Software architecture – a 20 year check up

Len Bass
What is the health of software architecture as a discipline?

• Complicated question
  – What is meant by health?
  – How is this measured?

• My take. The software architecture discipline is healthy if
  – There is an accepted body of knowledge suitable for both practitioners and academics
  – The body of knowledge is evolving to meet new challenges
Is there an accepted body of knowledge?

• Possible approaches
  – Look at citations – weighted toward academics and may not reflect breadth of knowledge of a field
  – Look at popularity – weighted toward classroom adoption and may not reflect what is useful to practitioners

• My approach – examine lists of “favorite” books to see if there is a small cluster of books.
  – If so, they should contain the accepted body of knowledge.
  – If not, may need to go into content to decide.

• /Q/ is this a reasonable approach?
Amazon lists

- Amazon has the facility to create lists – totally at the whim of the list maker.
  - I searched for lists within amazon.com (not other Amazon sites) with “software architecture” in title
  - I sorted by date.
  - I ignored lists that had software architecture + other topics
  - I went back until I had ten lists (Dec, 2007)
  - I enumerated the top five items in each list. Two lists had only 1 item, one list had four items.

- /Q/ What should we conclude by the fact that it took 5 years to generate 10 lists?
How many total books? (41 possible)

- /Q/
  - 5-16
  - 17-29
  - 30-41
How many total books? (41 possible)

• /Q/
  – 5-16
  – 17-29
  – 30-41

• /A/ 27
Distribution

• /Q/ What is the maximum number of lists on which a book appeared. I.e. if one book occurs on five lists the answer would be five.

  – 2,3
  – 4,5
  – 6,7
  – 8,9
Distribution

• /Q/ What is the maximum number of lists on which any single book appeared
  – 2,3
  – 4,5
  – 6,7
  – 8,9

• /A/ Documenting Software Architecture appeared on 8 lists. No other book appeared on more than 4 lists and most books only appeared once.
Is there an accepted body of knowledge?

- According to the Amazon list creators – yes.
Has the field evolved?

• Possible approaches
  – Analyze tables of contents for books
  – Examine other keywords for papers that use software architecture as a keyword.

• My approach
  – Examine WICSA session titles to determine overlap
    • If 100% overlap then no evolution
    • If 0% overlap then revolutionary changes in the field.

• /Q/ A reasonable approach?
## WICSA conference session titles

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>2012</th>
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<tbody>
<tr>
<td>Architecture models and</td>
<td>Product Lines</td>
<td>Architectural Decisions</td>
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<tr>
<td>descriptions (2 sessions)</td>
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<tr>
<td>Analysis and assessment</td>
<td>Case Studies and Architectural models (2 sessions)</td>
<td>Service Oriented Architectures</td>
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<td>of software architecture</td>
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<td>(2 sessions)</td>
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<tr>
<td>Techniques and methods</td>
<td>Architectural Knowledge and Decision Making (2 sessions)</td>
<td>Evolution and Variability</td>
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<td>for software architecture</td>
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<td>(2 sessions)</td>
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<td>Architectural Patterns and</td>
<td>Architecting for the Enterprise (2 sessions)</td>
<td>Architectural Methods and Techniques</td>
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<td>styles (2 sessions)</td>
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<tr>
<td>Interoperability, integration and evolution of software (2 sessions)</td>
<td>Documenting Software Architectures</td>
<td>Architecture and Requirements</td>
</tr>
<tr>
<td>Domain specific architectures and product families (2 sessions)</td>
<td>Non-Functional Attributes</td>
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Analysis of session titles

• Dropped from 1998
  – Architecture Patterns and styles

• Four are the same or similar
  – Architectural Methods and Techniques
  – Product Lines
  – Evolution
  – Documenting Software Architecture
  – Analysis and Assessment/Non-Functional Qualities

• New in 2012
  – Architecture for XXX
  – Architecture Knowledge and Decisions.
Has the field evolved?

• /A/ Yes. A mix of new topics, new or refined topics, and some topics no longer with us.

• The field is healthy
  – Coherent body of knowledge
  – Evolution
Moving forward

• How do we maintain the health of our community in the future.
  – Eat right
  – Exercise
  – Kick bad habits
  – New research areas
    • Tool chain
    • Inadequate quality attribute models
Tool chain

• One virtue of architecture is that it allows reasoning at a more abstract level than code.
• When moving to code the connection to the architecture is generally lost.
• Code is updated, architecture is not and architecture becomes disconnected from the code.
• Need to have a means for moving between code and architecture in both directions with relatively low overhead.
  – MDA is a start but there is no connection with architecture in MDA.
Quality attribute models.

• In order to perform trade offs among various quality attributes must be able to model them.
• Models for performance, reliability, and modifiability are reasonably mature.
• There are limited (or no) models for other attributes important to the design of architecture
  – Distributability of development
  – Business considerations
  – Upgradability
  – …
Conclusion

• We are a healthy community
• We have challenges for the future