



CENTER FOR
INFORMATION
SYSTEMS
RESEARCH

Sloan School
of Management

Massachusetts
Institute of
Technology

Cambridge
Massachusetts

CISR Research Briefings 2001 Volume 1, Nos. 1 and 2

March 2002

CISR WP No. 325 and Sloan WP No. 4428-02

© 2002 Massachusetts Institute of Technology. All rights reserved.

- Research Article:** a completed research article drawing on one or more CISR research projects that presents management frameworks, findings and recommendations.
- Research Summary:** a summary of a research project with preliminary findings.
- 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.

CISR Research Briefings 2001 Volume 1

TABLE OF CONTENTS

Number 1A

ATOMIC E-BUSINESS MODELS

Peter Weill

Director, Center for Information Systems Research
MIT Sloan School of Management

Michael R. Vitale

Dean, Australian Graduate School of Management, Sydney

Number 1B

WHEN IT OUTSOURCING WORKS

Natalia Levina

Ph.D. candidate, MIT Sloan School

Jeanne W. Ross

Principal Research Scientist
MIT Sloan Center for Information Systems Research

Number 2A

STRATEGIC IT INVESTMENT

Jeanne W. Ross

Principal Research Scientist
MIT Sloan Center for Information Systems Research

Cynthia Beath

Professor, University of Texas at Austin

Number 2B

EFFECTIVE IT GOVERNANCE

Peter Weill

Director, Center for Information Systems Research
MIT Sloan School of Management

Richard Woodham

Researcher
MIT Sloan Center for Information Systems Research

Number 2C

EXTEND, EXPAND, EXTRACT:

FORMULA FOR SUCCESS IN AN ELECTRONIC AGE

Jeanne W. Ross

Principal Research Scientist
MIT Sloan Center for Information Systems Research

Peter Weill

Director, Center for Information Systems Research,
MIT Sloan School of Management

Michael R. Vitale

Dean, Australian Graduate School of Management, Sydney



ATOMIC E-BUSINESS MODELS

Peter Weill

*Director, Center for Information Systems Research,
MIT Sloan School*

Michael R. Vitale

*Dean, Australian Graduate School
of Management, Sydney*

The rise and fall of the dot com has been a wake up call for traditional firms to migrate to e-business models. For most senior managers, this migration is a major challenge both strategically and operationally. Which e-business models should be aimed at which customer segments? How fast should the firm migrate to the new model? Does the firm have the skills, culture, and incentive structure to implement the e-business model? How many e-business initiatives should be undertaken? We propose the notion of *atomic e-business models* to provide some structure to the chaos that many senior managers see in e-business.

Our research has identified a finite set of atomic e-business models, each describing the essence of a different way of doing business electronically. The eight atomic e-business models (see Figure 1) aim to provide a mutually exclusive and exhaustive set of e-business models for consideration. The eight atomic models can be used as building blocks to build an e-business initiative within traditional firms. Understanding the characteristics of these atomic models allows us to analyze what is necessary to make them work alone or in combination as an e-business initiative.

Each atomic e-business model has different characteristics: different core competencies, sources of revenue, value propositions, and IT

infrastructure. For example, the American weather forecasting firm Accuweather (www.accuweather.com) is fundamentally a content provider, with a core competence in weather forecasting. To ensure and nurture their core competence Accuweather employs the world's largest team of professional forecasters. The forecasters work with IT professionals and a sophisticated IT infrastructure to gather, represent, customize, and distribute weather information to hundreds of direct to customer businesses such as CNN interactive and many TV and radio stations. As a content provider, Accuweather does not have direct contact with consumers. Nonetheless, Accuweather's brand is recognized by 180 million Americans, illustrating the importance of branding for the content provider atomic model.

Some atomic models, such as direct to customer (e.g. www.dell.com) and full service providers (e.g. www.GESupply.com), are electronic implementations and improvements of successful offline business models. Other atomic models (e.g. virtual communities, value net integrator) have become possible only with e-business. For example, 7-11 Japan, that country's most profitable retailer, has evolved into a value net integrator that coordinates the convenience store value net. Over time, 7-11 Japan has shed almost all physical assets and owns no stores, inventory, warehouses, computers, or vans. Instead, 7-11 Japan owns the strategy and brand, and, through electronic connections to the major players in its net, collects, analyzes, and distributes the data to the other participants—coordinating the value net.

