The Role of Architecture in Enterprise Processes

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This paper defines a strategy for implementing enterprise architecture for an IT operational model that supports both internal and external business partners. It introduces enterprise process architecture as a baseline for transferring current practices into an integrated process blueprint. The transition approach and recommended steps to move from the current disparate architecture to the envisioned integrated environment are provided including a proposed enterprise process architecture blueprint as reference model that represents integrated processes. A short-term approach to jump-start implementation of enterprise architecture is also provided. This approach includes a roadmap for merging and integrating key methodology elements such as project, development, and test management into a broader process framework.

INTRODUCTION

The purpose of the paper is to build management endorsement for the establishment of enterprise architecture to support emerging information technology (IT) organizations, which will use both internal and external sources for their operational and development activities. The paper presents a strategy for implementing IT enterprise architecture for processes so that IT management can implement a global process architecture that establishes flexible and configurable project management, development, test, and other practices. As outlined by Davenport, this architecture is needed in order for a company to internationalize its outsourcing by sending manufacturing and services to continents with low labor costs.(Davenport, 2005) IT organizations are subject to similar operational dynamics. The emerging IT business model is a virtual one whose IT investments fall into one of four areas: hardware and communications infrastructure, applications, data, and organizations.(Davenport, Hammer, & Metsistto, 1989) These areas can be geographically dispersed across the globe.

The intended audience for this paper includes academicians who study IT organizational theory and executive management responsible for formulating enterprise development processes that provide a framework within which high quality IT practices are deployed. This paper is divided into three sections.

- "Enterprise Process Architecture" defines a strategy for implementing enterprise architecture for an IT operational model that supports both internal and external business partners. This section outlines enterprise process architecture as a baseline for

transferring current practices into an integrated process blueprint of today's service-oriented IT organization.

- "Strategy to Transition to Enterprise Architecture" presents the transition approach and recommended steps to move from the current disparate architecture to the envisioned integrated environment. It includes a proposed enterprise process architecture blueprint, aligned with a chief technology office reference model that represents integrated processes. The strategy discusses eliminating discrete methodologies by discipline in favor of implementing comprehensive enterprise processes. The blueprint also describes high priority complementary processes needed to operate the emerging virtual IT organization.
- "Initial Enterprise Architecture Framework Deployment" describes a short-term approach to jump-start implementation of enterprise architecture. This section describes the existing architectural processes in current practices that are candidates for merging and integrating into enterprise (global) processes. Then, a roadmap is presented for merging and integrating key methodology elements such as project, development, and test management, and other methodologies and processes into a broader process framework.

ASSUMPTIONS

Applicable to many contemporary IT organizations, the following assumptions were used in formulating the strategy presented in this paper:

- There are multiple project management, development, and testing organizations, both within and outside a company, each with localized practices and processes which will require integration within enterprise process architecture.
- Architectural governance and oversight for business, technology, system, and information architectures will be the responsibility of business management in conjunction with IT management (generally refer to as an IT governance business monarchy model); external vendor efforts will be required to align with company technology standards and reference models.(Weill & Ross, 2005)
- Many applications will execute in production at a company's owned and operated data centers. Some applications may run externally. Others will be provided through software as a service (SaaS).
- A time tracking system will be used for time tracking project management, development, testing, and other IT activities in order to measure actual expenditures associated with processes.
- Project management of internal development and testing will be conducted by company staff or contractors.
- Project management of external activities will be the responsibility of the vendor, subject to company oversight.
- Application coding by external development units may be subject to company quality assurance oversight and review.
- Information security policies regarding data sensitivity will apply to IT work activities under the scrutiny of company security policies and officers.
- Production execution of applications will be subject to policies, processes, and procedures of company owned data centers.

