Evolving Enterprise Solution Architecture: Process Overview

Enterprise Planning & Architecture Strategies
Philip Allega

FOCAL POINT
Applications are the intersection between business processes and information. Solutions illustrate the intersection point of application functionality and related technologies (e.g., infrastructure patterns) to deliver business capabilities (e.g., customer relationship management, loan processing for a financial services firm, material resource planning for a manufacturing organization). Enterprise solution architecture (ESA) provides the critical link between enterprise architecture (EA), IT portfolio management, and enterprise program management (EPM). Effective and efficient portfolio management is dependent on the union of applications and infrastructure patterns (e.g., the technologies that support the deployment and management of applications) mapped to business capabilities. In best-practice organizations, senior business and IT executives utilize ESA to provide clarity and direction for designing the integrated set of future solutions that will capture and reflect their overall business goals.

CONTEXT
Enterprise solution architecture (see Figure 1) provides the critical linkage from all EA components (e.g., enterprise business architecture [EBA], enterprise information architecture [EIA], enterprise technical architecture [ETA]) to portfolio management and EPM. Creating the ESA leverages key EA deliverables (e.g., common requirements vision [CRV], conceptual architecture) and each of the other component architectures (e.g., future business process and information flows derived from enterprise business architecture and/or enterprise information architecture, technological components of enterprise technical architecture) to describe the integrated technology solution portfolio and the optimal future state that supports the business environment.

The ESA serves two purposes: identifying the solution patterns for the future state of the solution architecture, and acting as a “one-stop shop” for project managers seeking technology advice for solutions that have been derived from the ETA. The strategic purpose is to identify the portfolio of optimal solutions to meet the holistic needs of the enterprise. How and when these issues are approached is dependent on the maturity of the architecture effort (see EPAS META Practices 32 and 33). Architecture efforts below maturity Level 2 seeking to expand into ESA must recognize that the immaturity of the EA effort will result in less-than-desirable results. Critical success factors for the development of ESA include proven success in the development of EBA and EIA, a holistic view of the enterprise, and strong linkage among and definition of business change requirements, business information requirements, and information technology requirements that describe the business solution requirements to support enterprise business strategies. The quality of the ESA is no better than the quality of the EBA, EIA, and ETA. The focus is not on enabling a single solution, but on identifying and enabling the optimal portfolio of enterprise solutions. The target is described within the ESA as the holistic set of solutions required to meet business objectives.

META Trend: By 2005, 70% of Global 2000 enterprises will move beyond a pure technology architecture focus to include enterprise business architecture (50%), enterprise information architecture (60%), and enterprise solution architecture (70%). Architecture teams that fail to move beyond a technical focus will come under increasing pressure to demonstrate business value.
Savvy CIOs recognize the value of embracing the portfolio management approach. Figure 2 illustrates trends in Global 2000 organizations involving portfolio management adoption and EA integration. The primary growth is in the use of portfolios as communication vehicles (50% of the G2000 by 2002/03, 65% by 2003/04, and more than 80% by 2005/06), evolving to management of specific dimensions (e.g., an infrastructure view, an application view) that will reach 40% by 2005/06. Holistic management of IT investments as one portfolio reaches 15% by 2005/06. Business and IT portfolio management achieves world-class performance (2% of the G2000 in 2002/03, 2.4% by 2003/04, and 3% by 2005/06).

Successful IT executives demonstrate the ability to integrate and illustrate business and technology decisions/solutions that support the business vision. These mature IT organization (ITO) leaders are equal partners at the executive table, driving business decision making and leveraging technology solutions to enable such decisions. Currently, less than 3% of IT leadership in Global 2000 organizations demonstrates such capabilities. Ten percent of G2000 organizations currently have initiated ESA efforts, yet fewer than 5% are integrating their IT investment portfolio (e.g., information, process, human capital, technology). By 2006, 30% of G2000 CIOs will adopt IT investment portfolio management that includes ESA.
The Key Deliverables of Enterprise Architecture

