

# One Day Workshop, Friday, May 4, 2000

## Guide to the Software Engineering Body of Knowledge: Overview and Applications



Is Software Engineering really Engineering? Not yet, according to the usual licensing and accreditation requirements of the engineering profession. The Guide to the Software Engineering Body of Knowledge (SWEBOK) is a joint project of the IEEE Computer Society and the Association for Computing Machinery that may change that state of affairs. The project is developing a broad consensus on the core contents of the software engineering discipline. It is anticipated that the Guide will find use in developing software engineering curricula, accrediting curricula, developing licensing examinations, and describing and certifying competencies. The current "Stone Man" version of the Guide outlines ten knowledge areas of software engineering, identifies generally accepted topics within these knowledge areas, points to relevant reference material for all topics, and specifies other disciplines related to software engineering. The next phase of the project will develop an "Iron Man" version based largely on trial application of the current version in realistic situations. This workshop is intended to provide one of those trial uses. Using the SWEBOK Guide, we will define the various competencies needed to implement a comprehensive set of processes for the software life cycle. The resulting definitions would be useful in writing position descriptions, describing project staffing, and evaluating proposals. Lockheed Martin and some of its subcontractors have agreed to cooperate in this exercise to ensure that we are dealing with a realistic situation. The result is expected to be broadly applicable to both suppliers and acquirers of software. Following the exercise, we will evaluate the utility of the Guide in performing the task. Finally, we will offer participants the opportunity to provide feedback on the overall project. More information regarding the SWEBOK project, including the current version of the Guide, can be found at <http://www.swebok.org>.

### Workshop Outline:

- Mission and structure of the project.
- Overview of the Stone Man version of the Guide to the SWEBOK.
- Status and development process of the Guide.
- Applications of the Guide in the fields of education, human resource management, professional development and licensing and certification.
- Class exercise in applying the Guide to defining the competencies needed to support software life cycle process deployment.
- Strategy for uptake and promotion of the Guide.
- Discussion of promotion, trial usage and experimentation.

### Workshop Leaders:

#### *Université du Québec à Montréal*

- Pierre Bourque
- Robert Dupuis

#### *The MITRE Corporation*

- James W. Moore

#### *Lockheed Martin Corporation*

- Perry Deweese

# ***Guide to the Software Engineering Body of Knowledge*** **Overview and Applications**

**Robert Dupuis, Pierre Bourque, UQAM**

**Jeff Tait, Lockheed Martin**

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**Perry DeWeese, Lockheed Martin**

**James W. Moore, The MITRE Corporation**

**STC 2000**

**Salt Lake City**

**May 5, 2000**



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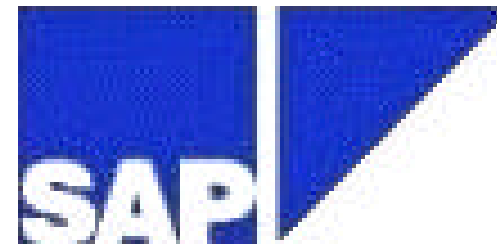


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the e-development company™

**Raytheon**

Project managed by:

**UQAM**



# Workshop Agenda

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- ⊙ 8:00 Introduction and Objectives
- ⊙ 8:15 SWEBOK Project Overview
- ⊙ 10:00 SWEBOK Applications: an example in competency management
- ⊙ 11:00 Audience Input
- ⊙ 11:30 *Lunch*
- ⊙ 1:00 SWEBOK diffusion and pilot projects
- ⊙ 1:15 Audience Input
- ⊙ 3:00 Closing



# Workshop Objectives

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- ⊙ Present the Guide to the SWEBOK project and a brief overview of the Stone Man version of the Guide
- ⊙ Discuss potential applications of the Guide
- ⊙ Discuss the diffusion strategy for the Guide
- ⊙ Discuss the pilot project strategy
- ⊙ Prepare the attendees to be reviewers
- ⊙ Deliver a summary of workshop proposals

# Project Overview Presentation Plan

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## ◎ **Project background**

- ◎ Project scope, objectives, audience and plan
- ◎ Contents of the Guide

# IEEE-CS/ACM Software Engineering Coordinating Committee

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- ⊙ Four task forces
  - ❖ Code of ethics  
([www.computer.org/tab/swecc/SWCEPP.htm](http://www.computer.org/tab/swecc/SWCEPP.htm))
  - ❖ Body of knowledge
  - ❖ Education
  - ❖ Performance norms for software engineers

# Recognized Profession?

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## ⊙ Starr\*:

