Guide to the Software Engineering Body of Knowledge

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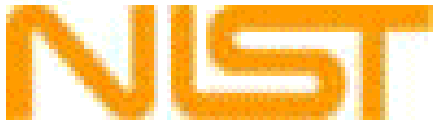
ICSSEA'99

Paris

December 8, 1999

Corporate Support by:



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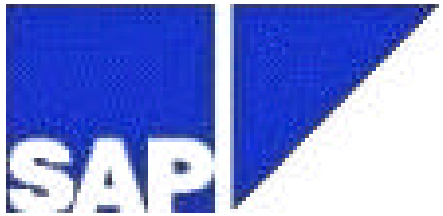


Project managed by:

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

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

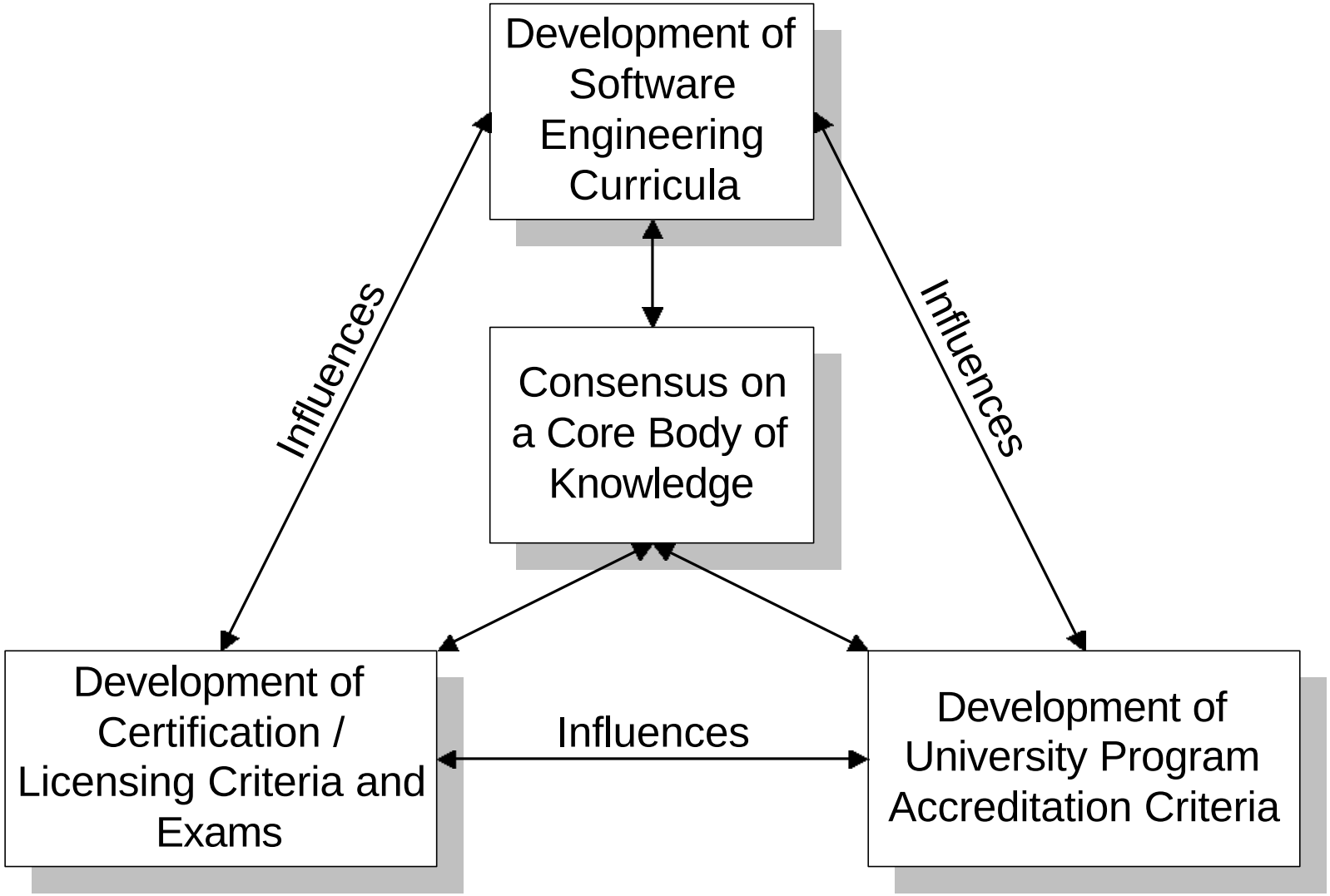
Window of Opportunity?

- 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



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

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- **Project scope, objectives and audience**
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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

