relied on third parties to develop and host applications. Those firms that built in-house capability “virtualized” the mobile service by building a middleware layer between the mobile service and the enterprise applications. In summary, the first generation of mobile services rallied around “efficiency.” They generated value within the existing business model, necessitating minimal changes in the user’s behavior and minimal “irreversible” technology investments in firms’ business architectures.

Those services that relied on multiple value drivers—for example efficiency and complementarities—generated more value. For example, brokerage houses used mobile services complementing their existing channels. Complementary value came from the integration of information and potential product flows from other existing service platforms. The implementation of complementary value also implied greater investments in a service provider’s business architecture.

Japan’s highly successful i-mode service by NTT DoCoMo was the only example studied that leveraged all four sources of value: efficiency, complementarity, lock-in and novelty. NTT DoCoMo heralds this service as highly profitable suggesting successful value capture. Value sources included:

- **Efficiency**: An i-mode customer had access to over 50,000 websites (official and unofficial partner sites) with a rich mix of free and fee-based online content. I-mode engendered quality competition among sites within a category (e.g. games, dating services, weather) of the “I” menu (the directory on the handset’s start-up menu). The over 1,500 official i-mode affiliates provided fee-based content sites. Being part of the i-mode menu billing system lowered their marketing, selling and personal costs.

- **Complementarities**: Because of the 1,500 affiliates, an i-mode user is exposed to a wide range of complementary products. A large number of content providers allow cross selling. The complementarities further expand to both i-mode customers and partners when the unofficial sites are considered.

- **Lock-in**: The monthly subscription fees to the fee-based content sites encourage repeat purchases. The personalized i-menu options similarly encourage lock-in. Content providers (i.e., official affiliates) have high switching costs because i-mode demands unique content and investment in sites that are accessible directly from the i-menu.

- **Novelty**: NTT DoCoMo is recognized as a pioneer in mobile transactions particularly in the way it has nurtured content creation by the voluntary community of individuals, interest groups and amateur entrepreneurs who use its services.

The value proposition from mobile applications must be compelling to whet the appetite of potential customers, particularly given the considerable uncertainty about the underlying wireless infrastructures, access protocols and the glut of user devices. M-business offerings need to incorporate a bundle of value drivers for users to realize the value and pay for services. Figure 1 summarizes the sources of value in m-business. We expect that the more quadrants a new m-business addresses, the more success will be achieved.
Figure 1: Sources of Value in M-Business

**Fundamental User Behavior Changes**

<table>
<thead>
<tr>
<th>High</th>
<th>Novelty in structures &amp; governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock-in</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>Complementarities</td>
</tr>
<tr>
<td>Low</td>
<td></td>
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</table>

Degree of Change in a Provider’s Business Architecture
IT infrastructure as services

IT infrastructure is the foundation of IT-budgeted for IT capabilities that are made available throughout the business as services. The services notion of information technology infrastructure is very powerful as managers can more readily value a service than a component such as a server. For example, the service of providing a fully maintained laptop computer with access to all of the enterprise’s systems and the Internet can be specified, measured, and controlled in a service level agreement. Perhaps most importantly, managers can price services in the marketplace for comparison.

Infrastructure services are deployed at several levels and the location is an executive decision

Where to place the IT infrastructure capability (e.g., enterprise-wide or in a business unit) is a strategic decision depending on the principles for doing business across the enterprise (see Figure 1). Many enterprises are creating or expanding shared IT infrastructure services units (point B on Figure 1) dropping infrastructure out of the business units (point A on Figure 1) driven by business maxims such as “a single point of customer contact” or “capitalize on our economies of scale.”

IT infrastructure services: ten capability clusters spanning seventy services

An integrated IT infrastructure combines all the enterprise’s shared IT capability into a platform for electronically conducted business. The Executive Vice President of Customer Service at Delta Airlines describes their integrated IT infrastructure as a digital nervous system and explains how it is used:

The whole notion around the digital nervous system is if we were to have a change in our operations control center—let's say a cancelled flight—with one or two entries, that information would be pushed into all of the operating and customer groups without an individual or 25 individuals having to actually access or send that information. The information would come to the reservations call centers; it would go to the
airports; it would go to the Crown Room Clubs. It would actually go to customer PDAs, cell phones, beepers; even customers’ laptops, giving them the information around the fact that Flight 222 from Washington to Atlanta has cancelled, and we’ve rebooked you on Flight 223 that leaves two hours from now.3

A complex integrated infrastructure like Delta’s requires a large number of services bound together to create a unique capability for the enterprise. Studying the infrastructure services provided by 89 enterprises revealed a total of 70 different infrastructure services in ten capability clusters (see Figure 2).4

An integrated infrastructure provides capability to the enterprise’s IT applications which connect via specified standards depicted by the five short rods on the top of the infrastructure in Figure 2. The infrastructure connects externally to business partners via agreed standards to business partners as illustrated at the bottom of Figure 2. Access to the infrastructure is via integrated electronic channels. Usually the channels include all or some of: a physical outlet (e.g. store or branch with point of sale device); web, email, physical mail (scanned); interactive voice response; wireless devices such as cell phones; kiosks; and a direct point to point connection (e.g. private network). Integrating all of the channels to the customer to deliver a single picture of the customer’s relationship with the enterprise is a significant challenge. All communications pass through a security and risk capability including the provision of firewalls, security policy (e.g. remote access, encryption, use of passwords, etc.) as well as disaster planning and recovery. The electronic interactions within the enterprise and with customers and partners occur via the set of communications services. A key asset in an electronically connected business world is enterprise data including information on customers, products, processes, performance and capabilities. Enterprises are striving to manage these key data assets independent of applications and make them available on an enterprise-wide basis.

On top of the data sits a series of infrastructure applications—applications that are shared and standard across the enterprise. These often include enterprise-wide applications that support shared services in areas such as accounting, human resource management and budgeting. IT facilities management spans the physical infrastructure layers on the platform described so far, providing services such as large scale processing, server farms and a common systems development environment.

The six preceding infrastructure capability clusters comprise the physical layer of infrastructure capability. The following four clusters are the management-oriented infrastructure capabilities. The IT management services coordinate the integrated enterprise infrastructure and manage the relationships with the business units. Typically the management services include IS planning, project management, service level agreements and negotiating with vendors and outsourcers. The IT architecture and standards infrastructure services spans the physical layers of infrastructure services and connects directly with IT management, IT research and development and often customers and partners. The IT architecture and standards services are a set of policies and rules that govern the use of information technology and plot a migration path to the way business will be done in the future. IT education and training includes training in the use of the enterprise’s specific technologies and systems and well as more general management education about how to envision, invest in and use IT to create business value. IT research and development includes the enterprise’s efforts to look for new ways to use IT to create business value and to evaluate proposals for the use of new technologies.

A superior IT infrastructure contains an integrated set of services in each of the ten capability clusters consistent with the enterprise’s strategic direction. Enterprisew that compete by having above industry average strategic agility via IT will have more services in each capability cluster and more expansive implementations of each service, each with more demanding service level agreements.

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4 A full list of the 70 infrastructure services comprising each of the infrastructure capability clusters is provided in the working paper along with details of patterns of capability found in different enterprises.
Figure 1: IT Infrastructure can be deployed at multiple levels

![Diagram of IT infrastructure with multiple levels and shared/centrally coordinated areas.]

Figure 2: An Integrated IT Infrastructure with Ten Capability Cluster

![Diagram of an integrated IT infrastructure with ten capability clusters including IT Education, IT R&D, IT Architecture & Standards, IT Facilities Management, Application Infrastructure, Data Management, Communication, Security & Risk, and Integrated Electronic Channels.]

- Enterprise-wide Infrastructure
- LOCAL IT
- Corporate Infra
- Public Infrastructure (e.g., Internet, Vendors, Telco’s, Industry Networks)
- Order processing
- Knowledge management
- Financial management
- Home page
- PC/LAN service
- Electronic mail
- Large scale processing
- Customer database
- Electronic exchanges
- Telecommunications
- Service providers
- Banking industry networks
- Customers, Business Partners, Public Infrastructures
CRITICAL SUCCESS FACTORS: A 2002 RETROSPECTIVE

John F. Rockart, Senior Lecturer
MIT Sloan School of Management

More than twenty years ago I described an approach, in the Harvard Business Review, enabling executives to focus on the few things that were most important for the business. The purpose of the article was to help executives determine their own information needs. Since then the Critical Success Factors (CSFs) concept has proven to be even more useful in helping management teams focus on what is critical for their organizations. As I still receive many calls asking how to “most effectively carry out a CSF study” this briefing provides some retrospective guidelines.

CSF’s follow an age-old literature on the need for managerial focus. In 1979, I defined CSFs as:

...the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas in which ‘things must go right’ for the business to flourish.1

To understand their CSFs, managers must step back from the all-too-involving day-to-day issues and think deeply about what is really critical for the future of the organization. Although this sounds simple, it is not. Without careful thought and a structure, superficial, and incorrect, factors often result. Although the CSF process usually takes six to twelve hours of each manager’s time, the success rate is good.

While working with a single individual is both interesting and fruitful, it is reasonably straightforward and was described in the HBR paper. However, working with a management team is much more complex. The process involves dealing with a sometimes-difficult set of relationships among the leaders of an organization while providing the role of the facilitator. Done well, knowledge is developed on both sides. Significant decisions are made and positive action results.

Drawing upon my own experience working directly with companies and my involvement in, or review of, CSF work done by consulting companies, some clear patterns have emerged. Typically, developing CSFs is a three-step process.

