Lessons in Architecture Evaluation

Dragos Manolescu
ThoughtWorks, Inc.
(dragos@thoughtworks.com)

Target Audience and Objective

- People interested in architecture evaluation:
  - Architects (but also developers, testers, etc.)
  - Managers
  - Decision makers
- Objective:
  - Share insight from conducting formal evaluations on projects

Why architecture evaluation?

- Catching problems early saves time and money
- The complexity of software systems increases
  - Hard problems
  - Many constraints (legacy applications, COTS components, …)
- Software architecture determines (without guaranteeing) many architecture goals:
  - Performance
  - Modifiability
  - Security
  - Availability
  - … others

Benefits and costs

- **Benefits:**
  - Data from AT&T, Lucent and Avaya
  - More than 700 evaluations since 1988
  - Estimated average savings of $1,000,000 per 100,000 LoC (IEEE Software, May/April 2005)
- **Costs:**
  - Grow and nurture the expertise
  - Allocate project time and resources

What can architecture evaluation accomplish?

- Prove designs
- Validate assumptions
- Pressure-test constraints
- Verify documentation
- Perform cost-benefit analysis for different alternatives
- Inject the reviewer's expertise into the project

Lessons:

•Gain cross-organizational buy in

•Improve the understanding of the problem space

Who's involved?

- Evaluation team
- Architecture team
- Architecture stakeholders
- Evaluation sponsors

Lessons:

•It may be hard to obtain direct access to the stakeholders

•Typically executives don't get involved at the beginning but become interested quickly

When do you do it?

A. Validate a newly developed architecture
B. Understand an existing architecture
C. Select one out of many candidate architectures

Lessons:

- Sometimes it's too late to make design changes
- Sometimes there's no support for radical decisions
- Sometimes "les jeux sont fait" and the evaluation is just a show

First steps

- Prescreen the project/system
  - Satisfied pre-requisites?
  - Management support?
  - Suitable evaluation team?
- Select an appropriate method
  - What is the objective?
  - What is the target?

Lessons:

•Sometimes the prescreening reveals that you should not proceed with the evaluation

•Not all methods are equal; pick the appropriate method for the job

How do you it?

- Checklist-based; a particular type of architecture
- Simulation-based; architectures for which there are formal models
- Scenario-based
  - SAAM: side-by-side; modifiability
  - ATAM: single system; risks and tradeoffs
  - CBAM: single system; risks, tradeoffs and costs
  - … others
- Custom
- Hybrid

Lessons:

•SAAM(-like) evaluations are a good choice for COTS product selection

•CBAM requires cost and benefit estimates that the architecture/stakeholders may be unable to produce

Articulating architecture goals

- All architecture goals depend on the context
- Scenarios capture the quality goals of interest to the stakeholders in a concrete context
- Several scenario types: use case, growth, exploratory

Lessons:

•Assembling a single scenario may require talking to many different SMEs

•You will work hard to help SMEs focus on details that are architecturally significant rather than on functionality

How do you organize this information?

- Scenarios: key elements
  - Stimulus
  - Environment
  - Response
  - Response measures

- Utility tree: visual representation
  - Utility of the system
  - Architecture goals and specializations (optional)
  - Scenarios

Lessons:

•Mind map diagrams are great for drawing utility trees

•When using scenarios for COTS evaluation you may invest more time preparing than the vendor

Are all architecture goals equally important?

- Some of the architecture goals are in conflict with each other
- Stakeholders have different interests and will push their own agendas
- Strike a balance through prioritizing the architecture goals

Lessons:

•Executives may not be comfortable allowing stakeholders prioritize the architecture goals

•Mismatches between executives' and stakeholders' priorities provide interesting insight

Architecture analysis

- How does the architecture support the evaluation scenarios?
  - Some scenarios are supported out of the box
  - Other scenarios require architectural changes
- Estimate the effort required to make the modifications

Lessons:

•For COTS selection evaluation scenarios force product vendors to focus on the things that you're interested in

•Scenarios are also great for exploring design alternatives

Architecture analysis (cont.)

- The outcome of scenario analysis puts you in a better position than a traditional multi-attribute evaluation
  - You have a well-framed problem
  - You have evaluation criteria derived from stakeholder expectations
  - The evaluation considers how the architecture integrates within the environment and how it behaves when doing so

Lessons:

- You can spot vendor/product problems that the widespread multi-attribute evaluation doesn't uncover
- Vendors see that you're serious and are more open to allocating resources

Architecture evaluation outputs

- Direct outputs (depend on objectives)
  - Product/design problem identification
  - Explicit architectural risks and tradeoffs
  - … others
- Indirect outputs
  - Better understanding of the problem
  - Identified stakeholder roles and interests
  - Catalog of architecture strategies
  - Improved inter-organizational communication
  - … others
- Better prepared to shift from problem identification to problem resolution

Conclusion

- ThoughtWorks' architecture evaluation projects have been successful
  - Architects adopted the methods as standards for their architecture groups
  - Management and technical staff changed the way the evaluate COTS products
- There is an increased interest in evaluation
  - Architecture evaluation proper
  - Other types of evaluation (SOA assessment, buy vs build, COTS selection etc.)