PART I

Value of Enterprise Architecture and SOA

CHAPTER 1

What Is an Architecture Practice, and Why Do You Need One?

I have been studying and practicing architecture from an information technology and business strategy perspective for more than 20 years. While the concept of architecture was not well defined, well understood, or well communicated in those early years, the advancements in computing technologies were forcing the concept to the surface due to unmanaged complexities in information technology (IT) that were impacting efficiencies and costs. IT organizations were being further impacted by a rapidly accelerating trend of computer literacy by the nontechnical business community. Systems were no longer being perceived as magical "black boxes," and the business involvement was not limited to business requirements. In some cases today the business jumps right over the pragmatic assessment of requirements into the selection of a prebuilt vendor solution for IT to "install."

Since the beginning of multiplatform computing, much has been written about the value of an enterprise architecture practice. Most revolves around the "selling" of architecture to the business leaders. This material is essential for obtaining buy-in and commitment. As architects, however, we recognize there is a more fundamental underlying reason why architecture is important. That reason is simply that computing technology and systems have become increasingly more complex. The number of technologies, the ways those technologies are being adapted and utilized, and the multitude of alternatives available as solutions to any given business need seem to grow exponentially each year. The result is that there are literally thousands of ways that technology can solve any one business need. While this is good in terms of competitiveness and pricing, it is bad in terms of complexity and overhead. In other words, the good news is we have many alternatives and options for solving a problem technically. The bad news is we have many alternatives and options for solving a problem technically, and without an architecture you end up implementing many different ways to solve different instances of the same problem.

Business Organizations and Departments Do Not Operate as Isolated Islands

The obstacles begin to emerge when it is realized that individual business needs are not self-contained or isolated islands. All or a portion of any one business's

needs may, and often do, have value to other business units and other business processes. While the ability to enter and validate an order from a customer was originally perceived as an internally bounded business activity, today many customers are provided the capability to directly enter the order through the Web or through a partner web site supporting your business. These add-on systems are directly influenced and impacted by the way the order system works. Adding the capability to identify high-value customers for premier services or to cross-sell customers through any of these add-on mechanisms will depend largely on how the underlying application operates and how the add-on solutions are implemented.

The point is, adapting to any of these evolutionary changes without consideration of an architecture has a high probability of incurring excessive costs for duplicity and support and may not even be attainable for technical or financial reasons.

Thus, in addition to providing guidance and traceable links to the business strategy and business unit plans, an architecture provides fundamental, basic analytical, and management capabilities to ensure that everything aligns properly and works efficiently.

If you think about building a home, the architect shows you, the customer, floor plans and layouts, even perhaps a scale model. He may even show the plans or model in the context of a high-level architecture (i.e., where it sits on the lot or how far it is set back from the street). What he does not show you is how all the plumbing and wiring is laid into the building and interconnected or where the heat ducts are. He may not show where the utilities are brought in from the street. Rest assured, however, that all of these specifications are documented and will be part of the delivery. They are specified not only based on your input in terms of the size of the building and its layout, but also on the zoning and building codes of the community. There is an expectation that the customer does not have to worry about these code and zoning requirements. The architect takes care of them. Do you as the customer take the blame and responsibility if the building inspector finds a violation?

Now let us think back to when the Pilgrims first settled in America. Certainly they applied basic building principles, but there were no building or zoning rules. As our country grew and became more crowded and complex, the need for these regulations became more apparent. Similarly, as the size and complexity of our technology infrastructure grew, we recognized the need for these basic standards and principles as well.

An enterprise architecture practice is an organization within the company that manages the complexities of the IT environment and applies principles and techniques to reduce the complexities, improve efficiencies, and reduce capital and operational expenditures. This alone should be enough to justify an architecture practice. Architecture, however, can provide an even more critical service. Architecture can help the business take advantage of the IT infrastructure to gain competitive advantages over the competition. An architecture-compliant environment and strategic architecture principles can provide opportunities and advantages not possible without these capabilities.

