

The Emerging Consensus on the Software Engineering Body of Knowledge

A. Abran,

P. Bourque, R. Dupuis, J. W. Moore, L. Tripp

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Corporate Support by:



CANADIAN COUNCIL OF PROFESSIONAL ENGINEERS
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Project managed by:



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:

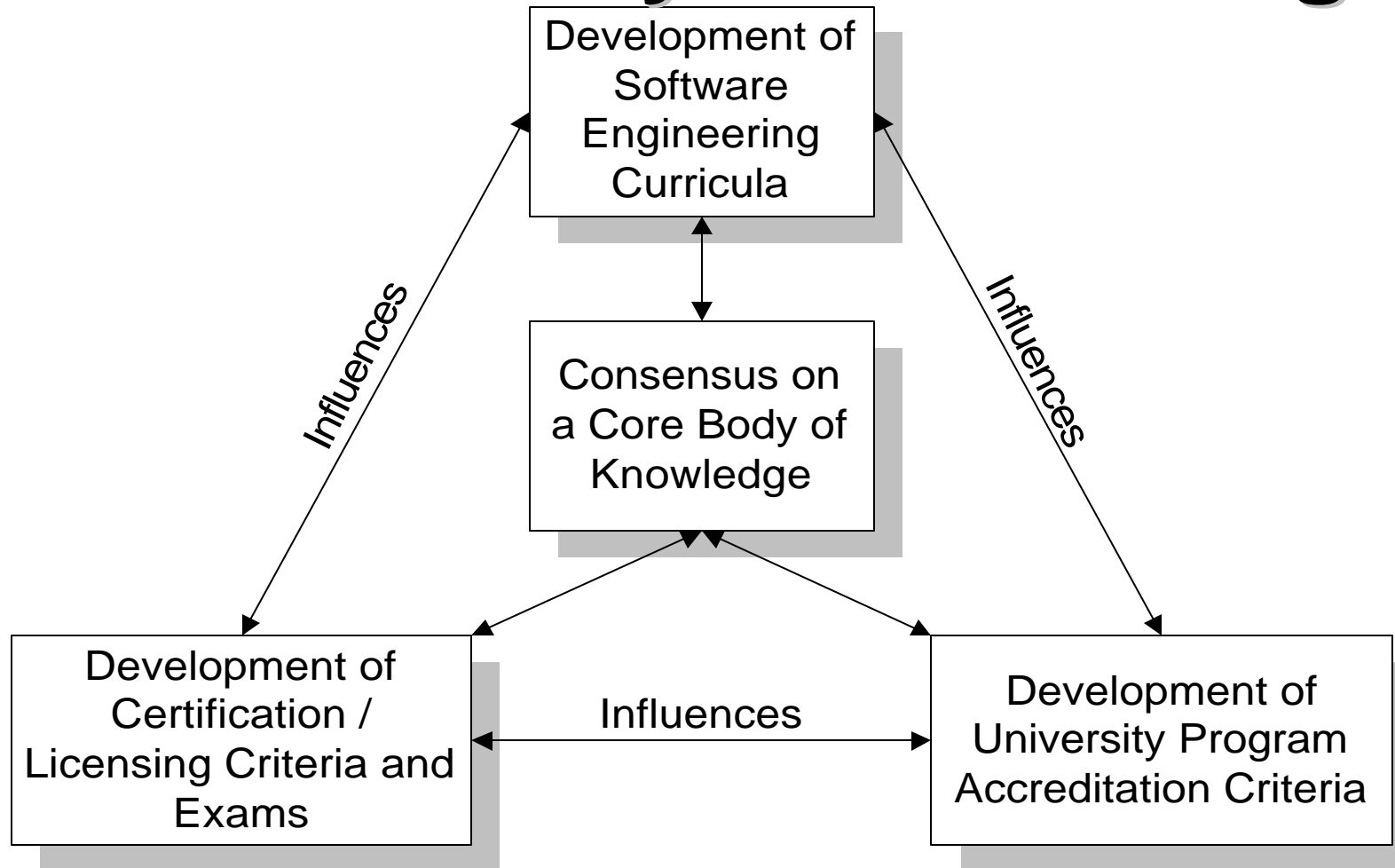
- ❖ Decision to license software engineers: a strategy with significant impact on:
 - industry (e.g. mobility of staff & training)
 - universities
 - policy bodies
 - individuals
- (+ engineering boards in Canada and universities)

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



Presentation Plan

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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