The three steps include (1) an introductory workshop explaining the concept to management with compelling examples; (2) interviews with the management team and other key employees. From these interviews a set of CSFs are developed by the facilitator to use as a starting point for the discussion. This initial set of CSFs is then (3) presented in a “focusing workshop,” often a day long, encouraging the management team to fully debate what is critical to the organization. By the end of the workshop, the organization’s CSFs and a set of action programs emerge.

The introductory workshop. The workshop usually consists of a 30–45 minute presentation about the CSF concept and steps in the study. Questions arise and are answered, often with examples. The introductory workshop is designed to involve and gain commitment of the senior management team to the process.

An equally important part of the workshop is the understanding the facilitator gains about the management team. The facilitator is looking for signs among participants of three potential causes of later problems: a failure to understand the process, negativity or a lack of interest. Failure to understand or accept the importance of CSFs sometimes happens. Managers with well-defined strategies and operating plans may not see the need for an additional process. It is critical to note negative behavior, as it usually is the symptom of a deeper concern that must be addressed. In one case, a clearly paranoid manager believed that the study was targeted at him. Disinterest on the part of the CEO can also kill a study. In one organization the CEO was in and out of the introductory workshop. Others noted his example and people questioned whether the study should proceed. Although the study did proceed, it was far from a success.


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The Interviews. There are two major approaches to interviewing the management team: as a group or individually. Group interviews are less time consuming and can result in a workable set of CSFs. However, to acquire a deeper understanding of an organization and what should be done to improve effectiveness, I strongly favor individual interviews.

Group interviews of a management team can suffer from several factors. First, knowing others will be there to respond, each individual is not required to think deeply about the organization’s CSFs prior to the interview. Second, in some organizations, there is a tendency to “follow the leader” as he or she speaks. Finally, much valuable information about what is really critical in the organization often comes from the comments of managers below the top management team. These managers are rarely included in a group interviewing session.

I usually interview about 20 people, including all the top management team and some second line managers. I find it useful to ask to meet with the “up and comers” in the organization among the more junior managers. For individual interviews, people must come prepared. Most will have thought about the relevant CSFs during the introductory workshop and the evening before the interview. Time and time again, I find participants arriving at the interview with a sheaf of notes and a clearly defined set of CSFs. After stating their views, many will ask what the interviewer has heard from others. Making use of this interest, the interviewer can test his evolving ideas about the organization’s CSFs in a later discussion, being careful to maintain the confidentiality of individual sources.

The Focusing Workshop. This is the crux of the process. There are three parts to this workshop—discussion, agreement on CSFs and development of actions.

1. Discussion. No matter how carefully the facilitator has listened and analyzed the interview data, the CSF’s presented will not be gratefully accepted by all members of the management team. Even if the facilitator has done a perceptive job, there is bound to be extensive discussion and, sometimes, hostility on the part of some to the suggested CSFs. I have encountered four reasons for this lack of acceptance. First, some of the material is new to some participants and they work hard to question and understand it. Second, in most studies, there are one or more participants whose pet projects, perhaps fundamental to their function, are not on the critical list. Third, there can be a none-too-subtle shift implied by the CSFs in the direction of the organization and, thus, in the power of individuals. For example, in one case, a member of the top management team could clearly see in the discussion that a strategic thrust he had championed would be put on the backburner. Fourth, the discussion can lead to major changes in the way that the management team views the business. In another study, after much heated discussion, the senior management team realized from their newly developed—but, impractical—CSFs that the strategy they had been following was badly flawed. The actions that were critical to that strategy could not be effectively carried out. A competitor was in a much stronger position with regard to these few critical factors. This team spent two extra days rethinking their strategy. Typically, this discussion part of the workshop takes four or five hours but it can go longer.

2. Agreement on CSFs. The next step in the focusing workshop is agreement and commitment by the management team to the CSFs. This step is easy given an effective discussion. If not, much more discussion will follow.

3. Development of Actions. The development of action plans is the final step of the workshop. CSFs, no matter how well thought through, are just a set of words. The management team must translate the CSFs into action. I usually ask each member of the group to write down the three or four key actions that the CSFs imply. Each of these is put on the board, aggregating like actions. While the discussion of these actions can take a while, if the CSFs are clear, it is interesting how quickly a set of actions, 6–12 in my experience, are agreed upon. In one case it took less than an hour for a management team to agree upon eight actions that they knew would cost several tens of millions of dollars. In another, the key action program involved a major change in one line of business. The stage is thus set for the assignment of leaders for each action program. Measures for success, accountabilities and the implications for budgets are next. The measures for success can then be translated into information needs for the senior management team to lead and monitor the change.
**Figure 1: The CSF Process**

- **Introductory Workshop**
  - Introduction to the CSF concept
  - Introduction to the CSF process

- **Individual Interviews**
  - Interviews with ~20 key executives and managers
  - Each lasts 1 to 1-1/2 hours
  - Individual views on the organization's CSFs discussed

- **Focusing Workshop**
  - One-day workshop with senior management team
  - CSFs developed through the interviews debated
  - Action programs developed

- **CSFs**
  - Output from the workshop

- **Actions, Programs & Projects**
  - Equally important output from the workshop
  - Provide focus on what must be done to move forward in critical areas
STAGES OF IT ARCHITECTURE:
PURSUING ALIGNMENT AND AGILITY

Jeanne Ross, Principal Research Scientist
MIT Center for Information Systems Research

Peter Weill, Director
MIT Center for Information Systems Research

For almost 100 years Johnson & Johnson, a global consumer and health care company, achieved success as a decentralized firm. By the early 1990s, J&J had over 160 autonomous operating companies, but the company had encountered a powerful new breed of customer, who had no patience for the multiple salespersons, invoices and shipments characteristic of doing business with multiple J&J companies. J&J’s IT capability paralleled its organizational structure. To meet customer demands, the firm moved toward a new, more centralized and standardized, information technology architecture that enabled greater information sharing across operating units.

Like J&J, many firms have found that changing market conditions occasionally force changes in business models. But a firm’s IT capabilities—embodied in its architecture—are usually designed to enable its existing business model. As the pace of business strategy change accelerates, firms frequently find that their IT capability is not aligned with their business strategy. How can firms maintain alignment between business strategy and IT—via a strategic view of IT architecture?

Our research indicates that firms can achieve greater business–IT alignment through a new view of IT architecture that emphasizes both flexible architectural designs and a habit of designing business strategies to leverage existing IT capabilities.

Both flexible architectures and new habits take time to evolve. The concept of architecture maturity stages can help firms track their progress toward these goals while reaping steadily increasing benefits from their IT capabilities.

Figure 1 presents an overview of four architectural stages. As firms move from left to right through the stages, they develop reusable capabilities and greater flexibility. Firms undergo three important transitions as they move through the stages: (1) from an application-centric to a data-centric approach to building IT capability; (2) from a reactive to a proactive approach to IT-business alignment; and (3) from business cases focused on isolated ROIs to portfolio-oriented justification processes focused on strategic objectives. (See Figure 2.) The stages differ in their relative distribution of resources among IT applications, infrastructure (defined here as the shared technology base) and data as reflected on the vertical axis of the model.

In the first stage, Application Silos, a firm invests most of its IT resources in functional applications with a small investment in a data center that performs centralized transaction processing. In the early 1990s, most firms were in this stage. They funded applications based on the individually calculated costs and benefits of inserting technology into a narrowly defined process.

The first stage allows functional optimization, but firms burdened with Application Silo legacies have found their IT capability inflexible to changing business needs (e.g., difficulties in developing e-business applications requiring straight through processing). Application silos are expensive to maintain and slow to build. As firms create complex webs of applications, they become progressively slower and support becomes more expensive.

In an effort to reduce IT costs and enable integration across functions and business units, firms move into the second stage, Centralized Core. In this stage, resources are shifted from application development to infrastructure development as the firm extracts infrastructure from applications and introduces

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1 This research was made possible by the support of CISR sponsors and in particular, CISR patron Microsoft Corp.
3 We define IT architecture as the organizing logic for key information technology capabilities and the rules for preserving that logic.
enterprise-wide standards for technologies and systems. The firm also invests in data, creating data warehouses to collect historical data for analytical purposes.

Firms of all sizes, including large, global firms like Johnson & Johnson, Citicorp and DuPont, realize significant benefits from standardizing on a core set of technologies. Technology standards enable them to reduce costs by limiting skill requirements and technical complexity. Reduced technical complexity also facilitates cross-functional integration. Firms implement a Centralized Core architecture to align with existing or intended organizational structure rather than strategy. A firm’s strategy is embodied in its processes, and the Centralized Core architecture does not align with business processes.

Firms in the third stage, Hardwired Business, build their key IT capabilities around their core business processes, and thus align architecture with business strategy. In this stage firms further diminish the relative proportion of resources spent on applications because core transaction processes become “wired” into the infrastructure. Investment in data increases as firms create large databases of transaction data for use in integrated systems.

Hard-wired firms look for opportunities to leverage their IT capability. At UPS, for example, strategy is partly driven by the question, “What can we do next with our package data to provide services for our customers?” UPS hardwired its business by developing a set of systems around its DIAD, a technology that captures an electronic signature at the time of package delivery. Similarly, Citibank Asia built an IT capability around its branch banking processes, which it leverages both by dropping the infrastructure into new branch banks throughout the region and by adding new customer services like life stage marketing. Many manufacturing firms have hardwired their supply chain processes through packaged enterprise resource planning, supply chain and customer relationship management systems.

Hardwiring provides speed to market with services that extend the core business. Hardwiring does not provide strategic agility. To position itself for a broader range of strategic options, a firm must move into the fourth stage, Modularity. This stage involves isolating data from existing processes and creating reusable technology components. Then, when new business opportunities arise, a firm can leverage its data and technology components.