As a way to illustrate how technology complexity has evolved, I would like to present a brief history of computing. I will focus on some key technological milestones that have played a major role in this evolution. Understanding the past helps us deal with the future. We need to use what history has taught us to help us

avoid similar mistakes in the future. We also need to realize that taking advantage of new technologies and approaches can be accelerated if we understand how the adoption of previous technologies evolved.

Looking at the Past to Understand the Future

Technology advancements are for the most part an evolution. Each new technology concept is based on improving what already exists. Companies that can recognize these improvements early on and adopt them are usually the ones that gain the greatest competitive advantage from them. Understanding how computing has evolved historically and the roles that technologies played in that evolution can help us assess where technologies of today might lead us in the future.

In the beginning, business use of computers was simple and straightforward (although it may not have seemed so to those adopting it). It consisted of punch cards in, green bar printouts, and assembler language in the middle. There were not many options involved for how to do things.

Three key technology advancements resulted in the next major leap in business computing. First was the development of a new program language called common business-oriented language (COBOL) designed for writing business applications. The second advancement was the introduction of magnetic disks allowing data and programs to be readily accessible in real time. The third advancement was the introduction of the real-time terminal device based on the customer information control system (CICS) from IBM. These technologies brought us out of the world of batch processing into real-time processing, at least at a rudimentary level. As a result of these advancements, the type and volume of business applications exploded. In addition to performing traditional financial batch processes, such as general ledger and payroll, computers were now being used to price and process orders, generate invoices, and manage inventories and purchases.

The next major milestone was the introduction of the mini- and super-minicomputers that exploded the competitiveness of the computer hardware market and started the continuous advancements in the price performance of computer hardware that continues to this day. People walk around today with devices in their pocket that have more processing power and storage capacity than a computer with a footprint the size of a football field in the 1960s!

There was, however, a downside to this era of the computer evolution. The downside was the proliferation of redundant data and duplicity of business logic through the explosion of silo business applications.

Businesses began extracting data from the mainframe to their minis, tweaking duplicated business logic to support a slightly different set of processes, and providing a custom user interface to support them. And thus the era of multiple "stovepipe" applications with significant redundancy of data and logic began.

The next two technology advances did not create a new era of computing, they simply extended the boundaries of the existing proliferation era and slapped a new label on it. These two advances were:

1. Significant advancements in networking and network interoperability
2. The introduction of the macrocomputer known as the personal computer (PC)

For the first time there was availability of computing power at the desktop and connectivity to tap into it. The new label attached to applications developed in this phase was *client-server*. Now business data (especially reference and edit/validation supporting data) and business logic were not being duplicated on a few minicomputer platforms. They were being proliferated to hundreds, if not thousands, of desktop PCs throughout the company.

At this point most businesses had reached the epitome of what I call the resource-consumption model. Every new application:

- Was more costly and time consuming to develop and deploy.
- Added to the total year-over-year fixed cost expenses of operations.

More important, but seldom recognized, this proliferation did not improve, but instead eroded, the flexibility and adaptability to business changes.

In fact, many companies were backed into a corner where their only option was to build or buy another silo stovepipe solution even though they recognized the long-term impact of these decisions. Some companies were lucky enough to recognize the value of middleware and adopted an enterprise application integration (EAI) framework. This helped to minimize the number of point-to-point connections among the systems and reduced the need for some redundant business data and logic. Those that did adopt a middleware EAI strategy were better positioned to move to the next layer of sophistication.

The next major technology advancements were unique in that they came from an entirely different direction. They were not focused on helping businesses improve their internal systems, but they ended up revolutionizing the way we conduct business. I am talking, of course, about the Web browser and World Wide Web technologies.

While many companies were successfully extending their systems externally to their customers and suppliers, they did so without the availability of a globally accepted ubiquitous channel to do so. Customer and vendor penetration was limited in that it often required that they also make a significant investment to participate in this electronic relationship. (Bulletin Boards were the exception.)

