

# **The Business-IT Gap: A Key Challenge**

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## **The Dynamics: Coevolution**

Technological tools and organizational methods have been coevolving rapidly over the past two hundred years as the world's population has grown from an estimated one billion people in 1800 to six billion people in 2000. Technological tools are ways of harnessing nature to accomplish work, ranging from steam engines to electricity, from automobiles to airplanes, from telephones to computers. Organizational methods are ways of organizing and managing people and other resources to accomplish work, ranging from factories to assembly lines, from M-organizations to franchises, from call centers to outsourcing. Rapid coevolution creates a number of challenges for business. In this paper, we examine one of the challenges (the business-IT gap) created by rapid coevolution and an approach to the challenge (business architecture).

The world of business today is increasingly competitive and uncertain. A period of innovation and market growth has been followed by one of rigorous competition, unrelenting financial pressures, and unpredictable threats. Managers today are faced with decisions about outsourcing and cost cutting, business process integration and productivity, partnerships and investments for growth. These are issues at every level from departments to business units, from enterprises to industries, and from regional to global economic planners. The level of business complexity has risen. In a few short years the ability of small local enterprises to reach out to achieve global presence has exploded, clearly enabled by technology.

These issues of complexity, competitiveness, and uncertainty can be elevated to an overarching concern for enterprise sustainability. An enterprise can be any human social system, including business, government, and a whole range of non-profit and NGO institutions. These institutions are what sustain human life. In turn, they depend on the interplay of human intervention and the natural environment to be sustained.

In the past fifty years with the rise of digital computing, the information technology (IT) industry has grown to be key provider of tools for business growth, driving business productivity, automation, and opening up numerous new business niches and models. There is a continuous feedback of business needs and opportunities to technology requirements, and from technology advances to new business opportunities. Waves of innovation from mainframe, to minicomputer, to personal computers, to the web and mobile computing/communication stand out in each decade, as do any number of businesses that helped create or benefited from the waves of innovation. Put simply, modern businesses could not exist without complex technology, and complex

technology could not exist without modern businesses. They have coevolved to depend on each other.

### **The Challenge: Bridging the Business-IT Gap**

At the same time that these coevolutionary changes have been occurring and generating success stories, there has been the perception over a number of years of a widespread failure for information technology to realize its expected potential in terms of value to businesses. Frequently one reads an industry analysts report that points to failure rates for IT initiatives that may exceed 50%. This level of failure would be quite unacceptable for many professions, and constitutes a huge drain on available capital. Our definition of a key challenge is any business investment that consumes more than 10% of annual profits and has an expected failure rate of greater than 50%.

This failure rate is referred to as the business-IT gap. Many IT services businesses have recognized this gap between the desire to address business issues and problems (reduce cost, create new business models, implement new business processes, gain competitive advantage, etc.), and the ability to implement successful solutions using information technology. Sometimes the gap arises because of in the ability of business people and technical people to communicate effectively with one another. Sometimes the technology works, but the organizational factors are not aligned with the change. Sometime the organizational factors are in place, but the technology is not delivering as promised. Sometime the technology works and the organizational factors are in place, but unexpectedly the needs of the business or other external factors have changed. There are many reasons why IT projects can fail to deliver expected returns.

The business worries about strategy, problems, and external pressures, while information technologists think about platforms, middleware, networks, applications, and legacy systems. Business communication tends to be informal, stochastic, and conducted in natural language with a common context assumed by human beings, while IT aims toward the formal, deterministic artificial language communication within an explicit context of machine processing. The ability to move back and forth on this boundary is critical to both enterprises and providers of technology. Bridging the gap is more critical than ever because rapid information technology advances have escalated the rate of development of new business functions and new modes of business operations.

There will always be communication gaps between people who wake up every morning worrying about how the corporate strategy is being enacted, and people who stay up all night trying to assure that a legacy system closes within the monthly billing cycle window. This is natural. We need specialization, and we need single-mindedness of specialists within their areas of specialty. The fact is, the gap many never disappear, and may actually grow. So the question becomes what kinds of approaches can help bridge the gap?

### **An Approach: Business Architecture**

The good news is that some people have gotten very adept at dealing with the gap. Much of the success of IT services businesses in being able to bridge the gap is based on the fact that, over recent years, the industry has come to appreciate the power of an architectural approach. An ar-

chitectural approach emphasizes the need for multiple levels of abstraction, standardized interfaces offered by well-defined modules, encapsulation, information hiding, and the like. This allows specialists to focus on their parts of the problem, and to meet at well-defined interfaces, but to understand the other levels of the problem that provide a context for their work. This doesn't mean the problem goes away, but that there is a principled approach to address it.

An architected view of business offers some of the same benefits on the business level as an architected view of software has provided for software engineers. One could argue, by the way, that the software engineers learned this approach from the hardware engineers. In spite of progress that has been made in software architecture and lately in the emerging discipline of business architecture, it is a well-recognized problem that there is still a gap between the two. Working from a generally shared paradigm of architectural thinking sets the stage for bridging the gap in a powerful way. A major contribution has been the recognition of functional and nonfunctional characteristics of business as analogs of functional and nonfunctional requirements of software.