ENTERPRISE PROCESS ARCHITECTURE

This section describes a strategy for defining and implementing enterprise process architecture. To define a strategy, four topics are covered:
1. The rationale and strategic imperative for implementation of an enterprise process architecture
2. An initial enterprise process model as a reference for creating emerging enterprise process architecture
3. A project management, development, and testing focus within the enterprise process architecture to target specific process groups and methodologies supporting these business activities
4. An initial enterprise methodology framework

Rationale

Stockholder and executive management have grown more concerned about IT financial investments and the return on these investments. Project priorities drive the real value of financial expenditures. Development schedules and budgets are critical to achieving company business goals and objectives. A core principle in this paper is that a company's business model should be managed through proven management principles and complemented with additional principles that allow executive management to conduct business in a dynamic, growing market. The framework for effective management is the establishment of a management discipline and information for effective decision making. A management discipline can be defined as the processes by which management, making use of available resources, directs and controls its responsibilities to meet company goals and objectives. The essential components of the management system are:

- Services – Value-added business services built and deployed for customers who utilize a company as a business partner.
- Business Processes – Groups of logically related decisions or activities required to plan, organize, direct, staff, and control a company's business resources.
- Organization – Logical groupings of people, responsibilities, and duties to accomplish the business processes.
- Technology – Clusters of infrastructure such as hardware, networks, operating systems, and system software that provide the foundation for services to business customers.
- Data – Categories of logically related information required make managerial decisions and accomplish the business processes.
- Applications – Physical groups of software functions required to implement and operate value-added business services. The purpose of enterprise process architecture is to give management a means of directing and controlling work activities so as to meet targeted business objectives.

The basic management activities are planning, directing, and controlling. Sound management practice of these activities results in measurement that can be used to evaluate operational productivity, efficiency, and effectiveness. Thus, enterprise process architecture is the framework by which company operation is planned, conducted and controlled. High level process architecture blends the many planning, directing, and controlling management activities in such a manner that they map company strategies into detailed operation. In addition, the architectural

framework is designed with components to ensure success and delivery of a product through measurement, reporting, and decision support.

The Strategic Imperative for Enterprise Architecture

In today's global service economy, an IT organization is a consolidation of multiple, disparate organizations including the core company and those of strategic alliances and service providers. This actual company consolidation is a form of merger among many diverse companies. The consolidation is minimally constrained by uncommon company cultures (one of the primary reasons for merger failure), since there is an existing working partnership among these entities. However, integration of the individual company operations will be an important success factor. The strategic imperative for enterprise architecture is supported by IT as a service, consolidation, and merger research, illustrated by the following points:

- IT as a service helps enterprises align their business operations, workforce, and technologies to maximize their profit by continuously improving their performance.(Qui, 2007)
- A focus on integration and cost-cutting can result in the neglect of day-to-day business.(Adolph, Elrod, & Neely) Enterprise methodology supports day-to-day a company's development and testing core operation.
- Aggressive initial integration targets are important.(Banal-Estanol & Seldeslachts) An aggressive integration of a company processes supports the company's strategic intent to push for cost savings, revenue growth, and external development.
- Cultural differences inhibit business operation.(American Public Power Association) Enterprise methodology establishes roles and expectations and reduces tension associated with disparate organizational processes.
- Process management is an important factor in successful mergers.(Schmalensee, Ridell, & Joiner) Baldrige Criteria for performance excellence, including process management, is cited as contributing to success mergers. Enterprise methodology reflects how a company will design and monitor the processes that it will use to produce superior services and applications.
- Companies seek to standardize processes to make commerce easier, deploy uniform information systems, and support outsourcing.(Davenport, 2005)

New Process Architecture Characteristics

Process architecture will merge existing processes, methods, and procedures and then iteratively develop the architectural framework to provide greater standardization, integration, and agility for business operation. The enterprise process architecture will be:

- A more comprehensive and integrated process framework
- Simpler than current processes and methods
- A focus shift to planning and controlling (with lesser focus on how the job is getting done) to ensure work activity:
  - Aligns with company goals and objectives
  - Meets company business and quality requirements
  - Adapts to a wider range of partners and providers
- Driven by information and decision making
- Able to cluster multiple projects through an integrated set of activities, deliverables, reviews, and measurements

High Level Enterprise Process Overview

    Figure 1 illustrates a high level enterprise process model that drives strategic processes into actual work activities as the lowest level of the process architecture.(A Management System for the Information Business, 1981) The model is used as an initial enterprise process architecture reference model. With this high level enterprise process architecture, there are eleven major process groups. The flow of information between process groups generally illustrates the relationship of these processes. The basic explanation of process architecture begins with strategic planning, progresses to translation of strategic objectives into tactical objectives, and finally drives the operation of actual services and the creation of new services.