EA is a continuous process triggered by changes in external and internal forces to the enterprise (see Figure 3) that goes beyond the goals of business and IT alignment and closer to integration between business and the ITO to achieve the same mission and goals. The process model illustrates the correct approach with which to identify and link business strategy to the future direction of IT, guiding both the ITO and the business in the management and creation of IT solutions and components to support business needs. Figure 4 defines the key components of the enterprise architecture process. Common to each component of the EA process model are the following three key deliverables:

- **Common requirements vision:** A CRV is a set of common and cohesive enterprise-level requirements to achieve an enterprise’s business strategies.
- **Conceptual architecture:** This is comprised of the key principles that guide engineering across all domain architectures (e.g., business process, technology).
- **Architecture modeling:** Models are simplified abstract representations of complex subject matter.

![Figure 3 — EA Process Model: Key Deliverables](image-url)
Expanding and Leveraging the Common Requirements Vision for ESA

As depicted in Figure 3, the CRV is a common deliverable for EA, not a discrete deliverable for each of the component architectures. The purpose of the CRV is to provide a “common and cohesive vision” between the business and the ITO on the requirements driving each component of enterprise architecture (see EPAS Delta 88). The resulting deliverable is typically 10-15 pages in length, targeted at senior management, and developed in concert with business strategists, business technologists, the architecture team (see EPAS Delta 102), as well as senior corporate, LOB, and IT management. The goal of the deliverable is twofold: 1) gain support of the architecture process; and 2) obtain a sign-off on what is required, not how it will be accomplished.

Each element of the CRV specifies the critical future-state requirements of the organization. Each element, in combination with conceptual architecture principles, sets boundaries and guides future-state modeling within each of the component architectures and gap analysis across the EA. A CRV consists of various requirements types, including the following:

- **Business change requirements** (BCRs) describe what is necessary to change about the business operations (processes, relationships, organization, structure, business model, etc.) to achieve business strategies.
- **Business information requirements** (BIRs) describe what the enterprise must do to leverage information to achieve business strategies.

### Figure 4 — Holistic Enterprise Architecture Terms Defined

- **Enterprise architecture (EA):** A top-down, business-strategy-driven process that coordinates the parallel, internally consistent development of enterprise business, information, and technology architectures, as well as the enterprise solution architecture (EBA, EIA, ETA, ESA). It represents the holistic expression of the enterprise’s key business, information, application, and technology strategies as well as their impact on business functions and processes. Conducted within an appropriate, collaborative organization/governance context, EA artifacts consist of a common requirements vision (CRV), a conceptual architecture (CA), as well as current- and future-state models of four key components: EBA, EIA, ETA, and ESA.

- **Enterprise business architecture (EBA):** A business-vision-driven, disciplined process that decomposes the enterprise’s business strategies, the assets and processes required to execute them, and their impact on business functions. Artifacts of the EBA consist of a common requirements vision (CRV), a conceptual architecture (CA), as well as current- and future-state models of business activity that articulate the extended enterprise value chain. EBA is implemented through the enterprise’s EIA, ETA, and ESA, and defines the business design for sustainable competitive advantage.

- **Enterprise information architecture (EIA):** An EBA-driven, disciplined process that details the enterprise’s information strategies, its extended information value chain, and their impact on technical architecture. A “mirror image” of the EBA, artifacts of the EIA consist of a common requirements vision (CRV), a conceptual architecture (CA), as well as current- and future-state information models that describe the extended information value chain; delineate the key information artifacts of business events, models, and information flows; provide logically consistent information management principles; and enable rapid business decision making and information sharing.

- **Enterprise technical architecture (ETA):** An EIA-driven, disciplined process that details the enterprise’s technology strategies, its extended technology linkages, and their impact on program/project initiatives. Consistent with the EBA and EIA, artifacts of the ETA consist of a common requirements vision (CRV), a conceptual architecture (CA) set of guiding principles, as well as current- and future-state models of the enterprise’s infrastructure and technology platforms. The ETA enables rapid engineering, solution development, and technical innovation.