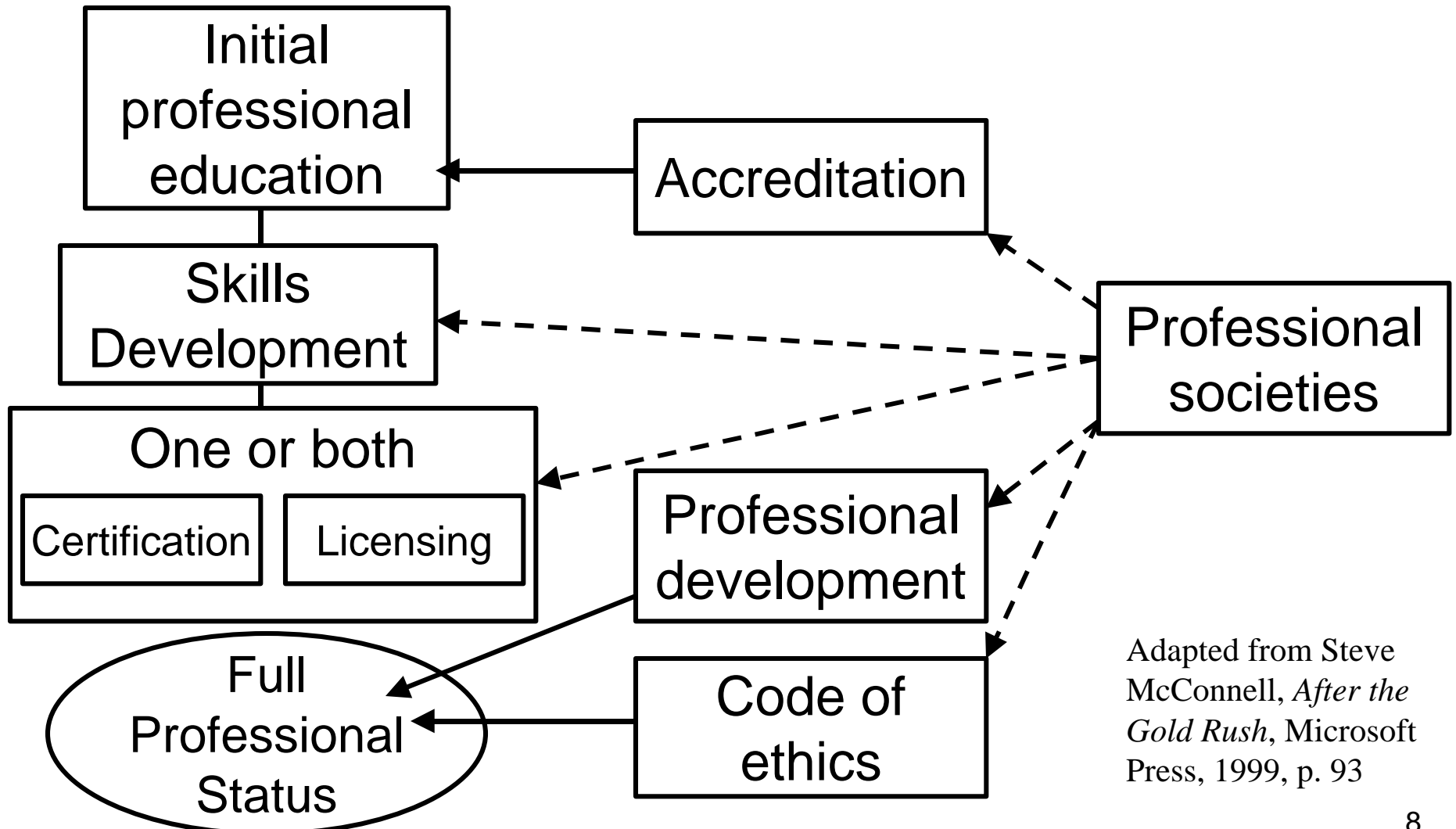
- ❖ Knowledge and competence validated by the community of peers
- ❖ Consensually validated knowledge rests on rational, scientific grounds
- ❖ Judgment and advice oriented toward a set of substantive values

\* P. Starr, *The Social Transformation of American Medicine*: BasicBooks, 1982.



# Professional Development

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

# Project Overview Presentation Plan

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- ⦿ Project background
- ⦿ **Project scope, objectives, audience and plan**
- ⦿ Contents of the Guide

# Project Objectives

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- ⦿ 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

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- ⦿ 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

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- ⊙ Public and private organizations
- ⊙ Practicing software engineers
- ⊙ Makers of public policy
- ⊙ Professional societies
- ⊙ Software engineering students
- ⊙ Educators and trainers

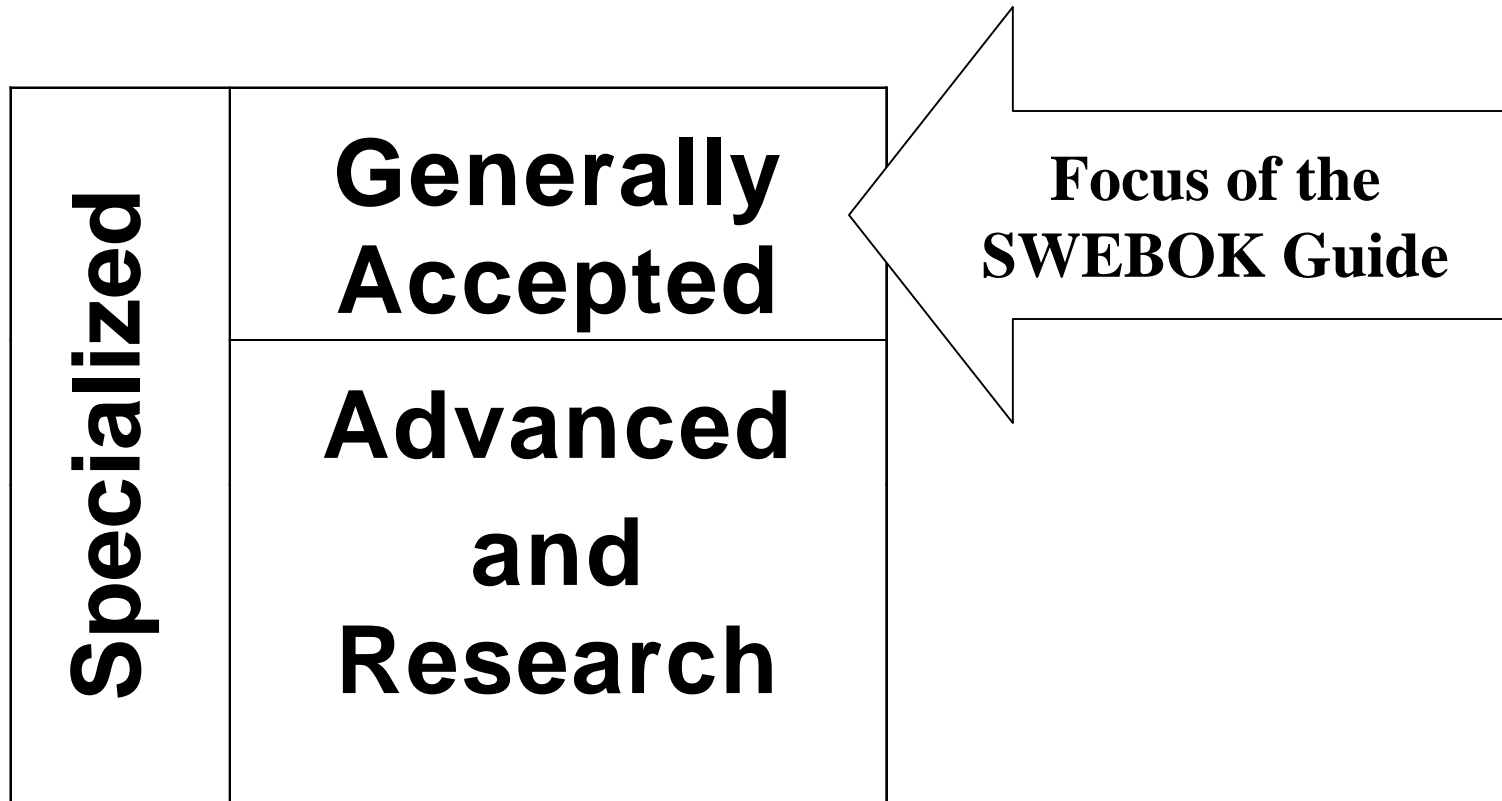
# What Are we Not Trying to Accomplish?