Our study of 50 e-business initiatives revealed that each initiative contained, on average, two atomic models. The empirical data showed that

some atomic business models are compatible and can be combined to create powerful value propositions to customers. Other combinations of atomic business models are incompatible and unstable leading to problems such as channel, information, infrastructure or competency conflict. Figure 2 summarizes the results of combining pairs of atomic models.¹

Carefully identifying customer segments is crucial in designing and implementing e-business models as different combinations of atomic models will appeal to each segment. For example, Lonely Planet, a successful travel book publisher (www.lonelyplanet.com.au), attributes its off-line success to a loyal customer base, a well-known brand, motivated and highly qualified writers and editorial staff, a can-do culture with an irreverent style, and a significant amount of intellectual capital. As Lonely Planet takes its business on-line, it has adopted different e-business models for different segments.

- **Content provider:** Lonely Planet creates branded and unbranded travel content that is distributed via a number of intermediaries, including the sale of books via electronic and physical bookstores such as Amazon.com and Borders. Lonely Planet content is sold to allies like Travelocity and Yahoo, which use it to attract visitors or to sell travel services.
- **Virtual Community:** Lonely Planet has created a thriving *virtual community* that revolves around their website, which receives 3 million hits a day from 2 million unique visitors a month. The center of the *virtual community* is the Thorn Tree bulletin board, on which travelers and potential travelers post more than 1,500 messages a day.
- **Direct to Customer:** Lonely Planet has made a careful entry into the *direct to customer*

¹ Figure 2 was compiled by analyzing the correlation matrix of the use of atomic business models in the 50 initiatives studied. All but the neutral relationships were statistically significant correlations for the positive or negative use of two models in combination.

business model. The CitySync initiative delivers city guides directly downloaded to consumers' palm top devices.

Lonely Planet is not sure which e-business models will ultimately succeed, but the firm is sure that it needs its travel content (text, images, video, maps, etc.) stored in an integrated knowledge bank. Whatever the product or the distribution channel (book stores, handheld devices, websites, etc.), Lonely Planet needs an IT infrastructure to access, integrate, and distribute travel content electronically. The knowledge bank is one of Lonely Planet's e-business building blocks that support all its e-business initiatives.

Figure 1

Atomic e-Business Models	
Content Provider	Provides content (e.g. information, digital products & services) via intermediaries.
Direct to Consumer	Provides goods or services directly to the customer often bypassing traditional channel players.
Full Service Provider	Provides a full range of services in one domain (e.g. financial, health) from own products and best of breed, attempting to own the consumer relationship.
Intermediary	Brings together buyers and sellers by concentrating information (e.g., search agent, auctions).
Shared Infrastructure	Brings together multiple competitors to cooperate by sharing common IT infrastructure.
Value Net Integrator	Coordinates the value net (or chain) by gathering, synthesizing, and distributing information.
Virtual Community	Facilitate and create loyalty to an online community of people with a common interest enabling interaction and service provision.
Whole of Enterprise / Government	Provides a firm-wide single point of contact consolidating all services provided by a large multi-business organization organized by customer events.

Note: All atomic models are both B2B and B2C except content providers.
Source: P. Weill & M. Vitale Place to Space: Migrating to e-Business Models, Harvard Business School Press, forthcoming 2001. © 2001 Weill & Vitale

Figure 2

Synergies & Conflict between Atomic Models for an e-Business Initiative (based on a study of 50 e-business initiatives)								
	CP	D2C	FSP	I	SI	VNI	VC	WOE
Content Provider (CP)		STOP	⚠	⚠	⚪	STOP	⚪	⚪
Direct to Customer (D2C)			⚪	⚪	STOP	⚪	✓	✓
Full Service Provider (FSP)				✓	⚠	⚠	✓	⚪
Intermediary (I)					⚠	⚠	⚪	✓
Shared Infrastructure (SI)						⚪	⚪	⚠
Value Net Integrator (VNI)							✓	⚠
Virtual Community (VC)								⚪
Whole of Enterprise (WOE)								

STOP = clear conflict
 ⚠ = caution possible conflict
 ✓ = clear synergy
 = neutral



WHEN IT OUTSOURCING WORKS

Natalia Levina

Ph.D. candidate, MIT Sloan School

Jeanne W. Ross

Principal Research Scientist, MIT Center for Information Systems Research

IT outsourcing has been marked by high hopes and bitter disappointment. But even as some relationships falter, offerings such as application service providers and business process outsourcing herald new possibilities for IT management. Indeed, both economic and core competency literature argue that firms should source at least some IT services using external providers. Given frequent disillusionment with outsourcing, what services should firms outsource? Under what conditions will outsourcing be successful?

