Business-based IT architecture: The business leader's role in enabling public-sector change

Mike Anderson
Michael Betz

Unlike their counterparts in the corporate world, government leaders do not feel the pressure of market forces directly. Yet they must deal with something far more challenging: legislative mandates and public expectations. Every year, government agency leaders must react to new laws and regulations, meet the public's ever-increasing demands for new and better services, and improve the productivity of their organizations. That requires government executives to leverage information technology to create organizations that can respond speedily to changing political, social, and legislative environments.

But achieving those goals is not easy, even when government personnel are willing to embrace new ways of doing their work. The reason is simple but the fix is not: government legacy computer systems, built and maintained over many years, get in the way. They make it difficult (if not impossible) to access critical information, link systems that need to share data, and update technology. As a result, these legacy systems discourage the implementation of innovative technologies, and the

new processes and systems that can provide major productivity gains.

The problem is not in each system per se, but rather in the IT architecture, the overall design of an organization's many and disparate information systems, and how they link together to support the enterprise's business processes. Building an effective IT architecture (or mending a broken one) is a complex, technical task, and non-IT leaders might ask why they need to

concern themselves with it, why they simply can't ask their CIO to make sure it works and leave it at that. The following questions and answers are based on McKinsey's experience with IT architecture, and on discussions with public-sector leaders and CIOs. They highlight why the critical task of designing and maintaining an optimal IT architecture can't, in fact, be left solely to the IT department, and why it demands the extensive and intensive participation of the CEO and business unit (or agency) leaders.

We also discuss how business leaders can help create an IT architecture that will enable government institutions to update their information systems rapidly.

WHY DOES IT ARCHITECTURE MATTER?

A responsive IT architecture is critical to any industry in which companies must update IT-intensive business processes rapidly to remain competitive. It is, however, particularly important in the public sector. The scale of government operations alone creates a huge complexity challenge that only an efficient IT architecture can address. For example, the US federal government consists of 273 agencies, and most have their own IT departments running their own systems on their own platforms. One large US civilian agency spends more than $1.5 billion annually on IT and runs more than 400 disparate software applications.

Many organizations today operate with similarly complex, costly, and inflexible IT architectures that make IT more of a hindrance than a help. In these organizations, just keeping the legacy systems running may

consume an enormous percentage of the IT budget, making it difficult to invest adequately in beneficial new solutions.

At the same time, the smallest system changes can take months, even years. This situation frustrates the business leaders and their constituents who want change. It also frustrates the IT departments that want to develop innovative new systems. And it lies at the root of the longstanding tension between the business and its IT departments.

This situation plays out time and again at government organizations around the world. At one US civilian government agency, an incoming head of an important policy unit found that by the time IT could implement a necessary new feature, the need for it had changed entirely. The culprit was an IT environment so complex and inflexible that it took months just to analyze and account for the ripple effects of making even minor modifications. The policy leader and the IT department were both thwarted and frustrated. In effect, the agency's IT architecture had stopped change in its tracks.

HOW DID THIS PROBLEM GET SO BAD? I THOUGHT IT WAS SUPPOSED TO IMPROVE OPERATIONS? WHAT WENT WRONG?

From local government to the federal level, there are inspiring examples of IT's power to deliver better service at lower cost. For example, the US Internal Revenue Service's shift to electronic tax returns has made it far easier for citizens to pay their taxes. At the same time, it has saved the government millions of dollars in processing paper returns.

Unfortunately, for every instance where technology has delivered value in government, there are dozens of examples where it has failed to do so. In our experience, this is not for lack of investment. (The US federal government spent over $63 billion on IT in 2006.) Instead, the problem lies in the costs and effort demanded to keep a leaking ship afloat.

In one government agency that provides services to other agencies, the cost of its complex IT architecture hit a breaking point. Major IT projects were running years behind schedule and far over budget. To access the agency's various systems, its business partners had to remember up to 12 different passwords. So they posted them on their cubicle walls—an obvious security risk. Not surprisingly, the agency's leadership viewed IT as a liability. When shown that more than 80 percent of the IT budget went to supporting legacy operations rather than new, innovative systems, they were shocked but not surprised. The

relationship between business and IT leaders had gone beyond strained; it had become nonexistent.