The World Wide Web changed all this. What started out as a mechanism to help find information more easily on the Internet and more intuitively through a graphical user interface ended up providing a globally accessible ubiquitous user interface for processing business transactions. Business transactions were now capable of traversing multiple companies and multiple industries through partnerships that heretofore were unheard of. We only have to look at the online travel web sites like Orbitz® or Priceline® to see the synergistic market value of partnerships across multiple industries with a common goal (selling travel services).

The World Wide Web explosion was fueled by the introduction of another technology: fiber optic networks. Fiber optics not only geometrically expanded the bandwidth globally, but its proliferation did to the cost of wide area networks what chip advancements did to the cost of computers. Not only was bandwidth cheap and plentiful, but a standard ubiquitous interface called the Web browser was made available to take advantage of it! Wireless technologies are now taking away the physical restrictions of this new world. It truly is now anytime, anyplace.

Which brings us to today. On the positive side, we have this wonderful capability to reach out to anyone, anywhere, and conduct business. We have the ability to blend our strengths with those of our partners and even competitors to increase exposure and market share. On the negative side, we have this portfolio of redundant and stovepipe internal business applications on a massive heterogeneous set of technologies requiring heavy human involvement to navigate them when performing business activities.

If you think about what has evolved, it is ironic that we have actually come full circle from where we started. When we started there was only *one* system (one that was relatively simple by today's standards), the big mainframe with punch cards in and green bar printout. We have now evolved to where we are again at *one* system. Scott McNeely from Sun Microsystems once said, "The network is the system." As business looks at its need to get at whatever information or processes it needs, whenever it needs it, wherever it needs it, is it not looking at the entirety of systems as one? The distinction between yesterday and today is that systems were originally viewed as physical by the business. Today they are viewed as conceptual.

This is both good and bad for architects. On the good side, it gives us the ability to highlight and communicate the value of the logical and conceptual components of architecture. On the downside, our need to maintain an up-to-date and accurate mapping of the conceptual-to-logical and logical-to-physical components of our environment is absolutely critical.

Thus the evolution of technologies and the capabilities they provided have had as great an impact on how businesses operate as anything else they have encountered. They have also been responsible for the single largest expenditure increase year over year. Even though the cost of many technologies has shrunk considerably over the years, the total amount IT spends has increased significantly over that same period. This is partly due to the fact that companies today use more technologies and have more business applications than they ever had before. What is not necessarily understood by the business is the fact that the acquisition of most of these technologies and business applications was not made based on architectural principles and added a significant amount of costs associated with redundancy, duplicity, and complexity. There is a lot of waste and a lot of unnecessary overhead in most IT operations today. Therefore, it is critical that the architects are aware of the technologies and capabilities coming down the pipe. Many of these may be beneficial to or desirable by the business. Architects need to proactively understand what will be required to minimize the architectural impact of these technologies and maximize their effectiveness if they are brought in-house.

Summary

The answer to why we need an architecture practice is:

- To ensure that all the IT investments will hang together and work the way they are suppose to work and when they are supposed to work.
- To proactively ensure that any new technologies, platforms, or solutions introduced into the environment are the best solutions from a business *and* architecture perspective.

- To be the agents of advancement of the business's understanding of and participation in an architectural approach to IT systems.
- To leverage and exploit the understanding and participation of the business to identify strategic opportunities and maximize the return on investment on IT expenditures.

While any one of us may have taken on a project to build a shed in the backyard or finish off a room in the house without a formal plan, none of us believe we could build a skyscraper without architects. We would not, however, use architects if they were not formally trained in and knowledgeable about the architectural design principles and practices as well as all the regulations and laws applicable for the development environment. We must believe that this is also true for our IT systems as well.

None of us would go out and buy a prebuilt spare bedroom to attach to our house without an architecture design for how that room will be integrated with the existing house. Buying a prebuilt business application without considering the architectural impact can result in similar restrictions and complexities when implemented.