We found that firms can assess the IT outsourcing decision using the concept of *complementarities*. Complementarities refer to mutually reinforcing competencies and strategies, such that the joint effect is greater than the sum of the individual effects. At Texas Instruments, for example, the IT unit simultaneously pursued cost cutting and improved customer service objectives.¹ While potentially in conflict, the two objectives led to complementarities between new competencies. Cost cutting efforts at the firm included reducing IT head count, simplifying architectures, and writing service level agreements to cap IT expenses. Customer service objectives led to creation of business unit CIOs and quarterly

meetings to discuss business unit requirements. The result of these efforts was that communications with business units identified additional opportunities for cost-cutting initiatives, while cost-cutting initiatives generated credibility and enhanced communication. The IT unit developed competencies that made it easier to achieve one objective *because* it was pursuing the other. In contrast, we observed firms that used cost cutting as an excuse for lapses in customer service.

In general, internal IT units pursue excellence by being both responsive to strategic priorities and cost effective. To achieve these objectives in-house units must overcome both market and organizational constraints:

- *The market constraint—a skills issue.* IT competence demands a workforce that demonstrates operational excellence on repetitive, even mundane, tasks, while ensuring rapid adoption of new skills as new technologies become available. This dichotomy can lead to skill shortages, disillusionment, and turnover.
- *The organizational constraint—a focus issue.* A firm's priority is to develop competencies for industry excellence. Thus, management must weigh investments focused on developing IT systems and competencies against all other investments focused on making the firm more competitive in its core markets. This balancing act limits opportunities to develop and apply IT core competencies.

Outsourcing vendors face the same market constraints as internal IT units, but they are not hampered by internal organizational constraints.

¹ For more information on TI's cost-cutting and customer service initiatives, see Working Paper #299 "Texas Instruments Inc.: Service Level Agreements and Cultural Change."

For example, vendors can implement career development and compensation practices that and policies. Similarly, vendors can introduce highly standardized methodologies that may be counter-cultural in some organizations.

We studied a successful, long-term systems management outsourcing relationship where the vendor implemented multiple practices towards the development of four core competencies²:

1. **personnel development (pd)**—the use of junior staff, mentoring, redundant skill creation, training, promotion from within, and staff rotation addressed skill shortages and combated turn-over trends in the IT labor market;
2. **methodology development and dissemination (mdd)**—a project office, corporate practice groups, standardization and documentation of processes, employee process ownership, and methodology training ensured cost effective, predictable customer service;
3. **customer relationship management (crm)**—communicating priorities and status, sharing efficiency benefits, managing expectations, and sharing expertise increased responsiveness to customer needs; and
4. **project management (pm)**—a team-based environment and cross-team collaboration, individual responsibility for systems, work documentation, and project management training allowed the vendor to meet project constraints while building and leveraging competencies.

The success of the outsourcing relationship resulted not just from the sum of the individual core competencies, but from the fact that these four competencies were mutually reinforcing and were implemented across a large number of projects. For example the standardization of work processes established the firm's methodology (mdd), but it also supported development of junior staff (pd), simplified

internal IT units might have great difficulty implementing due to company-wide pay scales project management (pm) and specified key customer interactions (crm). Similarly, customer relationship management (crm) was built on communicating priorities and status, which proved critical to effective project management (pm) and, by identifying what clients needed to know, contributed to both personnel (pd) and methodology development (mdd). Thus, the set of competencies created a “momentum” in which learning or improvement in one area contributed to each of the other competencies, as depicted in Figure 1.

Internal IT units can create complementarities, but IT market constraints and a firm's organizational constraints will often conspire to make complementarities more difficult to achieve. Thus, IT outsourcing can deliver cost-effective and responsive technology services if a firm uses a *complementarities* approach, as follows:

1. Identify market and organizational constraints that limit internal IT unit effectiveness.
2. Seek vendor competencies that specifically target those constraints.
3. Design an outsourcing agreement that specifies and rewards complementarities over and above individual service levels for each vendor competence.

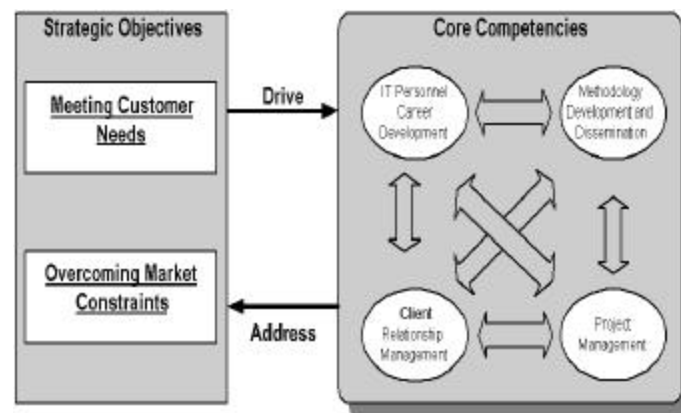


Figure 1

² Working paper #313, “From the Vendor’s Perspective: A Complementarities Theory View on the Value Proposition in IT Outsourcing,” provides a more detailed report on the vendor’s competencies and their complementarities.

