Enterprise Architecture

in context of the

Services-Oriented Enterprise
What is Enterprise Architecture?

- Need to distinguish EA as
  - Responsibility domain
  - Organizational infrastructure
- In either case EA spans across
  - Organizational architecture
  - Systems architecture
- EA as a responsibility domain
  - Addressed within EA
EA as responsibility domain

- Processes & responsibilities for EA
- Includes
  - Architecture requirements gathering
  - Architecture vision formulation
  - Architecture definition
  - Implementation governance
  - Change management
- May be guided by TOGAF
EA as Organizational Infrastructure

- Infrastructure within which
  - Organization realizes its vision & mission
  - Business processes are deployed and executed

- Business processes
  - Generate stakeholder value

- EA
  - Not direct value generator
  - Provides suitable infrastructure generated.
  - Is core organizational asset
Reference architectures

- Can design enterprise & systems architecture from scratch
  - Assembled from
    - Proven design patterns
      - Hierarchical, Pipes & Filters, Blackboard, Microkernel, ...
    - Strategies for realizing quality requirements
      - Low cost, scalability/growth, reliability, performance, accessibility/integrability, security, ...

- Alternatively base EA on proven reference architecture(s)
  Used for millenia
  - Reference architectures for temples, castles, machines, airports, software systems, enterprises, ...

Address challenges faced in a particular domain.
Model-Driven Development (MDD/MDA)

- Functional Requirements
  - technology-neutral business process design
    - Done in problem domain => BAs Would recommend using services-oriented design process like URDAD
  - Platform Independent Model (PIM)
    - Business model
      - Implementation Architecture
        - Code generation, generation of training materials, DB structure generation, ...
        - Platform Specific Model (PSM)
          - implementation mapping
          - implementation
            - Enterprise Deployment Model (EDM)

Architectural Requirements
  - conceptual architecture design
  - Conceptual Architecture
    - includes technology/platform selection

- Architectural Design
  - Scope
  - Quality requirements
  - Integration Requirements
  - Architectural Constraints
The Services-Oriented Enterprise
Drivers

- **Context**
  - Global competition
  - Increased regulatory requirements
  - More rapidly evolving client needs
  - The need to be globally integrated

- **Requires organizations to be**
  - More flexible
  - Leaner and more focused
  - More open and transparent
From structure to service focused

- Traditional organizations
  - Hierarchical
  - Very structure focused
- More “flat” organizations
  - Typically only less layers
- SOE
  - More service, less structure focused
  - All activities around service delivery
  - Every organizational unit sees itself as both
    - Service provider &
    - Service consumer
There is only a services sector

- **Formal services sector**
  - Dominates advanced economies

- **Actually**
  - Only services sector
  - e.g. Manufacturing
    - = service to transform raw materials into products

- **Services vs products based pricing**
  - Used across sectors
    - e.g. Telecommunication services packaged as products (e.g. data bundles)
What is a SOE?

- SOE is an organization which is
  - Globally integrated
  - Core focus
    - Service delivery
    - Managing processes for service delivery
- Organization in services sector
  - Not necessarily SOE
Requirements for SOE (1/2)

- Any activity @ any level of granularity
  - Part of realizing service
- Service orchestration
  - Higher level services assembled from lower level services
- Services contracts for all required services
  - Internal (manual or automated) & external services
- Can switch between service providers realizing contract
  - Does not require change to business process
- Mechanisms for service governance
Requirements for SOE (2/2)

- Infrastructure for
  - Service request routing, delivery, transformation
- Technology neutral business process design
  - Business processes managed by business
- Structure driven from process
  - Continuous optimization and shedding
- Dynamic service provider selection
  - Real-time
    - Service discovery
    - Service provider selection
SOE structure

Strategic Management
responsibility for defining vision, mission & core strategies through which they are realized.

Marketing
responsible for identifying market opportunities which fall within the vision and scope of the organization.

