Guide to the Software Engineering Body of Knowledge

Status Report
Robert Dupuis, Pierre Bourque, Alain Abran
UQAM
James W. Moore, The Mitre Corporation
Leonard Tripp, Boeing
FIE’99
San Juan
November 12, 1999
Presentation Objectives

- Present the Status of the Guide to the Software Engineering Body of Knowledge project
- Recruit reviewers for the next review cycle
Project Overview
Presentation Plan

✧ Project background
  ✧ Project scope, objectives and audience
  ✧ Description of current phase
  ✧ Concluding remarks
Software Engineering

- Now 30 years old!
- Millions of pages on the subject!
- Hundreds of conferences and workshops annually!
- Multiple university programs
- Millions of practitioners around the world?

Is the field really mature?
Recognized Profession?

- Starr*: 
  - Knowledge and competence validated by the community of peers
  - Consensually validated knowledge rests on rational, scientific grounds
  - Judgment and advice oriented toward a set of substantive values

Window of Opportunity?

- Texas Board of Professional Engineers
- Computer Science Curriculum 2001
- Possible liability issues: Y2K, etc.
- Increased interest in the establishment of a profession
IEEE-CS/ACM Software Engineering Coordinating Committee

- Four task forces
  - Code of ethics
  - Body of knowledge
  - Education
  - Performance norms for software engineers
Key Interrelationships for a Core Body of Knowledge

Development of Software Engineering Curricula

Consensus on a Core Body of Knowledge

Development of Certification / Licensing Criteria and Exams

Development of University Program Accreditation Criteria
What is Software Engineering?

- IEEE 610.12:
  - “(1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.
  - (2) The study of approaches as in (1).”
Project Overview
Presentation Plan

- Project background
- **Project scope, objectives and audience**
  - Description of current phase
  - Concluding remarks
Project Objectives

- Characterize the contents of the Software Engineering Body of Knowledge
- Provide a topical access to the Software Engineering Body of Knowledge
- Promote a consistent view of software engineering worldwide
Project Objectives

- Clarify the place of, and set the boundary of, software engineering with respect to other disciplines (computer science, project management, computer engineering, mathematics, etc.)

- Provide a foundation for curriculum development and individual certification and licensing material
Intended Audience

- Public and private organizations
- Practicing software engineers
- Makers of public policy
- Professional societies
- Software engineering students
- Educators and trainers
What Are we Not Trying to Accomplish?

- Not a curriculum development effort!
- Not an all-inclusive description of the sum of knowledge in the field
- Not all categories of knowledge
## Categories of Knowledge in the SWEBOK

<table>
<thead>
<tr>
<th>Specialized</th>
<th>Generally Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Advanced and Research</td>
</tr>
</tbody>
</table>
Two Underlying Principles of the Project

- **Transparency**: the development process is itself published and fully documented

- **Consensus-building**: the development process is designed to build, over time, consensus in industry, among professional societies and standards-setting bodies and in academia
Project Overview
Presentation Plan

- Project background
- Project scope, objectives and audience

- Description of current phase
- Concluding remarks
A Three-Phase Approach for Developing the Guide to the SWEBOK

1998: Straw Man Version

1999: Stone Man Version

2000: Iron Man Version

www.swebok.org
Description of Current Phase

- Project Team
- Stone Man Deliverables
- Development and Review Process
- Results to Date
Participants from a Broad Spectrum of Audiences

- Industry
- Professional societies
- Standards setting bodies
- Academia
- Authors
- International representation
Project Team

- Editorial team
- Industrial Advisory Board
- Panel of Experts
- Knowledge Area Specialists
- Reviewers/Review Captains
- Members of the software engineering community
Editorial Team

- Project “Champion”:
  - Leonard Tripp, 1999 President, IEEE Computer Society

- Executive Editors:
  - Alain Abran, UQAM
  - James W. Moore, The MITRE Corp.

- Editors:
  - Pierre Bourque, UQAM
  - Robert Dupuis, UQAM
Roles of the Industrial Advisory Board

- Provide input to ensure relevance to various audiences
- Review and approve strategy and deliverables
- Oversee development process
- Assist in promoting the Guide to the Software Engineering Body of Knowledge
- Lend credibility to the project
Industrial Advisory Board

- Met in Fall of 1998 and Summer of 1999
- Mario R. Barbacci, Software Engineering Institute, representing the IEEE Computer Society
- Carl Chang, University of Illinois at Chicago, Editor Emeritus, IEEE Software, representing Computing Curricula 2001
Industrial Advisory Board

- François Coallier, Bell Canada, speaking as ISO/IEC JTC 1 / SC7 Chairman
- Morven Gentleman, National Research Council of Canada
- Paula Hawthorn representing the ACM
- Dan Nash, Raytheon Systems Company
- Laure Le Bars, SAP Labs (Canada)
Industrial Advisory Board

- Bryan Pflug, The Boeing Company
- Larry Reeker, National Institute of Standards and Technology
- Dolores Wallace, National Institute of Standards and Technology
Panel of Experts