STRATEGIC IT INVESTMENT

Jeanne W. Ross

*Principal Research Scientist, MIT Center
for Information Systems Research*

Cynthia Beath

Professor, University of Texas at Austin

Over the past 10 to 15 years a flood of IT-enabled business initiatives has elevated the importance of, and firms' investment in, information technology. Indeed, opportunities to strategically deploy IT seem limitless; on the other hand, resources required by these investments—capital, IT expertise, management focus, organizational capacity for change—are severely limited. Firms must make trade-offs in choosing from among their many investment opportunities: short-term versus long-term, local versus cross-functional, specific business solution versus shared infrastructure. Given multiple, often conflicting, investment objectives, how can firms assess their IT investment opportunities? How do they maximize the value received from IT?

In a study of 30 firms' e-business initiatives, most participants supplemented traditional approaches to IT investment with new approaches. At 16 firms, senior management made a *lump sum allocation to support infrastructure*, and at 12 firms, senior management funded a *budget for e-business experiments*. Our respondents were uneasy with these approaches, and they were not sure whether the new approaches represented "exceptions" or precedents for future investment.

Based on follow-up case studies, our sense is that these "exceptions" represent an ongoing need to adopt multiple investment rationales.

UPS, for example, adopted multiple approaches to IT investment.¹ Responding to competitive pressures, senior management invested \$11 billion between 1986 and 1995 to fund CIO-led initiatives targeted at building the IT foundation necessary to do business in the package delivery industry. In addition to making major corporate allocations for infrastructure, UPS also (1) uses business cases, called "charters," to justify major system development projects; (2) funds CIO efforts to continuously upgrade existing technologies; and (3) centrally funds both IT R&D (on new technologies) and business experiments (on new IT-driven business opportunities).

Figure 1 presents an IT investment framework based on the IT investment practices of the firms in our study. One dimension of the framework contrasts two strategic objectives for IT investment: short-term profitability versus long-term survival and growth. The second dimension contrasts technology scope: shared IT infrastructure versus business solutions.

As the framework suggests, electronic business environments are blurring the distinctions between short-term outcomes typically ascribed to applications and long-term outcomes normally associated with IT infrastructure. Specifically, IT infrastructure has become vital to meeting immediate business needs and generating short-term profits. Meanwhile, experimental business applications allow firms to test, adapt, and even reconstruct, their business models, emphasizing a key role for business applications in long-term growth. Thus, the framework proposes that short-term

¹ CISR Working Paper No. 318 is an in-depth case study of UPS' e-business efforts.

profitability depends on investments in *both* business applications *and* shared, standardized platforms. Long-term growth depends on investments in *both* firm-wide infrastructure transformation projects *and* business and IT experiments. This means that firms need to allocate their discretionary IT spending to four distinct types of initiatives:

- **Transformation:** investments that build an enabling infrastructure consistent with the long-term strategic objectives of the firm. Transformation initiatives change the core infrastructure with the intention of changing core business processes. These initiatives are risky and must be funded and led by senior management. As an example, Delta Air Lines undertook a transformation when senior management allocated almost \$1 billion to completely replace its core infrastructure.²
- **Renewal:** investments that upgrade infrastructure technologies and enterprise systems. These investments, typically funded through the CIO’s budget, can often be justified on a cost-benefit basis. Conceiving of IT infrastructure as a renewable asset, IT managers at Delta monitor 50 key technologies to determine when a standard technology has become ineffective or too expensive to support.
- **Process Improvement:** investments that support immediate business needs and build on the existing infrastructure. Because they rely on existing infrastructure, process improvement initiatives are relatively low risk and have measurable benefits. Thus, they can be funded through traditional capital budgeting processes. Delta’s new infrastructure enabled a new passenger boarding application that had predictable costs and quantifiable benefits.

² CISR Working Paper 317 is an in-depth case study of Delta Air Lines’ e-business efforts.

- **Experiments:** investments in business applications and IT R&D for purposes of testing new opportunities. These experiments are intended to be short-term and thus need not be built onto existing infrastructure. Delta invested in a variety of e-business experiments to learn the needs of various customer segments prior to building important new applications.