This state of affairs is not unusual. Government was one of the first sectors to develop, deploy, and run large-scale automated processes. Before many private-sector companies even had IT departments, governments were busy building large data processing and record-keeping systems.

However, there has been a heavy first-mover, early adopter tax. Decades of patches and ad hoc upgrades have produced some of the most complex and inflexible IT architectures in the world. Lacking the time and money to replace the full set of systems, and under pressure to deliver results, IT departments find more and more workarounds that only increase complexity. "Case Study in Simplifying an IT Architecture: Before" (Exhibit 1) depicts the actual IT architecture of one midsize federal agency.

Exhibit 1

CASE STUDY IN SIMPLIFYING AN IT ARCHITECTURE: BEFORE

CASE EXAMPLE
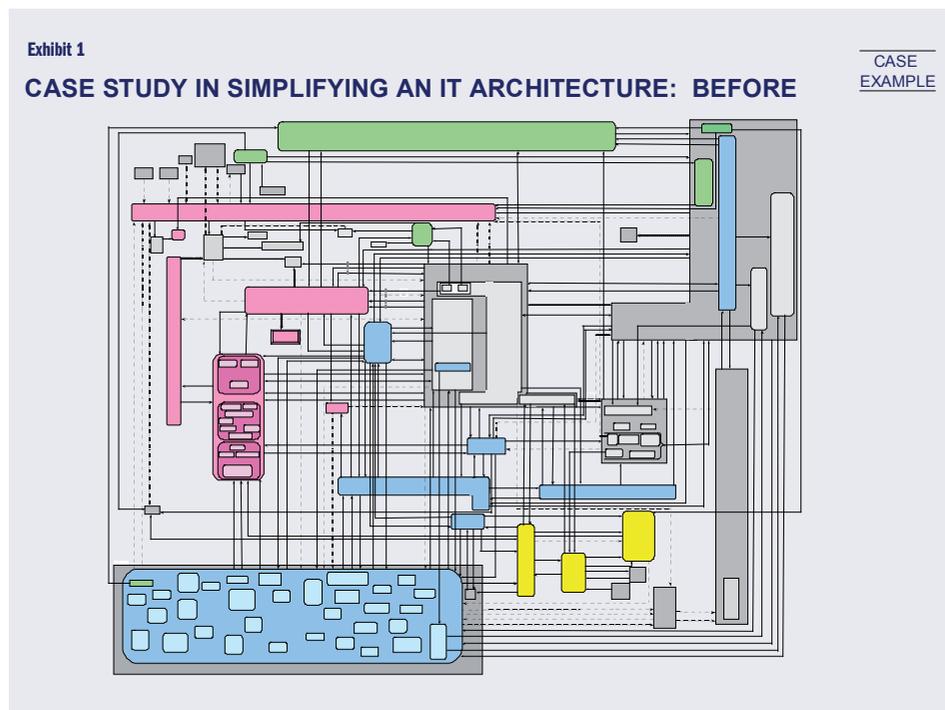
IF THIS GETS FIXED, WHAT BENEFITS CAN I EXPECT FROM AN OPTIMIZED IT ARCHITECTURE?

Specifically, we see four types of benefits from a good IT architecture:

- **Valuable new systems or new system features can be delivered in weeks instead of years.** One public-facing government agency reduced the time between major new system releases from two years to three months. This enabled the agency to increase revenue by quickly adding and changing product offerings. It also enabled online processing, which saved millions in operating costs.
- **More money available to build new systems.** Optimized IT architectures can flip the ratio of IT dollars spent running the business versus changing the business. One government agency that transformed its architecture reduced the amount of money it spent on basic operations from 85 percent to 60 percent of its IT budget, thereby freeing up resources for innovation and critical new systems.
- **Improved service and lower risk.** Standardizing reduces the complexity of troubleshooting many technologies. As one agency CIO joked, "The more different stuff I have running, the more that can go wrong." As a result of standardization, system up-times have increased (meaning that business can be conducted more reliably), and security audits now come out green instead of red.
- **Better working relationships between business and IT leaders.** Given the costs and inflexibility that come with managing legacy architectures, it is no wonder that the IT department has earned a reputation for being slow, unresponsive, and costly— everything the business does not want it to be. Is it any surprise then that the relationship between business and IT leaders has suffered? Once IT departments can leverage newly designed IT architectures, the relationship between IT and the business can begin to heal and a full business-IT partnership can become a reality.

SO WHAT DOES A GOOD IT ARCHITECTURE LOOK LIKE?

There are five hallmarks of an effective IT architecture:

- **Business-based domains.** Domains group together IT applications and databases based on the distinct business processes they support. For example, a cable network company might group together all the systems that support ad sales. Creating domains helps make it clear where different business units can innovate independently, and where they need to coordinate.
- **Modular components.** Rather than building and maintaining multiple applications that perform similar services (for example, authenticating users logging onto the network), identify opportunities to streamline and reuse common components. For example, one authentication system that can be used by multiple departments and agencies replaces 10 individual (and redundant) ones.
- **Standardized interface layers.** Whereas the old IT architecture featured one-to-one interconnection points, and bundled data with applications, the new architecture features well-defined interfaces into which

new modules and systems can plug and play. Small changes to one application no longer require changes in dozens of other systems.

- **Robust data designs and rules.** Business line accountability for data ownership and integrity creates a virtuous cycle of improvement in data quality and transparency. It also reduces the prevalance of overlapping and out-of-sync databases.

- **Standard infrastructure platforms.** In the old architecture, business applications and databases ran on a dizzying array of hardware and software platforms, with new ones bolted on whenever a new feature was required or demanded. This, of course, increased both management costs and operational complexity. Best-practice IT architectures streamline the environment to a much smaller set of standardized hardware platforms and software tools.

WHAT ARE THE BEST PRACTICES FOR BUILDING THIS KIND OF IT ARCHITECTURE?

Recognizing the value of IT architecture, some governments, including the US government, now require agencies to develop a plan for their IT architecture. While this is a good idea, too often the process for producing the plan is delegated to the CIO's organization and fails to gain meaningful input or support from you, the CEO, or the business unit leaders.

In one case, an agency badly in need of a coherent IT architecture produced a plan that sat on a shelf gathering dust. When asked why this was the case, the business unit leaders responded that they did not participate in developing it and did not understand the final recommendations, which focused on obscure technology standards. Like any good operational plan, IT architecture plans must be grounded in the business context, understood by all parts of the organizations, and focused on delivering tangible business value.

The organizations that have captured the most value from IT architecture have one thing in common: they involved senior business leaders in the process from the outset and kept them involved throughout. Specifically, they followed a three-part approach to transforming their IT architectures from rigid, costly environments to flexible, more efficient ones:

1. Take a business-based approach (rather than one that is technologically oriented) to IT architecture design, supported by senior business and IT leaders.
2. Develop a strategy for transforming the IT architecture, which progresses in an evolutionary fashion rather than all at once—the so-called big bang.
3. Make a firm commitment to supporting and updating the architecture over time.

IN PRACTICE, WHAT DOES IT MEAN TO HAVE A BUSINESS-BASED APPROACH TO IT ARCHITECTURE DESIGN?

Developing a clear end-to-end understanding of your core operational processes stands out as the first and most important step in designing an effective IT architecture. This is when and where the business

unit leaders must become involved as these processes often span organizational boundaries. According to our research, senior business executive involvement is the common thread across IT architecture efforts that deliver real value.

Imagine, for example, asking an architect to build your home but not telling him how many people will live in it, whether the house will be sited in Florida or Alaska, or if you will soon need to add another bedroom for a new child. Without that information, the best any architect can do is to build a generic box that might not accommodate your growing family or may have a heating system that's either inadequate to deal with Alaska's winters or may be an unnecessary expense in Florida's heat.