- Steve McConnell, Construx Software
- Roger Pressman, R.S. Pressman and Associates
- Ian Sommerville, Lancaster University
Project Funding

- Industry
- Professional societies
- UQAM
Stone Man Deliverables:

- Consensus on a list of Knowledge Areas
- Consensus on a list of topics and relevant reference materials for each Knowledge Area
- Consensus on a list of Related Disciplines
- Available free on the web
Knowledge Area Description

- Brief Description of Topics
- Classification of topics according to an engineering taxonomy
- Classification of topics according to Bloom's taxonomy
- Relevant Knowledge Areas of Related Disciplines
- Matrix Topics/Reference Material
- Reference Material
Stone Man Review Process

Version 0.1

Limited number of domain experts

Review Cycle 1

Version 0.5

Selected users

Review cycle 2

Version 0.7

Community

Review Cycle 3

Version 0.9
Stone Man Review Process

- Transparency and consensus-building
  - All intermediate versions of documents will be published and archived on www.swebok.org
  - All comments will be made public as well as the identity of the reviewers
  - Detailed comment disposition reports will be produced for Review Cycle 2 and 3
Knowledge Area Specialists

- Antonia Bertolino, Italy
- Terry Bollinger, USA
- Dave Carrington, Australia
- Khaled El Emam, Canada
- Stephen MacDonell and Andrew Gray, New-Zealand
- Pete Sawyer and Gerald Kotonya, UK
- John Scott and David Nisse, USA
- Guy Tremblay, Canada
- Tom Pigoski, USA
- Dolores Wallace and Larry Reeker, USA
# Version 0.5 Review Strategy

<table>
<thead>
<tr>
<th></th>
<th>Educators and Trainers</th>
<th>Small Org.</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Req. Analysis</td>
<td>Five to Ten reviewers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Development and Review Process

○ Reviewers are responsible for
  - Reading the Knowledge Area Description and consulting the selected reference material
  - Providing comments from one specified viewpoint

○ Schedule
  - Review Cycle 2: July, August and September 1999
  - Review Cycle 3: December 1999 and January 2000
Development and Review Process

- Criteria for reviewers are
  - Knowledge in the Area
  - Availability
  - Ability to give articulate, constructive comments
  - Representative of: software engineering practitioners, trainers and educators, standards developers, small industry, students, etc.
Examples of Questions to the Reviewers

- One question for each requirement:

- As a practitioner, do you find that the breakdowns of topics comply with the requirement of being sound and reasonable?

- As a practitioner, do you find that the reference material is readily available?
Development and Review Process

- Review Captains:
  - Responsible for compiling comments of a group of 5-10 reviewers for a specific Knowledge Area and Review Viewpoint

- Schedule:
  - September 1999
Reviewers Demographics

- Over 200 reviewers
- Over 400 reviews
- 25 countries
- 40% outside the US
Reviewers Demographics

- Viewpoints represented:
  - Individual Practitioners
  - Trainers & Educators
  - Researchers
  - Makes of Public Policy
  - Small to Medium-sized Software Organizations
Stone Man Version 0.5
Reviewer Response Database Search Tool

Option 1
Choose one or more from the following lists:

Choose a Knowledge Area
Choose a Review Viewpoint
Choose a Question

Search

Option 2
View all responses for a reviewer:

Choose a Reviewer

Search

Option 3
Enter the Unique Identifier of the Response:

Search
Guide to the SWEBOK - Stone Man Version 0.5
Reviewer Response Report

Knowledge Area: Software design
Review Viewpoint: Individual practitioners

Question 3:
Do you find that the proposed breakdowns of topics comply with the constraints cited in this specification?

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier: 2118</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td>Yes</td>
</tr>
<tr>
<td>Reviewers:</td>
<td></td>
</tr>
<tr>
<td>Allen, David</td>
<td>Arroyo-Figueroa, Javier</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier: 2119</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td></td>
</tr>
<tr>
<td>Reviewers:</td>
<td></td>
</tr>
<tr>
<td>Seibert, Mark</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier: 2120</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td></td>
</tr>
<tr>
<td>Reviewers:</td>
<td></td>
</tr>
<tr>
<td>Specific design methods, etc. need to be identified as such. It is not clear whether they serve as examples or approaches that may be supplanted</td>
<td></td>
</tr>
</tbody>
</table>
**Knowledge Area: Software engineering management**

**Review Viewpoint: Small to medium-sized organization practitioners**

**Question 1:**
Do you find that the breakdowns of topics comply with the requirement of being sound and reasonable?

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td>Disposition Rationale:</td>
</tr>
<tr>
<td>2834</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td>Disposition Rationale:</td>
</tr>
<tr>
<td>2855</td>
<td></td>
</tr>
<tr>
<td>The breakdowns do not together cover all the important topics and separately suffer from incompleteness and unevenness, and occasionally lack the clarity to allow a firm answer to this Review Question 1. Among the important topics that are difficult to place anywhere in the breakdown are security, subcontractor/supplier management, quality assurance (as opposed to quality control), intellectual property issues, professional development and training, managing project/process improvement, infrastructure issues including disaster recovery, competitive strategy, managing customer/supplier relations, dealing with higher management, and other interorganizational and inter-specialty coordination.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td>Disposition Rationale:</td>
</tr>
<tr>
<td>2856</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guide to the SWEBOK - Stone Man Version 0.5
Reviewer Response Report for One Response

Unique Reviewer Response Identifier: 1575

Knowledge Area: Software requirements analysis
Review Viewpoint: Individual practitioners

Question 3:
Do you find that the proposed breakdowns of topics comply with the constraints cited in this specification?