Traditional measures of a business have been in terms of revenue and profitability. These economic, or tangible measures are only known after the fact, and are therefore lagging indicators of the health and sustainability of the enterprise. In order to achieve more reliable and confident application of technology to realize business goals, we need a better framework for understanding those factors and characteristics. IBM's on demand literature describes enterprises that are:

- responsive in their ability to sense and respond to dynamic, unpredictable changes in demand, supply, pricing, labor, competitors' moves, capital markets and the needs of customers, partners, suppliers and employees,
- variable in terms of flexible cost structures and processes flexibly that reduce risk and increase productivity, cost control, capital efficiency and financial predictability
- focused on its core competencies and differentiating assets
- resilient in the face of changes and threats—from computer viruses, to earthquakes, to spikes in usage

Additional characteristics that might be desired by the leaders of a business may include: adaptable, efficient, optimized, quality-focused, economical, durable, secure, trustworthy, and sustainable.

It may appear that these are unquestionable expressions of goodness, or value. On the contrary, in fact, these characteristics are often incompatible with each other, and therefore represent distinct design-points that imply distinct investment decisions. Some characteristics are intended to be visible to the customer, while some are internal design points within the business that aren't readily apparent from the outside. These characteristics are rarely absolute aspects of business, but almost always represent a matter of degree, so that metrics and sensing or observation capabilities need to be put in place to track and evaluate the desired level of apparent or actual attainment of the characteristic.

An architected approach to business provides the ability to focus on selected business characteristics, by isolating and understanding various functional modules and the output and interaction

at their interfaces. The term business architecture is used in the sense of “the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution”. It is in this spirit that we think about architectures of the human social systems known as enterprises, which are systems that have both abstract and concrete structure, and can be understood as sets of identifiable components that are related to each other and to their environment.

At the heart of this issue is the business organization as a human social system. These systems present unique challenges to those who would hope to provide technology-based interventions that achieve demonstrable value in a measurable way. The key challenge is that social systems are intrinsically invisible. No one can point their finger at a social system, or reach out and touch one. A social system consists entirely of relationships among humans, and as such is invisible, intangible, colorless, tasteless and odorless. It's more like software than hardware, and even less deterministic and controllable. This makes them difficult to measure, to manage, and to design in a predictable and effective manner. To a significant extent, technology is used as a means to make the business system visible to those that would interact with it. Information technology exists as a kind of intellectual and conceptual prosthesis that extends the knowing and thinking power of individual people across larger and more complex networks of social systems.

The micro-architecture of business is something like the molecular structure of the fundamental 'stuff' from which businesses are made. At a micro-architecture level, there is a large degree of apparent commonality and simplicity. The micro-architecture of all business organizations is composed of a structure of conversations, commitments, contracts, and transactions. Most of the data managed by IT systems is simply a means of capturing exactly these conversations, commitments, contracts, and transactions within various configurations of trading partners and internal organizations. This apparent simplicity is somewhat misleading; since the properties of the system may be vastly different than the properties of the elemental building blocks (e.g., the simple set of four nucleotides adenine, guanine, cytosine and thymine gives rise to all the complexity of life).

The macro-level of business architecture addresses the equivalent of an anatomic level of structure and functionality of the individual enterprise. There are many ways to look at a more macro-architecture of business structure and functionality. A traditional organization chart is a point in time snapshot of how an enterprise has assigned responsibility for various functions. Reorganizations are common, so a successful business macro-architecture should consider roles and accountabilities beyond the point in time power and managerial alignments. In a relatively unchanging way all enterprises need sensing mechanisms, information transmitters and expressers, memory maintainers, a locating function, producers of the intrinsic products and services of the business, resource maintainers, business relationship maintainers, arbiters of behavioral norms, strategic direction setters, and bottom line oriented managers.

The eco-architecture of business addresses multiple enterprises as they interact with each other in a marketplace environment. Increasingly partnerships of supply chains are competing against another partnerships of supply chains to gain market share. Ecosystems of business are structured in two basic dimensions. The product dimension is how enterprises specialize and cooper-

ate in supply webs of extractors, component creators, and final assemblers of goods and services. The process dimension fosters specialization of enterprises that provide functionality to other businesses that determine it is in their interest to outsource this capability. One of the key issues in business today is the interplay of coordination costs and business effectiveness between the individual business macro-architecture of retained functionality and trans-enterprise eco-architectures.

A key to bridging the gap between business and technology is a semantic architecture that addresses both the content and structure of the terminology used in business. A semantic architecture identifies domain specific business terms from documents and conversations and classifies and links them into meaningful patterns based on pre-defined generic business concepts, extended by industry- and discipline-specific concepts. This network of terms and concepts provides the basis for object modeling, user interface design, persistent data management design, and test cases.

### **Concluding Remarks**

It is important to treat these arguments, and all others of this type, as if they were hypotheses, and not absolute truths. The history of management consulting has been replete with self-styled gurus who have led enterprises through exercises of disruptive change on the basis of individual experiences or extrapolation from anecdotal evidence. This points to the need for intensified and sustained research into the nature of businesses as social systems, the limits of such systems in terms of structures of relationships, and the implications of changing patterns of technologically enabled communications on management styles, profit drivers, and patterns of leadership and governance. This research needs to draw on a number of disciplines, including sociology, economics, anthropology, cognitive and social psychology, and even history and political science. It needs to recognize that every introduction of new technologies into an enterprise or marketplace is actually a form of applied social science experiment and should be treated as such. It needs to recognize that there may be cycles, invariants, and trajectories in terms of social system evolution, and that the limits and potential for coevolutionary change in business and technology are still largely to be determined.

We are looking to find or create existence proofs of the possibility of bridging from strategic business initiatives through business components and processes that realize the strategy, to software components that can be demonstrated to be architecturally compatible with those business components and processes, and that are implemented on an infrastructure that supports, and does not thwart, the design decisions made at the business level in terms of the desired functional and nonfunctional characteristics of the business. This is the heart of an ongoing research agenda that we intend to foster now, and into the foreseeable future.