The principles of successful architecture evaluations

Felix Bachmann
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This technical report features a systemic approach for managing risk that takes into account the complex nature of distributed environments. By starting at the top, examining program objectives and then...
Do You Have the Right Architecture?
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Certified ATAM lead evaluator

Co-author “Documenting Software Architectures – Views & Beyond”
Polling Question

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Agenda

To answer this question we need:

- A measure
- An understanding of the architecture
- The know how
Polling Questions

Have you already participated in an architecture evaluation?

- Yes
- No
Principles of Architecture Evaluation

The Measure
Building the Yardstick – 1

What do we need to measure of an architecture to decide if the architecture is good or not?

**Principle 1:** Quality Attributes determine the architecture.

Therefore we need to measure the quality attribute properties of the architecture.
Where do quality attributes come from?

**Principle 2:** Business Goals determine quality attribute requirements.

Therefore we need to understand the business goals of an organization and translate them into quality attribute requirements.
Building the Yardstick – 3

How do we get the business goals?

Principle 3: Business Goals represent what is important to the stakeholder communities. Therefore we need to let the stakeholders produce the quality attribute requirements.
Can quality attribute requirements be used as a measure?

Principle 4: Quality attributes requirements need to be specified with good measures. We use six-part scenarios for this purpose.
The Yardstick

**Principle 1:** Quality Attributes determine the architecture.

**Principle 2:** Business Goals determine quality attribute requirements.

**Principle 3:** Business Goals represent what's important to its stakeholder communities.

**Principle 4:** Quality attributes requirements need to be specified with good measures.

Creating the yardstick means:

Eliciting the organizational needs from the stakeholders and translating them into quality attribute requirements in a precise and measurable way.
Principles of Architecture Evaluation

Understanding the Architecture
Understanding the Architecture – 1

Remember:

**Principle 1:** Quality Attributes determine the architecture.

**Principle 5:** To understand an architecture you must understand its quality attribute properties.

In most cases those properties are unknown and/or undocumented. We extract the architecture approaches from the architecture.
Principle 6: The most important quality attribute requirements determine the parts of the system to focus the analysis on. We use a two dimensional prioritization (importance and difficulty) to determine the trouble spots in the architecture.
Do I have to care about functionality of the architecture at all?

**Principle 7:** The distribution of functionality in the architecture contributes to the quality attribute properties.

We use the quality attribute scenarios to determine the functionality to focus on.
The Architecture Understanding

**Principle 5:** To understand an architecture you must understand its quality attribute properties.

**Principle 6:** The most important quality attribute requirements determine the parts of the system to focus the analysis on.

**Principle 7:** The distribution of functionality in the architecture contributes to the quality attribute properties.

Understanding the architecture means: Understand the approaches the architect used, understand the functional distribution and understand where to find the trouble spots.
Principles of Architecture Evaluation

The Know How
How to Evaluate the Architecture – 1

We have the yardstick. We localized the interesting areas of the architecture. How exactly do we measure the architecture?

Principle 8: “Guilty until proven innocent.”

*It is the architect’s job to make the case that the architecture has the right quality attribute properties.*
The architect **should** have the best understanding of the architecture.
The architect **should** know all the stakeholders’ expectations.
The architect **should** have created the architecture to fulfill those stakeholder expectations.

Do you trust him/her?

Doing architecture evaluation always means not to believe the architect.
The architect knows all about the strengths of the architecture.
The architect may not know its weaknesses.
If we don’t trust the architect, whom can we trust?

**Principle 9:** Proper analysis disallows assumptions. Only facts count.

Facts can be provided by formal analysis, prototype results, or reasoning. The facts provided have to convince the evaluator. We mostly use interviews for uncovering the facts.
A final principle.

**Principle 10:** Evaluated organizations must own the evaluation results.

Adhering to this principle does not make the evaluation better. It increases the chances of producing a good product.
Performing the Evaluation

**Principle 8:** “Guilty until proven innocent.”

**Principle 9:** Proper analysis disallows assumptions. Only facts count.

**Principle 10:** Evaluated organizations must own the evaluation results.

Performing an evaluation means:

*Do not blindly trust anything that is provided. Ask for convincing evidence. Failure to provide this evidence results in risks.*
Polling Question

In your opinion, which of these principles has the biggest impact on the success of an architecture evaluation?

**Principle 1:** Quality Attributes determine the architecture.
**Principle 4:** Quality attributes requirements need to be specified with good measures.
**Principle 5:** To understand an architecture you must understand its quality attribute properties.
**Principle 7:** The distribution of functionality in the architecture contributes to the quality attribute properties.
**Principle 8:** “Guilty until proven innocent.”
Principles of Architecture Evaluation

Use the Principles or not?
Applying Principles – Or Not?

Using an architecture evaluation method that adheres to all the principles can almost guarantee successful results.