We have observed three managerial processes that enable wise investment in IT. The first is governance processes that ensure investment in all four types of initiatives described above. By allocating responsibility for different types of investments to different decision makers in a coordinated way, firms build long-term flexibility while ensuring short-term profitability. The second is a process for exposing IT costs. Firms cannot effectively justify shared IT infrastructure investments if they do not identify and understand their IT costs; and they will find it difficult to distribute funds among applications and infrastructure if their budgeting processes do not distinguish between the two. Third, firms need to design a high-level enterprise architecture that defines the IT capability they are trying to create. By developing an *as-is* picture of how IT supports core processes, as well as a *to-be* picture of an ideal IT environment to support those processes, a firm can identify its most critical IT infrastructure and applications needs. Together these processes focus firms’ limited resources on those investments that will reap the greatest benefit.

Figure 1: IT Investment Framework

Technology Scope		
Shared Infrastructure	Renewal <i>Discounted Cash Flow</i>	Transformation <i>Options</i>
	Process Improvement <i>Discounted Cash Flow</i>	Experiments <i>Options</i>
Business Applications	Short-Term Profitability	
	Long-Term Growth	
Strategic Objective		



EFFECTIVE IT GOVERNANCE

Peter Weill, *Director*,
MIT Center for Information Systems Research
Richard Woodham, *Researcher*,
MIT Center for Information Systems Research

The average total IT investment by firms is now greater than 4% of annual revenues and still rising. This results in the average firm's annual investment in information technology (IT) exceeding 50% of overall capital investment. As IT has become more important and pervasive, firms are increasingly challenged to manage and control IT to ensure value is created. In many firms centrally managed IT is no longer possible or desirable. To address this issue, many firms are refining IT governance structures that encourage behavior that leads to achieving the firm's business performance goals. We define IT governance as *specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT*. IT governance applies principles similar to those for financial governance (i.e. what dollars are available and which capital investment projects should the firm undertake) to IT investment and management. We studied the IT governance and financial performance of 24 large firms to understand the range of governance patterns adopted and those patterns used by top performing firms.¹

Based on quantitative and interview data we developed a framework for IT governance as shown in Figure 1. Effective governance requires harmonization of **business objectives**,

IT governance style and **business performance goals**. For example, the critical business objectives for the firm (e.g. grow existing business and reduce time to market) need to be harmonized (horizontal arrows) with the styles of IT governance (e.g. federal style for IT investments) and business performance goals (e.g. targets and time frames). In addition, harmonization is needed in how each of these is achieved or measured (vertical arrows): **business objectives** and **desirable behavior**, **IT governance style** and **mechanisms** and **business performance metrics** and **goals**. For example, the business objectives (e.g. sharing and reuse) are elaborated in a set of desirable behaviors (e.g. look within firm first).

Figure 2 describes the five different IT governance styles we found: business and IT monarchies, feudal, federal and anarchy. Firms adopted one of the **IT governance styles** in each of the four different **IT domains** we studied, often adopting different styles for each domain (i.e. IT principles, infrastructure, architecture and investment).

The typical pattern of governance style (exhibited by more than 50% of the firms) was where:

- An IT monarchy made decisions on high-level principles in the use of IT (e.g. IT is predominately used to cut costs).
- Either a business monarchy or IT monarchy made decisions about IT infrastructure capability needed for the firm (e.g. the firm needs a global network touching all workstations with the potential to connect all customers).
- An IT monarchy made decisions on IT architecture and standards (e.g. the network architecture will be global, secure to a specified degree and have a certain capacity and

¹ Data was used from the study of 40 firms entitled "Justifying & Funding IT Infrastructure," the Results Research Project ITI, The Concours Group, conducted by Eileen Birge, Nancy Wendt, Peter Weill, M. Lynne Markus & others. Analysis by Richard Woodham & Peter Weill.

scalability. The standard will be TCP/IP version x.x and be mandated globally.)

- A business monarchy made decisions on IT investments and priorities.
- In all four IT domains, input to decisions was gathered from a federal structure combining two or more of the following: senior executives, business unit leaders, business process owners, IT executives and end users.

This dominant pattern follows generally accepted governance guidelines of encouraging broad based inputs but tightly controlling the decision rights to a few leaders. Firms used a wide variety of mechanisms to implement a particular governance style often involving steering committees, a budgeting process, investment approvals and chargeback. For example, a business monarchy was often implemented with an executive committee containing the CEO, CFO and heads of the business units. The CIO was typically part of the committee and involved in decision-making but did not act independently from the senior leadership. This comment from a senior IT executive in a major travel organization explains how the business monarchy plays a central role in driving strategy: “We don’t have an IT strategy, we have a business strategy; the CIO is part of the senior leadership team that sets the strategy.”