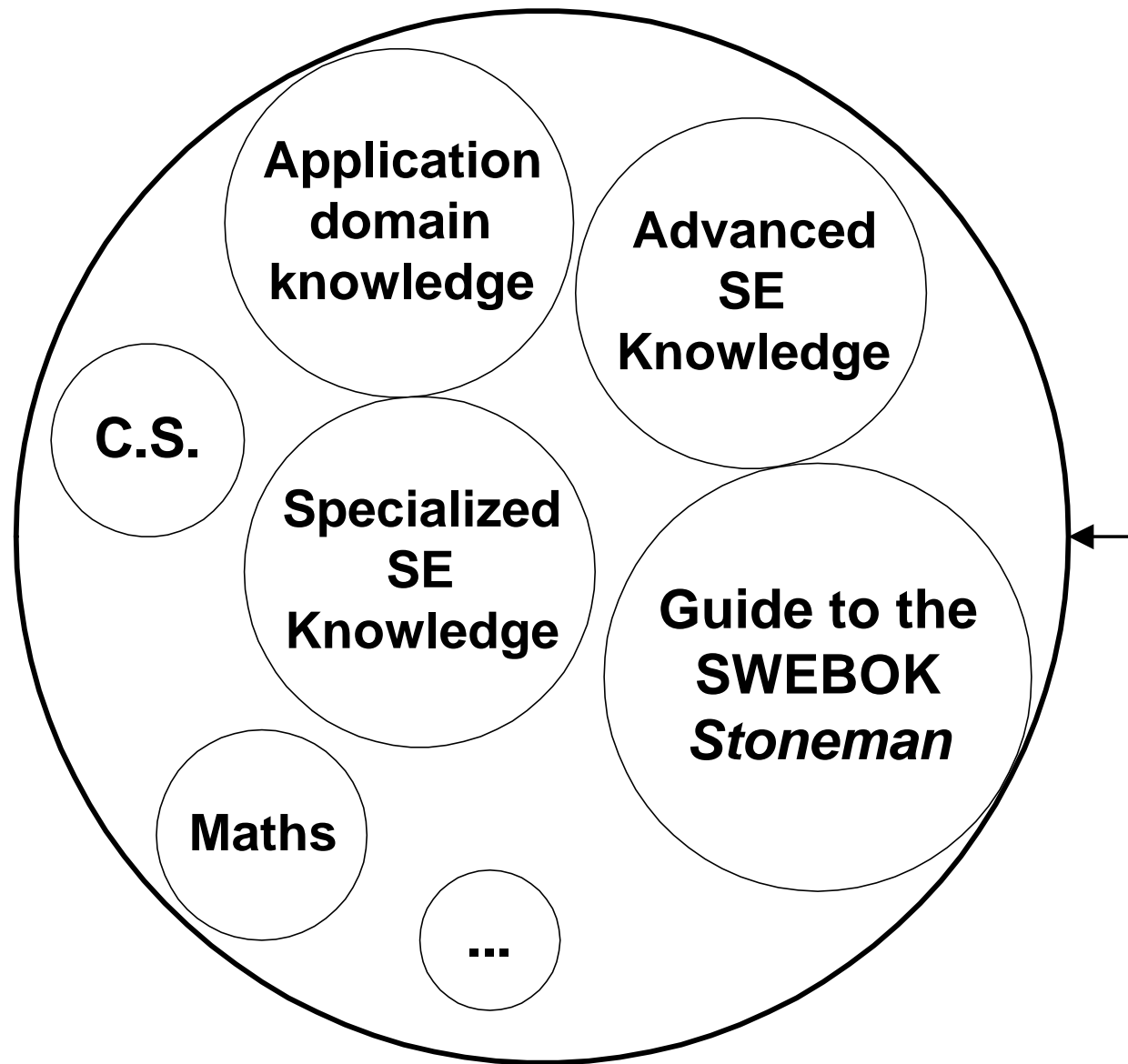
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- ⊙ Not a curriculum development effort!
- ⊙ Not an all-inclusive description of the sum of knowledge in the field
- ⊙ Not all categories of knowledge

# Categories of Knowledge in the SWEBOK

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**Knowledge  
of a  
Software  
Engineer**



# Two Underlying Principles of the Project

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- ⊙ **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

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- ⊙ Editorial team
- ⊙ Industrial Advisory Board
- ⊙ Panel of Experts
- ⊙ Knowledge Area Specialists
- ⊙ Reviewers