Resources in the Modularity stage are focused on developing reusable components and building and maintaining data stores wrapped in middleware for easy access. Applications in the Modularity stage are focused on experiments for testing new business concepts. This allocation of resources allows a firm to expand rapidly into adjacent businesses by assembling appropriate components to follow up on successful experiments.

The development of components, both internal and vendor-provided, is in early stages, so few firms have moved into the fourth stage. Firms like Delta Air Lines are moving toward Modularity by categorizing their business processes according to architectural styles and developing competencies in the critical styles. This positions the firm for increased componentization by developing platforms that are reused by business processes with similar processing requirements.

Different business units and processes within a firm will likely move through the architecture stages at different points in time. We recommend that firms move core processes first because they will provide the greatest opportunity for leveraging IT capabilities. Large, diversified firms may never find value in moving beyond the Centralized Core as an enterprise (although business divisions or customer segments will benefit from migration to more mature stages).

Each stage of maturity builds on the learning of prior stages. Thus, it is difficult for a firm to skip a stage. In fact, some of the dramatic failures in ERP implementations have resulted from trying to move too abruptly from Application Silos to Hardwired Business. We propose the Architecture Maturity Stages Model to help firms recognize appropriate management and alignment techniques for their given stage while they plot the migration to the next stage. Having a picture of the likely stages of evolution should facilitate the learning process as firms attempt to develop architectures that present strategic opportunities instead of just responding to them.

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Figure 1
Views of Architecture

![Figure 1: Views of Architecture](image)

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Figure 2
Architecture Stage

<table>
<thead>
<tr>
<th>IT Capability</th>
<th>Application Silos</th>
<th>Centralized Core</th>
<th>Hardwired Business</th>
<th>Modularity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Silos of applications with a data center for efficient transaction processing</td>
<td>Firm-wide technology standards; centralized or federal IT organization; data warehouses for shared data</td>
<td>Infrastructure includes core transaction processing; data integration for cross-functional processes</td>
<td>Components of technology, data &amp; code; middleware provides access to shared data</td>
</tr>
<tr>
<td>Approach to Alignment</td>
<td>React to local needs</td>
<td>React to enterprise-wide needs</td>
<td>Create opportunities for core business support</td>
<td>Create opportunities for new business models</td>
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<td>Business Case for Architecture</td>
<td>ROI of applications</td>
<td>ROI of standardization</td>
<td>Speed to market</td>
<td>Strategic Agility</td>
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<td>Key Learning</td>
<td>Technology-enabled change management</td>
<td>Standardization and exception management</td>
<td>Process integration for customer responsiveness</td>
<td>Practices facilitating reusability</td>
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IT INFRASTRUCTURE FOR STRATEGIC AGILITY

Peter Weill, Director  
MIT Center for Information Systems Research  
Mani Subramani, Assistant Professor  
Carlson School of Management  
Marianne Broadbent, Group Vice President, Gartner Executive Programs Worldwide

Investing in IT infrastructure is one of the most challenging tasks facing senior executives who often feel ill equipped to make these decisions. Investing in the right infrastructure at the right time enables rapid implementation of future electronically based business initiatives and cost reduction of current business processes.

This briefing presents a framework for senior executives to view IT infrastructure in business terms, enabling executives to make informed investment decisions. We studied 180 electronically based business initiatives in 89 top performing enterprises and identified the specific infrastructure capabilities needed for different types of business initiatives. A well-developed integrated IT infrastructure has ten clusters of IT infrastructure capabilities fine tuned to the enterprise’s set of electronically based business initiatives (see first briefing referenced in footnote and Figure 1 below).

Types of electronically based business initiatives

Strategic agility is the enterprise’s ability to readily implement desired business initiatives. Many elements contribute to an enterprise’s strategic agility including customer base, brand, core competences, employees’ ability to change and infrastructures. We focus here on IT infrastructure that can enable or hinder strategic agility for electronically based business initiatives.

Electronically based business initiatives have an almost unlimited scope. To help understand IT infrastructure requirements for these initiatives, three classifications of business initiatives are useful. Together they map out the different types of strategic agility that enterprises seek: (a) position on the value net (i.e., supply, internal, demand), (b) type of exchange (business to business—B2B, or business to consumer—B2C) and (c) type of innovation (i.e., new product and/or market). Examples of initiatives studied and classified by type include:

- A Web site to disseminate the request for, and submission of, tenders for a water utility’s engineering works (Supply/B2B/Existing Product/Market).
- Monitoring retail flooring product sales by a manufacturer to reduce lead times and inventory (Demand/B2B/Existing Product/Market).
- Online reservation systems to streamline bookings at franchisee and co-owned hotel properties (Demand & Internal/B2B/Existing Product/Market).

For each type of strategic agility we identified the clusters of high capability IT infrastructure possessed by the enterprise and the location of that capability (enterprise-wide or at the business unit level). Figure 1 describes the clusters where high infrastructure competencies (i.e., well above industry average) were found for different types of initiatives on the value net. Figure 2 summarizes the infrastructure needs for all types of initiatives. The infrastructure needs were determined by identifying statistically significant correlations between an enterprise’s business initiatives and the strengths in their infrastructure clusters.

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1 This research was made possible by the support of CISR sponsors and, in particular, CISR patron Gartner. This is the second of two research briefings derived from a CISR research project “IT Infrastructure for Strategic Agility.” The first briefing, “A Senior Management Briefing on IT Infrastructure” by Peter Weill, Mani Subramani and Marianne Broadbent, Volume II Number 1C February 2002, should be read in conjunction with this briefing. For more detail refer to CISR Working Paper No. 329, April 2002 “IT Infrastructure for Strategic Agility” by Peter Weill, Mani Subramani and Marianne Broadbent.
We drew the following lessons from these top-performing enterprises:

- Leading with electronically based initiatives in any position on the value net required substantial IT infrastructure, including some high capability clusters. Infrastructures that support supply-side and internal initiatives are the most similar. A high capability in IT architecture and standards is needed for strategic agility in any or all three positions on the value net. Executives consistently reported that IT architecture and standards was the hardest infrastructure capability to do well.

- Leading with demand-side initiatives required predominantly high capability infrastructures enterprise-wide rather than at the business unit level.

- A high capability data management cluster is important for leading on initiatives throughout the value net but there are conflicts about where to best locate responsibility. Locating at the business units works best for supply and internal initiatives with firm-wide high capability needed for demand side initiatives. A federal structure for data stewardship is one way to balance this conflict.

- Leading with B2B and B2C initiatives requires similar patterns of high capability infrastructures but they are nearly opposite in where that capability is best located.

- High capability in IT education was particularly needed for new product initiatives.

- To lead in several types of strategic agility requires an integrated infrastructure with high capabilities in all infrastructure clusters.

Investing in IT infrastructure for strategic agility

The evidence over a ten-year period from top performing enterprises is that different types of strategic agility require distinct patterns of high capability IT infrastructures. A high capability infrastructure takes time, money, leadership and focus to create. Investing in IT infrastructure is like buying and exercising real options. Infrastructure enables faster time-to-market if well used, but results in higher costs with inadequate return if underused. Building an infrastructure tailored to an enterprise’s strategic desires takes considerable time and expertise. While many technical components are commodities, the management processes used to implement the best mix of infrastructure capabilities to suit a specific enterprise are a much scarcer resource.

To address this infrastructure challenge we propose a series of steps:

1. Clarify the types of business initiatives the firm most wants to focus on. Using the three classifications for describing a business initiative, identify the family of electronically based business initiatives (i.e. strategic agility) the enterprise wants to lead with.

2. Identify the current IT infrastructure capability in each of the ten clusters. Review each of the ten IT infrastructure clusters and identify the current capability and potential for meeting increased demand.

3. Compare the enterprise capability with future needs for strategic agility and identify pressure points. Using Figure 2, identify the high capability infrastructure clusters needed for the strategic agility identified as desirable in step one. The paper referenced in the footnote provides the benchmarks for low and average capability for all clusters.

4. Create an IT infrastructure investment plan to fill the gaps. Turning this gap analysis into an investment program requires confidence in the strategic thinking necessary to complete step one.

Using the classifications for describing IT-based business initiatives, executives can identify the type of strategic agility they want to lead with. This is a process of strategic choice, balancing competing imperatives such as investing in longer-term agility versus shorter-term cost minimization. To lead on multiple strategic agility dimensions requires an integrated infrastructure with high capabilities in all infrastructure clusters and a deliberate approach to data management to manage conflicts.

Successful enterprises get the infrastructure balance right more often than not, because they make regular, systematic, modular and targeted investments in IT infrastructure based on an overall strategic direction. Leading firms also have a clear picture of their overall infrastructure capability, the trade-offs they need to make and how each incremental investment adds to their strategic agility.
Figure 1
High Capabilities Infrastructures Differ by Position on the Value Net*

Note: High Capability Enterprise Wide Competencies shaded Orange
High Capability BU level Capabilities shaded Yellow
* All relationships shown are statistically significant

Figure 2
Different Types of Business Initiatives have Different High Capability Infrastructures*

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SYNCHRONIZING IT MANAGEMENT PRACTICES FOR BUSINESS VALUE

Jeanne Ross, Principal Research Scientist
MIT Center for Information Systems Research

Cynthia Beath, Professor
The University of Texas at Austin

Mani Subramani, Assistant Professor
Carlson School of Management

As enterprise IT spending outpaces other budgetary increases, CIOs are feeling increased pressure to deliver observable business value. Generating this business value has always been challenging, because of the interdependencies between IT, business process and strategy. What types of IT management practices actually lead to IT-enabled business value? How can CIOs make that value evident?