Similarly, the only way IT architecture can be designed to support an organization's immediate and long-term needs is if the CEO shares his vision with the CIO for how the enterprise will operate in the future. Are you thinking about deploying a new customer service feature? Is there a new constituency whose needs your organization must address?

Unless the CIO is cognizant of his organization's goals, the IT architecture he builds could undermine the vision of the organization's leaders, serve it in costly, suboptimal ways, or simply not be able to support the changes that will become necessary in the future.

For example, say the organization's goal is to provide superior customer service. That requires consistent data and coordination of touch points like call centers, online portals, and even walk-in sites. But all too often, organizations design their applications and data stores around arbitrary organizational lines instead of the underlying processes, resulting in duplicative systems, out of sync data, and complicated, manual workarounds.

By working backward from distinct operational processes rather than from org charts, organizations can create what we call business domains. Each domain is a logical grouping of business activities that are tightly related to each other but largely distinct from those in other domains. Once these domains are defined with the input of the business unit leaders, the IT people can map the domains back to key applications and databases. This process, for example, shows where applications and data could be better connected to provide integrated support for key business operations and where they should be disaggregated to allow for more flexibility. It may also highlight sets of technology services that can be more effectively and efficiently delivered on an enterprise level, for example, user authentication. Finally, by breaking down the architecture into domains, business managers can see the connection between their operations and the underlying IT systems that support them without having to understand the details of the entire enterprise architecture.

WILL IMPLEMENTING THIS ARCHITECTURE TAKE YEARS AND COST MILLIONS?

We do not wish to underestimate the work and cost involved in designing and implementing a new IT architecture, but there are ways to limit both the time required and

the money spent. We recommend pursuing a managed evolution (explained below) that prioritizes changes that provide immediate and real business impact. This approach usually yields tangible benefits in months, not years, and avoids the risks and costs of big bang efforts that seek to change everything all at once. We also recommend starting from the bottom up, and looking to improve the architecture within business units and individual agencies before moving on to cross-agency and cross-departmental initiatives.

WILL IMPLEMENTING THIS ARCHITECTURAL PROCESS REQUIRE A MORE CENTRALIZED COMMAND-AND-CONTROL GOVERNANCE MODEL?

Optimally designed IT architectures can give departments in large agencies more freedom and independence rather than imposing another bureaucratic point of central control. For example, in the process of redesigning its IT architecture, one agency found that two business lines with very different technology needs were both tied to a large, monolithic application. The software made it impossible for either group to modify the application to its needs, as doing so would impact other, unrelated business processes. After establishing a new IT architecture that broke the system into components (ie, modularization, one of the five hallmarks of effective IT architecture), the business lines were able to go their separate ways, improving their own operations much faster than they could have when their systems tied them together.

In another organization, one business line was ready to invest a great deal

of time and money into a system for managing physical security. As a result of the IT architecture work, it realized that a different part of the agency already had a system that could be reused with a few small changes.

WHAT WORK *CAN* I LEAVE TO THE IT DEPARTMENT?

Underneath the business applications and databases, there are multiple operating platforms and interfaces —the software tools and hardware configurations that run the systems and allow them to connect to each other. Standardizing the infrastructure components and interfaces is largely a technical endeavor. But although this work falls into the IT department's realm, standardization should deliver real business value by freeing up resources from core operations for reinvestment into new business functionality.

Applying these design principles, the agency that led the transformation effort streamlined its IT architecture from the spaghetti-like chart shown in Exhibit 1 to the relatively sanitized one shown below.