# Editorial Team

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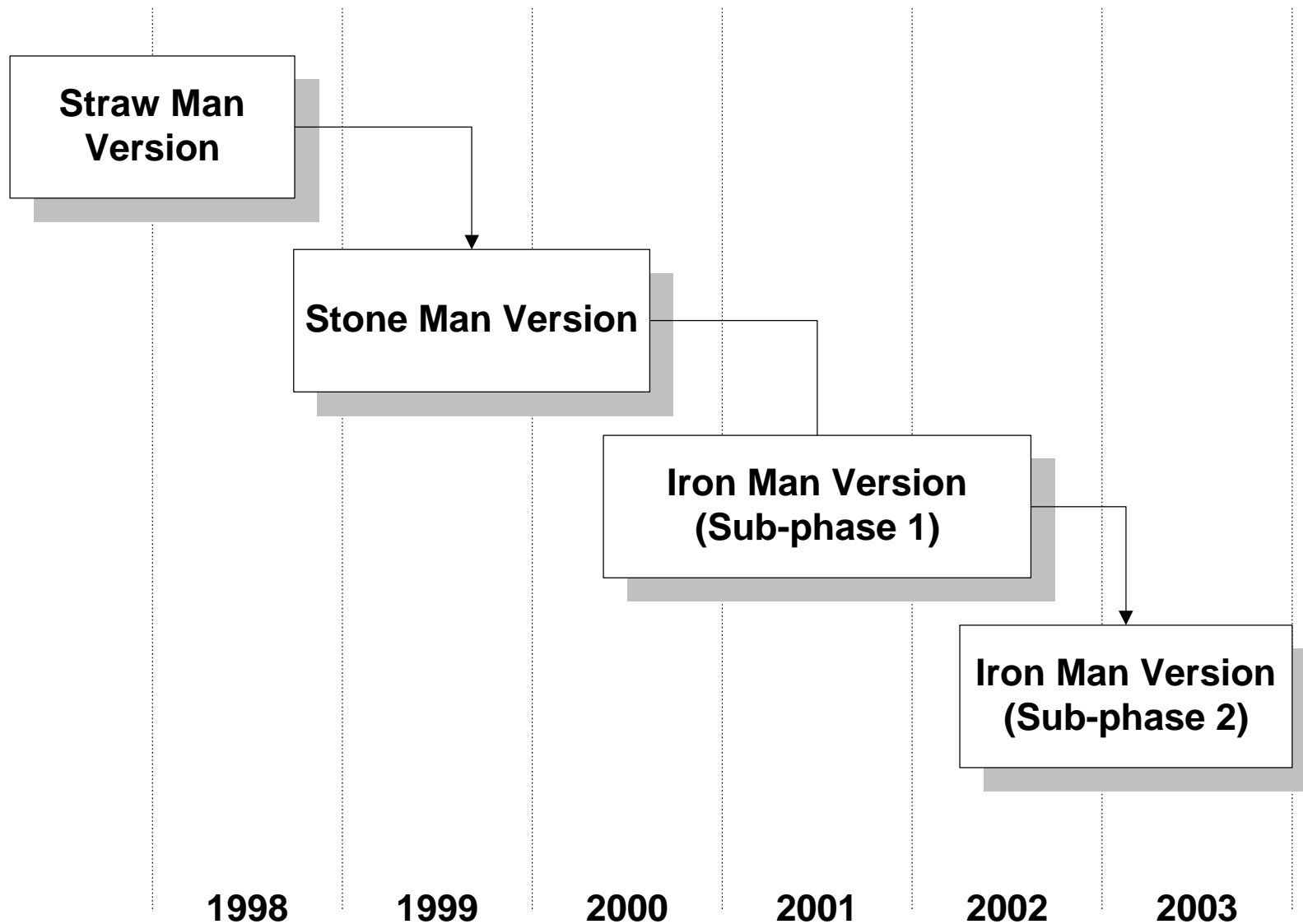
- ⊙ Project “Champion”:
  - ❖ Leonard Tripp, 1999 President, IEEE Computer Society
- ⊙ Executive Editors:
  - ❖ Alain Abran, UQAM
  - ❖ James W. Moore, The MITRE Corp.
- ⊙ Editors:
  - ❖ Pierre Bourque, UQAM
  - ❖ Robert Dupuis, UQAM

# Roles of the Industrial Advisory Board

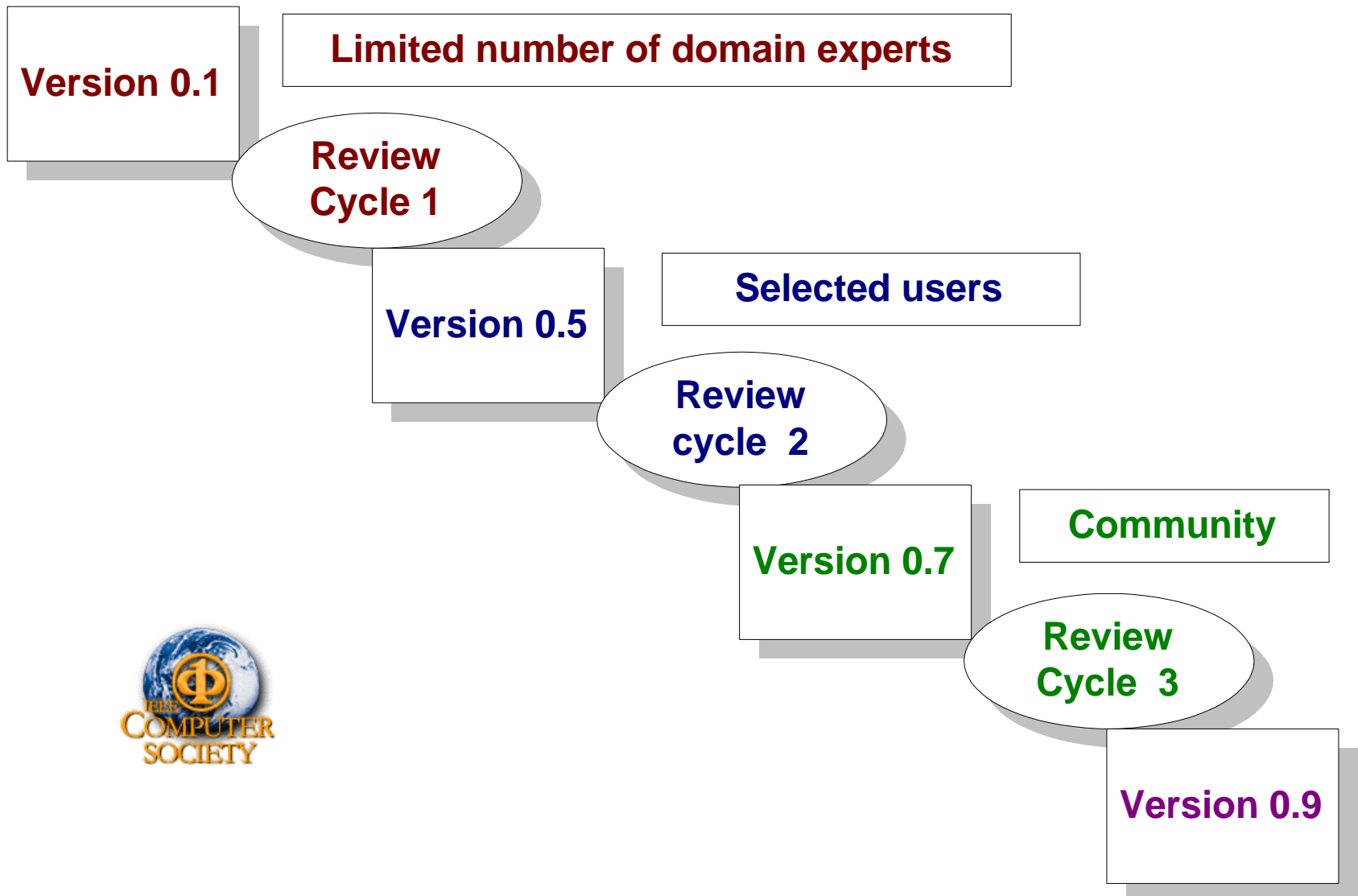
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- ⦿ Provide input to ensure relevance to various audiences
- ⦿ Review and approve strategy and deliverables
- ⦿ Oversee development process
- ⦿ Assist in promoting the Guide to the Software Engineering Body of Knowledge
- ⦿ Lend credibility to the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