An earlier CISR study revealed that IT delivers value to organizations through the development and use of three interdependent assets: human (a competent, highly motivated unit focused on addressing business needs), technology (shared data and platforms), and IT–business relationships (mutual understanding; shared risk and responsibility). As shown in Figure 1, these assets are built and leveraged through three core IT processes: IT innovation (identifying and planning appropriate applications of IT), solutions delivery (system design, purchase, development, configuration and implementation), and services provisioning (post-implementation operations and support). This briefing explores the management practices that enable firms to simultaneously build and leverage all three assets.

We asked 30 CIOs to describe their key new IT management practices. We also asked them to assess the quality of their IT management practices and the business value their firms received from IT. Eight practices were statistically significantly related to business value: technology architecture, enterprise applications, shared services, post-implementation reviews, IT unit assessment, service level agreements, project justification and project management (includes standardized methodologies, project offices, project tracking and related practices). These practices are part of three important management trends described by the CIOs:

- Technology standardization
- Disciplined project management
- Value clarification

Technology standardization practices (technology architectures, shared services and enterprise applications), though not new, help CIOs control technology costs and contain their skill requirements. Technology standardization practices usually require related human resource initiatives, such as centralization of IT staff, appointment of technology “czars” responsible for managing a class of technologies and establishment of technology councils or review boards for instituting and monitoring technology architectures and standards across business units. The CIO of a large insurance company explained how a change in the human asset enabled the objectives of standardization:

"We’ve centralized to achieve higher levels of specialization in technology and in project management, to attract and retain skilled technical people, as well as to rationalize and standardize infrastructure and development tools. We get faster delivery from all of these together."

With some exceptions, business executives were not involved in designing technical standards. They were, nonetheless, committed to the concept of standardization and their sponsorship was usually critical to successful implementation. Thus, while technology standardization is ostensibly a technology-based management initiative, it depends on a robust relationship asset, and its effectiveness depends upon related changes in the human asset.

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1 This research was made possible by the support of CISR sponsors and in particular, CISR patron IBM Corporation.
Disciplined project management practices include the establishment of project offices, and implementation of standardized methodologies such as those in the Software Engineering Institute’s capability maturity model (CMM). Firms seek to make project management more standardized and more predictable in order to efficiently leverage the firm’s existing technology assets. These changes are driven by new technology capabilities, which have enabled rapid delivery of more modular systems. In other words, disciplined project management practices are mainly targeted at the human asset, but they are driven by architectural changes in the technology asset. At the same time, successful project management requires engaging business managers and holding them accountable for business outcomes, a requirement that many firms are formalizing through project sponsor roles and regular stakeholder meetings:

*We are getting the business to take ownership of projects—for the new GL system, the owner is an accountant, who knows what needs to change and can make things work. We have business staff on projects full time. We train them in CMM.*

— (CIO, Health Care Services Company)

Thus, while these new project management practices are targeted mainly at improving human capabilities, they are made critical by advances in the technology assets and they have inevitable consequences for relationship assets.

Value clarification practices (post-implementation reviews, IT unit assessment, service level agreements, project justification) help firms reckon and negotiate both costs and benefits of IT. These practices require a commitment on the part of both IT and business executives to learn from experience. They hinge on metrics that capture costs, benefits and progress toward achieving expected value.

CIOs reported less sophistication in value clarification than in either technology standardization or project management. Indeed, several CIOs had introduced and then dropped post-implementation reviews and IT unit assessment, sensing that they were not deriving any value from these practices. But those CIOs who had successfully weathered the early frustration with these practices found that, once value clarification processes became absorbed into the organization’s culture, they enhanced understanding of potential opportunities created by IT. The CIO of an investment bank explained:

Post-implementation reviews are built into the development process. One to two weeks after deployment the project manager is responsible for a 15–20 page report detailing what went right and what went wrong and proposing suggestions for improvement. Everyone on the project team and other stakeholders reads this and discusses the key points. It’s become part of the culture.

Thus, while value clarification targets the IT-business unit relationship, it is usually driven by IT managers attempting to understand IT cost drivers. They share their understanding of costs with business partners who use the information to select projects and negotiate service levels. As a result, value clarification leads to changes in the technology asset.

Like the other two management trends, value clarification targets one asset (relationship), builds on developments in another asset (human) and demands changes in the third asset (technology) in order to achieve intended outcomes. Figure 2 demonstrates these interrelationships for each of the management trends.

Technology standardization, disciplined project management and value clarification were three of the top four management trends described by our respondents. The fourth set of management practices that our respondents were implementing were related to IT governance—practices such as IT steering committees, prioritization processes and IT strategic planning. These practices, however, did not demonstrate a statistical relationship to business value. We suspect this means that CIOs have not yet identified the full set of complementary practices that will make governance a value-adding management trend.

Because of the interdependence of IT’s three assets, isolated practices touching only one or two assets often do not have the intended impact. Our research suggests that management practices targeted at one asset require corresponding changes in other assets to be effective. Understanding the interdependence of the assets helps CIOs (1) identify management practices to improve core processes and build stronger IT assets and (2) recognize the family of related practices needed to keep assets “in sync,” so that management objectives are realized.
Figure 1
How IT Delivers Business Value


Figure 2
IT Management Trends: Synchronizing the Assets
WEB AGGREGATORS

Stuart Madnick,
J.N. Maguire Professor of Information Technology
MIT Sloan School of Management

Michael Siegel,
Principal Research Scientist
MIT Sloan School of Management

Web aggregators are shopbot-like entities that scour the Web extracting information from Web sites, such as yours, couple it with similar information from others (such as your competitors’ sites), and then perform “post-aggregation analysis” to make intelligent comparisons between yours and your competitors’ offerings.

Aggregators are not new. What has changed, though, with the advent of the Internet and other new technologies, is their ability to emerge overnight, at minimal cost, and without the need to establish partnerships with the various data sources (the aggregatees). As a result, incumbents can be caught off-guard and stumble in their panicked response when an aggregator appears in their industry.

Hundreds of aggregators already exist, in areas such as financial services, retail, and telecommunications. We predict they will soon emerge in many other industries because they are easy to construct and are potentially valuable to customers. Aggregators can extract, compare, and analyze information from your web site, with or without prior arrangement, using “web wrapping” (also called “screen scraping”) techniques. This process will become even easier due to the emerging extended Markup Language (XML) family of standards. They can automatically compare information (such as bank accounts and shipping rates) using mediation technologies, which can determine differences in the “meaning” of data. And they can use agent technologies to perform services on a user’s behalf.

Types of aggregators

Aggregators are used to build “integrated information collections” to either make comparisons or manage relationships. The collections can be built either from sources inside the organization (intra-organizational), between organizations (inter-organizational), or both. Advanced hybrid aggregators combine several types and sources in a single application. Examples of these aggregator types and sources are shown in Table 1.

Table 1: Examples of Aggregator Types and Sources

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Relationship</th>
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<tbody>
<tr>
<td>Inter-Organizational</td>
<td>Compare book prices or shipping costs of alternative suppliers</td>
</tr>
<tr>
<td>Intra-Organizational</td>
<td>Compare manufacturing costs in multiple plants</td>
</tr>
</tbody>
</table>

Comparison-type aggregators focus on collecting information about specific goods and services for evaluation. Shopbots, used for purchasing books, music, and electronics, are good examples.


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Intershipper (www.intershipper.net) acts as an intelligent assistant, helping users select the best shipper for a package, providing both price and non-price comparison aggregation services. Given a package source, destination, and weight, Intershipper compares shipping options from multiple carriers (e.g., FedEx, UPS, DHL). Intershipper can also list the closest drop-off centers for the carriers or show when a package is estimated/guaranteed to arrive. The information it collects is publicly available, so Intershipper has not needed to form explicit partnerships with the carriers to provide its services.

Relationship-type aggregators form information collections based on their relationship with aggregatees. For example, major financial institutions (Chase, Citibank, Merrill Lynch) and non-financial institutions (CNBC, AOL) are adopting financial account aggregator capabilities (from such aggregators as Yodlee, VerticalOne, CashEdge), giving their customers the ability to manage all of their financial relationships through a single aggregator.

MaxMiles (www.maxmiles.com) is another example. It runs a Web-based reward management program to help frequent travelers better manage the rewards they earn from airlines, hotels and car rental companies. Users provide their account and personal identification numbers for all their reward programs and authorize MaxMiles to access and analyze their data. In return, MaxMiles provides its customers with a consolidated statement that shows, among other things, the number of points they earned for each account and the number of points that will expire at each date.

MaxMiles can also identify flight segments that possibly were not properly credited. And, in the not-too-distant future, MaxMiles expects to offer more personalized account statements that help users take advantage of special offers for which they are interested and eligible.

MaxMiles does not have to formally partner with the reward programs to serve its clientele and a wide range of interactions with service providers has developed. Hyatt, for instance, outsources the administration of its Gold Passport Program to MaxMiles. On the other hand, in its click-wrap agreement, US Airways initially prohibited flyers from revealing their password to a third party. MaxMiles countered by requiring users to give it Limited Power-of-Attorney, as part of its registration process.

Both types of aggregators have numerous uses. One use is to keep customers and acquire new ones. To date, one of the major impacts of aggregators has been their ability to add value to customers’ online experiences. Generally, once one company in an industry provides a useful aggregation service, others are compelled to follow. For example, when Chase provided free financial account aggregation, most of the other major financial institutions did the same — mostly by licensing or renting the service from such providers as Yodlee and VerticalOne.