Exhibit 2
CASE STUDY IN SIMPLIFYING A AN IT ARCHITECTURE: AFTER
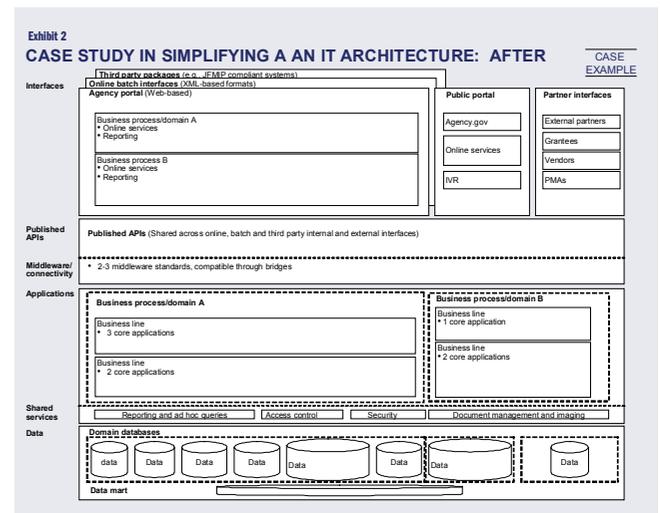
Walking the halls of the agency, one will find this picture pinned to the cubicle walls of IT and program area managers alike.

What problems should I watch out for as the implementation begins?

As they start migrating to the newly designed architecture, organizations often fall into one of two traps:

IT perfectionism can lead to new IT architectures that are conceptually attractive, considered cool by technologists, but that are risky and prone to failure if not executed exceptionally well. This pitfall can be exacerbated by the fact that requirements are likely to change during long projects due to external factors such as new policies that render original system design assumptions obsolete. Moreover, organizational credibility and political momentum can be lost in the time it takes to deliver concrete results.

Patching creates the opposite problem. Small improvements or fixes can deliver quick, visible results but over time increase complexity and introduce inconsistencies in design. Decisions that seem rational at the level of an individual project are often suboptimal from the perspective of the entire architecture. Too much patching produces unstable systems, high maintenance costs, and an inability to deliver further changes within reasonable time frames and costs.

To avoid these pitfalls, the business unit heads and IT leaders must work together just as they did in the design effort. In fact, the two groups can provide a healthy check on the other. We have witnessed cases where the business leadership helped guard against a tendency toward IT perfectionism, or IT for IT's sake, and where the IT leadership guarded against the countervailing tendency

Exhibit 3

There is a need for a balance between wholesale architectural changes and short term initiatives to meet immediate needs
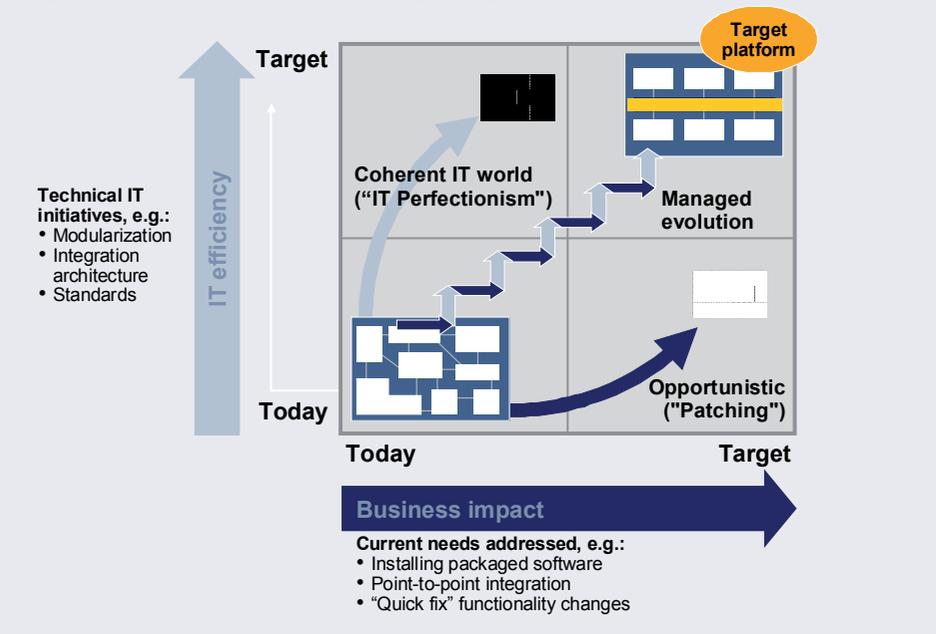
toward patching, the "I need this fixed right now!" scenario. As a result, the organization pursued a managed evolution to the target IT architecture that delivered short-term business benefits but did not derail the migration to a more flexible and efficient architecture.