# A Three-Phase Approach for Developing the Guide to the SWEBOK



# Stone Man Review Process



# Stone Man Review Process

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- ⦿ Transparency and consensus-building
  - ❖ All intermediate versions of documents are published and archived on [www.swebok.org](http://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

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- ◎ Cycle #2:
  - ❖ Over 200 reviewers
  - ❖ Over 400 reviews
  - ❖ From 25 countries
- ◎ Cycle #3:
  - ❖ Over 800 have registered to review
  - ❖ Over 230 have downloaded version 0.7 so far



# Project Overview Presentation Plan

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- ⦿ Project background
- ⦿ Project scope, objectives, audience and plan
- ⦿ **Contents of the Guide**

# Stone Man Deliverables:

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- ⊙ **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

# Baseline List of Knowledge Areas

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- ⦿ Software Requirements
- ⦿ Software Design
- ⦿ Software Construction
- ⦿ Software Testing
- ⦿ Software Maintenance

# Baseline List of Knowledge Areas

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- ⦿ Software Configuration Management
- ⦿ Software Engineering Management
- ⦿ Software Engineering Process
- ⦿ Software Engineering Tools and Methods
- ⦿ Software Quality



# Baseline List of Related Disciplines

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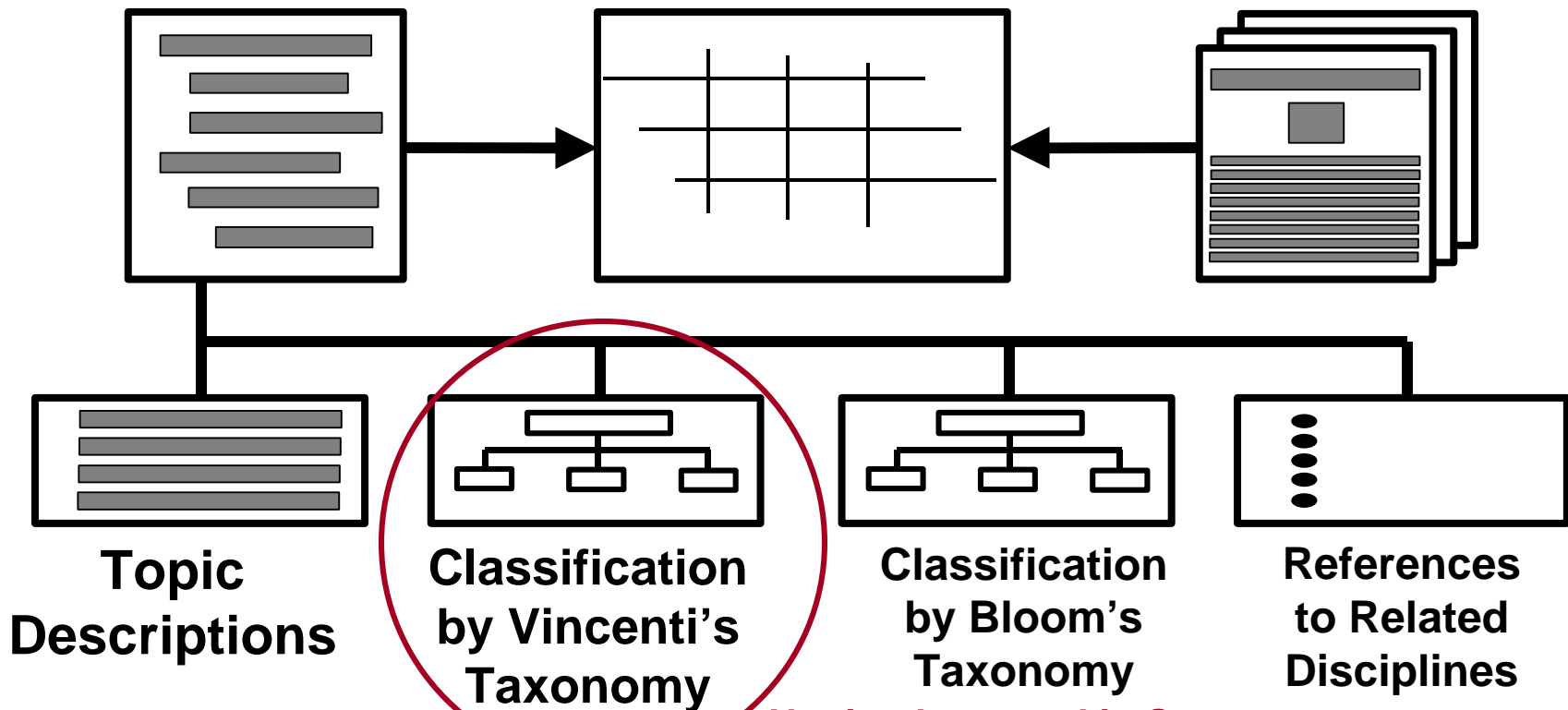
- ⦿ Computer Science (CC2001)
- ⦿ Mathematics (CC2001)
- ⦿ Project Management (PMBOK)
- ⦿ Computer Engineering
- ⦿ Cognitive Sciences and Human Factors
- ⦿ Systems Engineering
- ⦿ Management and Management Science