<table>
<thead>
<tr>
<th>Unique Reviewer Response Identifier: 1575</th>
<th>Response Disposition: No disposition yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer Response:</td>
<td>Disposition Rationale:</td>
</tr>
<tr>
<td>I might argue the &quot;Three important classes&quot; does not provide a useful set of distinctions for most practitioners. Creating a classification schema is always difficult. Too much depends upon viewpoint. I might argue the author only specified two types: information and embedded. The next dimension in the classification would have to be stand alone and networked. Within information, I can create several new distinctions each of which dramatically affects the requirements specification. For example, transaction systems that record and report business transactions or control business transactions (order entry, payroll), MIS (accounting systems), workflow (insurance claims), expert and knowledge base (help desk), decision support (EIS, statistical analysis), and publish-and-subscribe (operations manuals that are online, newsletters). The characteristics of these are equally different from the ones the author identified. The process to support requirements elicitation is different in each of these. The author appropriately mentions that the style of the requirements process must change to support the application characteristics (page 6).</td>
<td></td>
</tr>
</tbody>
</table>

Reviewers: Ferguson, Robert

Printed on Thu May 04 14:57:52 Eastern Standard Time 1999
Results to Date

- Approved by the Industrial Advisory Board:
  - Stone Man Development Plan
  - Baseline List of Knowledge Areas
  - Baseline List of Related Disciplines
  - Nomination of Knowledge Area Specialists
  - Knowledge Area Description Specifications
- Version 0.5 of the KA Descriptions
- Hundreds of reviews
Baseline List of Knowledge Areas

- Software Requirements Analysis
- Software Design
- Software Construction
- Software Testing
- Software Evolution and Maintenance
Guide to the Software Engineering Body of Knowledge

Software Requirements Analysis

- Requirements Engineering Process
  - Requirements Process Models
  - Requirements Process Actors
  - Requirements Process Support
    - Requirement Process Improvement
- Requirements Elicitation
  - Requirements Sources
    - Elicitation Techniques
- Requirements Analysis
  - Requirements Classification
    - Conceptual Modeling
    - Requirements Negotiation
- Requirements Validation
  - Requirements Reviews
    - Prototyping
    - Model Validation
      - Acceptance Tests
- Requirements Management
  - Change Management
  - Requirements Attributes
  - Requirements Tracing
  - Requirements Documentation
Baseline List of Knowledge Areas

- Software Configuration Management
- Software Quality Analysis
- Software Engineering Infrastructure
- Software Engineering Process
- Software Engineering Management
Baseline List of Related Disciplines

- Computer Science (CC2001)
- Mathematics (CC2001)
- Project Management (PMBOK)
- Computer Engineering
- Cognitive Sciences and Human Factors
- Systems Engineering
- Management and Management Science
Project Overview Presentation Plan

- Project background
- Project scope, objectives and audience
- Description of current phase

Concluding remarks
Institutional Collaboration

- Membership on Industrial Advisory Board
- Participation in review process and uptake of results by national professional societies
- Endorsement of results by national professional societies
Concluding Remarks

- Consensus on the core body of knowledge is key in all disciplines and pivotal for the evolution of SE toward a professional status
Concluding Remarks

- Involvement of all parties is key for relevancy, credibility and quick uptake:
  - Industry
  - Professional societies
  - Standards setting bodies
  - Academia
- Seeking many collaborators!
www.swebok.org
Editorial Team Coordinates

Alain Abran
Université du Québec à Montréal
Computer Science Dept.
C.P. 8888, Succ. Centre-Ville
Montréal, Québec
H3C 3P8 Canada
Tel.: (514) 987-3000 ext. 8900
Fax: (514) 987-8477
abran.alain@uqam.ca

Pierre Bourque
Université du Québec à Montréal
Computer Science Dept.
C.P. 8888, Succ. Centre-Ville
Montréal, Québec
H3C 3P8 Canada
Tel.: (514) 987-3000 ext. 0315
Fax: (514) 987-8477
bourque.pierre@uqam.ca
Editorial Team Coordinates

Robert Dupuis
Université du Québec à Montréal
Computer Science Dept.
C.P. 8888, Succ. Centre-Ville
Montréal, Québec
H3C 3P8 Canada
Tel.: (514) 987-3000 ext. 3479
Fax: (514) 987-8477
dupuis.robert@uqam.ca

James W. Moore
The MITRE Corporation
1820 Dolley Madison Blvd.
McLean, Virginia 22102-3481
USA
Tel: 703 883-7396
Fax: 703 883-5432
James.W.Moore@ieee.org