- **Enterprise solution architecture (ESA):** An EBA- and/or EIA-driven disciplined process that enables the development of a collection of integrated application systems required to satisfy business information needs, including the existing and planned inventory of applications and components, complete with relationships to supported information and business processes, and engineered linkages to ETA and infrastructure services.

*Source: META Group*
• **Information technology requirements** (ITRs) describe what capabilities information technology must provide to achieve business strategies.

• **Business solution requirements** (BSRs) describe what is required of solutions to satisfy business, information, and technology requirements to achieve business strategies.

To be an effective linkage and justification vehicle, a CRV must be completed with the participation of business professionals as well as IT professionals. Because each of the critical requirements previously listed is dependent on business strategies, the CRV typically includes a preamble that lists the following:

• **Environmental trends** describing changes in internal and external factors as perceived by senior business executives. Such factors include industry, economy, demography, technology, and regulatory changes that are impacting the organization.

• **Enterprise business strategies** describing the most important themes that give coherence and direction to the organization to meet perceived environmental trends. Such thematic statements provide a heuristic to constrain decision alternatives, communicate the intent of the organization, and set a target as to where the organization wants to be in the future.

Common requirements are developed as simple but meaningful phrases that are written for a senior management audience. In the information age, business and technology are inextricably linked. Thus, when expanding to more holistic enterprise architecture through ESA, the business change requirements, business information requirements, and technical architecture requirements are created and then combined into business solution requirements.

BCRs define what operational and organizational changes are needed to support strategies articulated in the business vision. Asking the question, “What processes, functions, components, and/or stakeholders must change to achieve enterprise business strategies?” assists CRV creators in deriving and stating the business change requirement. BCRs can include process, function, organization, and even entire business model changes.

Given that information is an input and an output to business processes, BIRs are derived from either BCRs or directly from enterprise business strategies. BIRs describe key information flows required to support the change by answering the question, “What information must move from where, to whom, over what period of time?” This is not a matter of simply restating current business processes, but rather a discovery process of deriving the critical ideal processes necessary to support the change requirements.

Asking the question, "What is required of the technical infrastructure to support the business information requirements?" derives ITRs. These are not statements of specific technologies, but rather descriptions of the attributes of the technology environment necessary to support the business information requirements. Similar to the other critical requirements described in the CRV, the creators must be careful to describe what is required and not specify the answer.

While business change requirements set the business context in which a solution will be applied, business information requirements set the context of the functionality that the solution must provide to support these critical information flows. Information technology requirements set the technical context of solutions. Together, they are used to discover and state business solution requirements.

Looking for logical groupings or clusters among business change requirements, BIRs and ITRs assist CRV creators in the derivation of business solution requirements. BSRs put a “stake in the ground” as to how a strategy will be executed (see EPAS Delta 88). Auditable linkages from enterprise business strategies through information technology requirements illustrate explicit relationships used in identification of business solution requirements (see Figure 5).
The development process of the CRV may follow a linear approach through the development of the ITRs. However, in many instances, business information requirements and business change requirements are derived concurrently and reconciled later. The derivation of BSRs deviates from a linear approach to consider the context set by the previously developed requirements. The recommended approach to discovery and statement of the BSRs follows a consistent best-practice format as follows:

1. The facilitator of the CRV development process reminds participants that the resulting BSR must answer the following question:
   - What solutions are required to satisfy the business change, business information, and technical architecture requirements?
2. The business context of the solution is identified through the selection of the first BCR.
3. Relationships to BIRs are sought.
4. The required information flows and points of functionality are described within the context of the BIRs that support the BCR.
5. Additional relationships are sought with other BCRs that are supported by the BIRs selected in Step 3.
6. The business context relationship is refined.
7. Additional relationships are sought with other BIRs that support BCRs identified in Step 5 and continue until all relationships are revealed for the first BCR identified in Step 2.
8. The technology context is set by seeking the relationships between identified BIRs and supported by ITRs.
9. The technical context is required from matrixed ITRs that support the BIRs that support the BCRs.
10. A concise statement is created that reflects the business context from the BCRs, the functionality required by the BIRs, and the technology context from supporting ITRs.
11. Step 2 is returned to and the process continued through step 10 until all relationships have been explored and stated as BSRs.
The resulting BSRs are holistic requirements for solutions that describe the business context stated by the BCR, the information flows and points of functionality inferred from related BIRs, and the technology context supported by the ITRs. This is an intuitive and perceptual effort marked by aggregation and recombination of requirements to set and describe the context (e.g., business, functionality, technology) of a solution. Essentially a pattern-discovery exercise, the creators of the CRV must include business and information technology professionals capable of discerning the critical relationships and their recombinants to effectively restate the previous requirements as business solution requirements (see EPAS META Practice 72).

