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Top-Down Versus Bottom-Up: Approaches To Enterprise Architecture

by Gene Leganza

BEST PRACTICES

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by **Gene Leganza**
with Adam Brown

EXECUTIVE SUMMARY

Two major approaches to enterprise architecture (EA) have evolved: a top-down approach that assumes comprehensive scope and strictly follows a formal process, and a bottom-up approach that starts with infrastructure technology standardization and then moves up the food chain to target high-priority problem areas and eventually influence business architecture. Each approach has its benefits and drawbacks, but it is far from arbitrary which is an appropriate model to choose — it is imperative that the approach fit the culture of the organization. Organizations that need results that affect the bottom line quickly or those where rampant technology diversity has degraded service delivery quality should start with the bottom-up approach. Organizations that need to address significant inefficiencies and redundancies in their business process or application portfolios and can wait at least a year for measurable benefits should start with the top-down approach. The best approach may be a hybrid; in any case it must be tailored to the specific needs of an organization. CIOs and chief architects should investigate common industry approaches along with variants and determine what is best.

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NOTES & RESOURCES

Forrester has gathered extensive information through consulting and inquiry.

Related Research

“The Pillars of Enterprise Architecture Terminology”

November 11, 2002, Planning Assumption

“Structures and Processes for Effective Enterprise Architectures”

June 12, 2002, Planning Assumption

“Using Patterns in Enterprise Architecture:

Part 1 — Benefits and Drawbacks of the Patterns Methodology”

April 13, 2001, Planning Assumption

BOOM CYCLES RESULT IN IT HAVOC

The client/server and dot-com booms introduced rampant technology diversity into IT organizations that had previously experienced mostly monolithic architectures. With diversity came soaring support costs, significant manageability problems, and application integration nightmares. IT solutions were developed in organizational silos with no enterprisewide planning. No governance processes guided project selection to ensure that the organization moved in a consistent direction. There was widespread redundancy and ineffective enterprisewide resource management.

EA RE-ESTABLISHES CONTROL

At various points in the past decade, IT management and technology thought leaders have intervened to bring order to the developing chaos. The first step was re-establishing the hegemony of a central IT management organization over computing resources. The second step was the dedication of one or more staff to a formal architecture program.

For any organization, the next set of steps depends on the approach to EA: A bottom-up approach involves setting infrastructure standards and introducing governance processes to ensure adherence to those standards, while a top-down approach dictates a formal analysis of the current state with respect to business process, application programs, data, and technology components.

Each approach requires senior management commitment and marks the beginning of a long road toward changing how the IT organization as a whole communicates, makes decisions, and engages in planning. Both approaches also promise an improved relationship with the business as technology planning is brought in sync with business planning.

Pragmatists Cut Costs Via Bottom-Up EA Planning

The general approach to bottom-up EA planning is to address the highest priority with immediate action. At the beginning, as technology diversity is usually seen as the chief problem, standardization of the technology architecture is typically the first order of business. A central architecture group categorizes all technology into a set of domains or sub-domains — for example, platform, network, and system management. The central EA group organizes teams of subject matter experts (SMEs) to work through technology choices and establish standards for each area. A governance process is set up to review all new projects to ensure that they use only accepted standard technology components.

Once the technical or infrastructure architecture has been defined and governance processes have been established, the typical next step in the progression from bottom

to top is the application architecture. Even as the infrastructure becomes standardized, new application development projects act as continuous catalysts for reintroducing technology diversity. In addition, most organizations have wide gaps in application design skills and creating a formal knowledge base for application architecture can provide the most effective means for shortening development cycles and improving the quality of IT solutions. Thus, application architecture employs both the technology standardization process used in the development of the infrastructure architecture, and it requires developing an approach toward documenting application design best practices and providing architecture and application design consultation services.

Continuing up the chain, mature EA organizations that have made significant progress in application architecture will take on the difficult and complex areas of data and business architecture. Political ownership of these areas makes them difficult to pursue until the EA group has gained significant credibility based on their accomplishments.