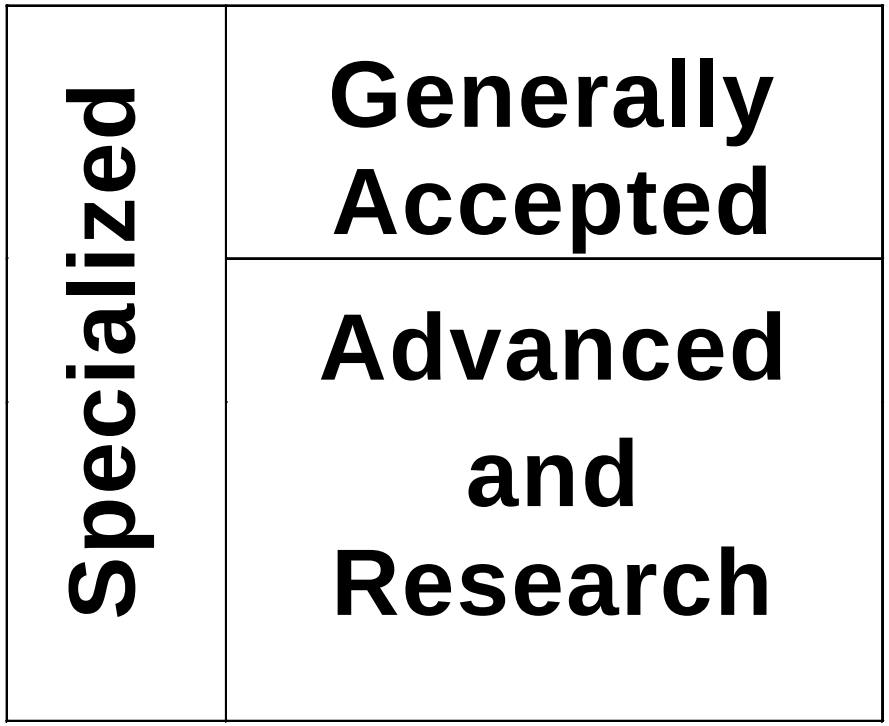
Intended Audience

- 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



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

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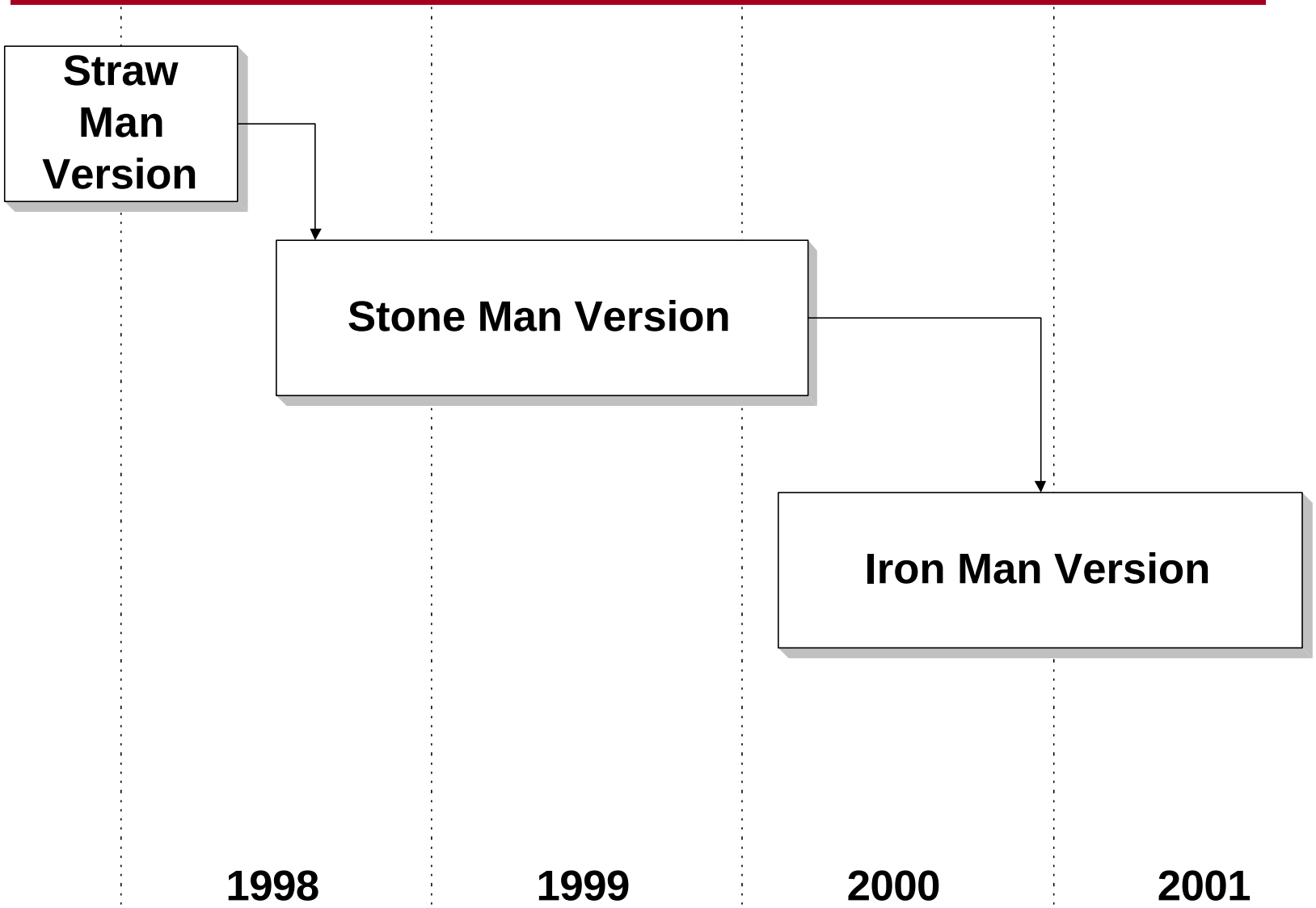
A Three-Phase Approach for Developing the Guide to the SWEBOK



