The Body of Knowledge and Curriculum to Advance Systems Engineering

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Agenda

1. BKCASE background and objectives
2. Systems Engineering Body of Knowledge – What's in a Wiki?
3. Questions

How We Got Here

In Spring 2007, 3 phase effort was proposed:

1. A reference curriculum* for graduate software engineering with the “right” amount of systems engineering
2. A reference curriculum for graduate systems engineering with the “right” amount of software engineering
3. A fully interdisciplinary reference curriculum for systems and software engineering

*A reference curriculum offers recommendations on longer-term objectives for students, outcomes at graduation, entrance expectations, curriculum architecture, and required knowledge. Recommendations will be tailored. They do not specify course offerings or packaging except as examples.

You Are Here…

DONE	*Phase 1.*	A reference curriculum for graduate software engineering with the “right” amount of systems engineering
NOW	*Phase 2.*	A reference curriculum for graduate systems engineering with the “right” amount of software engineering
FUTURE	*Phase 3.*	A fully interdisciplinary reference curriculum for systems and software engineering

What is BKCASE?

- Project to create:
  - Systems Engineering Body of Knowledge (SEBoK)
  - Graduate Reference Curriculum in Systems Engineering (GRCSE™ – pronounced “Gracie”)
- Started in September 2009
- Volunteer-based effort
- Project will run through 2012
- Intended for world-wide use

BKCASE Vision and Objectives

Vision

"Systems Engineering competency models, certification programs, textbooks, graduate programs, and related workforce development initiatives around the world align with BKCASE."

Objectives

1. **Create the SEBoK** and have it be **globally recognized** by the SE community as the authoritative guide to the body of knowledge for the SE discipline.
2. Create GRCSE and have it be globally recognized by the SE community as the **authoritative guidance for graduate programs** in SE.
3. Facilitate the **global alignment of related workforce development initiatives** with SEBoK and GRCSE.
4. **Transfer stewardship of SEBoK and GRCSE to INCOSE and the IEEE** after BKCASE publishes version 1.0 of those products, including possible integration into their certification, accreditation, and other workforce development and education initiatives.

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What is in GRCSE?

- ***Guidance for Constructing and Maintaining the Reference Curriculum:*** the fundamental principles, assumptions, and context for the reference curriculum authors
- ***Entrance Expectations:*** what students should be capable of and have experienced before they enter a graduate program
- ***Objectives:*** what students should be able to achieve 3 to 5 years after graduation based on what they learn in program
- ***Outcomes:*** what students should achieve by graduation
- ***Architecture:*** the structure of a curriculum to accommodate core material, university-specific material, and elective material
- ***Core Body of Knowledge:*** material that all students should master in a graduate SE program

Not specific courses. Not specific packaging. Adaption and selective adoption expected and encouraged.

SEBoK Purpose

To provide the boundaries, terminology, content, and structure needed to systematically and consistently *support* the following*:*

Purpose	Description
Inform Practice	Inform systems engineers about the boundaries, terminology, and structure of their discipline and point them to useful information needed to practice SE in any application domain
Inform Research	Inform researchers about the limitations and gaps in current SE knowledge that should help guide their research agenda
Inform Interactors	Inform performers in interacting disciplines (system implementation, project and enterprise management, other disciplines) of the nature and value of SE
Inform Curriculum Developers	Inform organizations defining the content that should be common in undergraduate and graduate programs in SE
Inform Certifiers	Inform organizations certifying individuals as qualified to practice systems engineering
Inform SE Staffing	Inform organizations and managers deciding which competencies that practicing systems engineers should possess in various roles ranging from apprentice to expert

Guide to the literature, not all the content of the literature

Who will use the SEBoK?

1. **Practicing Systems Engineers** – ID best references to support a new SE role; expand their areas of SE expertise and specialization; understand best SE practices in a project they are reviewing
2. **Process Engineers** – Understand which SE processes and assets are the most relevant; find examples in the literature of how others have tailored processes; find examples in the literature of how others have done self-assessed SE processes
3. **Faculty Members** – Decide on the core knowledge that all students in the program should master; incorporate SE concepts into non-SE courses or curricula
4. **GRCSE authors** - Decide what knowledge to expect from all SE graduate students
5. **Certifiers** - Understand what others have done, how such programs are typically structured, and how to select the knowledge that each person seeking certification should master

Who will use the SEBoK?