FIGURE 1
HIGH LEVEL ENTERPRISE PROCESS GROUPS
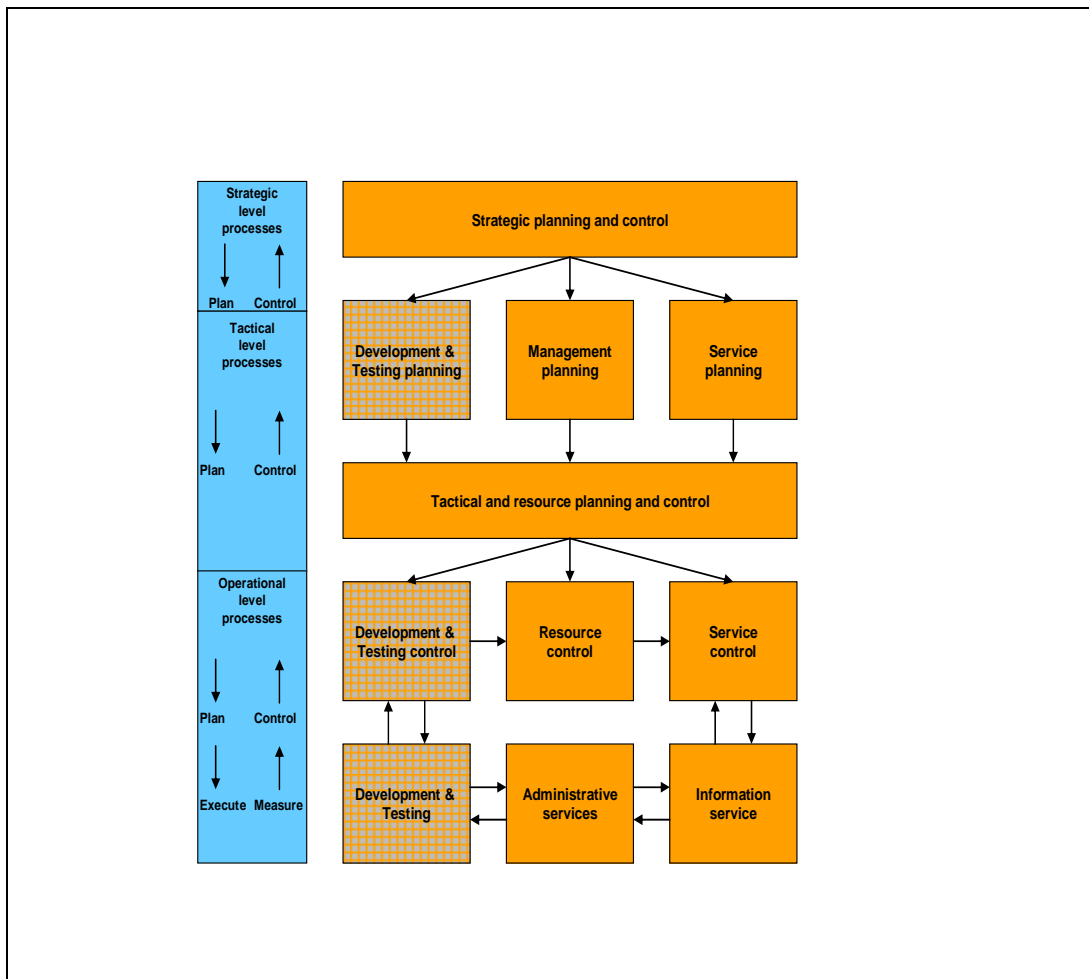
    Note that three of these illustrated process groups are specifically associated with project management, application development, and maintenance. The purpose of development and testing planning is to define the implementable subset of the strategic plan to be executed during the tactical time period. To do this, the core technology infrastructure is established upon which

an appropriate subset of applications will be deployed and maintained. In addition, this process group must manage project objectives, define specific work activities, and assign skilled resources.

Necessary changes to data architecture can be made to implement applications. The purpose of development and testing control is to maintain the satisfactory development of projects through tracking of schedule progress, management of project scope, resolution of development issues via project review, and gaining appropriate management decisions regarding project alternatives. Last, the purpose of the development and testing process group is to manage and execute development or maintenance projects, according to the methodologies and processes defined as development practice. Deployment and utilization of these methodologies and processes increased in importance with Sarbanes-Oxley regulatory legislation. The types of company projects that follow into the development and testing process group are:

- Application development and upgrade
- Application procurement and upgrade (purchased or outsourced)
- Hardware installation and upgrade
- Maintenance
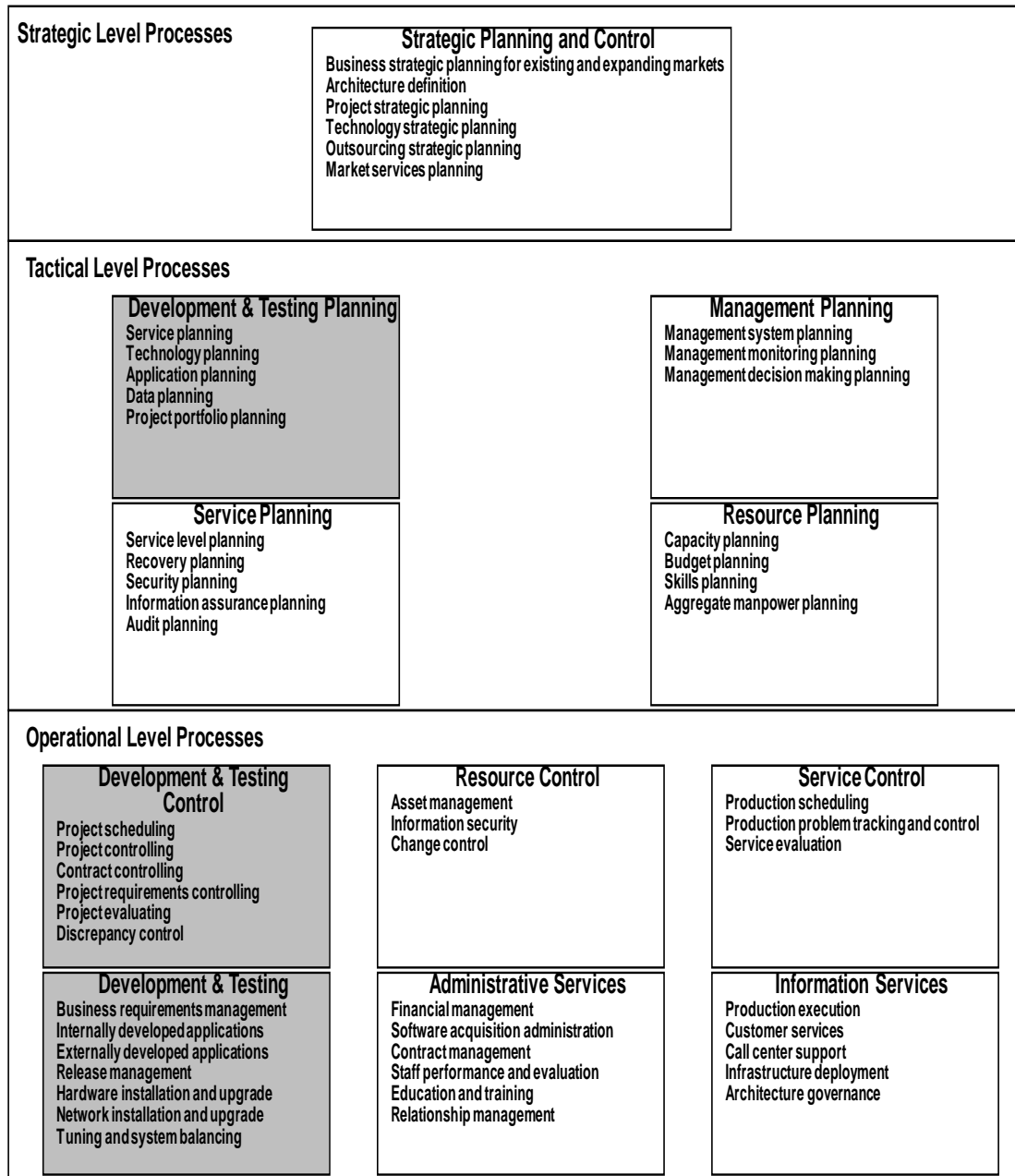- System and application tuning and balancing

Process Architecture Reference Model

In Figure 2, below, processes are shown for process groups in the high level process architecture reference model. The three process groups that focus on development and testing are accented in gray. There are several processes that are important for successful execution with internal and external development.