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

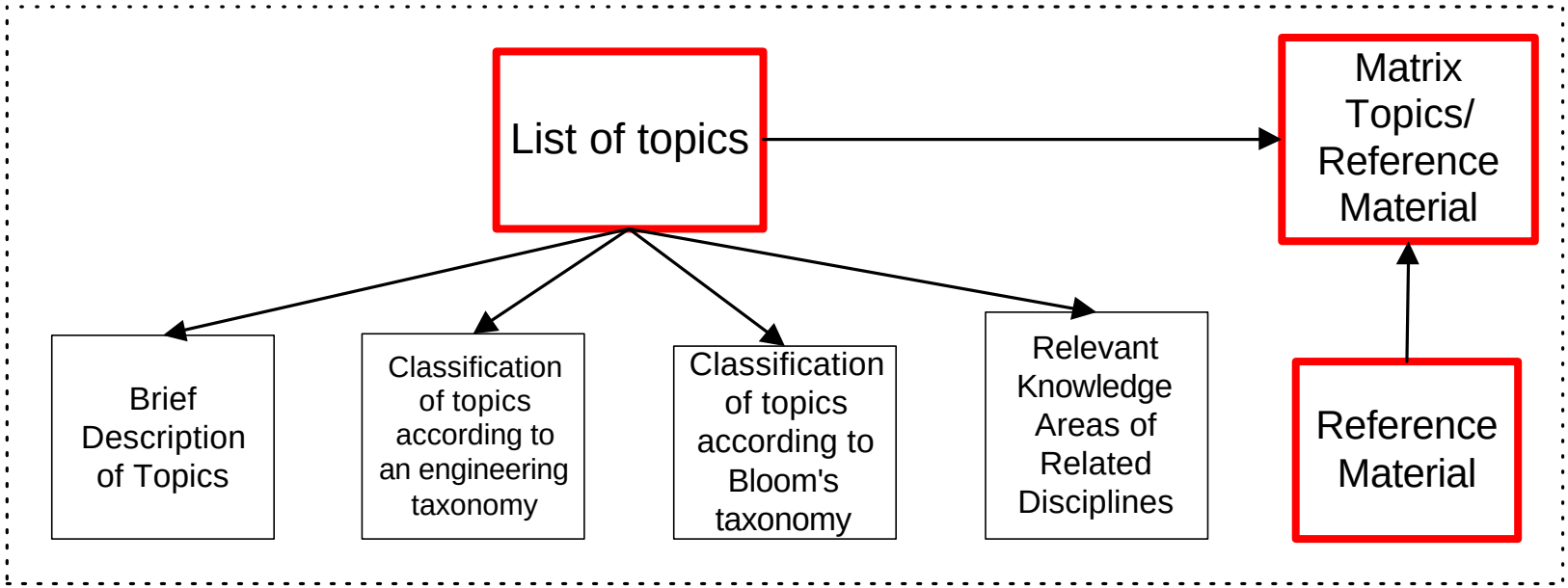
Project Funding

- Industry
- Professional societies
- UQAM

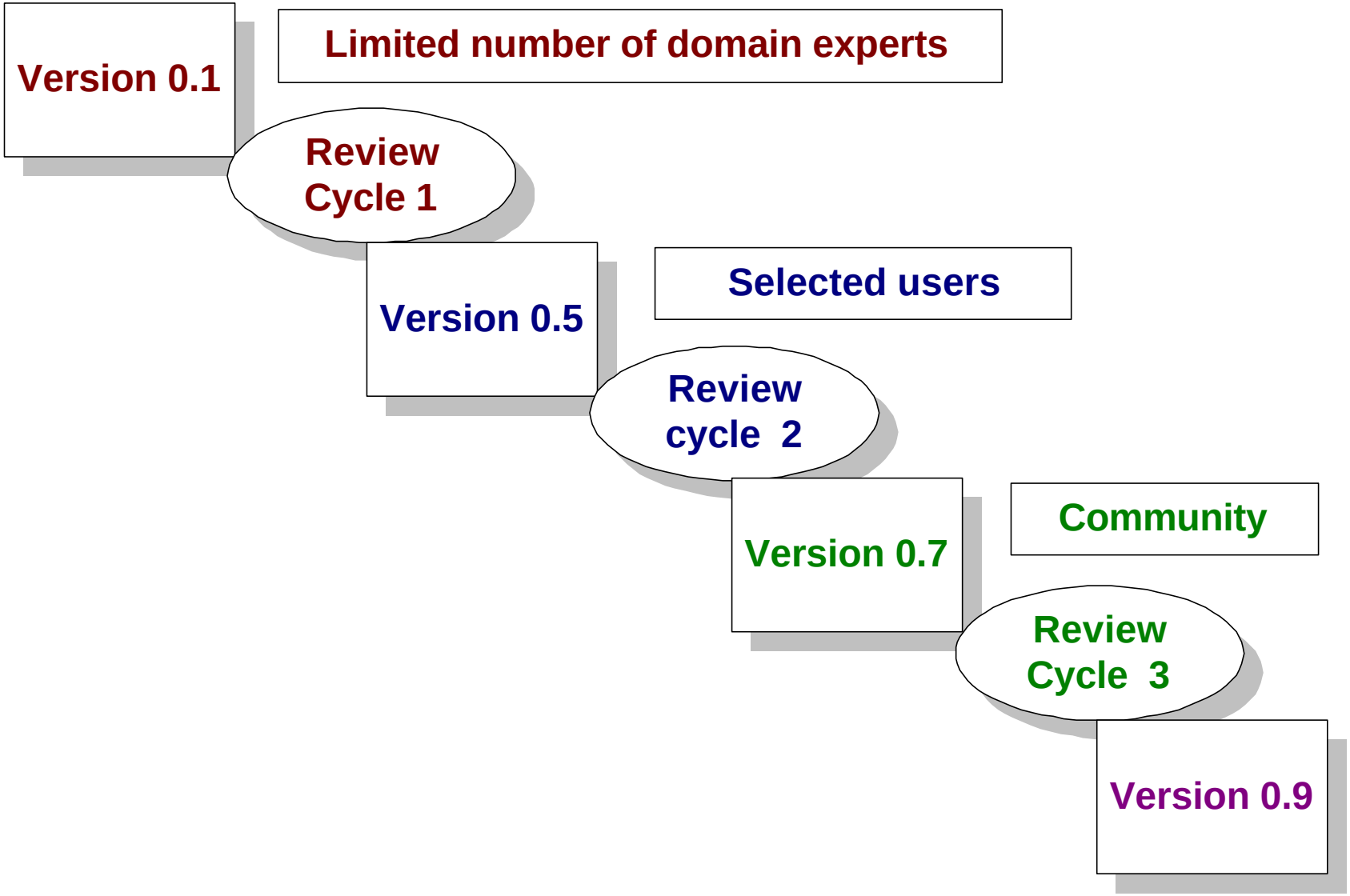
Stone Man Deliverables:

- **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



Stone Man Review Process



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

	Educators and Trainers	Small Org.	…	
Req. Analysis	Five to Ten reviewers			
Design				
Construction				
. . .				

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

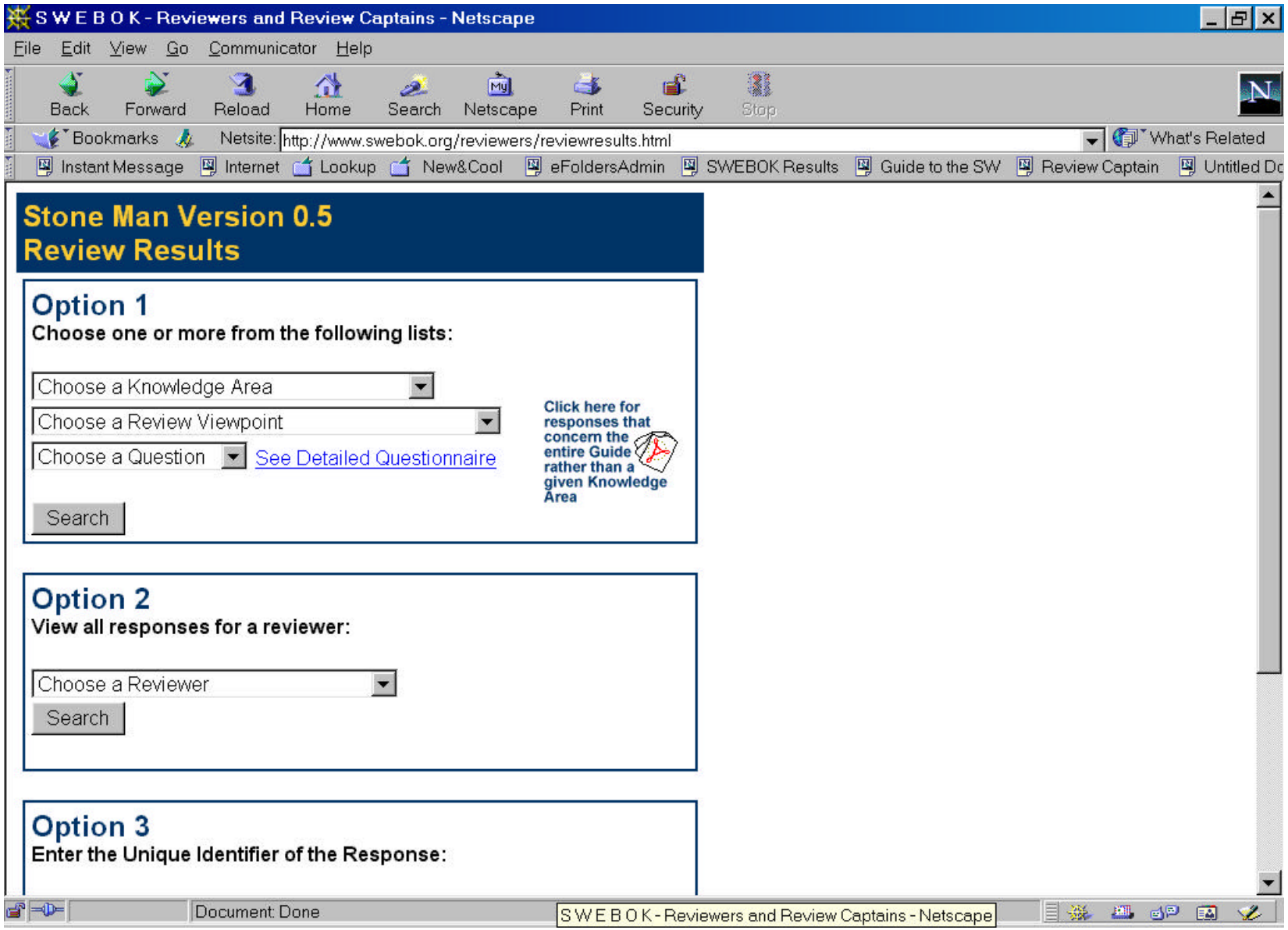
- Criteria for reviewers are
  - Knowledge in the Area
  - Availability
  - Ability to give articulate, constructive comments
  - Representative of: software engineering practitioners, trainers an educators, standards developers, small industry, students, etc.