An architecture evaluation method that does not use any of the principles will very likely end in a disaster.

If just one principle is not used, will that make the evaluation a failure?

  Maybe – maybe not

In a specific context, the adherence to some principles is more important than to others.

The better a method utilizes the principles, the higher the chances for success.
Perception of Evaluation Results

Perceived value of the Evaluation Results

Acceptable

Organization specific

Unacceptable

Evaluation 1  Evaluation 2  Evaluation 3

Evaluations
Your Decision!

… and carefully watch the results!
How does the SEI ATAM® utilize these principles?
Associated Texts

- **Software Architecture in Practice, 2nd Edition**
- **Documenting Software Architectures: Views and Beyond**
- **Evaluating Software Architectures: Methods and Case Studies**
- **Software Product Lines: Practices and Patterns**
# Certificate Program Course Matrix

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*Architecture Tradeoff Analysis Method® (ATAM®)*
Steps of the SEI ATAM

1. Present the ATAM
2. Present Business Drivers
3. Present Architecture
4. Identify Architectural Approaches
5. Generate Quality Attribute Utility Tree
6. Analyze Architectural Approaches
7. Brainstorm and Prioritize Scenarios
8. Analyze Architectural Approaches
9. Present Results
Step 1 – Present the ATAM

Purpose:
Inform stakeholders about what will happen.
Set the context.
Ensure a successful execution of the ATAM

Principles that apply to this step:
This step actually does not do any part of an architecture evaluation. Therefore none of the principles applies.
Step 2 – Present Business Drivers

Purpose:
Everyone, the evaluation team and stakeholders, understand what needs to be achieved. Starts building the yardstick

Principles that apply to this step:

**Principle 3:** Business Goals represent what’s important to its stakeholder communities.

**Principle 10:** Evaluated organizations must own the evaluation results.
Step 3 – Present Architecture

Purpose:
Setting the scope and understanding the big picture of the architecture.

Principles that apply to this step:

**Principle 5:** To understand an architecture you must understand its quality attribute properties.
Step 4 – Identify Architectural Approaches

Purpose:
Understand the concepts realized in the architecture. Divide and conquer, discover supported quality attributes.

Principles that apply to this step:

**Principle 1:** Quality Attributes determine the architecture.

**Principle 6:** The most important quality attribute requirements determine the parts of the system to focus the analysis on.

**Principle 10:** Evaluated organizations must own the evaluation results.
Purpose:
Translate business drivers into quality attributes
Make the quality attributes specific and measurable.
Achieve coverage of all business drivers.
Prioritization selects the scenarios with the highest chance of revealing risks.

Mechanism
Utility tree with detailed six part quality attribute scenarios as leaves. Two dimensional prioritization.

More …
Principles that apply to this step:

**Principle 2:** Business Goals determine quality attribute requirements.

**Principle 4:** Quality attributes requirements need to be specified with good measures.

**Principle 6:** The most important quality attribute requirements determine the parts of the system to focus the analysis on.

**Principle 10:** Evaluated organizations must own the evaluation results.
Purpose:
Architect to make the compelling case why the architecture supports the scenarios. If not, risks are identified.

Mechanism
Interviewing the architect. Architect needs to convince evaluator.
Principles that apply to this step:

**Principle 1:** Quality Attributes determine the architecture.

**Principle 7:** The distribution of functionality in the architecture contributes to the quality attribute properties.

**Principle 8:** “Guilty until proven innocent.”

**Principle 9:** Proper analysis disallows assumptions. Only facts count.

**Principle 10:** Evaluated organizations must own the evaluation results.
Purpose: Verify with stakeholders that step 5 actually achieved coverage.

Mechanism
Scenario brainstorming.
Prioritization that selects scenarios important to multiple stakeholders.

Principles that apply to this step:

**Principle 3:** Business Goals represent what’s important to its stakeholder communities.

**Principle 6:** The most important quality attribute requirements determine the parts of the system to focus the analysis on.
Step 8 – Analyze Architectural Approaches – 1

Purpose:
Architect to make the compelling case why the architecture supports the scenarios. If not, risks are identified.

Mechanism
Interviewing the architect. Architect needs to convince evaluator.
Principles that apply to this step:

**Principle 1:** Quality Attributes determine the architecture.

**Principle 7:** The distribution of functionality in the architecture contributes to the quality attribute properties.

**Principle 8:** “Guilty until proven innocent.”

**Principle 9:** Proper analysis disallows assumptions. Only facts count.

**Principle 10:** Evaluated organizations must own the evaluation results.
Step 9 – Present Results

Purpose:
Provide feedback to all stakeholders.
Provide results and show how valuable their input was to ensure their future participation.

Principles that apply to this step:

**Principle 10:** Evaluated organizations must own the evaluation results.
Questions?
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