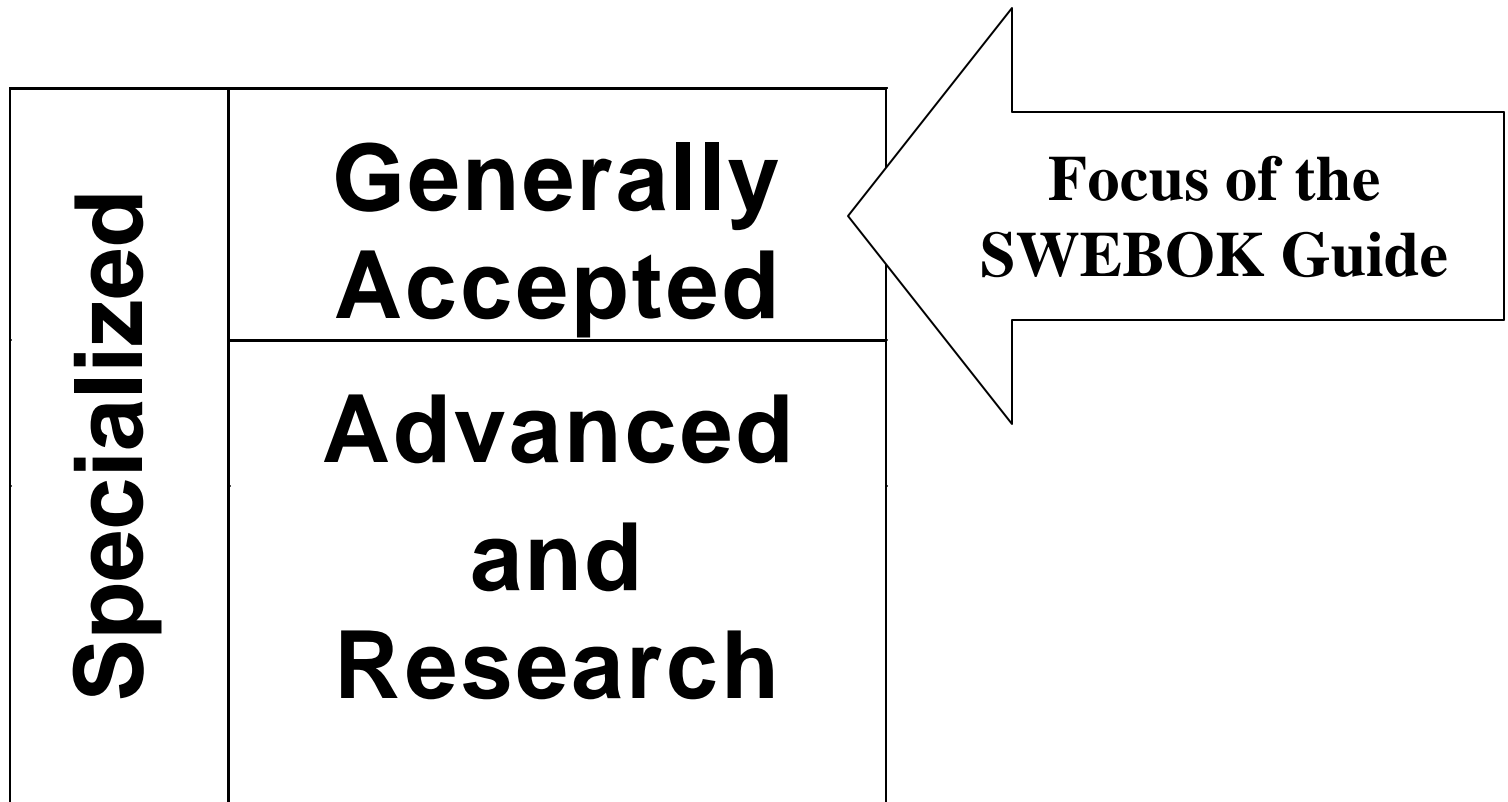
Intended Audiences

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

- ⊙ «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

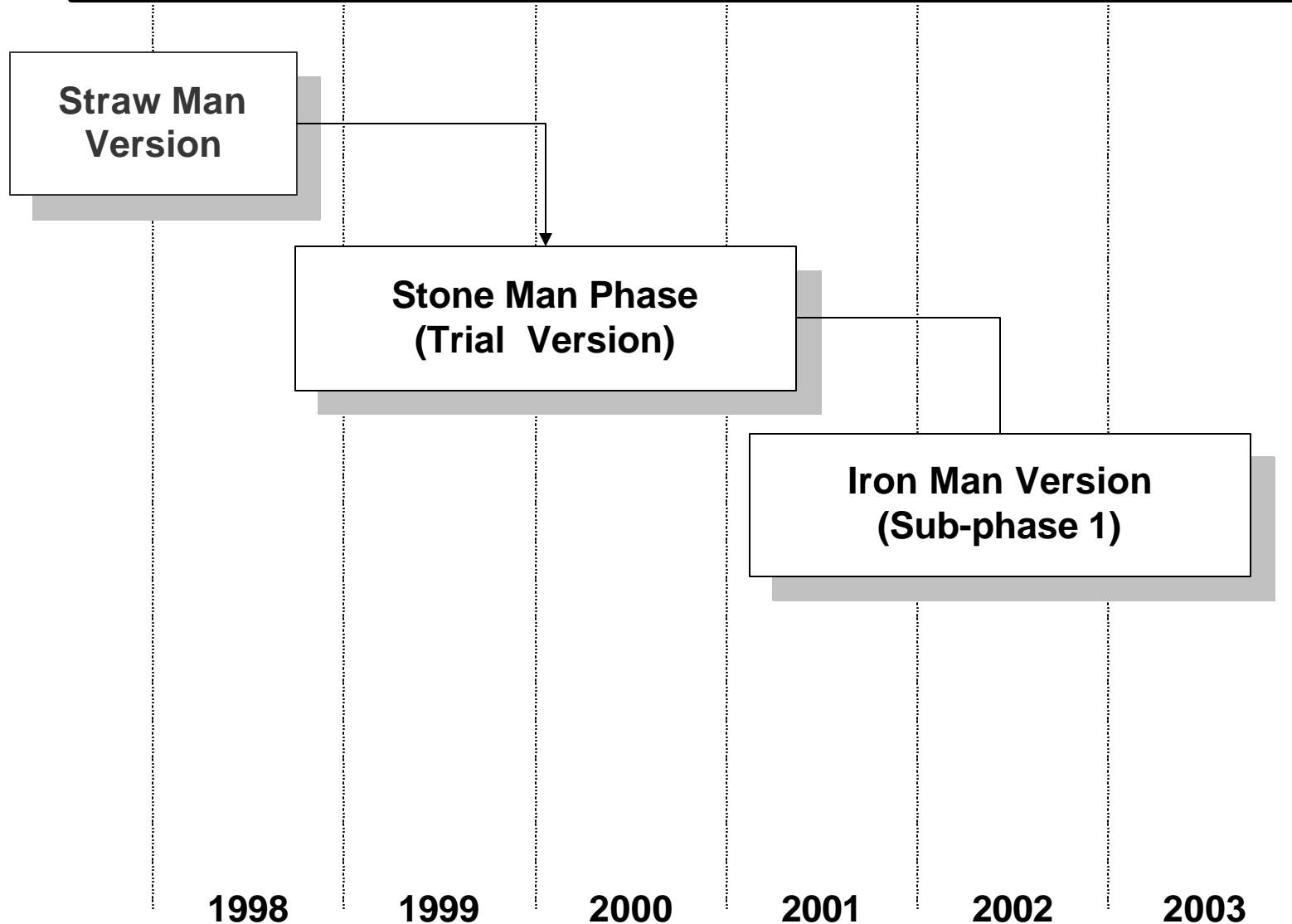
⊙ ACM:

- 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

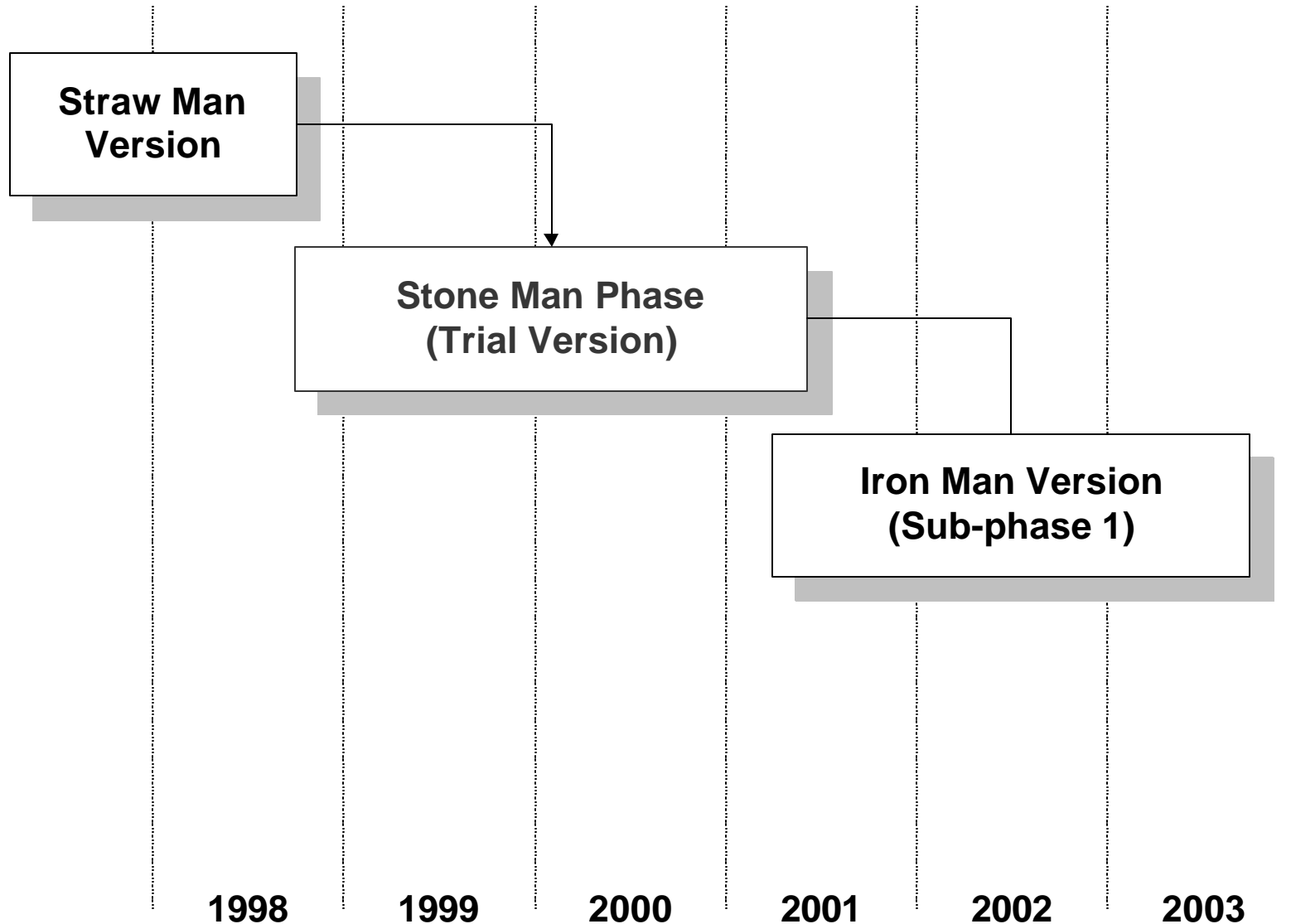
A Three-Phase Approach for Developing the Guide to the SWEBOK