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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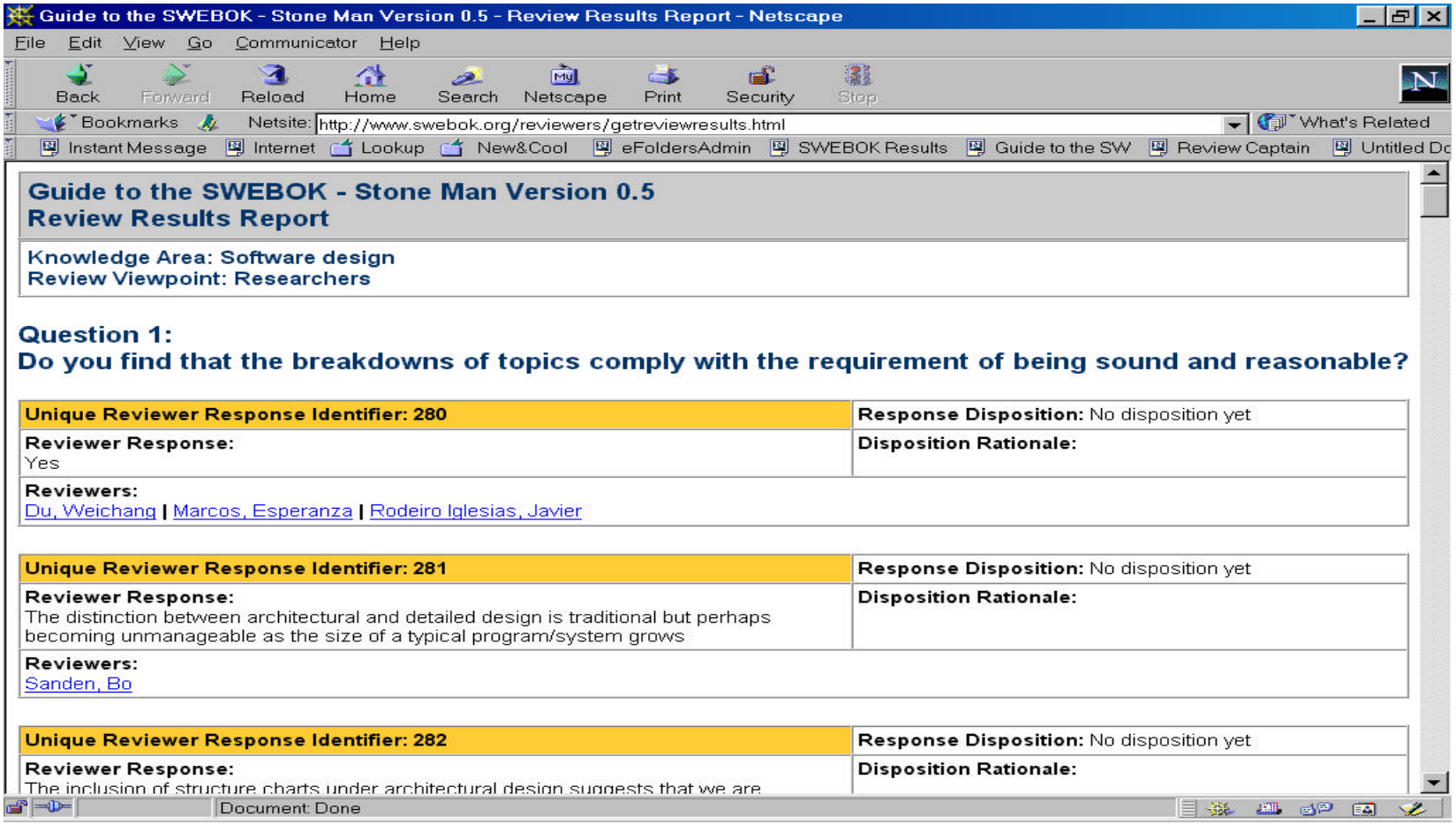
Stone Man Version 0.5
Review Results
Option 1
Choose one or more from the following lists:
Choose a Knowledge Area
Choose a Review Viewpoint
Choose a Question
See Detailed Questionnaire
Click here for responses that concern the entire Guide rather than a given Knowledge Area
Search
Option 2
View all responses for a reviewer:
Choose a Reviewer
Search
Option 3
Enter the Unique Identifier of the Response:
Document: Done
SWEBOK - Reviewers and Review Captains - Netscape