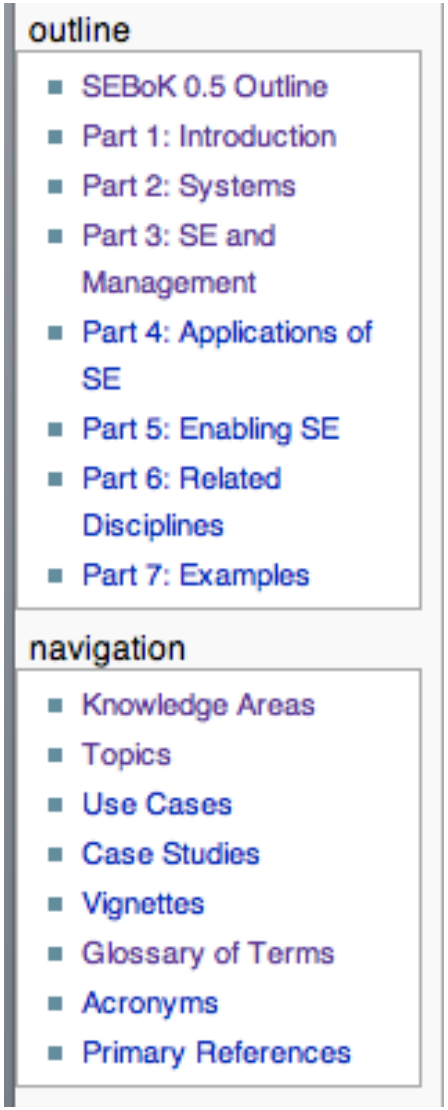
6. **General Managers, Other Engineers -** Understand the scope of SE relative to their roles; understand basic vocabulary, boundaries, and structure of SE and ID primary references; understand the role of the systems engineer versus others on a project
7. **Customers of Systems Engineering** – Better understand what to ask for, how to request it, and how to judge the quality of what is received
8. **SE Managers** – Read independent information to evaluate a proposal; develop competency-based job descriptions
9. **SE Researchers** - ID gaps in SE knowledge to guide research agendas