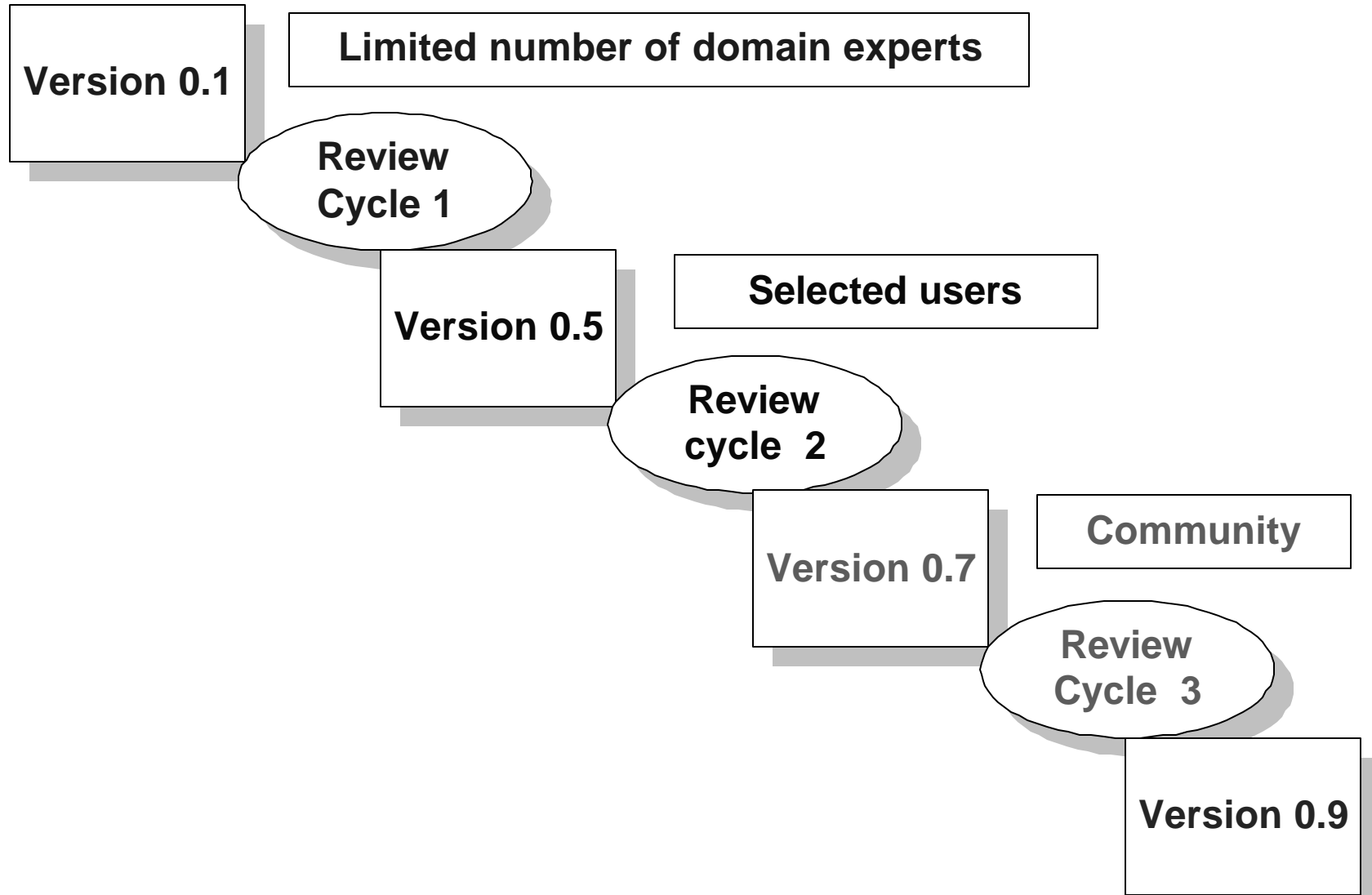
Project Team

- ⊙ 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



Phase 2: Stone Man Review Process



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

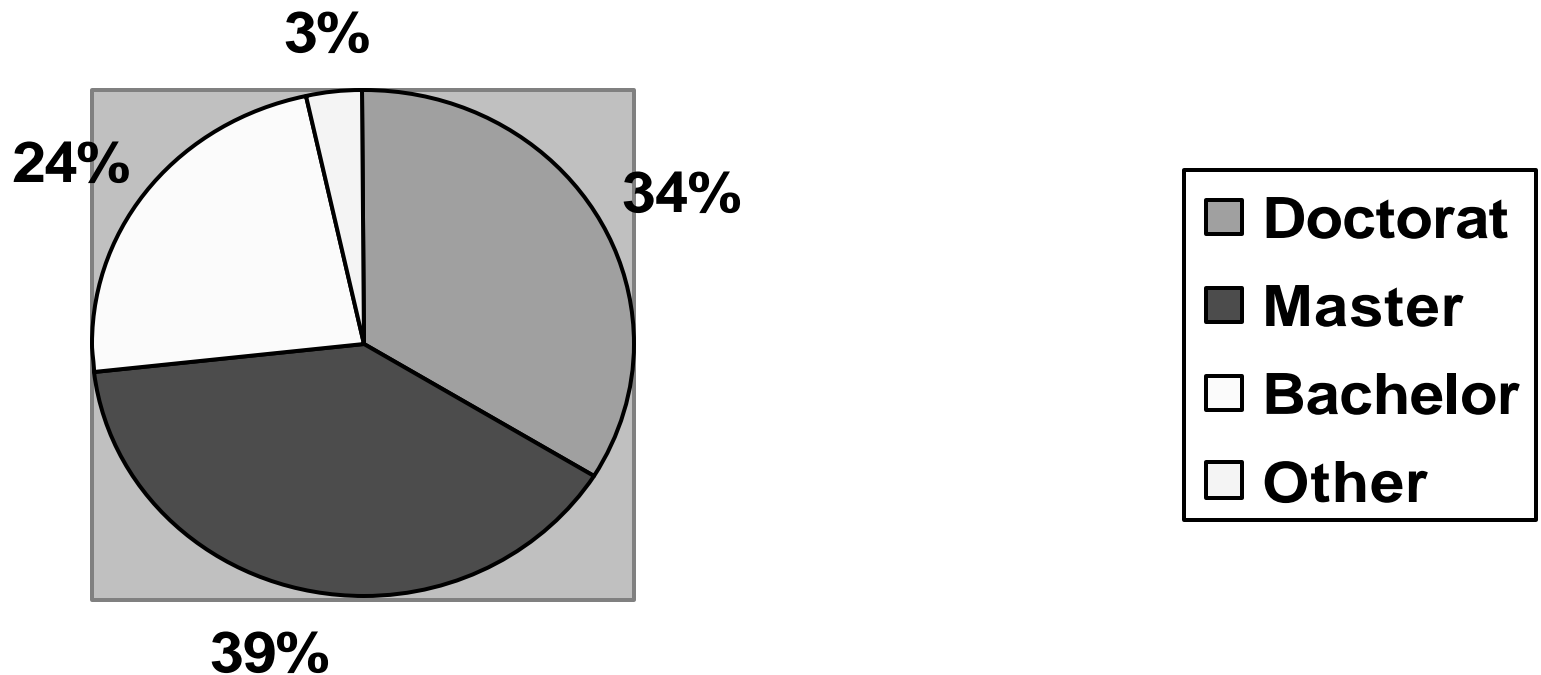
Data on reviewers

- ⊙ Version 0,1: 33
- ⊙ Version 0,5: 195
- ⊙ Version 0,7: 378
 - ❖ + ISO reviews from 5 countries

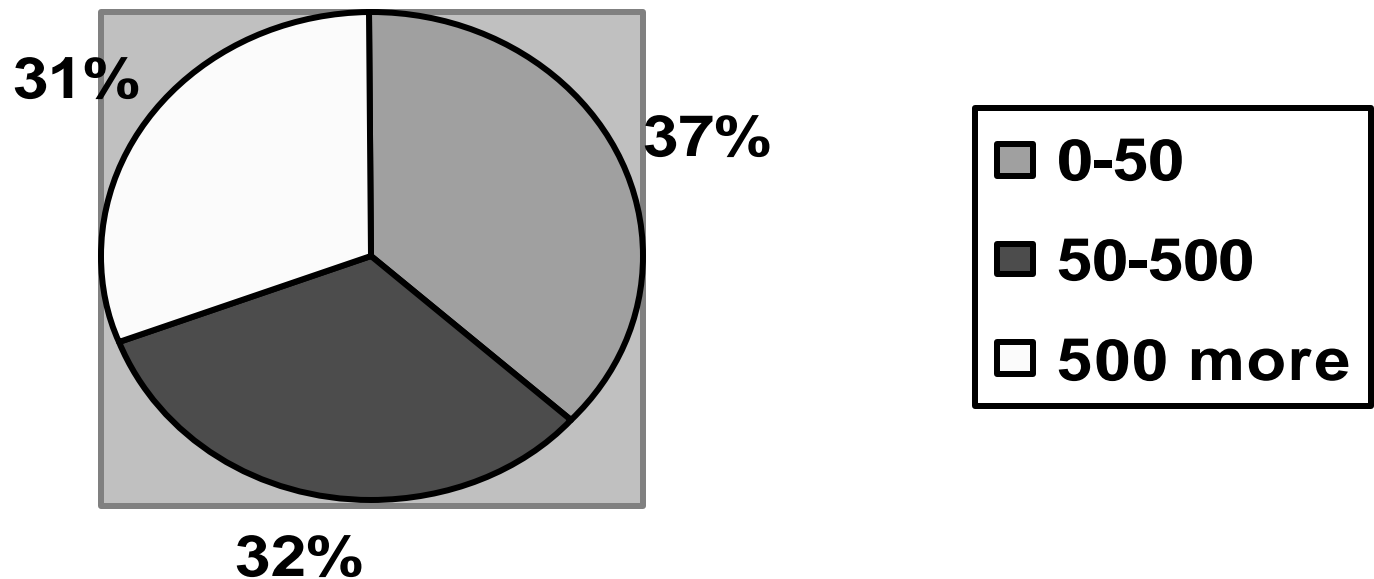
Geographic Distribution of Reviewers

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

Education of Reviewers



Organizations of Reviewers (no. of employees)