Another use is to understand a market. Aggregators are well positioned to collect detailed and highly valuable market information not available to individual aggregatees. Still another use is to find suppliers. Buyer-oriented aggregators can serve as purchasing agents, searching for the best provider. Finally, aggregators can generate sales leads. For instance, a financial account aggregator could direct individuals to new and more appropriate investment opportunities.

Strategic Issues

Executives are just beginning to realize the impact of aggregators on their business and web-based strategies. Many are not prepared to be openly compared with their competitors, to have their relationships with customers weakened or to lose the opportunity to harvest competitive information. Yet, aggregation will play a significant role in most enterprises, both private sector and government.

In short, like it or not, aggregators will use your Web-based content to create new information collections that will affect your current business model, branding and relationships. Aggregators will change the way your organization operates and the way global commerce develops. Thus, organizations need to: (i) rethink their strategies, preparing for aggregators, (ii) add aggregation capabilities to their internal and external operations and (iii) proactively decide where they should aggregate or be aggregated.
SIX IT DECISIONS YOUR IT PEOPLE SHOULDN’T MAKE

Jeanne Ross, Principal Research Scientist
MIT Center for Information Systems Research

Peter Weill, Director
MIT Center for Information Systems Research

Increasingly, senior managers recognize that generating value from IT requires their active involvement in IT-related decisions. But many managers are unsure of the role they need to play to bring about IT success. To that end, we have identified six key questions senior managers should not abdicate to their IT leaders. Three of the decisions relate to IT strategy; the other three relate to execution. They are listed in Table 1.

Decision 1: How much should we spend on IT?

Although many executives look to industry benchmarks for an answer to this question, most are aware that the correct answer is: it depends. Specifically, how much a firm spends on IT depends on the strategic role of IT in the organization. Clarifying that role is the first, and toughest, IT decision that non-IT managers must make. Management can emphasize, for example, cost cutting, a seamless supply chain or enhanced customer intimacy. Each has a different price tag. To fund IT appropriately, executives should not let industry benchmarks dictate spending level, but rather establish funding levels to support its role in the business.

As an example, United Parcel Service (UPS) and Federal Express (FedEx) claim to spend nearly the same amount on IT, even though FedEx is just two-thirds the size of UPS. But UPS has emphasized the reliability and efficiencies that IT offers while Federal Express has emphasized the flexibility IT provides in responding to customers. In fact, UPS also uses IT to respond to customer needs and FedEx

Decision 2: Which business processes should receive our IT dollars?

Once management understands the strategic role of IT, they must take on unpopular decisions as to which IT projects are strategic necessities and which are simply nice to have. This means looking well beyond estimated ROI and considering the long-term business impact of each project. Whittling down the IT project portfolio is important not only because financial resources are finite, but because successful implementation places considerable demands on managerial attention, a precious resource.

As Hershey Foods attempted to simultaneously implement a CRM, ERP and supply chain management system, it was unable to deliver much Halloween candy to retail stores. One reason why the firm missed deadlines is that each large IT project demands significant organizational change. Multiple high-profile projects can, as one executive described it, “exceed the firm’s capacity for change.” Presented with a list of approved projects, most IT units will make a valiant effort to deliver them, but an overly ambitious list that fails to distinguish what is most important will lead to both an over-extended IT unit and a business change agenda that cannot succeed. Thus, senior management must explicate which projects will—and will not—make the IT priority list.

Decision 3: Which IT capabilities need to be company-wide?

Centralized, standardized IT capabilities lead to cost savings and facilitate global integration. But centralization and standardization also assumes uniformity in the needs of individual business units and geographic regions. Without senior management direction, IT units will tend to either disregard standardization opportunities to better serve their internal customers (i.e. meet individual business unit needs) or standardize everything at the cost of business unit flexibility.

Johnson & Johnson started to address the IT challenges of a highly decentralized business model in the early 1990s, when customers increasingly insisted on a single face to the company’s 200 business units. Senior management identified the specific technology requirements—most notably, a global network, standardized desktop and a limited set of standard data definitions—absolutely necessary to meet the needs of customers. At the same time, J&J continued to allow business unit discretion in other technology decisions to sustain much of the business unit autonomy that had made the firm successful for almost 100 years.

**Decision 4: How good do our IT services really need to be?**

There are inherent tradeoffs in executing every IT project. Increasingly, executives have focused on speed-to-market of new IT products and services. But speed to market requires limiting requirements for functionality. What is the right balance between fast delivery and gold-plated functionality? That is a business, not an IT, decision.

Similarly, IT units feel responsible for the reliability and responsiveness of their systems. But these features cost money. At GTech, the world’s largest lottery firm, many clients (primarily government bodies) specify penalties as high as $10,000 per minute of system availability. Thus, management is willing to spend a great deal to ensure that systems never go down. In contrast, when Dow Corning designed the back-up for its ERP system, the firm decided that it could not afford to prevent all downtime. It built a “hot site” that would be used only if the system went down for several hours.

**Decision 5: What security and privacy risks will we accept?**

Security costs money. Perhaps more important to most organizations, though, is that many security measures introduce inconvenience. At MIT, the extraordinary security technologies that block would-be hackers limit the Institute’s ability to implement packaged software. For many firms, security concerns slow down implementation of new technologies, such as web services.

Privacy protections, being introduced in many countries, heighten the importance of security. User-friendly systems that give customers on-line access to their personal information can compromise the privacy of personal data. For example, Yale University allowed applicants to check whether they were accepted for admission by entering their date of birth and social security number. This allowed Princeton to check the status of high school seniors who had applied to both schools. IT units are capable of building highly secure systems, but the limits these systems impose on business functionality may be untenable. As a result, senior managers must make the tradeoff decisions.

**Decision 6: Whom do we blame if an IT initiative fails?**

When IT fails to generate intended benefits, the problem is more often related to failed business change than to technology problems. True, technical glitches create frustration with new systems, but we have found that technical glitches are easier to fix than business units are able to change.

At one midsize manufacturing concern, a new CEO recognized considerable unused potential in an expensive ERP system that IT had installed but business managers had not used. The CEO reorganized the company’s processes to take advantage of the system’s capabilities and the company turned a profit for the first time in 5 years. IT units can—almost universally—deliver systems. Whether or not they deliver value depends on the commitment of business managers to leverage their capabilities.

**IT Governance as a Decision Making Framework**

This list of decisions outlines a critical role for senior business executives in IT success. We are not suggesting, however, that these decisions form the agenda for isolated meetings in the executive suite. Instead, firms need governance structures that specify how IT decisions are made, carried out, reinforced and even challenged. By understanding the IT decisions they need to make, and establishing a structure for making and monitoring them, firms can start to generate real value from their IT investments.

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Figure 1
What Happens When Senior Managers Ignore Their IT Responsibilities?

<table>
<thead>
<tr>
<th>IT Decision</th>
<th>Role of Senior Management</th>
<th>Consequences of Abdicating the Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy Decisions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much should we spend on IT?</td>
<td>Define the strategic role that IT will play in the company and then determine the level of funding needed to achieve that objective.</td>
<td>The company doesn’t develop an IT platform that furthers its strategy, despite high IT spending.</td>
</tr>
<tr>
<td>Which business processes should receive our IT dollars?</td>
<td>Decide which IT initiatives will and will not be funded.</td>
<td>A lack of focus overwhelms the IT unit, which tries to deliver many projects that may have little enterprise-wide value or can’t be implemented well simultaneously.</td>
</tr>
<tr>
<td>Which IT capabilities need to be company wide?</td>
<td>Decide which IT capabilities should be provided centrally and which should be in individual businesses.</td>
<td>Excessive technical and process standardization limits the flexibility of business units, or frequent exceptions to the standards increase costs and limit business synergies.</td>
</tr>
<tr>
<td><strong>Execution Decisions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How good do our IT services really need to be?</td>
<td>Decide which features—for example, enhanced reliability or response time—are needed on the basis of their costs and benefits.</td>
<td>The company may pay for service options that, given its priorities, aren’t worth the costs.</td>
</tr>
<tr>
<td>What security and privacy risks will we accept?</td>
<td>Lead the decision making on the trade-offs between security/privacy and convenience.</td>
<td>An overemphasis on security and privacy may inconvenience customers, employees, and suppliers—or an under-emphasis may make data vulnerable.</td>
</tr>
<tr>
<td>Whom do we blame if an IT initiative fails?</td>
<td>Assign a business executive to be accountable for every IT project; monitor business metrics.</td>
<td>The business value of systems is never realized.</td>
</tr>
</tbody>
</table>
CUSTOMER DATA AS COMPETITIVE ASSET

J. Thomas Gormley, III, Independent Consultant and CISR Research Associate
Jeanne W. Ross, Principal Research Scientist
MIT Center for Information Systems Research

New technologies are making it easier to collect, analyze and disseminate customer data for strategic business purposes. Only a few firms, however, are turning customer data into gold. For the most part, the value companies have received from customer data has not kept pace with technological advances. How can firms generate value from customer data resources? What distinguishes firms that are able to make customer data a competitive weapon?

We studied how firms generate value from customer data through 30 surveys and seven case studies (including, for example, Aetna, Vodafone, Wells Fargo). We found that firms took three different approaches to building and leveraging customer data: (1) data utility, (2) enhanced marketing, and (3) customer intimacy. Each approach has different objectives and benefits, as summarized in Figure 1 and described below.

Data Utility: The objective of this IT-centric approach to customer data is to build a data asset to support multiple, often loosely defined, business needs. In the data utility approach the IT unit designs a technical architecture and then creates, populates and manages databases, data warehouses and data marts intended to support both predetermined and ad hoc queries.

