Introduction to the SWEBOK Guide and Project

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IEEE Computer Society

- Institute of Electrical and Electronics Engineers:
  - 360,000 members in 175 countries.
  - Publishes 30% of the world’s technical literature within its scope of interest.
- The Computer Society is the largest of IEEE’s 37 technical societies:
  - 100,000 members, 40% outside the US.
  - Founded in 1946, the world’s oldest and largest association of computing professionals.

Trial Version (2001)
Guide to the Software Engineering Body of Knowledge (SWEBOK®)

- Began as a collaboration among IEEE CS, ACM and the Université du Québec à Montréal
- International participation from industry, professional societies, standards bodies, academia, authors
- Over 500 hundred software engineering professionals have touched the document
- Release of Trial Version in 2001
- Registered in U.S. Patent Office
2004 SWEBOK Guide

- Available on www.swebok.org
- The 2004 Version was endorsed by the project’s Industrial Advisory Board in January 2004 and approved by the IEEE Computer Society Board of Governors in February 2004
- Also published in book form by the IEEE Computer Society Press and in Japanese by Ohmsha
- Also published as ISO Technical Report 19759
- Current draft versions in Arabic, French and Spanish

List of Knowledge Areas

- Software Requirements
- Software Design
- Software Construction
- Software Testing
- Software Maintenance
- Software Configuration Management
- Software Quality
- Software Engineering Tools & Methods
- Software Engineering Process
- Software Engineering Management
Presentation Objectives

- Give an overview of the emerging international consensus on the “core body of knowledge” of software engineering
- Briefly present the development process used to reach this emerging consensus

Presentation Plan

- Project background
  - Project scope, objectives, audience and development process
  - Contents of the Guide
  - Evolution of the Guide
  - Conclusion
  - Appendix: Breakdown of topics
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).”

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

Development of a Profession

Initial professional education  →  Accreditation

Skills Development  →  Professional societies

One or both  
- Certification
- Licensing

Full Professional Status  →  Professional development  →  Code of ethics

Adapted from Steve McConnell, After the Gold Rush, Microsoft Press, 1999, p. 93

Presentation Plan

- Project background
- **Project scope, objectives, audience and development process**
  - Contents of the Guide
  - How you can leverage the Guide within your organization
  - Evolution of the Guide
  - Conclusion
  - Breakdown of topics
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

| Specialized | Generally Accepted | Advanced and Research |

- **Target of the SWEBOK Guide**
  
  "Applicable to most projects, most of the time, and widespread consensus about their value and usefulness"
  
  Project Management Institute - PMI

- **North American Bachelor’s degree + 4 years of experience**

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**Knowledge of a Software Engineer**

- C.S.
- Specialized SE Knowledge
- Application domain knowledge
- Advanced SE Knowledge
- Guide to the SWEBOK Stoneman
- Maths
- ...
Three 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
- Available **free** on the web

Project Team

- Editorial Team of the Guide
- Industrial Advisory Board
- Associate Editors of the Knowledge Areas
- Reviewers
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

A Three-Phase Approach for Developing the Guide

- Straw Man Phase 1998
- Stone Man Phase 1999
- Iron Man Phase (Sub-phase 1) 2000
- Iron Man Phase (Sub-phase 2) 2001
- Trial Version 2002
- 2004 Version 2003
Formal resolutions

- Industrial Advisory Board (2001)
- IEEE CS Board of Governors (2001)
  - "The Board of Governors of the IEEE Computer Society accepts the Guide to the Software Engineering Body of Knowledge (Trial Version) as fulfilling its development requirements and is ready for field trials for a period of two years"
- IEEE CS Board of Governors (Feb. 2004)
  - Officially approved the 2004 Version
- Official recognition as ISO Technical Report 19759

Trial Version 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
Trial Version Review Process

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

Data on reviewers

Trial Version

- Version 0.1: 33
- Version 0.5: 195
- Version 0.7: 378
  - + ISO reviews from 5 countries
Geographic Distribution of Reviewers
Trial Version

- USA: 55%
- Europe: 18%
  - 90 reviewers from 25 countries
- Canada: 10%
- Australia: 5%
- Asia: 5%
- Latin America: 4%

Education level of reviewers
(Version 0.7)

- 34% Ph.D.
- 39% Masters
- 24% Bachelor
- 3% Other
Number of employees at reviewer location (Version 0.7)

- 31% 0-50
- 32% 50-500
- 37% Over 500

Number of years of practical experience (Version 0.7)