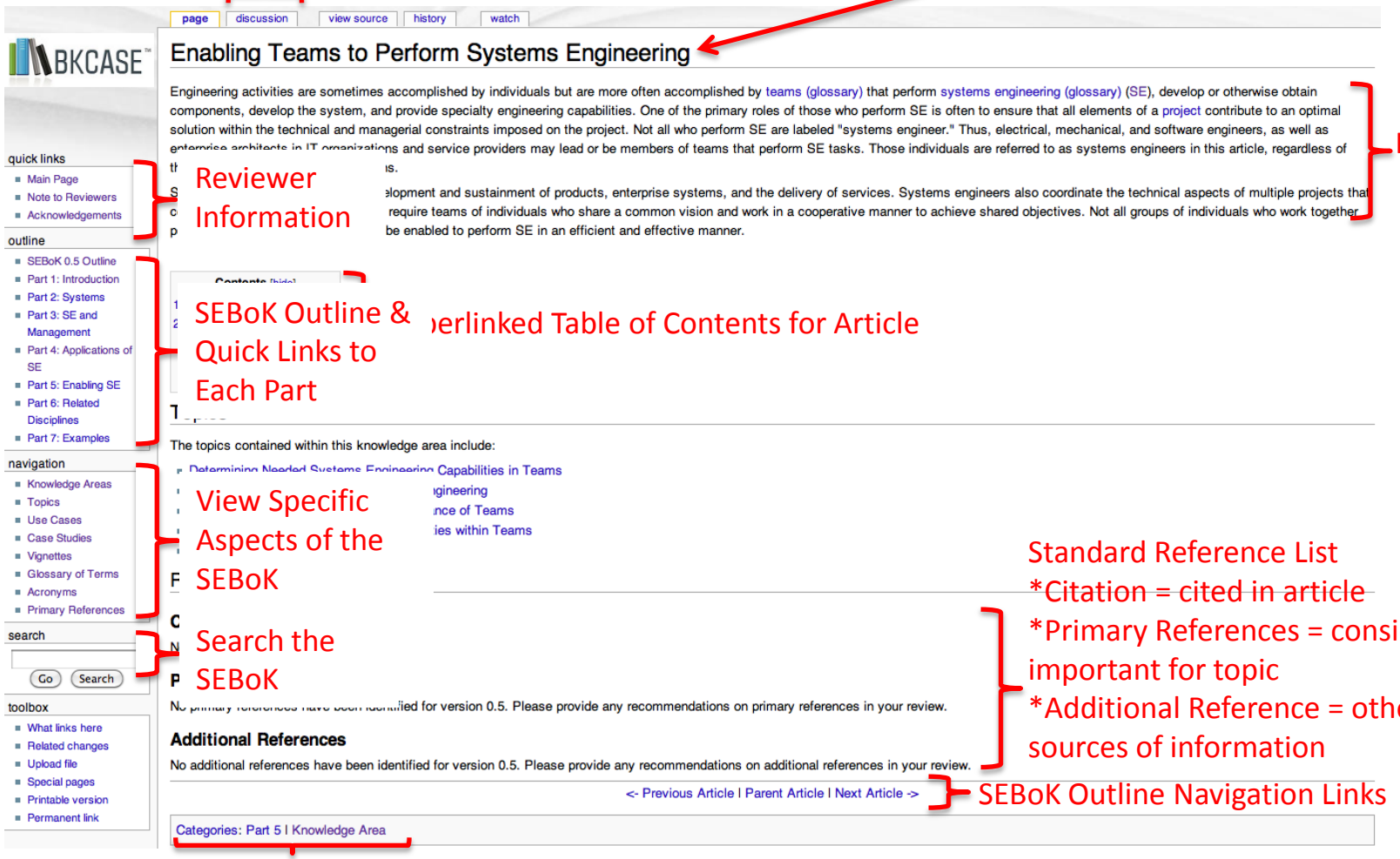
SEBoK Scope

- Natural systems: Solar system, real number system
  - Not a concern of SEBoK, other than being external environments
- Engineered systems: Technical or sociotechnical aggregations of physical, informational, and human elements that exhibit emergent properties not exhibited by the individual elements
  - Created by and for people
  - Have a purpose, with multiple views
  - Satisfy key stakeholders' value propositions
  - Have a life cycle and evolution dynamics
  - Have a boundary and an external environment
  - Are part of a system-of-interest hierarchy

SEBoK 0.5 Organization

- Main Body
  - 7 Parts
  - 32 Knowledge Areas
  - 115 Topics
- Auxiliary
  - Glossary
  - Primary References





Click here to review

Article Title (Subject)