# Knowledge Area Description

**Classification of Topics**

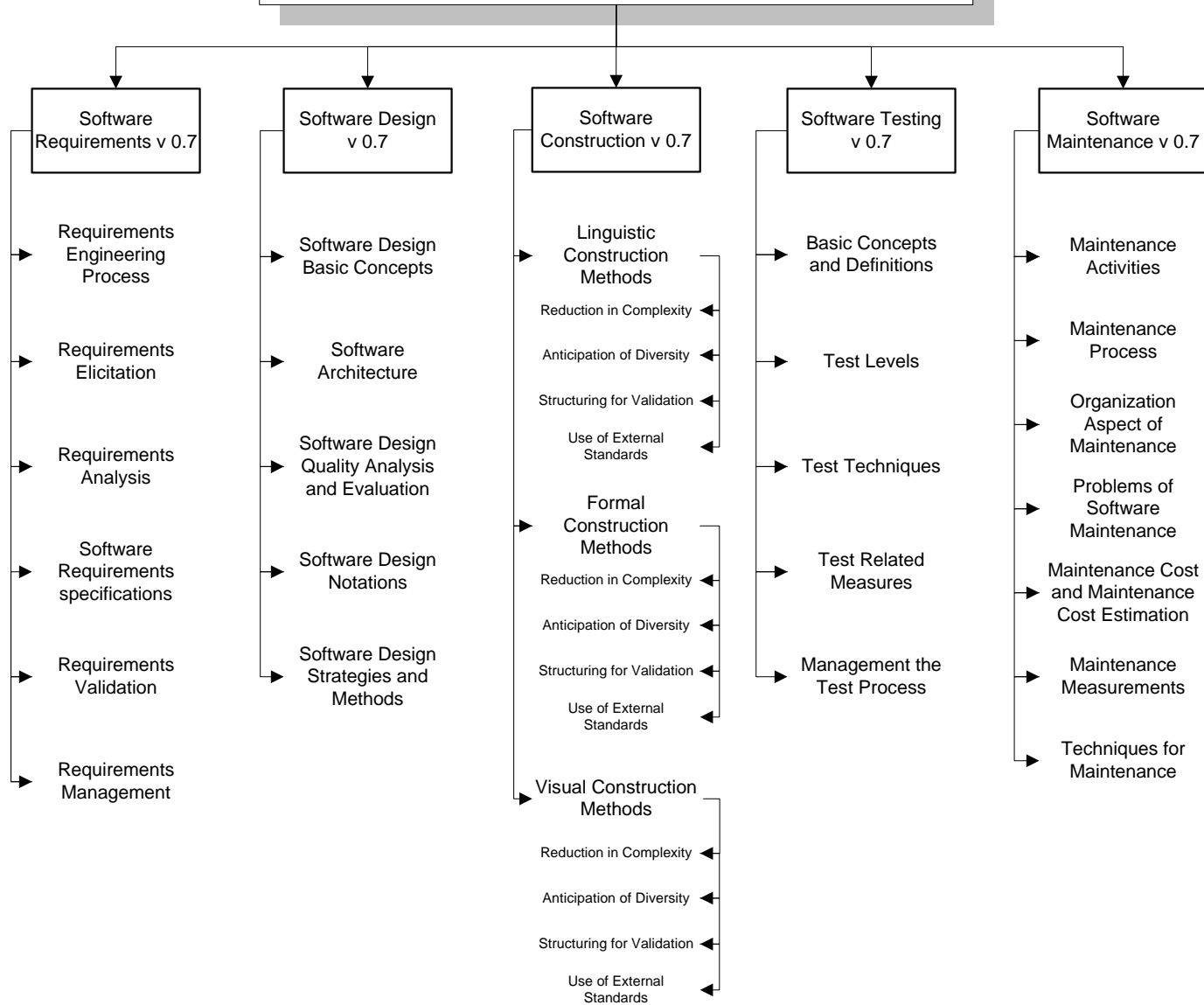
**Matrix of Topics & References**

**References**

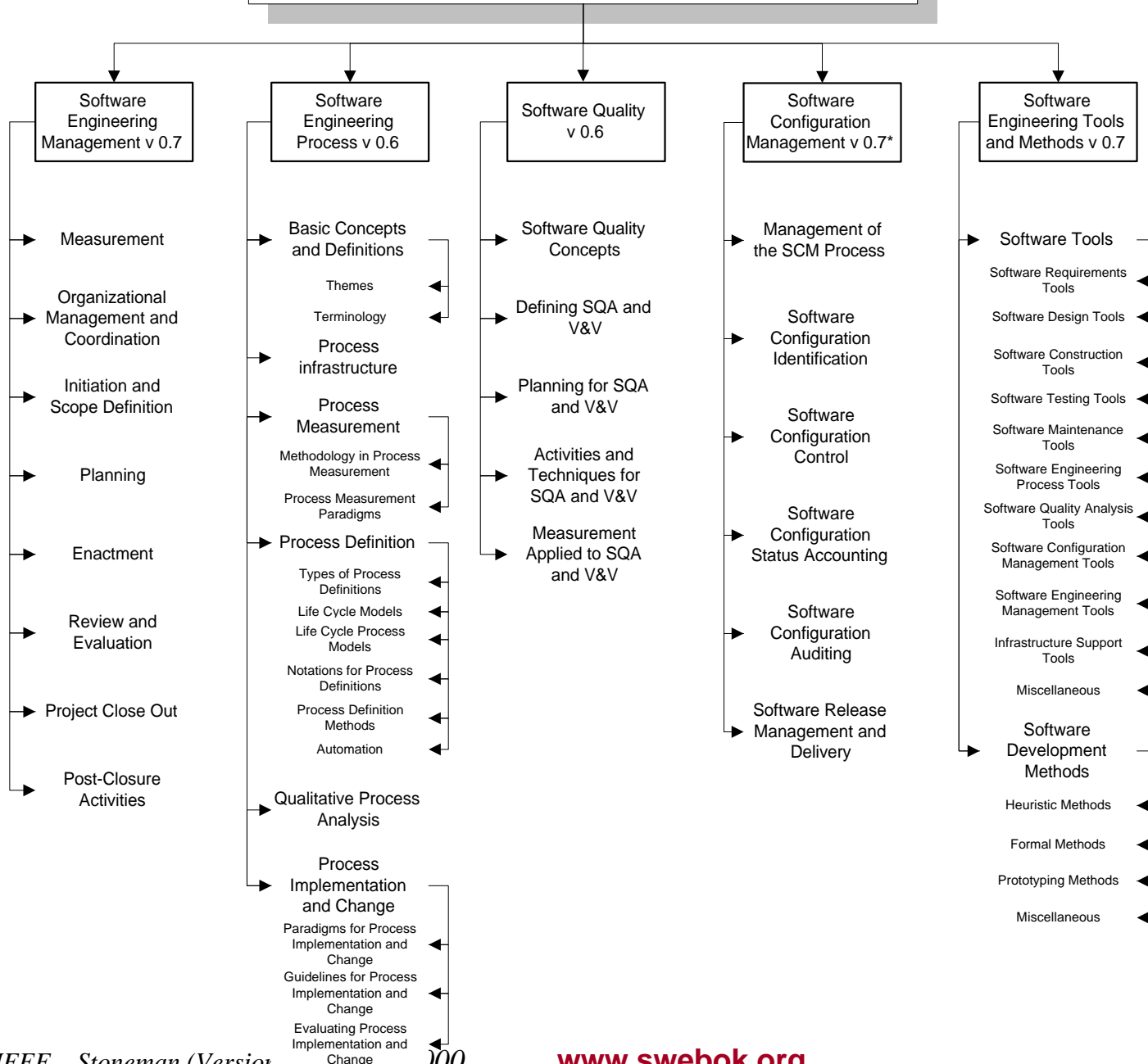


**Not implemented in Stoneman**

# Guide to the Software Engineering Body of Knowledge



# Guide to the Software Engineering Body of Knowledge





# SWEBOK Applications

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## ◎ Bloom's taxonomy



- ◎ Lockheed Martin/CSC example of applying the Guide to competency management
- ◎ Other potential applications
- ◎ Audience input

# Bloom 's Taxonomy

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- ⊙ What level of “knowledge”?
- ⊙ A hierarchy of educational objectives
- ⊙ Easy to understand and widely used
- ⊙ Six levels: knowledge, comprehension, application, analysis, synthesis and evaluation

# Bloom 's Taxonomy

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## ⊙ Knowledge

- ❖ observation and recall of information
- ❖ knowledge of major ideas

## ⊙ *Typical questions:*

- ❖ list...
- ❖ define...
- ❖ describe...

# Bloom 's Taxonomy

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## ⊙ Comprehension

- ❖ grasp meaning
- ❖ translate into new context
- ❖ order, group, predict consequences

## ⊙ *Typical questions:*

- ❖ summarize...
- ❖ contrast...

# Bloom 's Taxonomy

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## ⊙ **Application**

- ❖ use information
- ❖ use theories in new contexts
- ❖ solve problems

## ⊙ *Typical questions:*

- ❖ demonstrate...
- ❖ complete...

# Bloom 's Taxonomy

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## ⊙ Analysis

- ❖ see patterns
- ❖ recognize hidden meanings
- ❖ identify components

## ⊙ *Typical questions:*

- ❖ explain...
- ❖ compare...

# Bloom 's Taxonomy

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## ⊙ **Synthesis**

- ❖ use old ideas to create new ones
- ❖ generalize from given facts
- ❖ predict

## ⊙ *Typical questions:*

- ❖ combine...
- ❖ design...

# Bloom 's Taxonomy

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## ⊙ Evaluation