AS A BUSINESS LEADER, WHAT ARE MY ONGOING RESPONSIBILITIES TO THE PROJECT?

Even with a clearly defined path to a new IT architecture that is broken down into small steps, business and IT leaders must continue to work together to ensure that the organization makes progress and does not repeat the mistakes of the past. In organizations where business and IT leaders have worked together successfully to design a business-based IT architecture and develop a managed evolution plan for implementing it, this ongoing collaborative oversight occurs naturally. Business unit leaders intuitively come to understand the downsides of diverging from the IT architecture and the underlying standards (an understanding the CEO must reinforce) even as the IT leadership internalizes the priorities of the business.

DOES THAT MEAN CREATING ANOTHER REVIEW BOARD TO ENSURE THAT ALL THE BUSINESS UNITS ADHERE TO THE NEW STANDARDS?

Putting this oversight into place *does not* mean creating yet another bureaucratic committee. Instead, we recommend embedding oversight of progress toward the new IT architecture into an agency's existing IT governance model. At

one agency, compliance with IT architecture became part of the process for reviewing and approving new IT investments. Similarly, progress toward implementing the new architecture became part of the management review processes. Importantly, this governance also must extend to projects executed by outside vendors. Building support for these measures requires that the architecture strategy be communicated clearly throughout the organization—a task best performed by a business leader (or a CIO who can speak the language of the business).

WHAT ULTIMATELY HAPPENED IN THAT AGENCY WHERE THE EMPLOYEES WERE POSTING PASSWORDS ON THEIR CUBICLE WALLS? WHAT WAS THE NEW ARCHITECTURE'S ROI?

In that agency, the commissioner and CIO credit the business-based approach we advocate for designing and building a new IT architecture for a number of process and systems improvements. The average time to deploy new functionality and respond to legislative mandates fell significantly while the dollars freed up to pursue innovative solutions increased. Beyond these tangible benefits, the commissioner and CIO noted an equally important "soft" return: a stronger relationship between the business and IT leaders. The process forced each side to view the total business/technology environment from the other's perspective and jointly create something better.

As pressure intensifies to improve service and productivity, governments worldwide must make superior IT architecture development a core competency. The next generation of government services increasingly will depend on managing and processing information. In turn, that will require highly capable and scalable IT platforms that synchronize activities across many branches of government. This is a challenge that extends beyond the IT organization. It requires top-level leadership across the agency. New IT architectures will change the public sector's view of technology from a mysterious black box to a tool that can greatly improve every service government provides.

Fixing legacy systems: Lesson from banks

Walter Bertschinger

Many financial services companies, such as large banks and insurers, also rely heavily on legacy applications that have been built up and added to over the past 15 to 20 years. Many of them run on outdated technology platforms that are costly to maintain, and are inflexible—difficult to update to meet changing business requirements. These applications include, for example, payments and securities processing in banking, or policy and claims administration in insurance. Situations where legacy code represents 30 percent to 40 percent of the total application code are not uncommon.

In a recent survey by McKinsey & Company of banks, over 70 percent of them had started to overhaul their legacy systems to make them more flexible and responsive. A minority of banks—20 percent —said they will reengineer their existing code. Instead, the most common path to remediation is to replace legacy applications with commercial software packages. Sixty percent of the banks surveyed were taking this approach. This can be risky, however, as we've seen the scope—and therefore the costs—of these replacement projects mushroom unless leaders manage them very carefully. Additionally, these types of projects frequently under-deliver on expectations.

Michael Betz is an associate partner in McKinsey's Washington DC office; **Mike Anderson** is an engagement manager in the London Office; **Walter Bertschinger** is a senior expert at the Zurich Office.