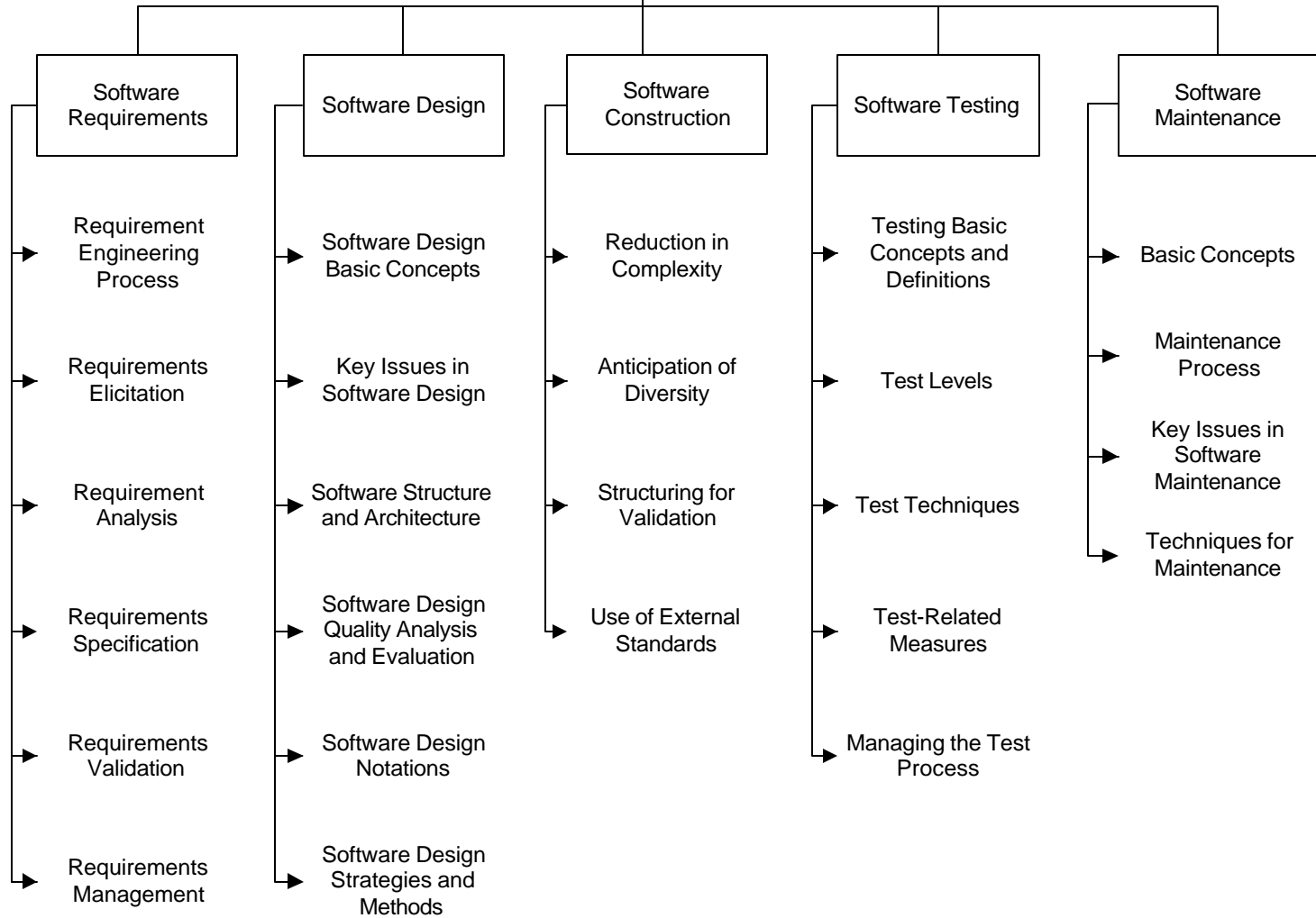
Project Overview Presentation Plan

- ⦿ 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

Guide to the Software Engineering Body of Knowledge (Version 0.95)