Business Analysis
stakeholder requirements analysis & business process design.

Architecture/Infrastructure
infrastructure design & optimization

Development
responsible for implementation mapping of technology neutral business processes onto architecture & technologies.

Service Governance
service provider selection & oversight

Operations
responsible for managing business process execution, monitoring and measurement.

Business units structured around responsibility domains which fall within the scope of the organization. Each department publishes services from a particular responsibility domain to the organization.

External service providers to whom services outside the scope of the organization have been outsourced.
Governance

Organizational policies & processes

- Oversight
  - Reporting
- Enforcement

- Critical for
  - Alignment with vision & mission
  - Quality management & assurance
  - Risk management
  - Business process optimization
Governance: Alignment with Vision & Mission

- All activities & services
  - Within scope of organization
  - Contribute to realizing organization's vision & mission

- Prioritization
  - Of
    - new services &
    - Changes to existing services
  - Guided by
    - stake holder value delivery
    - strategic
Governance: Services Catalog/Registry

- Includes services provided by
  - Internal business units
  - Internal systems
  - External service providers

- Basis for
  - Scope management
  - Service provider selection
  - Business process assembly
  - Enforcing organizational policies
Governance: Architecture

- Monitor that
  - Architecture provides suitable infrastructure
    - Hosting services provided by organization
    - Integration with
      - External service providers
      - Clients
    - Organizational qualities supported by infrastructure
      - Non-functional requirements met
        - Scalability
        - Reliability
        - Security
        - Accessibility
        - Auditability, ...
Governance: Service development management

- Enforce development process
- Management & oversight of
  - Stakeholder requirements analysis
  - Technology neutral business process design
  - Assessing infrastructure requirements met
  - Service construction
    - Coding, System selection & customization, ...
    - Training staff, ...
  - QA around service development
Governance: Contract delivery oversight

- Monitor that contracts met by
  - Internal service providers
    - Systems & business units
  - External service providers

- Ensure process followed on failure
  - Issues addressed
  - Alternative service sourced
  - Approved service providers updated
  - Loss recuperation/penalty processes
Governance:
Stake holder value generation

- Monitoring & oversight
  - Direct measurement
  - Processing client feedback

- Reporting
Governance: Security

- **Security policies**
  - Defined
  - Implemented
  - Adhered to

- **Ensure**
  - Access control on all resources (services & data)
  - Authentication
  - Protection of assets in transit
  - Non-repudiation
SOE & SOA

- **SOE**
  - Need not use SOA as underlying systems architecture
  - Systems architecture alignment => SOA

- **SOA**
  - Automates many tasks & responsibilities
    - Business process execution
    - Static & dynamic service provider discovery & selection
    - Service provider integration, request routing, transformation
    - Service governance
SOE & Cloud computing

- Cloud Computing
  - Also known as utility computing
  - Purchase from the cloud
    - Services
    - Data storage
    - Hardware infrastructure
- SOE services sourced from cloud
- SOE infrastructure can itself be in cloud
Business Process Design in Context of SOE

- Must be technology neutral
- Must specify
  - Linkage betw functional requirements & services
  - Full services contracts
  - How business processes assembled from available services
    - recursively
  - Data structure requirements for exchanged value objects
  - How requests assembled from available info
URDAD

- Fulfills requirements
- Uses
  - Responsibilities assigned to services contracts
  - Recursive service assembly
  - Generates full contracts
  - Business process localized in controller
    - Service providers decoupled
  - Technology neutral data structure requirements specification
SOE Strengths - 1

- Culture of service delivery
- Contracts based approach
  - Formalizes client requirements
    - Functional & non-functional
    - Localizes accountabilities
    - Facilitates testability & performance monitoring
    - Improves reliability
- Improved reuse
  - Services decoupled
  - Services contracts
- Effective service governance
SOE Strengths - 2

- **Competitive business units**
  - Continuously compete against external service providers

- **Globally integrated organization**
  - Service consumption
  - Service provision