The private sector has favored the bottom-up approach. It works well with the focus on quick tangible results typical of for-profit organizations. Positive aspects of the bottom-up approach, in priority order, are that (see Figure 1):

- **The program can have significant impact immediately.** Given the appropriate authority by the CIO, cleaning up the technology architecture is a straightforward matter, and sufficiently motivated organizations can accomplish much in six to 12 months. This can translate to millions in cost savings and cost avoidance.
- **Early successes build credibility rapidly.** Early wins start the EA effort off on the right foot and build much-needed credibility for the more politically complex efforts that follow.
- **It attacks problems in priority sequence.** The potentially overwhelming scope of an EA effort is simplified in a bottom-up approach: The biggest problem is attacked first. This can lead to significant early successes.
- **Scope and complexity build gradually.** Bottom-up allows technologists and managers to learn as they go. Success is more likely when the problems are encountered in bite-size chunks rather than expecting neophytes to manage large scope and complexity from the outset.

Figure 1 Pros And Cons Of The Top-Down And Bottom-Up Approaches

Approach	Pros	Cons
Top-down	Begins with clear view of the current state	Long lead time before having impact
	Emphasizes business issues at the outset	<ul style="list-style-type: none"> • Project governance process delayed by data collection and analysis • Significant training required for EA staff
	Establishes broad scope at the outset	Lack of business process re-engineering skills may reduce value of business architecture
Bottom-up	Significant potential for short-term bottom-line impact	Infrastructure origin can hamper subsequent expansion of scope
	<ul style="list-style-type: none"> • Focus on fast results builds credibility for EA program and architects • Attacks the most important problems first 	Governance introduces a policing action
	<ul style="list-style-type: none"> • Builds scope and complexity gradually • Does not need a major investment in dedicated staff to get started 	Can appear insensitive to business issues
	<ul style="list-style-type: none"> • Requires little or no upfront training • Introduces governance processes early in program 	Stepwise approach can be frustrating

Source: Forrester Research, Inc.

- **It does not need a large central EA team at the outset.** Creating a technical architecture usually involves a central project manager and the borrowed expertise of internal SMEs. There is no need to obtain funding for additions to staff to create the EA group before the project has garnered credibility.
- **The technology-oriented starting point begins in IT's sweet spot.** Many organizations execute technology standardization efforts without reading EA textbooks, becoming familiar with abstract EA concepts, or even calling the project EA. Infrastructure support staff understand the value of standards and how to select the best vendors and technology.

- **The resulting cost savings help justify new governance processes.** Governance processes are always politically difficult to introduce. When technology standardization and consolidation have yielded millions of dollars in savings, management's enthusiasm can pave the way to new processes to review and influence technology selection in projects.

Negative aspects of the bottom-up approach, also in order of importance, are that:

- **The typical infrastructure origin hampers efforts to expand scope.** Once the infrastructure-based EA group has cleaned up technology standards and attempts to broaden its scope, it is often blocked from influencing application development staff for political and cultural reasons — and the effort can stall.
- **A standards-based approach introduces governance as a police action.** The most typical introduction of governance is via an architecture review board that reviews projects designs and rejects nonstandard approaches. This makes architects the bad guys and can hamper IT community buy-in and future attempts at expanded scope.
- **The initial technology focus appears insensitive to business issues.** Governance processes introduced to prevent the introduction of nonstandard technology please neither application developers nor business project sponsors. It smacks of a “technology for technology's sake” attitude that is far from business-enabling.
- **Some areas in need of much improvement must wait for attention.** Bottom-up architects often perceive more clearly the problems they are not able to attack than the positive accomplishments they have made. It can be frustrating to watch the next technology diversity problem being invented because of the lack of an application or integration architecture as the technical architecture is being pursued.

Formalists Catalog The Enterprise Via Top-Down EA Planning

John Zachman originally introduced the concept of enterprise architecture in the late 1980s. The Zachman Framework for EA, together with publications on enterprise architecture planning from Dr. Steven Spewak in the early 1990s, established the formal top-down approach to EA.

Top-down EA planning entails the definition of a current state or as-is architecture in four categories: business processes, application programs, information/data, and infrastructure technology. This current state architecture is produced by a major data collection effort that gathers details and builds a portfolio or inventory of each architecture category. Then business plans are reviewed and an appropriate future state or to-be architecture is created

for each category. The future state is compared to the current state in a gap analysis, and a sequencing plan is developed to progress from the current state to the future state. Governance is introduced to oversee architecture definition and to ensure that all future projects contribute to building the future state.

The public sector, and in particular the US federal government, has embraced the top-down approach. In 1996, the US Congress passed the Clinger-Cohen Act, which mandated that all agencies develop their EA, and the Office of Management and Budget (OMB) has taken the lead in ensuring that EA planning is integral to the capital planning process.