- ❖ compare and discriminate
- ❖ assess value of theories
- ❖ make choices

## ⊙ *Typical questions:*

- ❖ summarize...
- ❖ grade...



# SWEBOK Applications

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- ⦿ Bloom's taxonomy
- ⦿ **Lockheed Martin/CSC  
example of applying the  
Guide to competency  
management**
- ⦿ Other potential applications
- ⦿ Audience input



# SWEBOK Applications

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- ⊙ Bloom's taxonomy
- ⊙ Lockheed Martin/CSC example of applying the Guide to competency management
- ⊙ **Other potential applications**
- ⊙ Audience input

# Applications of the Guide

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- ⊙ Industry & Government
  - ❖ job description
  - ❖ hiring
  - ❖ staffing of projects
  - ❖ career planning
  - ❖ contracting

# Applications of the Guide

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- ⊙ Professional development
  - ❖ internal training, corporate universities
  - ❖ course design
  - ❖ self-assessment
  - ❖ individual training

# Applications of the Guide

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- ⊙ Licensing & Certification
  - ❖ licensing exam questions
  - ❖ study material
  - ❖ in Software Engineering and other IT fields
  - ❖ could be on subsets of Knowledge Areas

# Applications of the Guide

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- ⊙ Education:
  - ❖ Curriculum design/evaluation
  - ❖ Program accreditation: CCPE, CSAB/ABET
  - ❖ Course design/evaluation

# SWEBOK Applications

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- ⊙ Bloom's taxonomy
- ⊙ Lockheed Martin/CSC example of applying the Guide to competency management
- ⊙ Other potential applications
- ⊙ **Audience input**

# Audience Input on Applications

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- ⦿ How could the Guide be used in your organization ?
- ⦿ What other applications do you see in your organization ?
- ⦿ What other applications do you see in the defense community ?



