



© ABB Group
April 27, 2009 | Slide 1

Power and productivity
for a better world™ **ABB**

Usability in Software Engineering Literature [1]

- Quality Attributes in the index of “Software Architecture in Practice” [Bass, Clements, Kazman, 2003]
 - Performance, >45 pages
 - Modifiability, > 45 pages
 - Security, ~36 pages
 - Availability, ~27 pages
 - Testability, ~22 pages
 - ...and Usability, ~17 pages

© ABB Group
April 27, 2009 | Slide 2

ABB

Usability in Software Engineering Literature [2]

- The SWEBOK guide has the objective to promote a consistent view of software engineering worldwide and was published 2004 by IEEE.
 - Usability in SWEBOK
 - The word “Usability” used 6 times but usability as such is not at all discussed
 - Software Ergonomics knowledge areas listed in the chapter “Related disciplines of Software Engineering”
 - Performance in SWEBOK
 - The word “Performance” used 32 times and discussed, e.g. performance analysis, performance testing, performance evaluation, performance requirements, performance degradation

© ABB Group
April 27, 2009 | Slide 3



Usability and Software Architecture Research Questions

- RQ1: Has usability impact on Software Design?
 - Concern: Is it necessary and possible to teach software engineers usability techniques as well as performance techniques?
- RQ2: How large is the impact of usability on Software Design?
 - Concern: Late usability testing leads to costly revision of software design
- RQ3: Can we build in support for usability in the Software Design early?
 - Concern: Prevent last and costly revision of software design

© ABB Group
April 27, 2009 | Slide 4



Usability and Software Architecture Research

- Research groups at the time for the ABB project start-up
 - Usability Supporting Architecture Pattern (USAP), CMU/SEI
 - Bonnie E. John, Len Bass, Elspeth Golden
 - STATUS, European Union project 2001-2003
 - Natalia Juristo, Eelke Folmer, Jan Bosch ...

© ABB Group
April 27, 2009 | Slide 5



USAP Method

Usability Supporting Architecture Pattern Method

© ABB Group
April 27, 2009 | Slide 6



USAP [1]: Study the List of General Usability Scenarios

- Warning/status/alert feedback
 - Status or alert indicators should be displayed when the appropriate conditions are satisfied.
- User profile
 - Each user should be able to set various parameters that control the presentation.
- Command aggregation
 - The user should be able to invoke a file with a collection of commands in it and have the individual commands executed.
- Recovering from failure
 - When the system, the processor, or the network fails, the user should not lose any work in progress.
- Supporting international use
 - The user should have the ability to use the system in a language and with a display format that is familiar to them.
- ... and 14 more so far

© ABB Group
April 27, 2009 | Slide 7



USAP [2]: Choose Your User Interface's Scenarios

The screenshot shows the Amazon.com homepage with several callouts pointing to specific UI elements:

- Comprehensive searching:** Points to the search bar and the 'Search Books' dropdown.
- Action on multiple objects:** Points to the 'Add to Cart' button.
- Reuse of information:** Points to the 'Your Account' link in the top right.
- Help:** Points to the 'Help' link in the top right.
- Identity management:** Points to the 'Your Account' link.
- User Profile:** Points to the 'Your Account' link.

The main content area displays 'Featured Titles in Software Engineering' with a list of books and their prices. The books listed are:

- Antipatterns: Identification, Refactoring, and Management (Aurabach Series on Applied Software Engineering)** by Philip A. Laplante. List Price: \$79.95, Our Price: \$68.41. You Save: \$11.54 (14%). 14 used & new from \$63.06. Usually ships in 1 to 3 weeks.
- Programming Languages for Business Problem Solving** by Shouhong Wang. List Price: \$93.95, Our Price: \$84.00. 15 used & new from \$84.00. In Stock.
- Building and Maintaining a Data Warehouse** by Fion Silvers. List Price: \$79.95, Our Price: \$57.56. You Save: \$22.39 (28%). 25 used & new from \$57.56. Usually ships in 7 to 13 days.
- Embedded Linux System Design and Development** by P. Baghel. List Price: \$73.95, Our Price: \$53.24. You Save: \$20.71 (28%). 30 used & new from \$52.95. In Stock.

© ABB Group
April 27, 2009 | Slide 8



USAP [3]: Study Your Scenarios' Responsibilities

- Scenario: User Profile
 - Responsibility Category: Authoring
 - Responsibility Sub-Category: Create a Specification
 - AU1.1 The system must provide a way for an authorized author to create a [User Profile]
 - ...
 - ...
 - Responsibility Category: Execution
 - Responsibility Sub-Category: Access the created Specification
 - ...
 - Responsibility Category: Logging
 - Responsibility Sub-Category: Specify the Items to be logged
 - ...
 - Responsibility Category: Authorization
 - Responsibility Sub-Category: Authentication
 - ...

© ABB Group
April 27, 2009 | Slide 9



USAP [4]: Study Your Responsibilities' Implementation

- Scenario: User Profile
 - Responsibility Category: Authoring
 - Responsibility Sub-Category: Create a Specification
 - AU1.1 The system must provide a way for an authorized author to create a [User Profile].

Implementation Details for AU1.1.

- The portion of the system that renders output must render a UI that allows the parameters to be specified and displays existing values.
- The portion of the system that accepts input from the user must accept parameters.
- There must be a portion of the system with a mechanism to create a new [User Profile].