There is broad recognition that government's multitude of stovepiped organizations has fostered redundancy in business processes, applications, data, and technology. Public-sector organizations have adopted the top-down approach to target redundancy at all levels, in most cases starting with the business architecture. The goal is to reduce redundancy within agencies, as well as to significantly improve how government functions across agencies.

The top-down approach dictates the formal data collection exercise needed to define the four portfolios of architecture components. The process of defining the future state across all categories implies business process re-engineering, application consolidation, an overhaul of the data architecture, and the standardization of the technical architecture.

But in practice, new visions for business and application architecture tend to focus on new capabilities driven by the business needs of the agency. Business units identify the new capabilities they need and define the applications, data, and technology needed to enable them, and this becomes the future state architecture. The portfolios are typically used to identify if the components of a new project request can be satisfied out of the current architecture. The most positive aspects of the top-down approach, in order of importance, are that:

- **It begins by establishing a clear view of the existing environment.** The initial data collection activity enables a consensus regarding the current state environment, which is a critical element for effective planning.
- **Business issues are emphasized at the outset.** The top-down approach is explicitly about improving the business. Technology plays a subservient role as the enabler of the business. This aspect alone is much more likely to capture the hearts and minds of business management more quickly than the bottom-up approach.
- **It establishes broad scope at the outset.** There is explicitly broad scope in the top-down approach. With the appropriate management support, all areas in need of improvement become subject to the EA program's scrutiny.

Negative aspects of the top-down approach, also in priority order, are that:

- **Top-down programs can be overly abstract and have little impact.** The formal approach and broad scope requires upfront training, process definition, and communication efforts to launch the program. The EA team must develop conceptual frameworks and broad-based models for enterprisewide involvement, and then engage in the time-consuming data collection process to establish the current state.

This can result in the perception of a high-profile program and establish high expectations for enterprisewide impact, in actuality, there might be little impact in the first year or more of the program's existence. It is very difficult to maintain organizational enthusiasm over this length of time, and the perception can grow of the EA program's being nothing more than a paper tiger.¹

- **The data collection process delays the introduction of governance.** In the top-down scenario, governance means oversight of the definition of the architecture. Many top-down EA programs delay the introduction of governance processes that can influence application design and technology selection and miss significant opportunities to positively impact the environment.
- **The formal methodology requires training to get started.** Few organizations in the early stages of implementation have internal staff who understand the formal approach to EA: Training is required, both for the EA group itself and for the business and IT community that is expected to participate in its processes. Many public-sector organizations depend heavily on external expertise to get started.
- **The methodology implies business process re-engineering skills.** The creation of a business process inventory and the orientation toward eliminating redundancy and re-engineering the current state implies that the EA organization will be able to draw important conclusions from the analysis of the as-is architecture data. But these skills are typically the realm of senior business consultants; it remains to be seen if many organizations that have followed this approach will find value in having assembled their business process portfolios.

Hybrids And Variants Evolve To Meet Specific Needs

It is common for bottom-up architects, after a few years of steady progress, to envy the ability of top-down architects to deal directly with the business architecture. They feel that their initial technology-oriented focus haunts them as they struggle to have more impact

on business planning. It is similarly common for top-down architects to envy the first-year successes of those following the bottom-up approach. Dealing for long periods of time in conceptual implementations leaves them longing for hands-on practical impact.

Actually, many hybrids of these two approaches exist: Infrastructure support teams often launch standardization efforts in concert with the data collection stage for top-down EA planning. They make dynamic use of business planning information made available through EA processes to steer the technology decisions needed to refine future state technical architectures.

Similarly, as bottom-up architects gain credibility through their early successes, they can market their modeling and analysis skills successfully to the business to enable valuable business/IT planning efforts before completing application and data architecture programs.

Pragmatic leadership can address the weaknesses of either approach by focusing resources where they are needed the most. CIOs should first consider the major issues related to EA programs (see Figure 2). Following this, they should consider their own priorities and which approach is best suited to address their particular needs (see Figure 3). Most organizations opt to begin with one approach and then introduce aspects of the other approach after initial milestones have been met. It is difficult to begin with a hybrid approach unless internal staff or management have previous architecture experience, but once the groundwork is laid for either the top-down or bottom-up approach, astute leaders can direct resources where they are most needed rather than blindly following a cookbook approach to either method.

Significant variants exist that have been tailored to specific organizational needs. One financial services company with autonomous units that create technology-based products leaves all product-related architecture decisions to the business units. The central architecture team concerns itself solely with the integration architecture and mandates that all products, regardless of their architecture, interoperate via this architecture. This enables their sales staff to mix and match products into custom packages for prospects. All products snap together via their integration architecture.