Figure 6 illustrates the result of a simplistic set of requirements within a fictitious CRV. Inferential and explicit relationships are filtered through experience and guided by BCR, BIR, and ITR statements to succinctly state a BSR indicating the requirement for solutions that will support each of these requirements. For example, the requirement of “modular customer relationship management applications” is not stated elsewhere in the previous requirements, but is inferred by the experience and knowledge of business and information technology participants in the CRV development process.

**Figure 6 — BSR Discovery and Statement Example**

<table>
<thead>
<tr>
<th>BCR</th>
<th>BIR</th>
<th>ITR</th>
<th>BSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide multiple sales channels for clients</td>
<td>Provide one entry and update point for all customer order information</td>
<td>Securely extend access to the order management system to allow customer interaction through multiple technologies, including telephones, personal computers, cellular phones, and PDA’s.</td>
<td>Leverage modular customer relationship management applications with partitioning of application logic, user interface, and information management to allow customers to interact either through customer relationship managers for customer intimacy or through diverse self-service channels for customer autonomy.</td>
</tr>
<tr>
<td>Institute client relationship managers to build customer intimacy through relationships</td>
<td>Provide an integrated view of all customer account information to client relationship managers</td>
<td>Provide near real time consolidation of customer information and associated account activity across all interaction channels and all lines of business to facilitate account management, as well as self-service.</td>
<td>Supports BCR1, BCR2, BIR1, BIR2, ITR1, ITR2</td>
</tr>
</tbody>
</table>

Source: META Group
ESA: From CRV Into Conceptual Architecture and Beyond

The purpose of the conceptual architecture principle development process is to define a logically consistent set of principles that will guide engineering across all domain architectures and to identify the “soft” gaps between the current state and the future target architecture. Best practices in ESA conceptual architecture principles must be considered for applicability within each effort (see EPAS META Practices 72 and 74). Identifying the different domain architectures required to develop the future target completes this phase of conceptual architecture development (see EPAS META Practice 13).

EBA and EIA domains derived from the conceptual architecture linkage to the CRV provide the boundaries of ESA domains (see Figure 7 and EPAS META Practices 55 and 60). The categorization taxonomy for ESA is based on the output from the EBA and EIA. While EIA models give insights into the functionality required by new solutions, the EBA domains provide the context for the taxonomical grouping of solutions (see EPAS META Practice 60). The architecture team and business management involved in the creation of the conceptual architecture group similar activities based on the use of high-level business modeling (see EPAS META Practices 12 and 14). Such candidates for groupings include the following:

- Customer relationship management process
- Commerce chain management process
- Accounting
- Human resources management
- Product development

These groupings will overlap as functions and processes collide. As information flow processes are modeled in greater detail within the EIA, newly required capabilities will inevitably cross EBA-derived domain groupings. Such capabilities must be raised to the forefront of the ESA. For example, a new process to segment the customer base to discover how to increase sales and maintain brand loyalty may extend beyond customer relationship management processes alone. The new information flow may cross to product development, commerce chain management processes, and accounting to represent a new capability in attracting and retaining customers. Such capabilities become domains for the ESA, in addition to groupings from the EBA itself. These relationships are illustrated via a matrix (i.e., EBA domains across the top, functionality requirements for the information flow on the side, and intersection points illustrating the connection in support of the newly required capability). Figure 8 illustrates these relationships to defining the ESA domains.
Figure 7 — Modeling the Solution Architecture: EBA/EIA Drive Solution Domains