(a)

(b)

ww

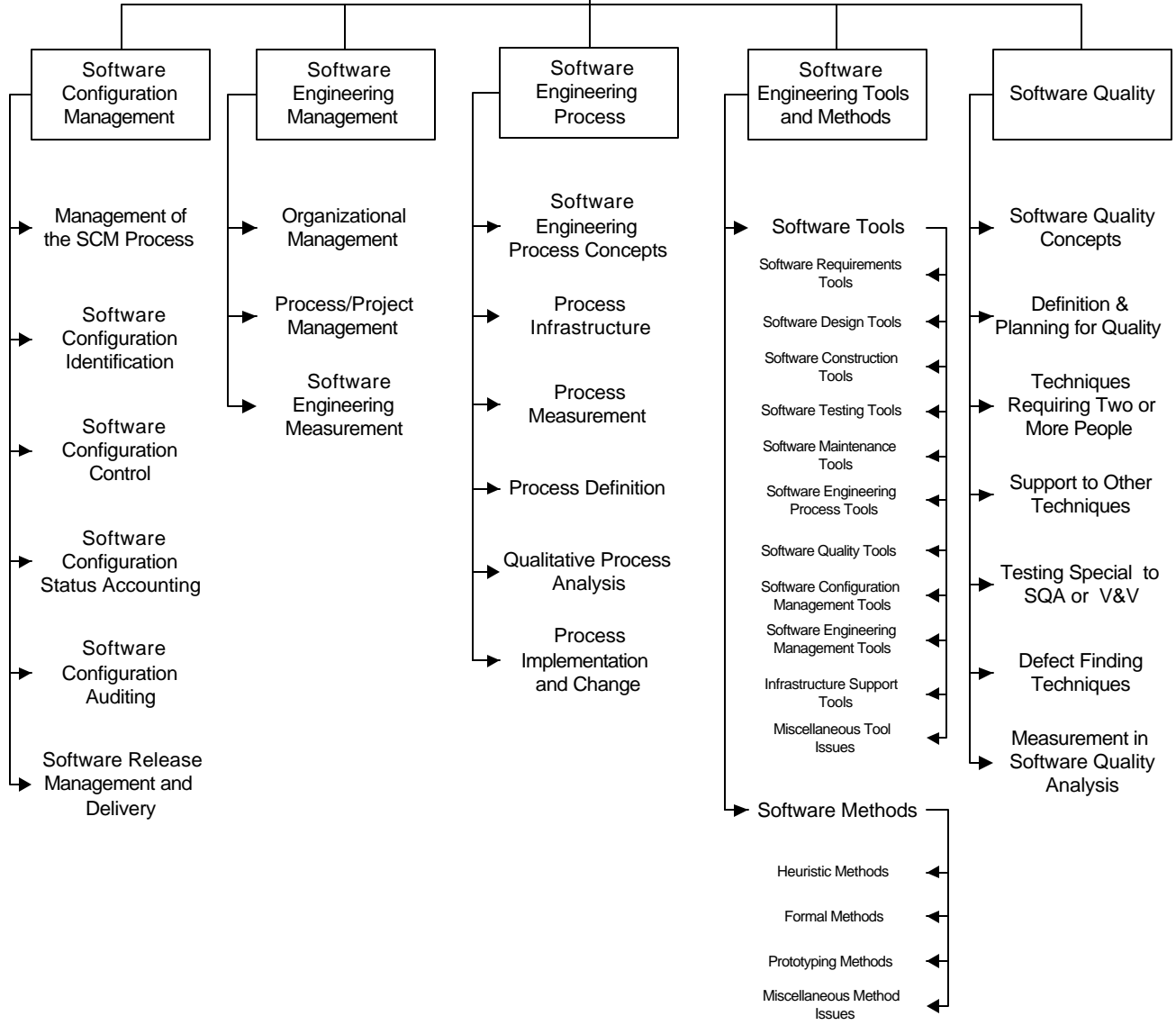
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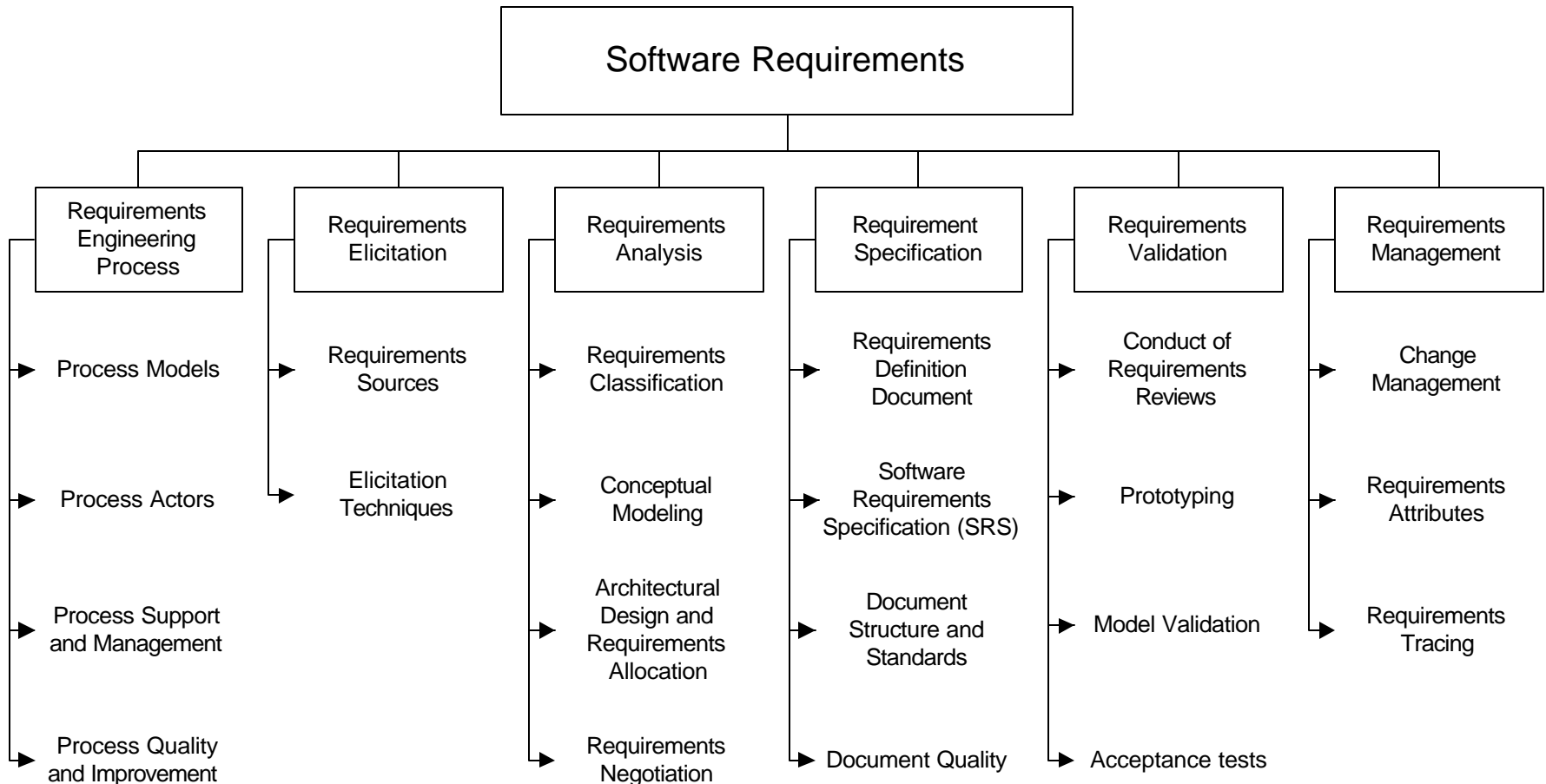
(d)