In another variant, a pharmaceutical company started an application architecture-only effort as its enterprise architecture program. In its culture, central corporate meddling in business unit developments is contrary to their approach to innovation.

Its effort is focused mostly on reusing service components and is targeting time-to-market through the use of centrally-maintained common services. They used consulting and project review board models to govern the reuse-oriented architecture program.

Figure 2 How Each Approach Handles Major EA Issues

Issue	Top-down approach	Bottom-up approach
Complexity	The comprehensive scope is accompanied by the complexity of the full program from the outset.	Complexity is reduced as scope is limited and problems are approached in priority sequence. Scope and complexity build gradually.
Initial investment	The formal methodology requires training to get started. Many organizations initially depend heavily on external expertise.	The small EA team can begin by coordinating internal SMEs borrowed for the program. The initial technology-only approach falls into IT's sweet spot.
Impact and value	<ul style="list-style-type: none"> • Early wins are unlikely in the first year of the effort. • Over time, the EA program can be perceived as being nothing more than a paper tiger. • Little historical evidence to date for value in business process inventories. 	<ul style="list-style-type: none"> • The program can have significant impact quickly. • Early successes build the much-needed credibility for the more politically complex efforts that follow. • Some areas much in need of improvement must wait for attention due to the step-wise approach.
Governance issues	The data collection process delays the introduction of governance.	<ul style="list-style-type: none"> • Early cost savings help justify new governance processes, which are introduced early. • Governance is introduced as a policing process, making architects the bad guys in the eyes of the business and development organizations.
Scope issues	<ul style="list-style-type: none"> • Broad scope is explicitly established at the outset. • The initial data collection activity enables a consensus regarding the current state, which is critical to effective planning. 	The typical infrastructure origin hampers efforts to expand scope.
Cultural buy-in	Business issues are emphasized at the outset, thus improving business buy-in.	Initial technology focus appears insensitive to business issues.

Source: Forrester Research, Inc.

Figure 3 Matching Requirements To The Right EA Style

If you need to	Choose
Standardize your infrastructure technology architecture	Bottom-up
Standardize your application architecture	
Develop a technology road map	
Control project technology choices	
Show results within 12 months from an EA program	
Control scope and resource commitments carefully	
Avoid formal, somewhat abstract methodologies	
Satisfy OMB project funding requirements (form OMB 300)	Top-down
Evaluate your business architecture	
Analyze the relationships between business processes, applications, and technology	
Focus on information and data in the enterprise	
Established broad scope at the beginning of the EA program	

Source: Forrester Research, Inc.

RECOMMENDATIONS

CRAFTING YOUR APPROACH TO EA — OVERALL RECOMMENDATIONS

- Begin by obtaining executive support.
- Craft a vision around an appropriate scope for the program.
- Define basic principles to guide architecture decision-making.
- Introduce architecture governance via proactive, helpful processes like consulting services.
- To maximize impact, make your goal changing how the organization makes decisions.
- Keep score. Measure successes as if the future of your program depends on it. It probably does.

IF PURSUING A BOTTOM-UP APPROACH

- Determine business drivers before evaluating technology strategy.
- Restructure after the infrastructure phase if the architecture group is located within the infrastructure organization and if you intend to broaden the scope of the EA effort. The EA group should report into a level with authority over all those whose behavior is expected to change.
- Be inclusive from the outset. Be careful not to create an “us versus them” culture by having the infrastructure represent the architecture while the developers represent the forces of diversity. Inclusiveness breeds buy-in.
- Keep score.

IF PURSUING A TOP-DOWN APPROACH

- Set clear expectations regarding the time frame for deliverables.
- Avoid an ivory tower approach. Actively involve SMEs and their managers to define the scope and vision of the program.
- Appoint an individual with internal credibility as the EA leader or in a key EA position. In a broad-based program, the skeptical will need a reason to believe.
- Avoid discussing EA via elaborate conceptual models or frameworks. Demonstrate a pragmatic approach by communicating through concrete examples of how EA will affect a particular stakeholder.
- Keep score.

ENDNOTES

¹ EA assessments should measure accomplishments, not just artifacts; include data from IT practitioners, and include interviews of stakeholders outside the central EA group. See the March 16, 2004, Best Practices “Is Your EA Program a Paper Tiger?”

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