The Emerging Consensus on the Software Engineering Body of Knowledge

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Presentation Plan

- **Project background**
  - Project objectives, audiences and plan
  - Content of the Guide
  - Next steps
  - Research Issues
Key Issues

- Groups and individuals:
  - Different views of software engineering

- Universities:
  - Offering undergraduate degrees in *Software Engineering*, outside of traditional Engineering Departments
  - Limited consistency across curriculum
  - Different accreditation groups (Canada: CIPS and CCPE)

- Increased interest in the establishment of a profession
Market Trends - Examples

Texas Board of Engineers:

- Decision to license software engineers: a strategy with significant impact on:
  - industry (e.g. mobility of staff & training)
  - universities
  - policy bodies
  - individuals

(+ engineering boards in Canada and universities)
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).”
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

Influences

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Project Objectives

- Promote a consistent view of *software engineering* worldwide
- Clarify the place of, and set the boundary of, software engineering with respect to other disciplines
- Characterize the contents of the Software Engineering Body of Knowledge - SWEBOK
- Provide a topical access to the Software Engineering Body of Knowledge
- Provide a foundation for curriculum development and individual certification and licensing material
Intended Audiences

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

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

- Generally Accepted
- Advanced and Research

Focus of the SWEBOK Guide
Generally Accepted

- «Applies to most projects, most of the time, and widespread consensus validates its value and effectiveness»
  - Project Management Institute

- Bachelor + 4 years of experience
IEEE and ACM strategies

- IEEE-CS:
  - initial focus on generally accepted
  - strategy with intermediate deliverables
  - contributions to the maturation and consensus building

- ACM:
  - opposition to licensing
    - withdrawal from joint efforts with IEEE-CS
  - concerns: focus on specialized knowledge
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

  - Consensus does not equal Unanimity!

- Available **free** on the web
A Three-Phase Approach for Developing the Guide to the SWEBOK

- Straw Man Version
- Stone Man Phase (Trial Version)
- Iron Man Version (Sub-phase 1)
Project Team

- Editorial team
- Industrial Advisory Board
- Knowledge Area Specialists
- A very large international group of Reviewers
A Three-Phase Approach for Developing the Guide to the SWEBOK

- **Straw Man Version**
- **Stone Man Phase** (Trial Version)
- **Iron Man Version** (Sub-phase 1)

Year Timeline:
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003

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Phase 2: 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 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
Data on reviewers

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

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

- Doctorat: 39%
- Master: 34%
- Bachelor: 24%
- Other: 3%
Organizations of Reviewers (no. of employees)

- 37% in 0-50 employees
- 32% in 50-500 employees
- 31% in 500 more employees
Project Overview
Presentation Plan

- Project background
- Project scope, objectives, audience and plan

Contents of the Guide

- How you can leverage the Guide within your organization
- Conclusion
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
Knowledge Area Description

Classification of Topics

Matrix of Topics & References

References

Not implemented in Stoneman
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 Science (CC2001)
- Mathematics (CC2001)
- Project Management (PMBOK)
- Computer Engineering
- Cognitive Sciences and Human Factors
- Systems Engineering
- Management and Management Science
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Straw Man Version

Stone Man Version

Iron Man Version (Sub-phase 1)

Iron Man Version (Sub-phase 2)

1998 1999 2000 2001 2002 2003

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Collection of feedback from:

- Education:
  - Curriculum design/evaluation
  - Program accreditation
  - Course design/evaluation
  - Internal training, corporate universities
Collection of feedback from:

- Industry & Government
  - job description
  - hiring
  - staffing of projects
  - career planning
  - contracting
Collection of feedback from:

- Policy organisations
  - Licensing & Certification
    - licensing exam questions
    - study material
    - in software engineering and other IT fields
    - could be on subsets of Knowledge Areas
  - R & D agencies: strategies for increasing engineering maturity of the domain
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Research Areas
SWEBOK & Research Issues

- The Engineering of:
  - Software Requirements
  - Software Design
  - Software Construction
  - Software Testing
  - Software Maintenance
  - Software Quality
  - Software Eng. Management
  - Software Eng. Tools & Methods
  - Software Engineering Process
  - Software Configuration Management
SWEBOK & R&D Issues

How much of Engineering Knowledge types within each of the 10 Knowledge Areas?

- Fundamental Design Concepts
- Criteria Specifications
- Theoretical Tools
- Quantitative Data
- Practical Considerations
- Design Instrumentalities

Significant progress required from all engineering perspectives

- Fundamental Design Concepts
- Criteria Specifications
- Theoretical Tools
  - Quantitative Data
- Practical Considerations
- Design Instrumentalities

Knowledge Area Description

Classification of Topics

Matrix of Topics & References

References

Topic Descriptions

Classification by Vincenti’s Taxonomy

Classification by Bloom’s Taxonomy

References to Related Disciplines

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Comparison of Research Areas

R & D Topics in Submission to NSERC Reallocations Committee ref Software Engineering:

- Software Development Process
- Software Engineering Environments
- Modelling and documentation
- Software patterns, structures and architecture
- Verification and validation

Source: 2001 - Jointly by Electrical/Computer Engineering and Computer Sciences
Concluding Remarks

- Software Engineering: The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software
  - IEEE 610.12

- Strengthening the Engineering Knowledge within this new discipline is required for a rapid maturation, and significant contribution to the Canadian software industry
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