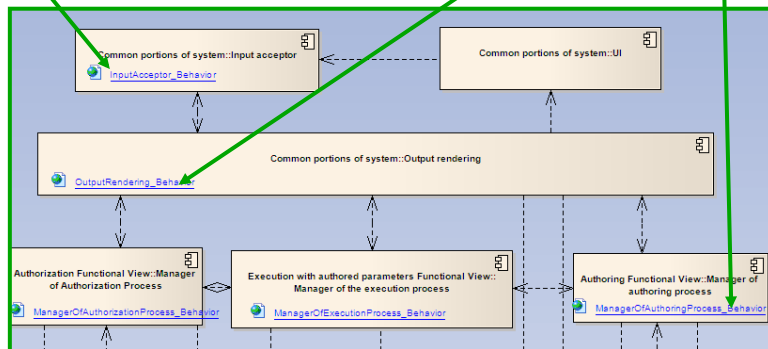
© ABB Group
April 27, 2009 | Slide 10



USAP [5]: Revise Your System Design

Implementation Details for AU1.1.

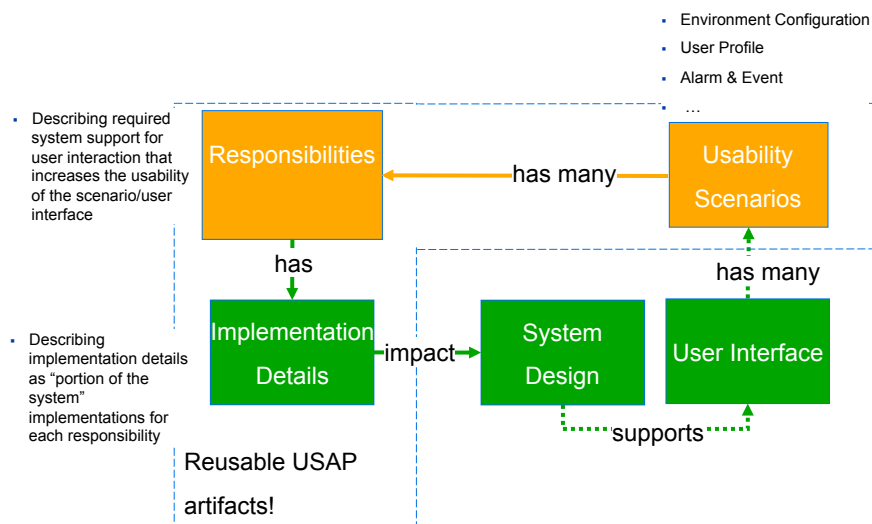
- The portion of the system that renders output must render a UI that allows the parameters to be specified and displays existing values.
- The portion of the system that accepts input from the user must accept parameters.
- There must be a portion of the system with a mechanism to create a new [User Profile].



© ABB Group
April 27, 2009 | Slide 11

ABB

USAP summary



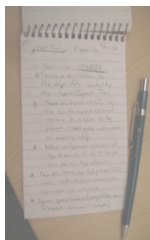
© ABB Group
April 27, 2009 | Slide 12

ABB

USAP tool

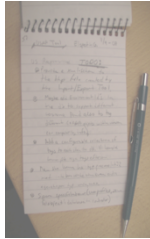
The top screenshot shows the 'USABILITY-SUPPORTING ARCHITECTURE PATTERN: AUTHORIZING' page. The sidebar menu includes 'Main Page', 'Authoring', 'Description', 'Responsibilities', 'Execution with authored parameters', 'Description', 'Responsibilities', 'Logging', 'Description', 'Responsibilities', and 'Execution with authored parameters'. The main content area shows 'RESPONSIBILITIES' and 'AUTHORIZING' sections. The 'AUTHORIZING' section includes 'AU.1. Create a specification' and 'AU.1.1 The system must provide a way for an authorized author to create a [User Profile, Configuration description, Conditions for Alarms, Events and Alerts]'. The 'AU.1.1' section has a table with columns for 'User Profile USAP', 'User Profile', and 'Architecture addresses this (Discuss status)'. The bottom screenshot shows the 'USABILITY-SUPPORTING ARCHITECTURE RESPONSIBILITIES' page. The 'ToDo List' section includes 'AUTHORIZING' and 'AU.1. Create a specification'. The 'AU.1.1' section has a table with columns for 'User Profile USAP', 'User Profile', 'Environment Configuration USAP', 'Configuration Description', 'Alarms, Events and Alerts USAP', and 'Conditions for Alarms, Events and Alerts'. A blue arrow points from the 'Add Implementation Details' link in the bottom screenshot to the 'Show Implementation Details' link in the top screenshot.

USAP responses at ABB of 6 hours interaction with USAP tool



- U1: We have discussed lots of internal stuff in the system but this gave us some picture of what the user is going to see.
- U2: And that is things that we were not going to get that input until very late in the design process, if we hadn't used this tool now. So it was good to have these points of view come in this early.... I think we have identified at least a couple of new subsystems.
- U1: Yes. And some shortcomings of the previous design.
- U2: Yeah.
- U3: ...it was easy to use, of course, no fancy stuff ...and one thing that was good was that I need to provide an answer to every question, and in order to provide an answer I need to read text, and it forces me to read the text, so I won't be able to just skip through it, all the stuff, that was very good.

USAP result at ABB of 6 hours interaction with USAP tool



- SystemABC
 - 14 major issues discovered
 - 6 to be fixed according to guidance in USAP
 - 4 would have been discovered anyway
 - 4 are still open as to whether they will be fixed.
 - Estimated cost savings > 5 person weeks
- SystemDEF
 - discovered 1 new issue

© ABB Group
April 27, 2009 | Slide 15



Finally

Thank you Len, Bonnie and Elsa
for a successful cooperation!

© ABB Group
April 27, 2009 | Slide 16