In every firm the quality, completeness and accessibility of customer data influenced the outcomes of customer data initiatives. However, firms that attempted to generate value by first building the asset for ad hoc use—and later deploying it to the business—may never realize expected benefits. At least two firms in our sample were frustrated by their inability to leverage large, centralized data warehouses. Neither of these firms intended to use a data utility approach, but they slipped into it when they lost focus on generating business value.

Enhanced Marketing: In this approach, the marketing department takes responsibility for understanding the firm’s customer segments and markets and, in the process, builds a data asset for customer intelligence. Queries and algorithms exploring both transaction and demographic data support marketing-oriented processes such as campaign management, cross-selling and sales automation. An attraction of the enhanced marketing approach is that initiatives can be small, targeted, and quickly implemented to generate a positive ROI. However, these multiple, independent ROI calculations can overstate the total return to the firm.

For example, one firm pursued a number of individual initiatives—supported by separate data repositories—using data analysis and list management to generate direct mail, e-mail and telephone-based marketing campaigns. In six months, this firm estimated increased revenues of 12 times the amount of its investment. But double counting and a short-term view inflated the cumulative effect of the initiatives on annual revenues and retention rates. Each user group created its own data mart such that the proliferating data marts likely represented increased overhead rather than an enhanced data asset.

To avoid this scenario, one firm has given responsibility for customer data to a single team that prioritizes business unit requests for data and analysis. The team looks for multiple requests for the same capabilities and builds the data warehouse based on these shared needs. Each new project then tends to cost less, as more needs are met with the existing data warehouse. In addition to a project ROI, this approach contributes to cumulative customer understanding and an increasingly valuable...
data asset. This asset has helped the firm with a variety of complex decisions, including risk management and calculating the impact of customer fees for new services.

**Customer Intimacy:** Firms pursuing customer intimacy set an explicit goal of focusing on customers rather than products, typically reorganizing themselves around newly determined customer segments, and crafting a strategy to build unique customer relationships.\(^2\) A customer intimacy approach generates value from customer data by first applying analytics to a broad set of production and demographic data in order to identify unique customer segments, and then delivering intelligence to support decision makers in their sales, marketing, and service interactions with customers. A customer intimacy approach must be led by senior management because, in order to generate value, it requires rethinking structures and processes to meet customer needs.

Customer intimate firms are predisposed to act on data. This can cause problems if data is redundant or incomplete. A financial services firm initiated its transformation to customer intimacy by analyzing existing customer data, in a data warehouse built in six months, to identify its most profitable customers. The firm later acknowledged that the data and models were not as robust or predictive as they would have wanted. However, the initial analysis allowed management to reorganize the firm to facilitate a customer-centric business model. In the course of its reorganization, management quickly recognized the kinds of data and analytics needed to support its new business model, and has incrementally improved the quality and depth of the data to address these needs. The warehouse enabled the firm to design new financial products by connecting its customer accounts so that one account could automatically offset another, resulting in more competitive pricing and interest rates. It has doubled the number of products per customer (a key metric) from 1.5 to 3.0, since the rollout of the data warehouse. The firm has continuously enhanced its data and is now planning the fifth iteration of its data warehouse. By regularly investing in its data asset and exploring the meaning of the data through business innovations, the firm can realign itself with the changing needs of its customers.

**Implications of the three approaches:** Firms should choose between the enhanced marketing and customer intimacy approaches based on their dominant business discipline. Customer data is most strategic—and can generate the most significant returns—in a firm pursuing customer intimacy. But customer intimacy is not a workable model for all, or even most, firms. Customization of products and services to meet individual customer needs is expensive in terms of senior management time and attention. Thus, if a firm’s competitive strength is either product innovation or operational excellence, customer understanding is better applied to specific marketing, sales, and customer service processes rather than business strategy. This does not mean that customer data lacks strategic impact in an enhanced marketing approach. Firms pursuing operational excellence or product innovation can still gain a competitive edge by more effectively reflecting customer understanding in their products, prices and processes.

Regardless of approach, generating value from customer data involves balancing two requirements: (1) technical customer data capability and (2) managerial readiness to apply customer data to complex decisions. Figure 2 summarizes the risks of each approach in terms of these two requirements. The data utility approach builds a technical capability but risks never applying it to business decisions. Enhanced marketing takes a balanced approach but risks minimizing benefits by frittering away management time and attention on isolated projects of little consequence. Customer intimacy allows business need to define technology requirements but it carries the risk of a high-cost business model as the firm must constantly change technology and business process to respond to new customer needs. To generate value from customer data firms must clarify which approach fits their strategic focus and then manage the accompanying risks. The data utility approach is not recommended.

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Figure 1
Three Approaches to Generating Value from Customer Data

<table>
<thead>
<tr>
<th></th>
<th>Data Utility</th>
<th>Enhanced Marketing</th>
<th>Customer Intimacy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic Objective</strong></td>
<td>Reusable customer data asset; Tap value in data</td>
<td>Marketing and customer service effectiveness</td>
<td>Customer intimate organization; profitability</td>
</tr>
<tr>
<td><strong>Focus of Efforts</strong></td>
<td>Design data architecture; increase data accessibility and usage</td>
<td>Improve analytics and individual sales and services processes</td>
<td>Implement customer knowledge-driven strategy to serve unique customer segments</td>
</tr>
<tr>
<td><strong>Project Sponsor</strong></td>
<td>IT unit</td>
<td>Marketing/Sales</td>
<td>Senior Mgmt</td>
</tr>
<tr>
<td><strong>Metrics</strong></td>
<td># of users with access, regular use</td>
<td>ROI of initiatives</td>
<td>Firm performance</td>
</tr>
<tr>
<td><strong>Critical Success Factors</strong></td>
<td>Business leader takes responsibility for using the asset</td>
<td>Marketing becomes immersed in the data; Architectural and organizational focus on building reusable asset</td>
<td>Analytics reveal changing customer distinctions; Firm designed for rapid response to changing customer needs</td>
</tr>
</tbody>
</table>

Figure 2
Generating Value from Customer Data

Firms generated value when their data management technology matched their management readiness to use customer data, represented by arches approaching the value line.
ORGANIZING FOR “BRICKS AND CLICKS” E-BUSINESS

George Westerman, Research Scientist, MIT Center for Information Systems Research

Over the past three years, it has become clear that a “Bricks and Clicks” approach to e-business is far more powerful and profitable than a model based on “clicks” alone. What has been much less clear is how firms can do this. Managers need to understand what “bricks” capabilities they have, what “clicks” capabilities to build and how to connect them.

The answer is not simple. Our research shows that separating the online people from the offline allows speed and focus, but can prevent the online channel from leveraging the assets of the offline organization. Conversely, integrating the online organization too tightly with the offline can slow down the launch or make the new strategy unworkable.

This briefing describes an effective organization design for retail e-business derived from studying the e-businesses of 36 incumbent retailers. Firms that were more closely aligned with an “ideal” e-business structure far outperformed others, after controlling for some important factors.

An ideal structure for e-business in retail

The ideal structure for e-business resolves the tradeoff between separation to enable speed and learning, and integration to leverage existing assets. Too much separation is inefficient, and too much integration slows progress. The key is to locate units appropriately relative to existing capabilities and reporting structures.

Capability Leverage

With help from the National Retail Federation and several e-retailing experts, I identified six major sets of e-business capability:

- Direct Marketing;
- Advertising & Promotion;
- Fulfillment;
- Merchandising;
- Site Development; and
- Customer Service.

The e-business organization structure for each capability was related to the extent to which the firm could use existing skills and facilities in the e-business. Retailers’ skills in advertising and merchandising were useful in the online world. Additionally, catalog capabilities such as direct marketing, customer services, and fulfillment could be leveraged successfully in the online world with some changes. Catalog-only firms such as Micro-Warehouse, and multi-channel firms such as Sears, were well positioned. Meanwhile, store-only firms such as Best Buy or Kmart needed to find ways to acquire these capabilities.

The retailers’ existing capabilities fell into three categories.

- Use: Some capabilities could be used by the e-business without change. For example, catalog distribution centers were already capable of filling small orders and mailing them to customers. Firms could use these capabilities intact for online orders.
- Adapt: Other capabilities were good starting points, and could be modified to work in e-business. The more successful firms found a way to leverage and adapt existing capabilities for online, while keeping them intact for offline. They typically built a separate subunit located within the relevant offline unit. For example, catalog firms had telephone customer-service centers. These centers had useful skills and infrastructure, but needed to be upgraded to handle e-mail and answer questions about the website. The more successful firms created a subunit of e-Customer Service Reps (e-CSRs) within the Customer Service unit. The e-CSRs could use the firm’s existing skills, infrastructure, and systems, but had the freedom to experiment and
adapt them to the online environment without interfering with offline applications.

**Build/Acquire:** In some cases an existing capability was not used or did not exist. Then, a firm needed to BUILD it in a new unit or ACQUIRE it from outside. For example, store-only retailers needed to build skills in direct marketing and customer service and rebuild skills in fulfillment. All retailers found it difficult to adapt their existing IT staff capabilities to the e-business world.

The ADAPT structure was key. It enabled firms to find more capability leverage than they originally expected. This had two benefits. First, it prevented the e-business from expending extra money duplicating offline capabilities. Second, it helped avoid the “long hairs versus gray hairs” conflict that happened in many retailers, and enabled online and offline to cooperate more fully.

Managing the E-business: Change-Drivers

E-Business management, like organization structure, reflected a balance between delegation and control. The more successful e-businesses had a single, focused e-business manager, rather than co-managers or part-time managers.