Even if a firm adopted a particular governance style (e.g. business monarchy) for an IT domain (e.g. architecture and standards) the style was not always followed. Forty-five percent of firms reported no IT initiatives outside the governance structure and many of these firms had a governance mechanism for dealing with exceptions. For example, UPS has a set of subsidiaries that have unique systems requirements and do not fit neatly with UPS’ highly standardized IT environment. The IT manager responsible for subsidiaries instituted a policy requiring a joint statement from both the architects (arguing the value of compliance) and the applications developers or business sponsor (arguing the value of non-compliance) for any system designs that are off architecture. These statements can lead to resolution among the

parties, resolution by the subsidiary IT manager, or can be passed up to the CIO or ultimately, the senior steering committee, depending upon the strategic importance of the system.

Interestingly, top performing firms did not follow the typical governance pattern.² Instead, firms who were leading performers on a particular metric had specific governance patterns that appeared to encourage their unique combination of desirable behaviors. High market capitalization firms had very decentralized governance structures with federal styles for investment and feudal styles for architectures and anarchy (i.e. determined by the business process owner) for IT principles. This governance pattern is designed to give maximum autonomy to business unit managers to encourage entrepreneurship with less regard to standardization. In contrast, firms that are leading performers in terms of return on assets differ from the typical firm by having infrastructure and architectures decisions made by a centralized business monarchy (rather than an IT monarchy) to encourage sharing, reuse and asset utilization.

Implementing effective IT governance requires a deliberate process carefully specifying and harmonizing each of the elements in the framework. Each firm’s governance structure will be unique to its objectives and performance goals. Firms with effective IT governance also worked hard to make the governance mechanism transparent to all managers rather than covert. Part of this process usually involved education to help managers understand and use the governance mechanisms.

The alternative to governance is an uncoordinated set of mechanisms implemented at different times, each addressing a specific and often local issue. This is unlikely to be effective in focusing a firm’s IT practices on strategic business objectives.³

² All relationships described in this paragraph were statistically significant.

³ A working paper will be available shortly. Please contact CISR to receive the paper.