Figure 8 — Modeling the Solution Architecture: Relationship to the ETA
Modeling the Solution

Models present a simplified view of a complex reality and create an abstraction, eliminating irrelevant detail and providing focus to a limited number of important aspects. Moreover, effective models provide a basis for facilitated discussions among stakeholders, enabling them to agree on key fundamentals. Therefore, provisioning models is no easy task (see EPAS META Practice 40). There are various "model consumers" to satisfy (e.g., senior management, line-of-business managers, IT leaders, business and systems analysts, project managers, business partners), as well as a seemingly endless degree of detail that can be provided (e.g., business objective, functional requirement, information entity, business rule, technology component, interface, "actor," system configuration).

For the ESA, business solution requirements in the common requirements vision describe the high-level requirements for solutions that meet the challenges described in the enterprise business strategies. Within the ESA, business solution requirements are codified by general business process types (e.g., customer relationship management, supply chain interaction, Internet retail channel solutions) and may include other operationally oriented business process types (e.g., a retail organization may identify inventory management, employee scheduling) from the EBA and EIA. These business process types are mapped to future application solution needs, thus describing the future state of the ESA.

Each solution type identified is mapped to ETA domains, ETA domain principles, technologies, and products required to build the solution (see Figure 8). For example, airline industry transactional systems are closely tied to decisional systems for near-real-time analysis and optimization of operational parameters. These features require a solid data and middleware architecture and consistent application of the best engineering practices around logical n-tier design and modular, reusable components. To achieve the mobility requirements inherent in transportation, additional specialized technologies (e.g., satellite and wireless communications, GIS systems, GPS systems) will be included within the domain architectures.

The solution for the airline industry example would include a business process type called “near-real-time transactional system.” The near-real-time transactional system pattern is then linked to the principles and products within domains that support the solution (e.g., data, data warehouse, middleware, application development, security, network, platform). The appropriate infrastructure pattern is then identified as it pertains to solutions for this business process type (e.g., n-tier). Each business type is delineated in a similar manner and held within the ESA. The elegance of the EA process yields a complete set of ESA domains built from common and leverageable components of EBA, EIA, and ETA.

As with all enterprise architecture modeling efforts, the patterns to be modeled will be based on guidance from preceding work in enterprise architecture development efforts. Patterns are archetypes that provide guidance as recognized from the chaos of previously disparate entities. Therefore, the solution patterns for one organization will be different from any other organization, because the disparate parts will differ from organization to organization. The relationships are discovered via the processes and deliverables of enterprise architecture as illustrated. Patterns help streamline the process of delivering solutions for application and infrastructure developers to business units. Critical guidance in illustrating pattern relationships relies on the following:

- Business solution requirements that identify what must be modeled
- Conceptual architecture principles to guide pattern development
- An end-to-end view (e.g., a complete view, nothing missing)
- Ordered depiction of underlying components and shared services
- Defined dependencies (e.g., standards of multiple components from multiple domains should be implemented together)
As ESA efforts advance, more attributes are associated with applications and underlying technology components that compose the solution, thus enabling pattern matching (see ADS Deltas 868 and 872). Attributes relating to the transaction type may be attached to applications to enable pattern matching for reuse based on functionality (e.g., the automated process or function that the application or subsystem supports). Subpatterns may even be attributed to solutions to enable ESA rationalization (e.g., specifying country or compliance with certain regulations). Other attributes relating to cost, complexity, risk, and strategic alignment may be leveraged for portfolio optimization. Associating infrastructure patterns with the various components within the ESA will also assist with optimization, and enable more effective deployment and management of IT resources — particularly operational IT human resources.

**Bottom Line**

| Enterprise solution architecture development extends common enterprise architecture deliverables to specify business solution requirements to optimize the IT solution portfolio. |
| Business Impact: Deployment of solutions linked to business requirements accelerates enterprise actions and delivers near-term, real-world business value while meeting long-term goals. |