Option 1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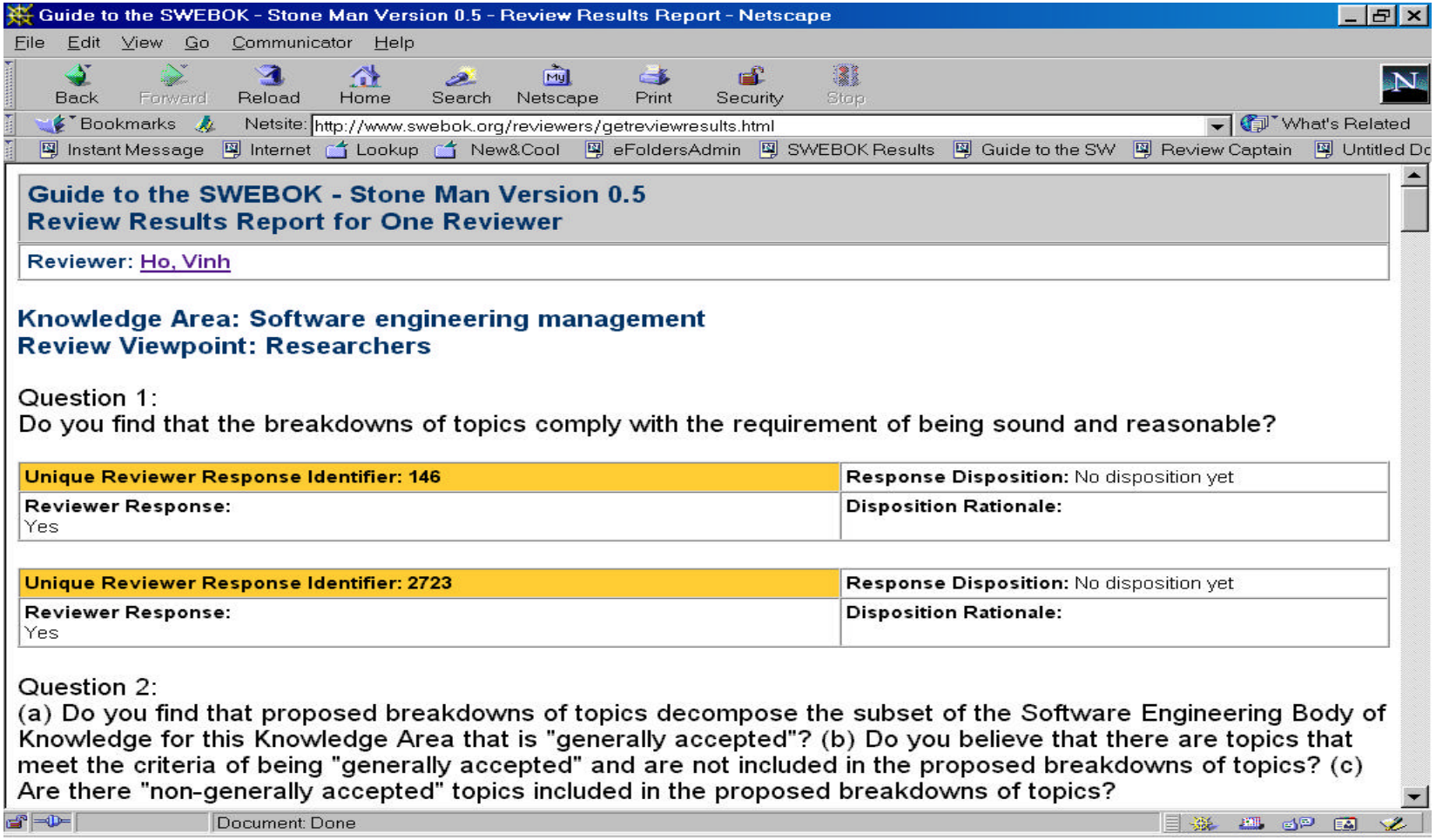
Guide to the SWEBOK - Stone Man Version 0.5
Review Results Report
Knowledge Area: Software design
Review Viewpoint: Researchers
Question 1:
Do you find that the breakdowns of topics comply with the requirement of being sound and reasonable?
Unique Reviewer Response Identifier: 280
Response Disposition: No disposition yet
Reviewer Response:
Yes
Disposition Rationale:
Reviewers:
Du, Weichang | Marcos, Esperanza | Rodeiro Iglesias, Javier
Unique Reviewer Response Identifier: 281
Response Disposition: No disposition yet
Reviewer Response:
The distinction between architectural and detailed design is traditional but perhaps becoming unmanageable as the size of a typical program/system grows
Disposition Rationale:
Reviewers:
Sanden, Bo
Unique Reviewer Response Identifier: 282
Response Disposition: No disposition yet
Reviewer Response:
The inclusion of structure charts under architectural design suggests that we are
Disposition Rationale:
Document: Done