- Business requirements management: creation of business requirements through collaborative processes
- Contract management: legal definition of external development responsibilities and liabilities
- Externally developed applications: touch points with external developers outsourcer that ensure activities, deliverables, and quality assurance concepts development liaison using subject matter experts (SME) who reviews what is produced by external development
- Financial management: extended financial accounting combined multiple views of financial accountability for internal and external development
- Relationship management: outsourcer identification, evaluation, and partnership including performance measurement
- Release management: activities conducted as maintenance that identify, organize, and complete updates to existing applications

The transition to enterprise methodology can be accomplished in two concurrent phases. In one phase, the team will complete a strategy to transition to enterprise architecture. Concurrent with this activity, analysis and deployment activities will be completed to deploy the initial enterprise methodology that is based on existing Inovant methodologies. The underlying approach for planned work is joint development with rapid completion of deliverables during multiple cycles. These activities are outlined and defined in the next two sections of this paper.

FIGURE 2
ENTERPRISE PROCESS OVERVIEW

Strategic Level Processes

Strategic Planning and Control
Business strategic planning for existing and expanding markets
Architecture definition
Project strategic planning
Technology strategic planning
Outsourcing strategic planning
Market services planning

Tactical Level Processes

Development & Testing Planning
Service planning
Technology planning
Application planning
Data planning
Project portfolio planning

Management Planning
Management system planning
Management monitoring planning
Management decision making planning

Service Planning
Service level planning
Recovery planning
Security planning
Information assurance planning
Audit planning

Resource Planning
Capacity planning
Budget planning
Skills planning
Aggregate manpower planning

Operational Level Processes

Development & Testing Control
Project scheduling
Project controlling
Contract controlling
Project requirements controlling
Project evaluating
Discrepancy control

Resource Control
Asset management
Information security
Change control

Service Control
Production scheduling
Production problem tracking and control
Service evaluation

Development & Testing
Business requirements management
Internally developed applications
Externally developed applications
Release management
Hardware installation and upgrade
Network installation and upgrade
Tuning and system balancing

Administrative Services
Financial management
Software acquisition administration
Contract management
Staff performance and evaluation
Education and training
Relationship management

Information Services
Production execution
Customer services
Call center support
Infrastructure deployment
Architecture governance

STRATEGY FOR TRANSITION TO ENTERPRISE ARCHITECTURE

To formulate a strategy for enterprise methodology, planned activities include analysis and design work that forms process architecture to which wholly integrated business processes align. The strategy development effort will focus on defining the various components that will be addressed during the evolution to enterprise architecture. Examples of strategy components that

may be addressed include: project initiation, requirements gathering and management, project estimation, simplification of project management, external development and testing, and integration into a company's operating environments.

Identified in Table A, three activities, are proposed to construct this transition strategy. With formulation of a transition strategy, a transition plan will guide construction of enterprise methodology based upon the enterprise process architecture reference model.

TABLE 1 TRANSITION STRATEGY WORK ACTIVITY	
Activity Name	**Description**
Enterprise Methodology Transition Plan	Draft an enterprise methodology transition plan that defines enterprise process architecture with targeted processes and methodologies, process integration requirements, a schedule for transition work, and estimated resources for proposed work.
Corporate Assessment	Review and revise the proposed enterprise methodology transition plan with selected corporate business units that may require integration with the enterprise process architecture.
Management Assessment	Review and revise the proposed enterprise transition plan with senior management who direct business operation and fund operational processes.

Following approval of the strategy plan, examples of additional work that might be required to implement the strategy include:
- Training and training materials for external development
- Strengthened project initiation and requirements definition
- Definition of roles and responsibilities for project managers, development and testing leads, and architects
- System maps with swim lanes for roles with links to other key processes; key controls using project processes, not project managers, to drive compliance
- A mapping approach for development deliverable content to business services and applications instead of an individual project
- An integrated view of both internal and external costs to determine total project cost and associated productivity
- Automated workflow for deliverable management and review
- Supplementary deliverables with a focus on simplifying existing deliverable volume