(e)

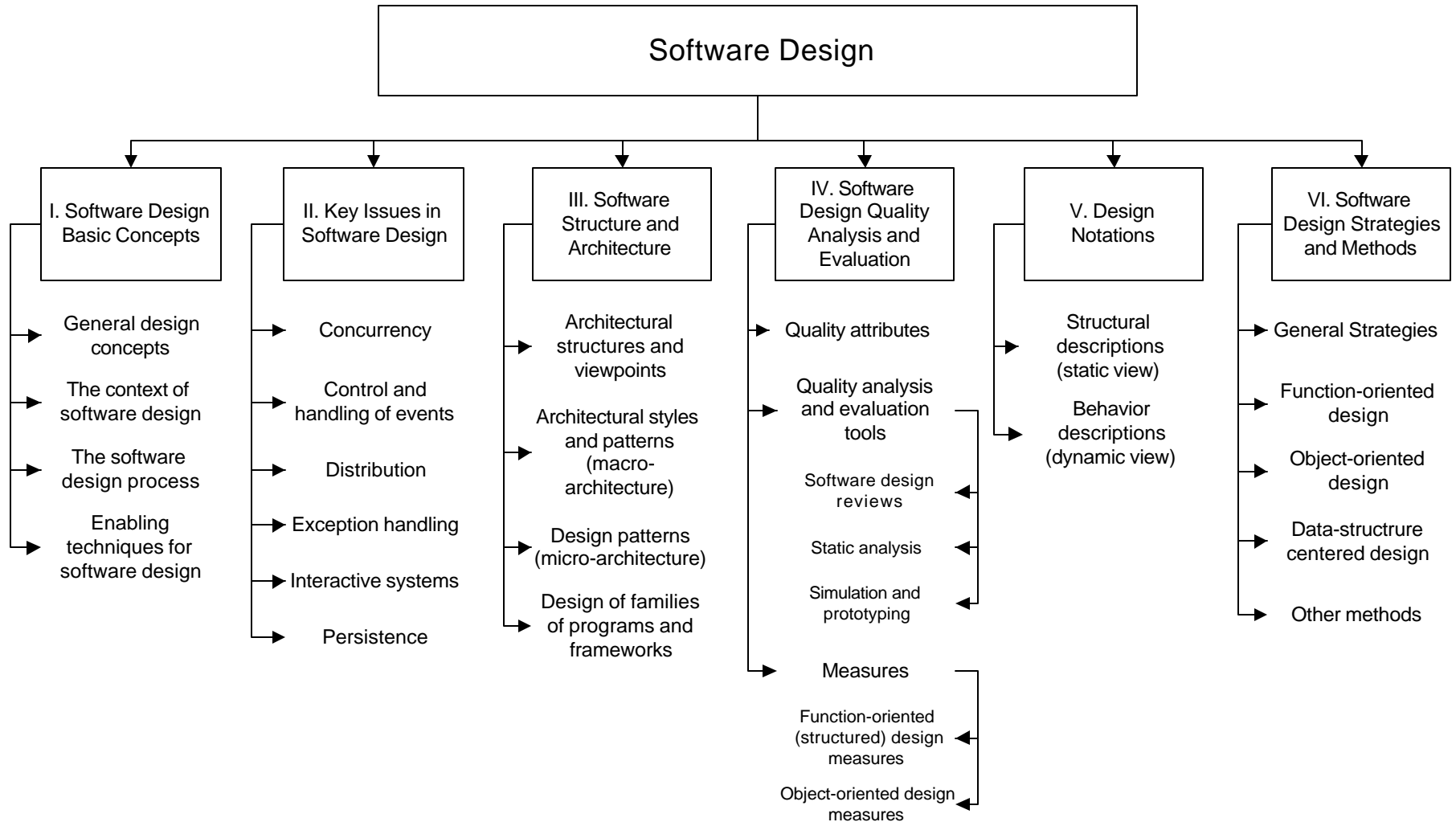
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Software Requirements