- 38% 0-9
- 32% 10-19
- 21% 20-29
- 9% 29+
A Three-Phase Approach for Developing the Guide

- Straw Man Phase
- Stone Man Phase
- Iron Man Phase (Sub-phase 1)
- Iron Man Phase (Sub-phase 2)
- Experimentation and Trial Usage
- Trial Version
- 2004 Version

Reviewers (2004 Version)
- Registered reviewers: 573
- Number of countries: 55
- Number of comments: 1020
- Number of reviewers submitting comments: 124
- Number of represented countries: 21

Years in the field
- Years in industry
Project Overview
Presentation Plan

- Project background
- Project scope, objectives, audience and development process

Contents of the Guide
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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
Knowledge Areas and Related Disciplines

- Software Requirements
- Software Design
- Software Construction
- Software Testing
- Software Maintenance
- Software Configuration Management
- Software Eng. Management
- Software Eng. Tools & Methods
- Software Engineering Process
- Software Quality

Related Disciplines
- Computer Engineering
- Computer Science
- Mathematics
- Project Management
- Management
- Quality Management
- Software Ergonomics
- Systems Engineering

Knowledge Area Description

Classification of Topics

Matrix of Topics & References

References

Topic Descriptions

Classification by Vincenti’s Taxonomy

Classification by Bloom’s Taxonomy

Not implemented

References to Related Disciplines

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Summary of changes in 2004 Version

- Standardization of the contents of the chapters in terms of table of contents, topic breakdown, terminology, reference citations and writing style
- Structural improvements in breakdown of topics: Software Construction, Software Engineering Management, Software Quality, Software Engineering Process
- Better representation of text in topic breakdown: Software Requirements, Software Testing, Software Maintenance
Summary of changes in 2004 Version

- New chapter on Related Disciplines (instead of an appendix)
- Better representation of standards in chapters and a new Appendix devoted to standards
- Updating of reference material
- Handling of trial usage feedback
- Handling of reviewer comments

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Evolution of the SWEBOK Guide

- Next planned version is 2009
- Main focus of changes
  - Harmonization of IEEE software engineering professional products with the SWEBOK Guide as the cornerstone
- Time-boxed block updates
  - To ensure currency
  - To permit structural evolution while ensuring internal consistency
  - To permit synchronization with coordinated efforts
  - To allow “follower” efforts to perform their own planning

Involvement with stakeholder groups
  - To support existing audiences

Openness and transparency
  - To appeal to new audiences
  - To give credibility to the product

Technical excellence
Presentation Plan

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Concluding Remarks

- Consensus on the core body of knowledge is key in all disciplines and pivotal for the evolution toward a professional status
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Figure 1 Breakdown of topics for the Software Design KA

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Figure 1. Breakdown of topics for the Software Construction KA.
Software Maintenance

- Fundamentals
  - Definitions and Terminology
  - Nature of Maintenance
  - Need for Maintenance
  - Majority of Maintenance Costs
  - Evolution of Software

- Key Issues in Software Maintenance
  - Technical
  - Management
  - Maintenance Cost and Estimation
  - Software Maintenance Measurement

- Maintenance Process
  - Maintenance Process Models
  - Maintenance Activities
  - Program Comprehension
  - Re-engineering
  - Reverse Engineering
  - Impact Analysis

Categories of Maintenance

Software Configuration Management

1. Software Configuration Management Fundamentals
   - Identifying Items to be Controlled
   - Software Configuration Library
   - Software Configuration Items
   - Software Configuration Item Relationships
   - Baseline Approval
   - Software Configuration Item

2. Key Issues in SCM
   - Organizational Contract for SCM
   - Constraints and Guidance for SCM
   - Planning for SCM
   - Organization and Responsibilities
   - SCM Resources and Schedules
   - Tool Selection and Implementation
   - Software Configuration Control
   - Software Configuration Management Plan

3. Software Configuration Control
   - Requesting, Evaluating and Approving Software Changes
   - Software Configuration Control Board
   - Software Change Impact Process
   - Implementing Software Changes
   - Deviations and Waivers

4. Software Configuration Status Accounting
   - Software Configuration Status Information
   - Software Configuration Status Reporting

5. Software Configuration Auditing
   - Software Functional Configuration Audit
   - Software Physical Configuration Audit
   - In-Process Audits of a Software Baseline

6. Software Release Management and Delivery
   - Software Building
   - Software Release Management

www.swebok.org