INITIAL ENTERPRISE ARCHITECURE FRAMEWORK

This section describes a short-term approach to jump-start implementation of enterprise architecture. A jump-start implementation assumes that the architectural elements for initial enterprise architecture currently exist, and in the proposed jump-start, only existing methodology elements are used. These activities can occur concurrent with the development of the strategy

development activities described in Section II and provide a framework upon which to build the strategy deliverables.
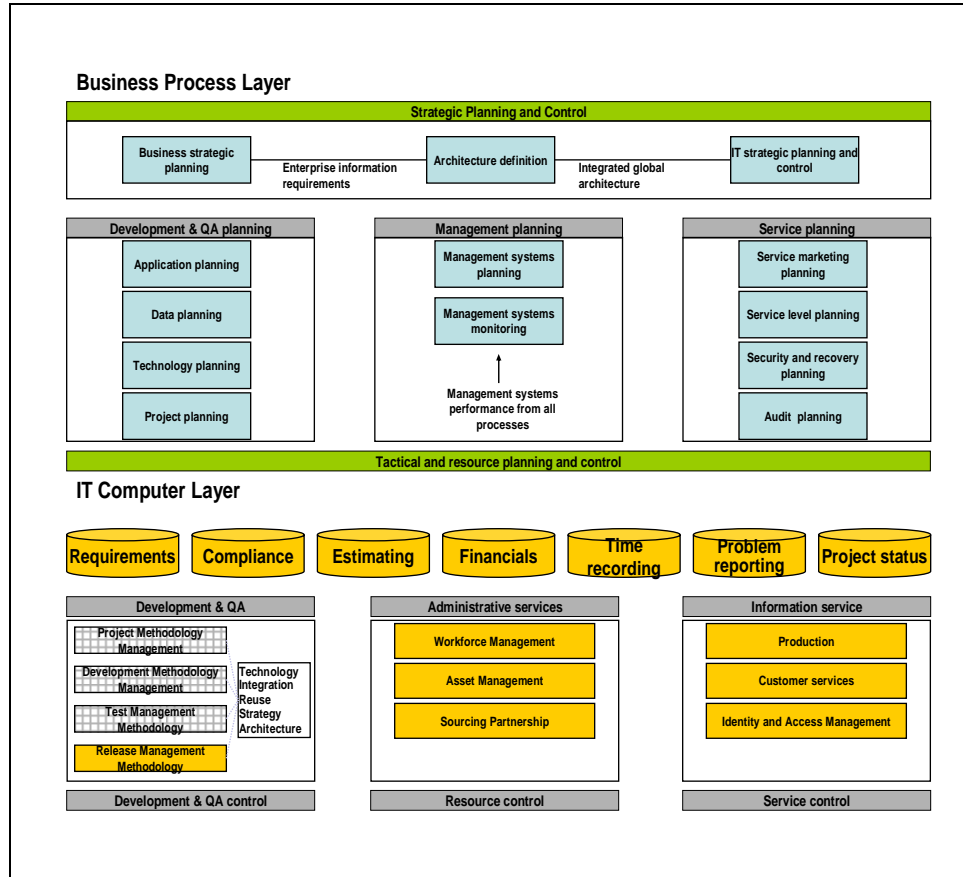
Four consolidation activities are recommended:
1. Evaluate project, development, and test practices and merge selected framework elements. For the purposes of this paper, integrated methodology management (IMM) refers to the three IT functions, project, development, and test.
2. Repackage the selected methodology framework elements under an enterprise umbrella as a consolidated architecture.
3. Include links to existing IT initiatives and requirements such as operational reference models, architectural governance, centers of excellence, identify and access management, and the growing enterprise reuse strategy.
4. Identify and link to selected corporate processes such as key controls and processing services.

The initial enterprise methodology framework is based upon a reference model, a concept deployed in many chief technology offices for business, system, information, and technical architectures. A conceptual target enterprise process architecture blueprint is shown in Figure 3. The blueprint identifies common IT processes that are candidates for integration into enterprise architecture.

Evaluation of IMM

Through an IT organization's evolution, it develops and implements several important methods and processes for project, development, and test functions. Although these methods are developed individually, they were not designed in silos. Project, development, and test functions contain effective integration features, identified here as process junctions, so that touch points among these methodologies are traversed smoothly during project execution. For example, test functions can be developed separate from development functions but design features envisioned in enterprise architecture include those features within which quality assurance and testing are integrated elements. At the same time in actual project deployment, there are vocabulary terms, timing factors, and local deployment discretion that provide identifiable hurdles for consistency, integrated operation. The short-term approach for jump-starting initial enterprise architecture is to consolidate and merge their architectural elements into a single common framework. For example, Table B presents the integration potential of selected IMM architectural elements.