Software Design

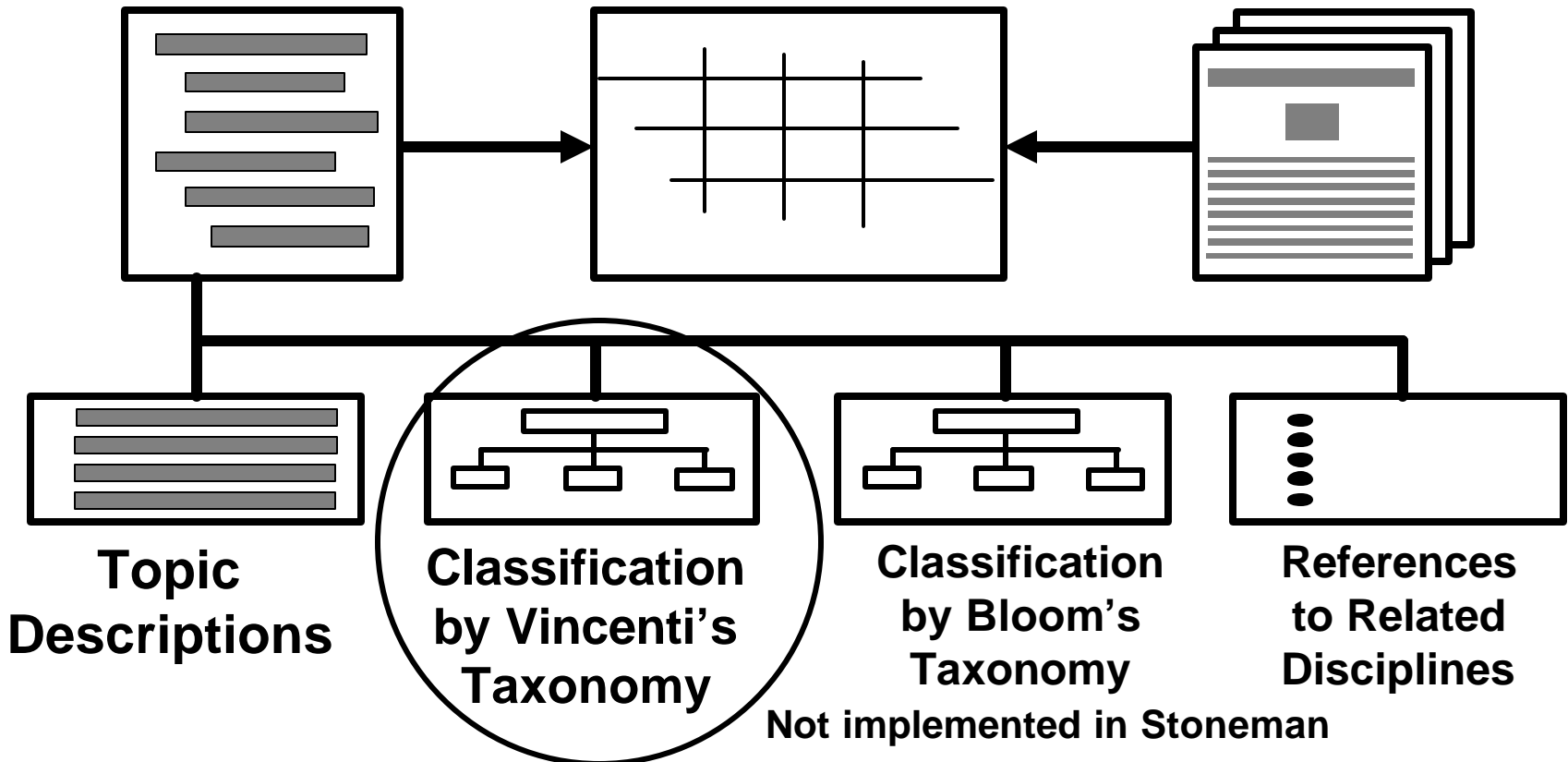


Knowledge Area Description

Classification of Topics

Matrix of Topics & References

References



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

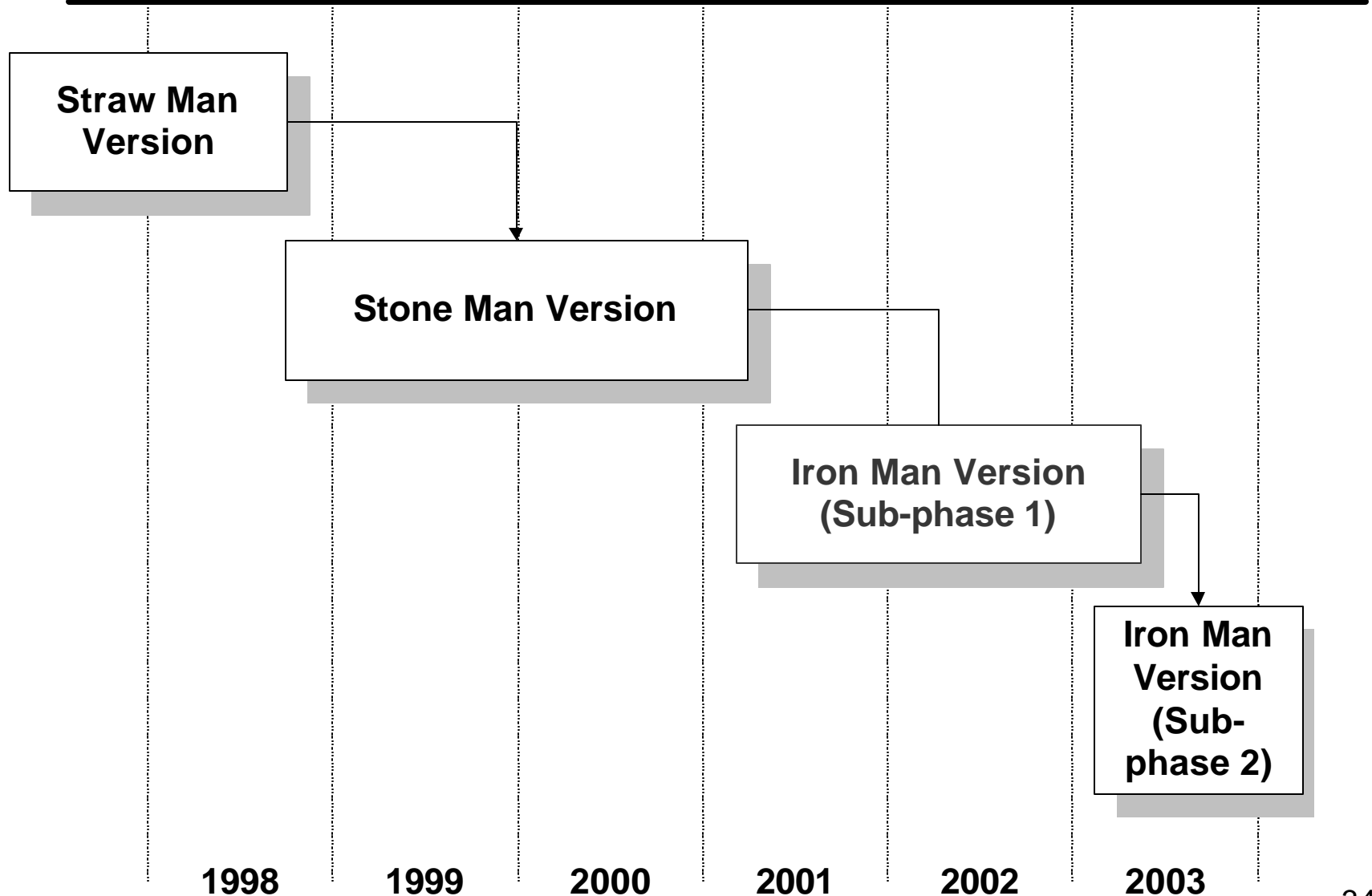
Related Disciplines

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



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

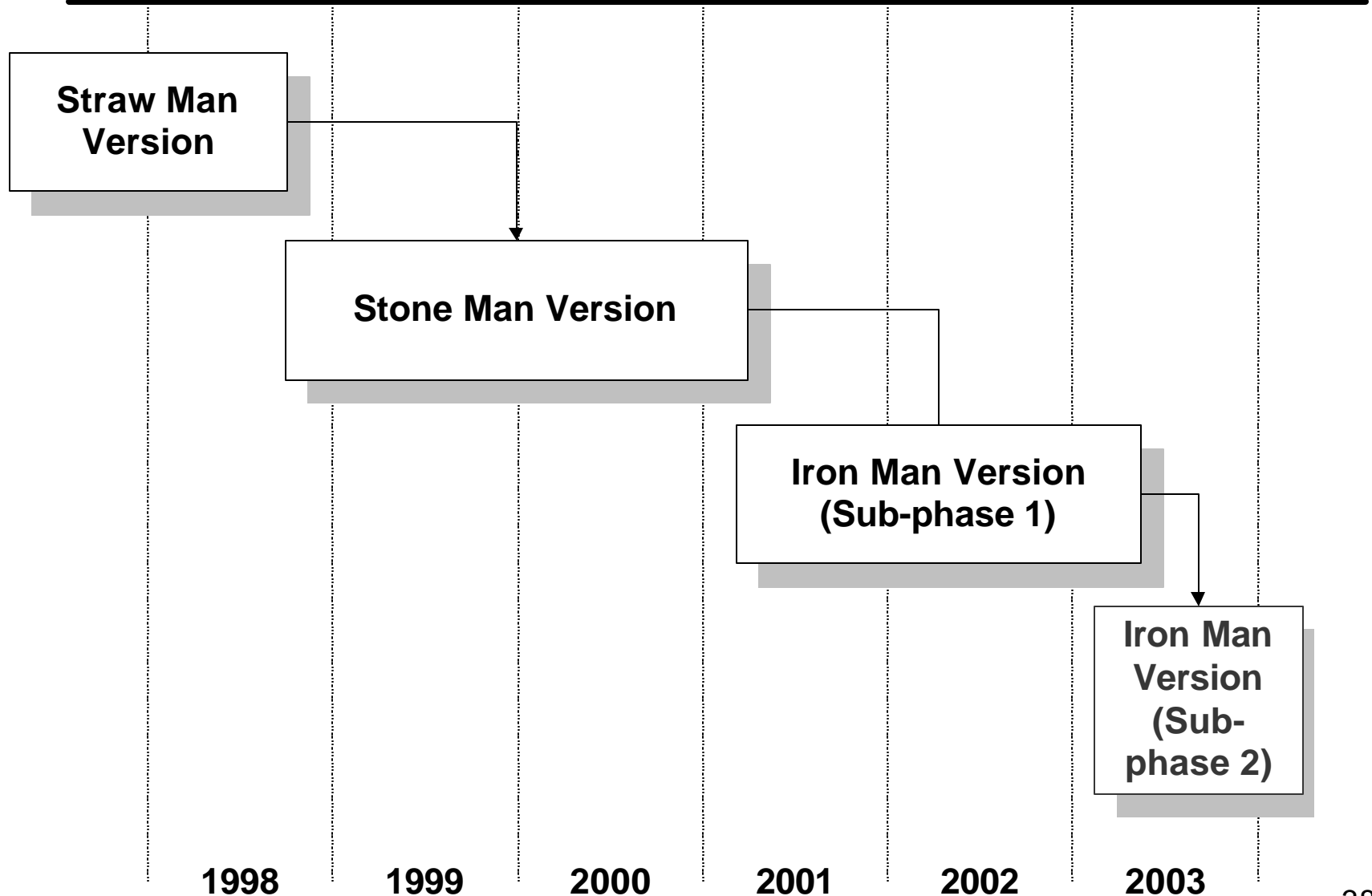
- study material

- 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

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



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- ⦿ Next steps
- ⦿ 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