Option 2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Guide to the SWEBOK - Stone Man Version 0.5
Review Results Report for One Reviewer
Reviewer: Ho, Vinh
Knowledge Area: Software engineering management
Review Viewpoint: Researchers
Question 1:
Do you find that the breakdowns of topics comply with the requirement of being sound and reasonable?
Unique Reviewer Response Identifier: 146
Response Disposition: No disposition yet
Reviewer Response:
Yes
Disposition Rationale:
Unique Reviewer Response Identifier: 2723
Response Disposition: No disposition yet
Reviewer Response:
Yes
Disposition Rationale:
Question 2:
(a) Do you find that proposed breakdowns of topics decompose the subset of the Software Engineering Body of Knowledge for this Knowledge Area that is "generally accepted"? (b) Do you believe that there are topics that meet the criteria of being "generally accepted" and are not included in the proposed breakdowns of topics? (c) Are there "non-generally accepted" topics included in the proposed breakdowns of topics?
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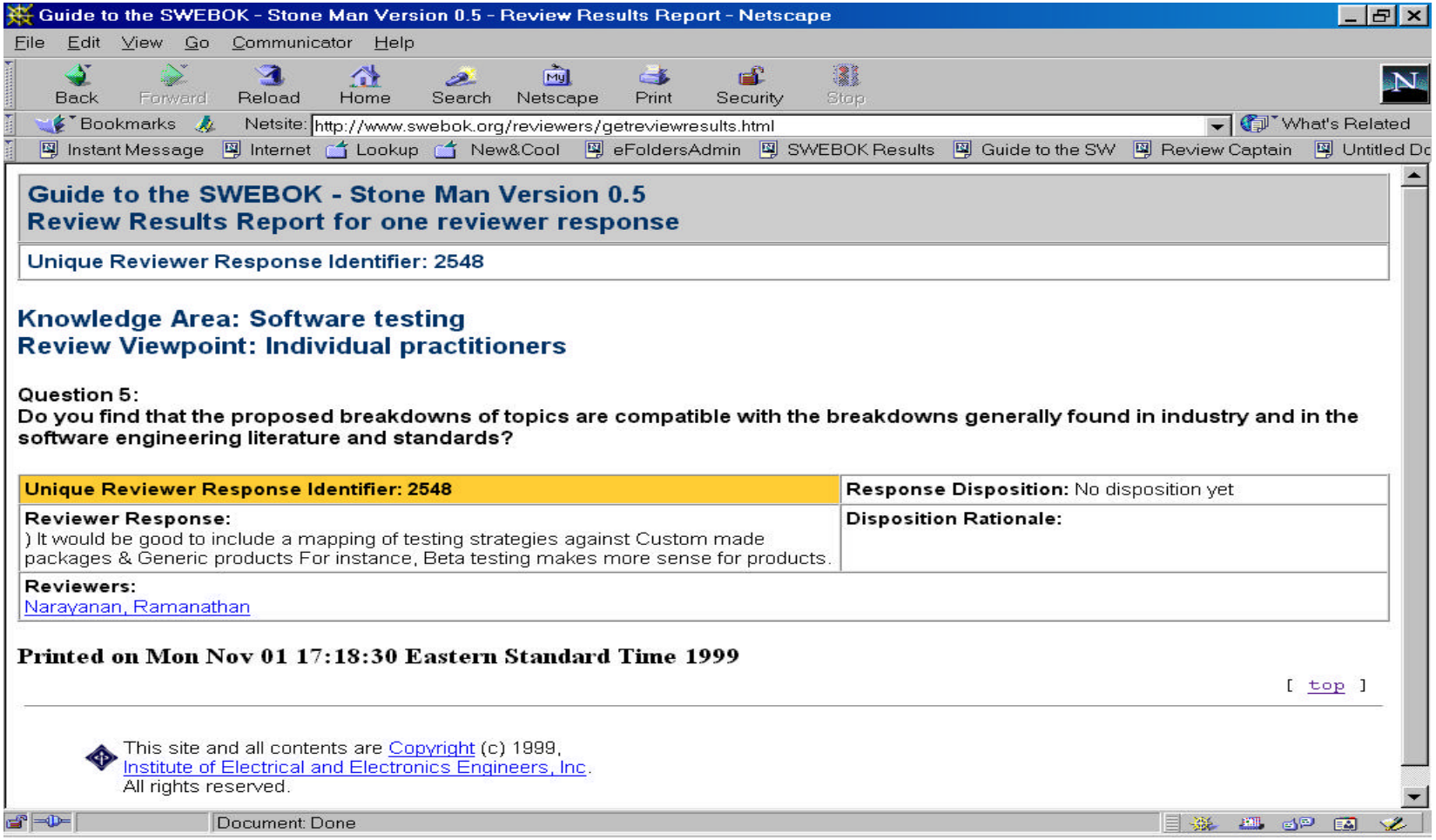
Option 3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Instant Message Internet Lookup New&Cool eFoldersAdmin SWEBOK Results Guide to the SW Review Captain Untitled Do
Guide to the SWEBOK - Stone Man Version 0.5
Review Results Report for one reviewer response
Unique Reviewer Response Identifier: 2548
Knowledge Area: Software testing
Review Viewpoint: Individual practitioners
Question 5:
Do you find that the proposed breakdowns of topics are compatible with the breakdowns generally found in industry and in the software engineering literature and standards?
Unique Reviewer Response Identifier: 2548
Response Disposition: No disposition yet
Reviewer Response:
) It would be good to include a mapping of testing strategies against Custom made packages & Generic products For instance, Beta testing makes more sense for products.
Disposition Rationale:
Reviewers:
Narayanan, Ramanathan
Printed on Mon Nov 01 17:18:30 Eastern Standard Time 1999
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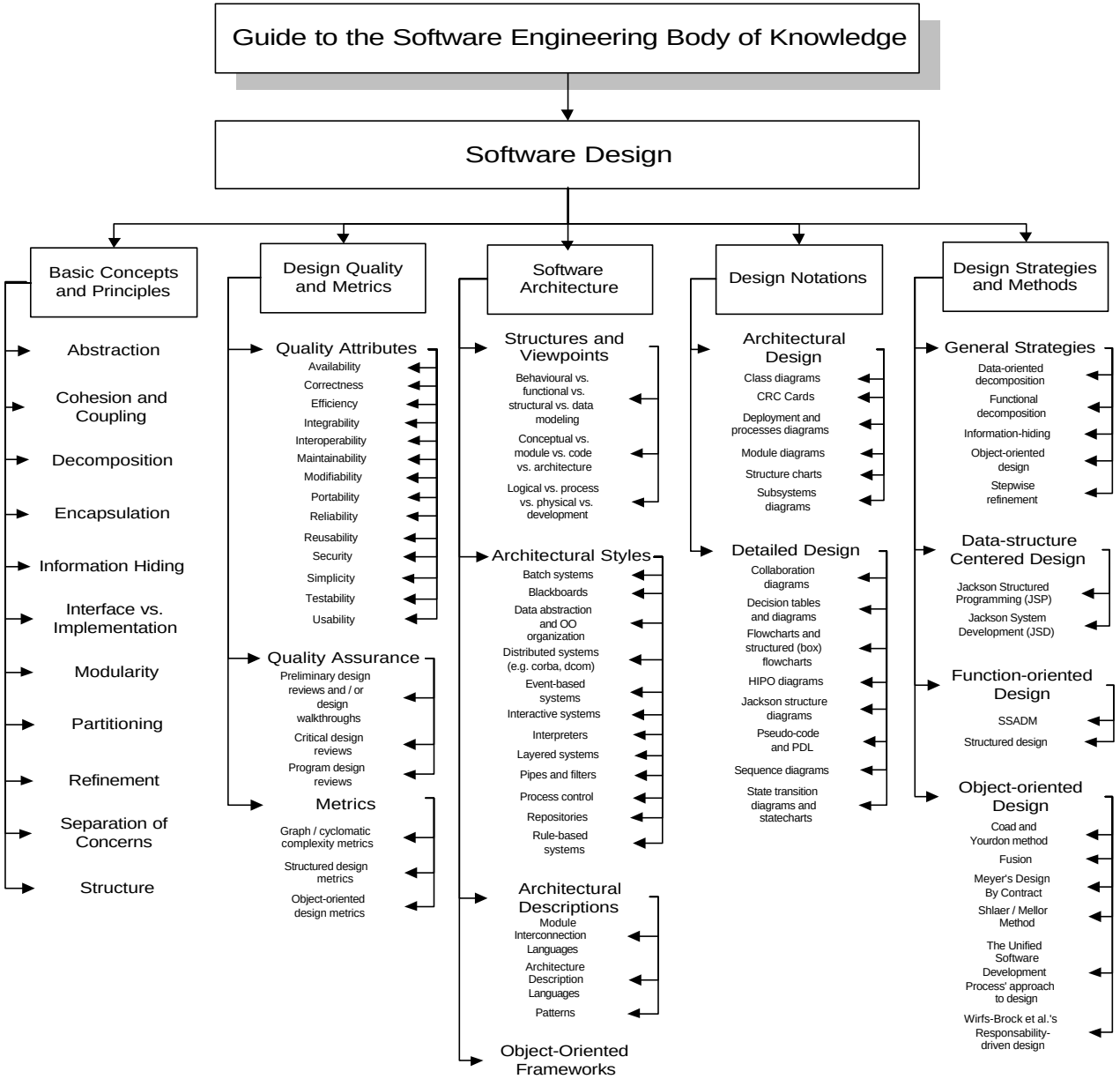
Document: Done