# **SWEBOK Diffusion and pilot projects**

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## **◎ Diffusion Strategy**

- ◎ Audience Input
- ◎ Pilot project strategy
- ◎ Audience input

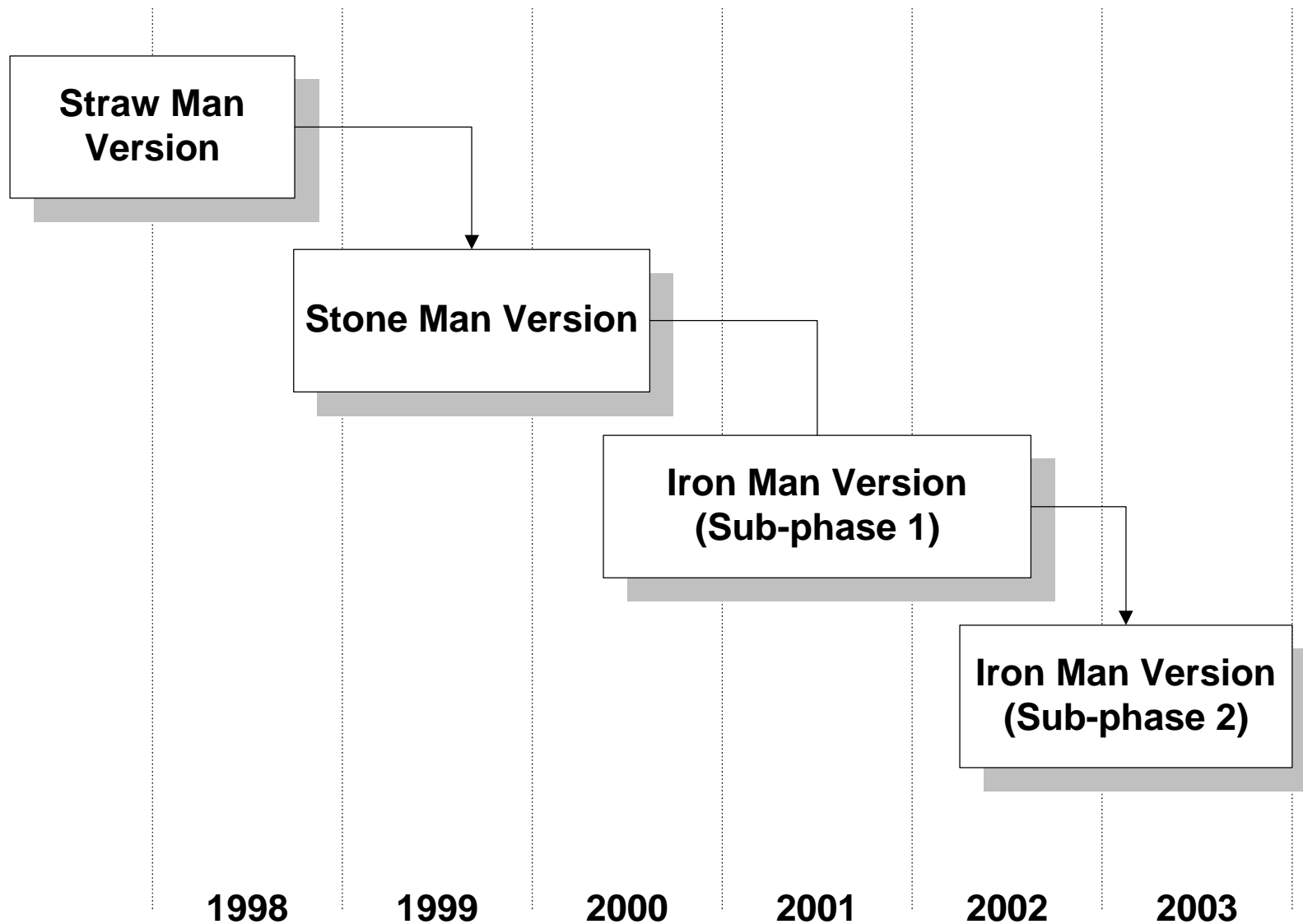


# Institutional Collaboration

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

# A Three-Phase Approach for Developing the Guide to the SWEBOK



# Diffusion strategy

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- ⊙ For a 24 month period: diffusion and experimentation
- ⊙ Presentations in major conferences
- ⊙ Presentation to companies and professional societies
- ⊙ Publication in journals and trade magazines

# SWEBOK Diffusion and pilot projects

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- ⦿ Diffusion Strategy
- ⦿ **Audience Input**
- ⦿ Pilot project strategy
- ⦿ Audience input

# Questions about the Diffusion strategy

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- ① What should be the primary message when promoting the Guide to the defense community?
- ① What specific audiences, groups, conferences, mailing lists, web sites should we target for the defense community?
- ① What content should we add to [www.swebok.org](http://www.swebok.org) that would be useful to this audience?



# **SWEBOK Diffusion and pilot projects**

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- ⊙ Diffusion Strategy
- ⊙ Audience Input
- ⊙ **Pilot project strategy**
- ⊙ Audience input

# Pilot project strategy

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- ⦿ Monitor directly a small number of pilot project sites using the Guide
- ⦿ Collect feed-back from a larger number of trial usage sites



# SWEBOK Diffusion and pilot projects

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- ⦿ Diffusion Strategy
- ⦿ Audience Input
- ⦿ Pilot project strategy
- ⦿ **Audience input**

# Questions about the Pilot projects strategy

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- ① What and how should the project team monitor these pilot projects? Roles, responsibilities and deliverables of each partner
- ① What feedback should we gather from these sites?



# Experimentation strategy: pilot projects

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- ⊙ What incentives can we provide organizations to participate?
- ⊙ What support or information provided by the project team would be most beneficial to these pilot sites?
- ⊙ Do the workshop participants have any candidates to suggest?



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- Deliver a summary of workshop proposals

# Concluding Remarks

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- ⦿ Consensus on the core body of knowledge is key in all disciplines and pivotal for the evolution of SE toward a professional status
- ⦿ Looking for individual and institutional collaborators
- ⦿ Sign up as a reviewer:  
[www.swebok.org](http://www.swebok.org)
- ⦿ *Hand in the survey forms!*

**[www.swebok.org](http://www.swebok.org)**