Figure 1: Effective IT Governance

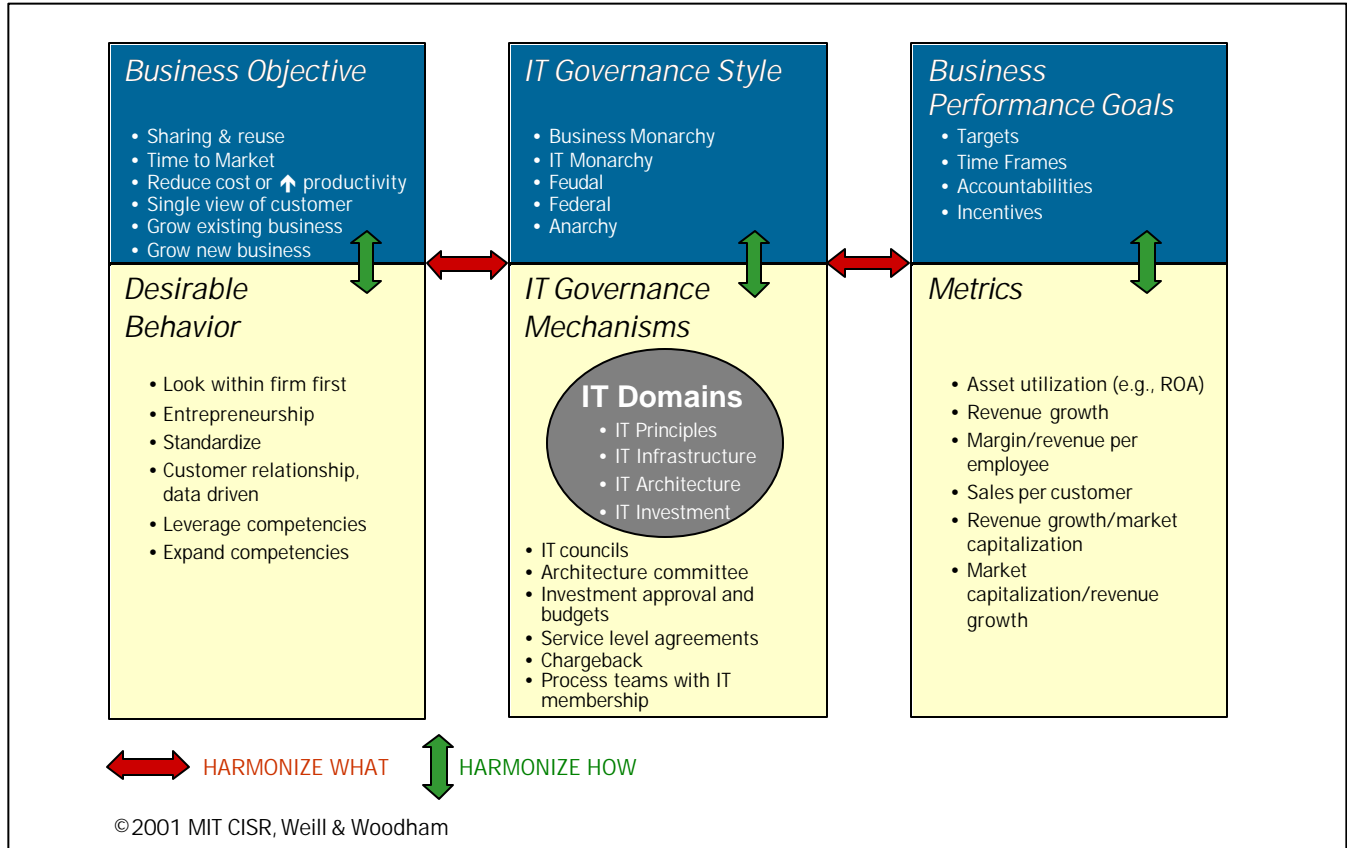


Figure 2: IT Governance Styles

IT Governance Style	Decision rights or inputs to decisions for a particular IT Domain are held by ...
Business Monarchy	A group of, or individual business executives ("C" level, e.g. CxO). Includes IT Councils, etc., containing senior business executives but excludes the CIO (and/or IT executives) acting independently.
IT Monarchy	Individuals or groups of IT executives.
Feudal	The business unit leader or his or her delegates.
Federal	Shared by a combination of senior executives, business unit leaders, business process owners, IT executives, and end users.
Anarchy	Each individual business process owner or end user.

Note: All archetypes include the possibility of decision rights held by or inputs to decisions by customers, suppliers, and outsourcers and were inspired by Davenport, 1997.



EXTEND, EXPAND, EXTRACT:
FORMULA FOR SUCCESS
IN AN ELECTRONIC AGE

Jeanne Ross, *Principal Research Scientist*
MIT Center for Information Systems Research
Peter Weill, *Director*
MIT Center for Information Systems Research
Michael Vitale, *Dean*
Australian Graduate School of Management

Not long ago the creativity, agility and responsiveness of dot-coms threatened the habits and profits of traditional, entrenched businesses. Burdened by legacies in both IT and business processes, traditional firms responded by leveraging their unique intangible assets: established customer relationships, brand recognition, buying power, financial strength, and industry expertise. For most firms, learning how to leverage those assets involved strategic experimentation. In some cases, firms even created new organizational units, such as e-Citi at Citicorp and e-Ventures at UPS to identify and address e-business opportunities.

While the e-business frenzy has subsided, the need for business experiments has not. Although many firms have disbanded special e-business units, experiments continue to help firms synchronize their internal capabilities with rapidly changing customer demands. Developed apart from the firm's deeply entrenched, slow-to-change internal processes, experiments permit rapid responsiveness to market opportunities. The ability to experiment is particularly valuable in an increasingly electronic business world, where IT provides the ability to reach customers through new electronic channels and to introduce information-based products and services. In a connected business world, enabling "sense and respond" capability experiments may become the dominant strategic paradigm. But how can firms

develop a competence in experimentation? How do they institutionalize experimental processes?

We have observed two types of business experiments in electronic environments: extension and expansion. *Extension* leverages existing processes and competencies via new channels to maximize short-term profitability. For example, Brady Corporation, a half-billion dollar manufacturer of identification products, has found that online catalog sales in its direct to customer business generates savings of about \$11 per order. Brady has traditionally sold primarily through distributors. The online catalog allows the firm to reach greater numbers of customers who do not regularly purchase identification products from distributors.

Expansion leverages market perceptions and customer expectations to explore new business models and opportunities for long-term growth. For example, Delta Air Lines started offering MYOBTravel.com, a travel portal for small and medium-sized businesses. Australia Post, the Australian post office, expanded into warehousing and home delivery of groceries. UPS created an online courier service that combines aspects of document delivery with call center services. Expansion experiments allow firms to dabble in businesses that are adjacent to their core business.

As the pace of change will continue unabated, firms need to maintain a pipeline of experiments. But experiments demand resources: money, staff, and most importantly, management attention. By definition some experiments will fail. Those can be discontinued, thereby releasing resources for future experiments. The bigger challenge is releasing resources from successful experiments. To sustain a pipeline, firms need to be equally proficient at *extraction*—reducing resource requirements—as they are at experimentation.

