Cost Aspects of Service-Oriented Architectures

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Agenda

• What is SOA?
• How SOA Changes Software Costing
• SOA Example – Amazon.com
• Considerations for Costing SOA
  • Scope, Scale, and Stage of the Project and its Environment
• Recommendations
  • SOA-Specific Data Collection
  • SOA-Specific Estimation Methodology
What is SOA?

• SOA is…
  – Service Oriented Architecture…
    • Architecture: A logical or physical representation of a system and its components (including hardware, software, interfaces, and related documentation)
    • Service: A self-describing, self-contained, modular unit (software component) that can be combined in different ways with other services to represent an application.
    • Service-Oriented: A design concept that presumes to encapsulate application logic (an independent “piece” of software) within services
  – … a design approach that takes advantage of group resources, client-server relationships, and the fact that many different parts of an organization or community might have the same computing needs.

The design approach currently called SOA is here to stay.
How SOA Changes Software Costing

• SOA is fundamentally different
  – Current methods of software cost estimation do not take into account the unique nature of SOA and SOA software development, maintenance, and reuse.

• SOA requires a new mental framework
  – SOA blurs the correlation between software utility, level of effort, and lines of delivered code.

• SOA is hard
  – Most marketing touts benefits of SOA without disclosing the new software development assumptions and challenges

• SOA changes the way that organizations do business
  – Capabilities are shared across the enterprise along with development and maintenance

• Little historical data on SOA is available
  – Estimates are based on cost data for systems developed using pre-SOA assumptions and methodologies
SOA Example – Amazon.com

Diagram showing the connections between Merchant, UPS, USPS, FedEx, Supplier A, Supplier B, Supplier C, Amazon, Customer, MasterCard, and Visa.
Considerations for Costing SOA

• SOA is complex, heterogeneous, and dynamic
  • Most of the important cost drivers are the same, but impact cost differently than in traditional software development

• Consider the ratio of architecture development to software development
  • The development of under-funded components will be hampered
  • The over-development of over-funded components will skew the architecture’s progress and cause implementation teams to get ahead of themselves

• Ensure that adequate up-front investment is planned to minimize cost during O&M
  • The architecture will need less maintenance
  • New services will have better technical requirements and a more stable integration environment
Considerations for Costing SOA

• Make cost estimates with an explicit understanding of perspective: service-level or SOA-level

  **SOA-level perspective**

• Characterize the overall effort in terms of Scope, Scale, and Stage…

  **Service-level perspective**
Scope of SOA Development

Affected by:

- The nature of the numerous, various, and dispersed users that need to be served
- Rank of the project champion
- Which level in the enterprise/organizational hierarchy the project is being developed
- Risks inherent in the government machine
- Uncertainty in ownership and financial responsibility

Some of the questions to consider:

- At what level in the bureaucratic hierarchy (program office, directorate, organization, agency, inter-agency, etc.) is the effort spearheaded?
- At what level is the SOA being developed?
- At what level will the SOA be used?
- What is the degree of complexity in the SOA’s federation plan?
- How developed or established is the federation plan?
- How developed or established are the architecture standards, governance, and practices?
- How motivated are the participants to collaborate?
- How stable and predictable is the budget?
- Is there a designated central orchestrator, a designated and established central organization that facilitates intra-federation collaboration, or no plan for either?
Scale of SOA Development

Affected by:

- Nature of the work to be done
- Quantity of work to be done
- Processes for and expertise in SOA development
- Time allocation
- Technological method for communication
- Choice of software products, programming languages, and development environments
- Testing plans

Some of the questions to consider:

- Does the project involve software development, software architecting, O&M support, or a combination of the three?
- Is enough time allotted to allow for appropriate technical specification and business coordination?
- How many stakeholders will be involved to handle security and information management for this effort?
- What method has the team chosen for communicating in the SOA (web services, DCOM, CORBA, JMS, etc.)?
- Has in situ testing been planned and allocated adequate time?
- To what degree is the team implementing best practices or incorporating lessons learned from previous SOA efforts?
- How experienced is the team with SOA and with the task at hand (e.g., programming web services)?
- What portion of the project is being contracted out, and at what point in the process?
Stage of SOA Development

Affected by:

• Life cycle phase(s) of the project
• Life cycle phase(s) of the SOA
• Choice of life cycle model/decomposition
• Cost perspective: service-level or SOA-level

Some of the questions to consider:

• During what phase(s) of the architecture’s life cycle will the work occur?
• Is the project a development-phase effort or an O&M-phase effort?
• How does the life cycle phase of the project overlap with the life cycle phase of the overall SOA?
• How well has the team described and delineated the life cycle phases of the SOA?
• From what perspective (system or SoS) is the estimate being performed?
Recommendations for SOA Data Collection
Incorporate Questions of Scope, Scale, and Stage into Data Collection

- Learn from current SOA projects
  - Interview representatives from completed and ongoing SOA projects
  - Develop and maintain a list of domain-specific cost drivers and risk areas
  - Domain-specific recommended practices and standards (e.g. Information Assurance)
- Calculate the value of experienced teams
  - Draw comparisons among the costs and risks incurred by fully experienced teams, somewhat experienced teams, and completely inexperienced teams
  - Survey team members and analyze mid-level cost data, for example
- Develop/Identify metrics addressing Scope, Scale, and Stage
  - Potential metrics include: # services, # external dependencies
  - SLOC is easily obtainable but has less impact due to rise of automated code generation; compatibility of auto-generated code is of greater interest
Recommendations for SOA Estimating

SOA-specific Estimation Methodology

- Experiment with parameters and their relationships
  - Develop a list of parameters that seem to impact the cost of a SOA project
  - Diagram the parameters’ dependencies and mathematical relationships
  - Define model applicability constraints by considering exactly what type of SOA development each parameter or set of parameters relates to

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\text{SOA Cost} = \text{Fixed Costs} + \text{Variable Costs}
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\text{Fixed Costs} = \text{Software Licensing} + \text{Hardware/Technology Purchase, Installation, and Configuration} + \text{Development and Maintenance of the Architecture Framework} + \text{Development of Interface Specifications} + \ldots
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\text{Variable Costs} = \text{Sum across all services of} \left( \text{Quantity of Functional Code per Service} \right) + \text{Quantity of Interface Code}
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\text{Quantity of Functional Code per Service} = \text{Learning Curve} \times \text{Volume of Work} \times \text{Number of Service Dependencies}
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\text{Quantity of Interface Code} = \text{Learning Curve} \times \text{Volume of Work} \times \text{Number of Software Dependencies}
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Difficult assembling historical cost data for complete SOA implementations inhibits development of improved estimating methodologies
Summary

• SOA is a design approach that is here to stay
• SOA fundamentally changes to how organizations do business
• Consider Scope, Scale, and Stage of the Project and its Environment when costing a SOA implementation
• SOA-specific data collection and assembly of costs for a complete system will enable development of improved estimating methodologies