- © [Vincenti90] W. Vincenti, What Engineers Know and How They Know It: Analytical Studies from Aeronautical History, The Johns Hopkins University Press, 1990.

Significant progress required from all engineering perspectives

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



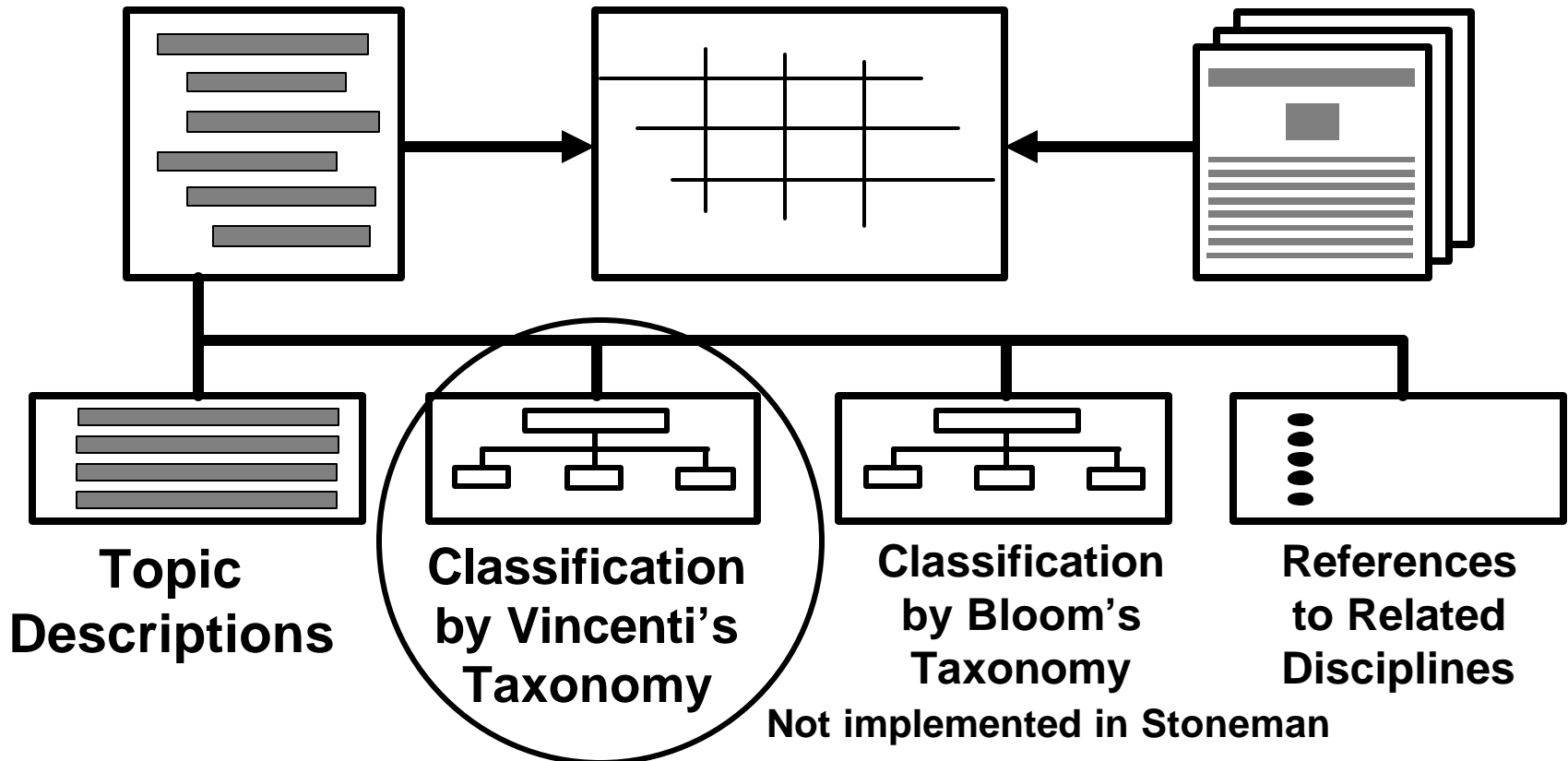
- © [Vincenti90] W. Vincenti, What Engineers Know and How They Know It: Analytical Studies from Aeronautical History, The Johns Hopkins University Press, 1990.

Knowledge Area Description

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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

www.swebok.org