The e-business manager did not control all capabilities for the e-business. The more successful e-businesses used a mix of reporting structures. Capabilities such as direct marketing, which drove change in many other parts of the e-business, needed to report to the e-business manager. Others, like fulfillment, which were relatively isolated from the rest of the e-business, could report to an offline manager.²

**Organizational Design for Successful E-business**

The analysis yielded two ideal profiles: one for catalog-capable firms and one for store-only retailers (see Figures 1 and 2).³ Here, a blue box separated from an existing unit is the BUILD/ACQUIRE case. A yellow box attached to an existing unit represents the ADAPT case (e.g. a subunit within an existing unit). If the existing unit appears without an associated shaded box, it represents the USE case. Solid or dotted arrows represent reporting relationships.

I examined the relationship between the extent of deviation from the ideal structure and the firm’s e-business revenues in calendar year 2000. Firms whose structures matched the ideal had higher online revenues, all else equal, than firms who did not.⁴ The more a firm deviated from the ideal, the worse its performance. If an e-business was mis-aligned on half of the six capabilities, it had only about 40% of the online revenues of a well-aligned one. In other words, if the mis-aligned e-business had matched the ideal structure, its online revenues could be expected to be 150% higher.

**Conclusion**

The organization designs in Figures 1 and 2 balance the need to integrate existing capabilities and the need to separate for speed and focus. They implement neither a complete spinout nor a fully-integrated structure. Instead, they represent a well-specified set of structures and reporting relationships that match e-business characteristics and the firm’s existing capabilities.

These organization designs come from studying B2C retail e-business. However, the key concepts of capability leverage and change-driving are useful ways to think about structuring a new organization in many contexts. They define a mix of separation and leverage that enables a firm to make use of existing assets while reducing inertia. Managing this tradeoff well is an important driver of performance in any new initiative.

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² There are two intermediate reporting arrangements. First, when the unit providing a capability is located in the existing organization, it can’t report directly to the e-business manager. So, it must use a dotted-line relationship instead. Second, if the unit is brand new to the organization, it reports to the e-business manager by default, since it has nowhere else to report.

³ These diagrams are for typical retailers. If a store-only firm had an existing capability that was more like a catalog capability, it would adopt a catalog-related e-business structure for that capability (and vice versa). For example, some store-only retailers already had a customer service facility and could leverage it in the e-business.

⁴ The relationship was statistically significant after controlling for factors such as firm size, e-business marketing spending, retail category (e.g. books vs. shoes) and time online.
Figure 1
Ideal e-Business Profile for Catalog-Capable Retailers

Legend:
- Unit in the existing organization, or a single unit providing capability for both online and offline (e.g., the USE approach)
- BUILD/ACQUIRE approach
- ADAPT approach (e-business subunit within an offline unit)
- Reporting relationships

Figure 2
Ideal e-Business Profile for Store-Only Retailers
PRESSURE TESTING AND CHANGING THE IT ORGANIZATION

Cyrus F. Gibson, Senior Lecturer, MIT Center for Information Systems Research

The increasing importance of IT to business has resulted in many changes in IT organization structure, reporting relationships and roles for IT. As IT organizations have gone from centralized to distributed to federal and back again, top executives continue to endeavor to align IT with the business to achieve business goals. To do so they are embracing the broader topic of IT governance\(^1\) of which the IT organization is a visible and significant piece. In this briefing we present the results of exploratory research on the executive role in assessing the enterprise-wide IT organization and approaches to changing it. We provide a short “pressure test” for IT organizational effectiveness and recommendations for change.

The work was motivated by questions from senior managers in executive education programs, asking us for quick-fire indicators and best practice guidelines to address IT issues. The research consisted of interviews with five CIOs and two CEOs in companies where the IT organization had been changed. Then we conducted a brief survey of 67 firms, using the results to make suggestions for identifying good and poor IT organizations. After the results were analyzed the survey was edited to become the pressure test.

In our interviews we explored executives’ views and experiences in assessing and changing IT organization. We identified three factors essential to assessment and several broad approaches to change. The factors were 1) the capability of the executives for understanding IT and executing change in the IT organization, 2) the quality of the IT organization, and 3) the business value being delivered by IT. We tested the relationships among the three factors with the survey and analyzed the interviews and used the literature to line up survey results with recommended types of change.

Figure 1 shows the survey results with responses presented simply as positive and negative dichotomies. When executives’ capability around IT is poor the quality of the IT organization is typically low. Yet when capability is good, there is only a 50-50 chance that the quality of the IT organization will be good. We conclude that the capability of executives for these kinds of decisions is necessary but not sufficient for an effective IT organization. The third row illustrates the positive relationship between quality of IT organization and business value from IT. These relationships were all statistically significant and thus unlikely to be due to chance.\(^2\)

The fourth row in Figure 1 shows the recommended approach to change based on the interviews and the literature.\(^3\) Here are illustrative examples of each:

- **Radical surgery**: At a large office-supply distributor and retailer the perceived e-commerce opportunities in the 90s led the CEO and board of directors to create a separate business division. This represented not only a change in IT responsibilities, but also in corporate organization. The intent was for


\(^2\) These correlations are statistically significant using the Pearson correlation coefficient. Multiple regression analysis indicates that executives’ capability in IT and quality of IT organization also interact highly, and that in combination relate more to IT value than each separately.

\(^3\) For example, see Christensen, C.M. and Overdorf, M., “Meeting the Challenge of Disruptive Change,” *Harvard Business Review*, March–April, 2000, pp 67–76.
IT-enabled web businesses to transcend old divisions, geographies and systems. But e-commerce sales never took off, IT managers across the firm were working at cross-purposes and no one knew what to do. In a difficult about-face, e-commerce was re-integrated into the established mainstream divisions. Only after these extreme structural changes did IT align with the business and the Web became a successful channel for sales and customer service.

- **Lead then oversee**: A large and growing commercial bank faced Internet-based competitors offering new services with a lower cost base. In response the top executive team first took direct responsibility, investing time and energy making key IT decisions without making a formal organizational change. They endorsed and monitored priority projects to adapt legacy systems and mandated corporate-wide commonality for IT including web-based products. Two years later the bank was a leader in on-line banking. Having led the change, these executives then stepped back and institutionalized more centralized IT decision making using a new IT steering committee.

- **Evolution**: Fifteen years ago a leading consumer investment management firm hired an outsider to clean up the IT function. Over time and with the support of the firm’s chief executive the new CIO achieved dramatic improvements. For example, the Internet was seamlessly incorporated, supporting new functionality, improved customer service and reduced costs of delivery. Five years after his arrival the CIO became one of the six top executives. This team makes critical IT management decisions and also monitors the organization. By getting the right person at the right time, allowing him to educate top management about IT and grooming him as a top executive, success with IT was achieved incrementally over time.

None of these three patterns of change is universally best. Each has its trade-offs. *Radical surgery* may be necessary but is costly and disruptive. *Lead then oversee* requires that the executives be knowledgeable and influential, and invest their time. *Evolution* requires executives with foresight, strategic vision and mutual trust, and a strong alignment of IT with business strategies.

Figure 2 is a quick pressure test based on our survey for top executives to do self-assessment. Take your answers and create scores for the three factors as follows:

1. Questions 1 and 2 are about your executives’ capability around IT.
   
   *If the sum of your answers on these questions is –2 to 0, then your executives’ capability is “poor.” Otherwise, it is “good.”*

2. Questions 3, 4, 5, 6, 7, and 8 are about the quality of the existing IT organization.
   
   *If the sum of your answers is –6 to 0, then your quality of IT organization is “low”; otherwise it is “high.”*

3. Question 9 is about business value generated by IT.
   
   *If your answer is 1 or 2, your business value from IT is “low,” if from 3 to 5 it is “high.”*

Plot your three sets of scores on the diagram in Figure 1 to see how you compare with our survey results and our recommended approach to changing the IT organization. If your executives’ capability score is “good” and your quality of IT organization is “high” you can probably use evolution for any changes. Any other combinations of those two factor scores are a warning sign and warrant investigation. Perhaps the existing executives, benefiting from expert input, can lead change. If your scores indicate radical surgery, typically the CEO and often the board of directors need to conduct a full audit and oversee the re-creation of your IT organization.
Figure 1
IT Organization: Assessment and Recommended Change Approach

I  Executives’ Capability in IT
   number of cases
   (Pressure test questions 1 & 2)
   POOR   20
   GOOD   47

II Quality of IT Organization
   number of cases
   (Pressure test questions 3 to 8)
   LOW 19
   HIGH 1
   LOW 24
   HIGH 23

III Business Value of IT
   mean BVIT scores
   (range 1-5)
   (Pressure test question 9)
   LOW 2.6
   LOW 2.0
   LOW 2.5
   HIGH 3.5

IV Recommended Change Approach
   Get expert help, conduct ‘Radical Surgery’
   Get expert help, employ ‘Lead then Reorganize’
   ‘Lead then Reorganize’
   ‘Evolution’

Figure 2
Pressure Test for IT Organization

Answer 1 for “most of the time,” 0 for “maybe or sometimes,” or -1 for “almost never” for your enterprise-wide IT:

1. Are the executives who are responsible for monitoring and changing the IT organization adequately knowledgeable and informed about business strategy and IT issues and opportunities? 

2. Do the executives who are responsible for monitoring and changing the IT organization have the necessary authority and influence? 

3. Do managers at all levels feel their time is well spent in IT decision-making and execution? 

4. Is IT decision-making and execution timely, (e.g., important decisions are not left hanging, deadlines are regularly met)? 