FIGURE 3
CONCEPTUAL TARGET ENTERPRISE PROCESS ARCHITECTURE BLUEPRING

Business Process Layer

Strategic Planning and Control

Business strategic planning — Enterprise information requirements — Architecture definition — Integrated global architecture — IT strategic planning and control

Development & QA planning
- Application planning
- Data planning
- Technology planning
- Project planning

Management planning
- Management systems planning
- Management systems monitoring
- Management systems performance from all processes

Service planning
- Service marketing planning
- Service level planning
- Security and recovery planning
- Audit planning

Tactical and resource planning and control

IT Computer Layer

Requirements · Compliance · Estimating · Financials · Time recording · Problem reporting · Project status

Development & QA
- Project Methodology Management
- Development Methodology Management
- Test Management Methodology
- Release Management Methodology
- Technology Integration Reuse Strategy Architecture

Development & QA control

Administrative services
- Workforce Management
- Asset Management
- Sourcing Partnership

Resource control

Information service
- Production
- Customer services
- Identity and Access Management

Service control

TABLE 2
IMM INTEGRATION POTENTIAL

Architecture Element	Development	Test	Project Management	Integration Potential
Standardized work break down structure	Yes	Yes	Some	Yes, need to define a work breakdown structure of project management activities
Deliverables	Yes	Yes	Yes	Yes, need to rationalize deliverables across disciplines
Review and signoff	Yes	Yes	Yes	Yes
Web implementation	Yes	Yes	Yes	Yes with an high level enterprise entry page that

TABLE 2 IMM INTEGRATION POTENTIAL				
Architecture Element	Development	Test	Project Management	Integration Potential
				links to initial enterprise development methodology and other existing complementary company methodologies and processes
Planned deliverable approach	Yes	Yes	Yes	Yes, with development and test integration and automated work flow for project management review and approval
Automated artifact storage	Yes	Yes	No	Yes, with a single, integration artifact storage process
Automated work flow	Yes	Yes	No	Yes, with extensions for deliverable reviews

Enterprise Integration

Successful integration of IMM architectural elements yields a consolidated set of process groups for development and test. The resulting merged architecture can achieve an enterprise presence through the deployment of common architectural elements. Enterprise integration can be achieved through integrated services describing a "what is development and testing at company" overview along with framework elements for a planned development approach, project scheduling and time recording, deliverables, reviews, signoffs, and artifact storage. Complementary project management responsibilities will be accessible within the development and testing framework for initiating, planning, executing, and launching an application.

- A standardized work break down structure configurable for project size and development breadth and depth
- Configurable set of deliverables that apply to clusters of work such as change control.
- Consistent review and signoff processes configurable based upon the development approach and who is responsible for internal and external work aligned with project milestones such as quality review gates.
- Process integration among existing and developing company processes. For example, a test approach and artifact storage and a development approach and artifact storage processes are merged into a single process flow for all deliverable review and storage in a standard company repository.

Initial Technology Office Enterprise Methodology Integration

The initial enterprise methodology framework can be enhanced in two ways. The first way is identified below and the second way is described in the next section. The first way is by integrating the extended scope of development and testing to include selected processes deployed with the chief technology office reference models. This extension can be achieved through

various degrees of integration from Web links to chief technology office web pages to actual process integration. The processes deployed by the chief technology office that can be targeted including the following:

- Project architecture work sessions
- Technology standards
- Enterprise architecture and reference models
- Architecture review

Extended Company Enterprise Methodology Integration

The second way that an initial enterprise methodology framework can be enhanced is through integration of company-wide methodologies and processes. At the company level, there are many potential integration targets. As with chief technology office methodologies and processes, this extension can be achieved through various degrees of integration, ranging from Web links to company web pages to actual process integration. There are many candidate company processes with potential for integration including, but not limited to, the following:

- Processing services
- Key controls
- Software configuration management

CONCLUSIONS

Existing disparate project management, development, and testing methodologies provide a valuable framework within which to execute projects; however, it is clear that they must evolve to better support both current and anticipated business environments at a company. While a simple streamlining and integration of these existing methodologies is a valuable short-term solution, work must also begin on the design of a global methodology with emphasis on planning, project initiation, and integration with other corporate processes to be prepared for the changes and challenges facing the companies. The commitment and support of the integrated management methodology in one form or another is feasible and viable in the short run. Pending management approval and funding, work can be staged to deploy an initial enterprise architecture and to complete an enterprise transition strategy plan that will define what, how, and when streamlined, integrated processes and practices will be implemented to support a company's new competitive business model.

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