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 Design
Basic Concepts and Principles
Abstraction
Cohesion and Coupling
Decomposition
Encapsulation
Information Hiding
Interface vs. Implementation
Modularity
Partitioning
Refinement
Separation of Concerns
Structure
Design Quality and Metrics
Quality Attributes
Availability
Correctness
Efficiency
Integrability
Interoperability
Maintainability
Modifiability
Portability
Reliability
Reusability
Security
Simplicity
Testability
Usability
Quality Assurance
Preliminary design reviews and / or design walkthroughs
Critical design reviews
Program design reviews
Metrics
Graph / cyclomatic complexity metrics
Structured design metrics
Object-oriented design metrics
Software Architecture
Structures and Viewpoints
Behavioural vs. functional vs. structural vs. data modeling
Conceptual vs. module vs. code vs. architecture
Logical vs. process vs. physical vs. development
Architectural Styles
Batch systems
Blackboards
Data abstraction and OO organization
Distributed systems (e.g. corba, dcom)
Event-based systems
Interactive systems
Interpreters
Layered systems
Pipes and filters
Process control
Repositories
Rule-based systems
Architectural Descriptions
Module Interconnection Languages
Architecture Description Languages
Patterns
Object-Oriented Frameworks
Design Notations
Architectural Design
Class diagrams
CRC Cards
Deployment and processes diagrams
Module diagrams
Structure charts
Subsystems diagrams
Detailed Design
Collaboration diagrams
Decision tables and diagrams
Flowcharts and structured (box) flowcharts
HIPO diagrams
Jackson structure diagrams
Pseudo-code and PDL
Sequence diagrams
State transition diagrams and statecharts
Design Strategies and Methods
General Strategies
Data-oriented decomposition
Functional decomposition
Information-hiding
Object-oriented design
Stepwise refinement
Data-structure Centered Design
Jackson Structured Programming (JSP)
Jackson System Development (JSD)
Function-oriented Design
SSADM
Structured design
Object-oriented Design
Coad and Yourdon method
Fusion
Meyer's Design By Contract
Shlaer / Mellor Method
The Unified Software Development Process' approach to design
Wirfs-Brock et al.'s Responsability-driven design

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

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