5. Can your IT decision making processes be described clearly by those involved and those affected? 

6. Would those descriptions be consistent with one another? 

7. Is your IT organization able to handle sudden changes in strategic business or IT direction, either imposed from the environment or intended by senior executives? 

8. Do important IT decisions get executed without having to be overridden by senior executives? 

9. Relative to your competition (or where you think you should be) rate the contribution of IT to generating business value: (answer from 5 very high to 1 very low) 


DESCRIBING AND ASSESSING IT GOVERNANCE—THE GOVERNANCE ARRANGEMENTS MATRIX

Peter Weill, Director
MIT Center for Information Systems Research
Marianne Broadbent, Group Vice-President and Head of Research Worldwide, Gartner Executive Programs

The complexity and difficulty of explaining IT governance is one of the most serious barriers to increasing the value derived from IT. Our recent study of IT governance in 256 enterprises in 23 countries identified that the strongest predictor of effective IT governance was the percentage of managers in leadership positions who can accurately describe the IT governance of their enterprise. To help understand, design and communicate effective governance, we propose a simple framework—the Governance Arrangements Matrix—that specifies decision rights in the five key IT domains.

IT governance applies many of the same principles of corporate and financial governance to the enterprise’s IT assets. We define IT governance as specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT. Our definition of IT governance aims to capture the simplicity of IT governance; decision rights and accountability; and its complexity: desirable behaviors that are different in every enterprise. Governance is not about what decisions get made—that is management—but is about who makes the decisions and how they are made.

The Governance Arrangements Matrix uses a provocative set of political governance archetypes (i.e., monarchy, feudal, federal, duopoly and anarchy) for each decision domain (i.e., IT principles, infrastructure, architecture, business application needs and investment). The matrix also identifies the set of mechanisms used to implement the governance arrangements (e.g., committees, approval processes, relationships and organizational structures). Depending on their desirable behaviors, and many other factors, enterprises vary significantly on how they govern. Figure 1 presents the way the 256 enterprises provided input to, and made, the five key IT decisions (see Figure 2 for the definition of the terms). The most common patterns (shaded orange in Figure 1) had federal inputs to all five decisions and IT monarchies for the more technical IT architecture and IT infrastructure decisions. However, for the other three more business oriented IT decisions, the patterns were less strong with firms using business monarchies, federal, feudal and duopoly arrangements depending on their objectives.

The Governance Arrangements Matrix, as shown in the example below, is used to describe, analyze and communicate an enterprise’s governance.

Metropolitan Police Service - Scotland Yard

The Metropolitan Police Service—Scotland Yard (MPS) provides policing services for London in addition to national responsibilities. The MPS employs over 40,000 people, approximately 25% of the total police service for England, and over 1,500 of these are in the Directorate of Information.

The MPS has six business units and a strong desire to gain greater synergies across all its operations. The executive body for MPS is the Management Board that has two top-level committees: one for performance review and one for resource allocation. Beneath this there are a series of Strategic Committees of which one is the Information Management Steering Group (IMSG). Depending on the area of operation, the IMSG reports into each of the three groups: Management Board, Performance and Resource Committees.

1 This CISR briefing is the second in a series on IT governance. The first briefing was “Effective IT Governance,” Weill, P. & Woodham, R., MIT CISR Research Briefing Vol. 1, No 2B, September 2001. For detailed information see “Don’t Lead, Govern: Implementing Effective IT Governance,” Weill, P., and Woodham, R., MIT CISR Working Paper No. 326, April 2002. This research was made possible by the support of CISR sponsors, and in particular CISR Patron Gartner and their EXP Program.

The underlying value discipline of MPS is operational excellence, with a strong focus on streamlining and improving processes. The pressures for synergy are very high but there are challenges involving the extra effort necessary for corporate wide solutions. MPS, describes their IT principles as follows: *Most of the information needed to investigate and solve crimes is in one or more independent systems that are located throughout the MPS. Our challenge is not only to make data input much easier (and not duplicated); but to make it readily available anytime, anywhere.*

Ailsa Beaton, Director of Information for the MPS, and her colleagues designed MPS’ IT governance arrangements to achieve these and other enterprise objectives implementing a number of changes in the ways decisions were made. Figure 3 presents the Governance Arrangements Matrix applied to the MPS. MPS uses a business monarchy for decision making for IT investment and identifying business application needs. The Information Management Steering Group (IMSG) and the Director of Information are the mechanisms and people who make those decisions. A federal structure with three mechanisms makes IT principle decisions while the IT architecture and infrastructure decisions are made by IT monarchies. For all the decisions except IT architecture, federal or duopoly structures are used to provide input to the decision.

The MPS has a structured and transparent process for making IT investment decisions. Decisions are made on the recommendation of the IMSG that meets every three months and is chaired by the Deputy Commissioner. There is a formal IT portfolio approach under the auspices of the IMSG that is given a budget for IT-related projects. The IMSG, in its role as an investment committee, decides on funded projects (what will go on the list) as well as how to start or stop projects and how to fund new work. IMSG also provides input to forward budgeting. Each proposed project must be linked to specific strategies which include e-policing, infrastructure, information management and call-handling services.

By contrast to the IT investment decision making process, the infrastructure strategies are driven by the Information group. “I have drawn a strong line between infrastructure and applications in terms of decision rights,” states Beaton. “When the business wants to do something it is their decision and we work with them. But with infrastructure projects, I am the sponsor—and a bidder like everyone else.”

The MPS had lots of different networks and senior officers would need three different workstations on their desks—for finance, email and internet access. Beaton put a strategy to the Management Board for major infrastructure investment, which was accepted and is due for completion at the end of March 2003. To date, the consolidation moves have taken several million pounds out of the cost base.

Figure 1
How Do Enterprises Govern IT?

<table>
<thead>
<tr>
<th>Governance Archetype</th>
<th>IT Principles</th>
<th>IT Infrastructure Strategies</th>
<th>IT Architecture</th>
<th>Business Application Needs</th>
<th>IT Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input</td>
<td>Decision</td>
<td>Input</td>
<td>Decision</td>
<td>Input</td>
</tr>
<tr>
<td>Business Monarchy</td>
<td>0</td>
<td>27</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>IT Monarchy</td>
<td>1</td>
<td>18</td>
<td>10</td>
<td>59</td>
<td>20</td>
</tr>
<tr>
<td>Feudal</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Federal</td>
<td>83</td>
<td>14</td>
<td>59</td>
<td>6</td>
<td>46</td>
</tr>
<tr>
<td>Duopoly</td>
<td>15</td>
<td>36</td>
<td>30</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>Anarchy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>No Data or Don’t Know</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

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Figure 2
Definitions

<table>
<thead>
<tr>
<th>Five Key IT Decisions</th>
<th>IT Governance Archetypes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT Principles</strong></td>
<td>High level statements about how IT is used in the business</td>
</tr>
<tr>
<td></td>
<td>“C” level executives, as a group or individuals (e.g., CEO, COO, CFO, CIO, etc., but not CIO acting independently)</td>
</tr>
<tr>
<td><strong>IT Infrastructure Strategies</strong></td>
<td>Strategies for the base foundation of budgeted-for IT capability (both technical and human), shared throughout the firm as reliable services, and centrally coordinated (e.g., network, help desk, shared data)</td>
</tr>
<tr>
<td></td>
<td>Individuals or groups of IT executives</td>
</tr>
<tr>
<td><strong>IT Architecture</strong></td>
<td>An integrated set of technical choices to guide the organization in satisfying business needs</td>
</tr>
<tr>
<td></td>
<td>Business unit leaders, key process owners, or their delegates</td>
</tr>
<tr>
<td><strong>Business Application Needs</strong></td>
<td>Business applications to be acquired or built</td>
</tr>
<tr>
<td></td>
<td>IT executives and one other group (e.g., “C” level or business unit leaders)</td>
</tr>
<tr>
<td><strong>IT Investment and Prioritization</strong></td>
<td>Decisions about how much and where to invest in IT including project approvals and justification techniques</td>
</tr>
<tr>
<td></td>
<td>Shared by “C” level executives and at least one other business group (e.g., “C” level and business unit leaders)</td>
</tr>
<tr>
<td></td>
<td>Anarchy</td>
</tr>
</tbody>
</table>

Figure 3
IT Governance Arrangements Matrix for MPS–Scotland Yard

<table>
<thead>
<tr>
<th>Decision Domain</th>
<th>IT Principles</th>
<th>IT Infrastructure Strategies</th>
<th>IT Architecture</th>
<th>Business Application Needs</th>
<th>IT Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Decision</td>
<td>Input</td>
<td>Decision</td>
<td>Input</td>
<td>Input</td>
</tr>
</tbody>
</table>

**Governance Archetypes:***

- **Business Monarchy**
- **IT Monarchy**
- **Feudal**
- **Federal**
- **Duopoly**

**Governance Mechanisms:**

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMSG</td>
<td>Info Mgt Steering Grp reports to Mgt Bnd</td>
</tr>
<tr>
<td>Dir of Info</td>
<td>Director of Information</td>
</tr>
<tr>
<td>IM Leaders</td>
<td>Information Mgt Leadership Group</td>
</tr>
<tr>
<td>Biz Owners</td>
<td>Business program/project owners</td>
</tr>
<tr>
<td>Biz Liaison</td>
<td>Enterprise-Wide IT Budget Management</td>
</tr>
<tr>
<td>Arch Comm</td>
<td>Architecture Committee</td>
</tr>
<tr>
<td>IT Portfolio</td>
<td>Formal IT Portfolio approach</td>
</tr>
</tbody>
</table>

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