- **Improved flexibility & time-to-market**
  - Rapidly assemble higher level services

- **Simpler performance measurement & management**
  - Measure value generation across levels of granularity
SOE Strengths - 3

- Reduced gap betw Business & IT
  - Technology neutral requirements & processes
  - IT & organizational infrastructure aligned
  - Similar vocabulary
- Alligned with “Software as service”
- Business processes visible to business
- Simpler ROI estimation
  - Across levels of granularity
- Improved resilience
SOE Risks

- Inhibited innovation
  - At operational level
- Easy introduction of new services misleading
  - Processes not adhered to due to simplicity
- Neglecting asset maintenance
  - Assets not currently used do not get much attention
Design principles & activities

Design activities
- enforce single responsibility principle
- fix levels of granularity
- decouple via contracts
- localize business process information
- document relationships between design layers
- drive structure from process

Design qualities
- clean layers of granularity
- high level of reusability
- maintainability/extensibility
- testability
- simplicity/understandability
- technology neutral
- traceability

Business benefits
- reduced cost, flexibility, time-to-market
- improved reliability
- business can take ownership of business processes
URDAD - in detail

Business Analysis

Analysis

- select use case/service
- identify stakeholders for service
- identify stakeholder requirements for service
- specify user workflow
- specify exchanged value objects
- specify pre-, post-conditions & quality requirements

Technology neutral design

- select service provider from this level of granularity as subject for next level of granularity
- PIM for current level of granularity
- project out collaboration context
- specify service request construction
- specify how subject assembles business process across services providers
- assign each responsibility domain to separate services contract
- group functional requirements into responsibility domains

Implementation

- map PIM onto implementation architecture & technologies
- PSM
- implementation
- EDM
Example

Process insurance claim
User workflow

: Policyholder

processClaim(processClaimRequest=)

alt

[policy active]

acceptSettlementOffer(acceptSettlementOfferRequest=)

alt

[settlementOffer accepted]

processClaimResult

[else]

settlementOfferNotAcceptedException

[else]

policyNotActiveException
Pre-, post-conditions & quality requirements

class processClaim [servicesContract]

Claims
  +processClaim(processClaimRequest : ProcessClaimRequest) : ProcessClaimResult

Constraints
- post: settlement report has been provided
- post: claim settled
- post: loss recuperation process started
- pre: policy active
- pre: settlement offer accepted
- quality: accessibility - service accessible through web, mobile devices, and web services portals
- quality: auditability - all information received from or sent to the client persisted
- quality: performance - claims processed in 48 hours
- quality: reliability - claim processed as per contract for 98% of claims
- quality: scalability - process up to 10000 claims per day
Have use case contract

- Use case contract includes
  - functional requirements for each stake holder
  - user work flow
  - stake holder requirements around business process
  - structure of exchanged value objects
  - pre- & post-conditions
  - quality requirements
Collaboration context
Transition to next level of granularity

- Select one role player as new subject
  - from previous level of granularity
    - service => use cases
    - actors
    - user work flow

- Lower level requirements analysis
  - functional requirements for stake holder
  - specify pre-, post-conditions & quality requirements

- Lower level design
  - responsibility identification & allocation
  - business process specification => lower level contracts
BA's across organization build organization-wide business model

- Business processes span domains of responsibility
- Each BA model just what is in their domain of expertise
- Decoupled via contracts on both ends.
- Roll out via island driving
  - Build competent teams who learn & prove approach
- Essential in context of
  - SOE/SOA
  - out-sourcing
Benefits of technology neutral design using URDAD

- Design remains technology neutral
  - Business process design understandable by business
  - Can change technologies without changing business process
- Simple algorithmic methodology
  - For each level of granularity
    - services contracts + business process
- Verifiable quality
  - Bi-directional traceability
  - Can project out relevant level of granularity
  - Solid services contracts (reusability, testability)
- Facilitates relatively straightforward technology mappings

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