Figure 1: Extend-Expand-Extract Processes

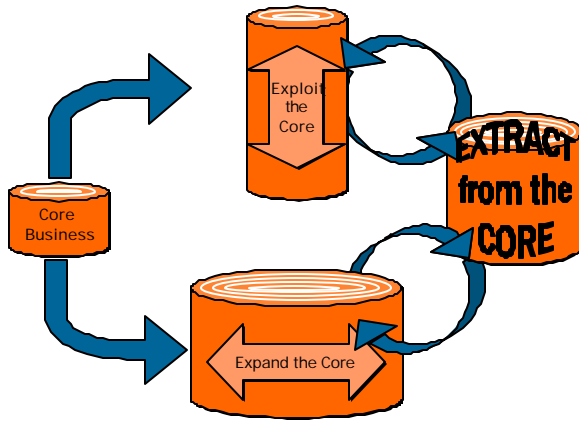


Figure 1 describes the extend-expand-extract process that will likely characterize successful 21st century firms. Firms experiment in ways that extend current processes or expand their existing markets. Firms then extract resources either by declaring the experiment a failure or by identifying systems or processes that reduce the time and money requirements for successful experiments. Over time, the firm's core business becomes denser (stronger) while gradually growing in scope to uniquely define the firm relative to its competitors.

Innovative firms like 3M and Johnson & Johnson have practiced extend-expand-extract for years as they develop and market new products. This process is critical in firms like these, which typically have more than a third of annual sales from products introduced in the last five years. What distinguishes electronic age business initiatives is their heavy dependence on IT:

- IT supports extension through existing systems and data that can be extended—and often enriched—through electronic channels. Chase Manhattan Bank, for example, has put a web front-end on some of its institutional investment systems to support online transactions and information exchange. Smaller investors, who previously were not able to command the attention of sales agents, are now able to obtain investment information and complete transactions online.
- IT supports expansion through infrastructure components and development tools that

enable rapid development of systems to support new business models. For example, Delta Air Lines executives credit an existing infrastructure component, initially built to support the reservation process, with allowing the firm to introduce its MYOBTravel initiative within a few months of conception, rather than the year that would have been more typical of such development efforts.

- IT supports extraction through the firm's infrastructure services. Staples has found that infrastructure investments in an intranet, enterprise systems, and centralized systems operations permit the firm to regularly absorb its business experiments into the firm's existing infrastructure. In doing so, Staples has increased process standardization and discipline across the firm.

Effective IT management plays a key role in enabling the extend-expand-extract process. Without readily accessible corporate data, extension efforts will be handicapped, and cause a firm to miss opportunities for increased profitability. Without reusable components and rapid development techniques, expansion opportunities are limited and a firm will have fewer opportunities to test new business models. Without a standardized, firm-wide IT infrastructure, a firm will not be able to complete the extraction process, and thus will continue to consume resources that could be applied to new experiments.

The extend-expand-extract process highlights the need for an effective IT architecture. Firms with a well-designed IT architecture that embodies the firm's core business are positioned to leverage their IT capability in both extension and expansion initiatives and also to extract and absorb successful experiments into their core. Of course, some expansion initiatives will stretch the limits of the architecture, identifying the need for new capabilities. In doing so, these experiments help the firm evolve toward new, profitable business models.

CISR MISSION

CISR was founded 25 years ago and has a strong track record of practice based research on the management of information technology. As we enter the twenty-first century, CISR's mission is to perform practical empirical research on how firms generate business value from IT. CISR disseminates this research via electronic research briefings, working papers, research workshops and executive education. Recent and current research topics include:

- Architecture-Driven Business Strategies
- Converting Customer Data into an Asset
- The IT Portfolio—Benchmarks & Performance
- Assessing IT Governance Effectiveness
- Strategies for Web Services

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.

CISR is funded in part by Research Patrons and Sponsors.



CISR gratefully acknowledges the support and contributions of its current Research Patrons and Sponsors...

CISR RESEARCH PATRONS

Accenture
Compaq Computer Corporation
Gartner
IBM Corporation
Microsoft Corporation

CISR SPONSORS

Aetna
Dresdner Kleinwort Wasserstein
Dow Corning Corporation
The Guardian Life Insurance Co. of America
The Gillette Company
Intel Corporation
Marsh, Inc.
MetLife
Ortho Biotech Products, LP
Pfizer Inc.
Qwest Communications
State Street Corporation
TRW, Inc.

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, Ass't. to the Dir.	dfitz@mit.edu
Jeanne Ross, Principal Res. Scientist	jross@mit.edu
Jack Rockart, Sr. Lecturer	jrockart@mit.edu
Chuck Gibson, Sr. Lecturer	cgibson@mit.edu
Chris Foglia, Center Manager	cfoglia@mit.edu
Administrative Assistant	cisr-aa@mit.edu