Introduction

Reviewer Information

SEBoK Outline & Quick Links to Each Part

erlinked Table of Contents for Article

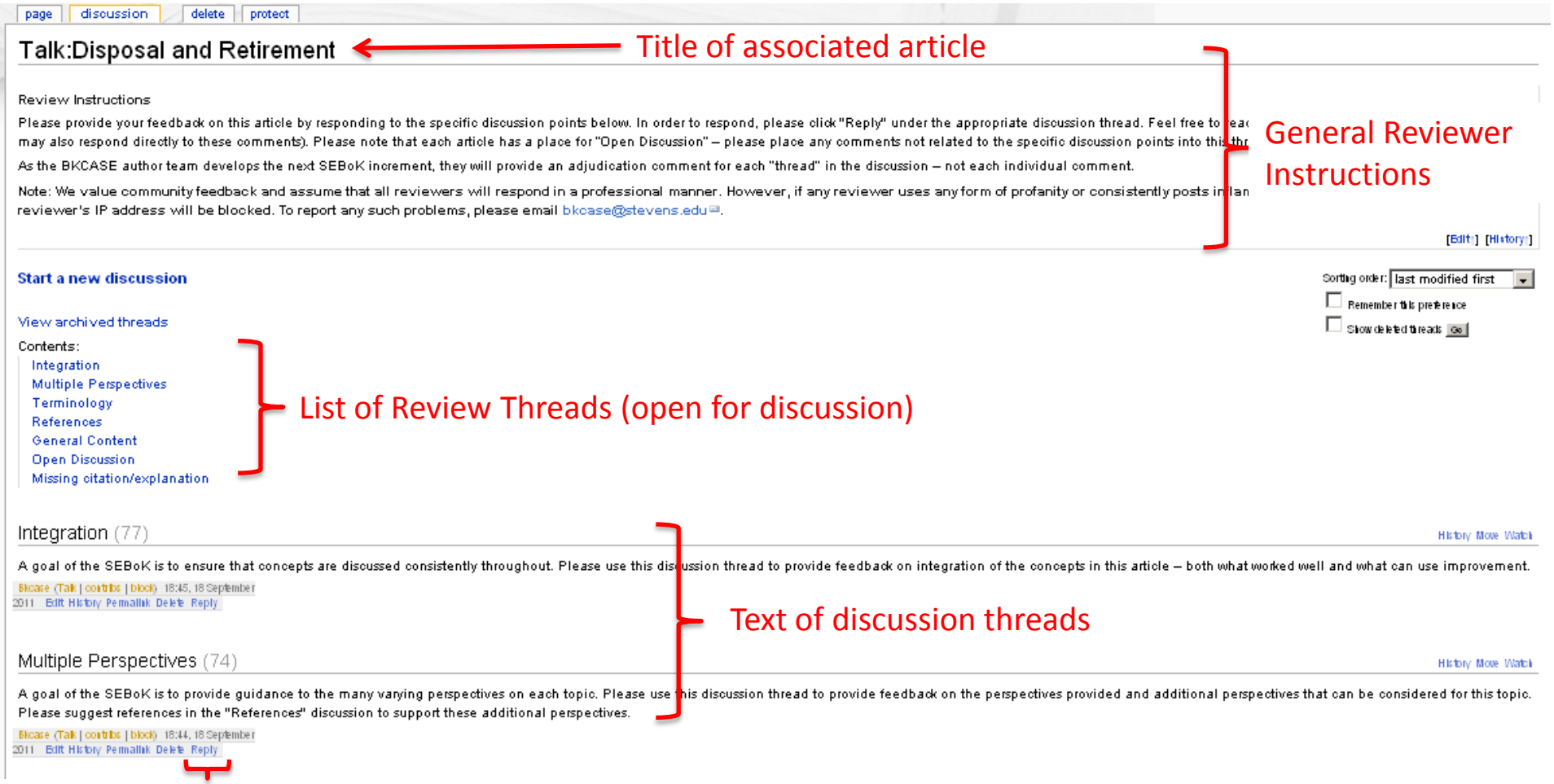
View Specific Aspects of the SEBoK

Search the SEBoK

Standard Reference List
*Citation = cited in article
*Primary References = considered very important for topic
*Additional Reference = other good sources of information

SEBoK Outline Navigation Links

Outline information: Part the article belongs to; level of article (part, knowledge area, or topic)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Talk:Disposal and Retirement
Title of associated article
Review Instructions
Please provide your feedback on this article by responding to the specific discussion points below. In order to respond, please click "Reply" under the appropriate discussion thread. Feel free to rea
may also respond directly to these comments). Please note that each article has a place for "Open Discussion" – please place any comments not related to the specific discussion points into this thr
As the BKCASE author team develops the next SEBoK increment, they will provide an adjudication comment for each "thread" in the discussion – not each individual comment.
Note: We value community feedback and assume that all reviewers will respond in a professional manner. However, if any reviewer uses any form of profanity or consistently posts in an
reviewer's IP address will be blocked. To report any such problems, please email bkcase@stevens.edu.
General Reviewer Instructions
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Sorting order: last modified first
Remember this preference
Show deleted threads
View archived threads
Contents:
Integration
Multiple Perspectives
Terminology
References
General Content
Open Discussion
Missing citation/explanation
List of Review Threads (open for discussion)
Integration (77)
History Move Watch
A goal of the SEBoK is to ensure that concepts are discussed consistently throughout. Please use this discussion thread to provide feedback on integration of the concepts in this article – both what worked well and what can use improvement.
Bkcase (Talk | contribs | block) 18:45, 18 September 2011 Edit History Permalink Delete Reply
Multiple Perspectives (74)
History Move Watch
A goal of the SEBoK is to provide guidance to the many varying perspectives on each topic. Please use this discussion thread to provide feedback on the perspectives provided and additional perspectives that can be considered for this topic. Please suggest references in the "References" discussion to support these additional perspectives.
Bkcase (Talk | contribs | block) 18:44, 18 September 2011 Edit History Permalink Delete Reply
Text of discussion threads
"Reply" to add comments on each discussion topic

Review Comments to be added under discussion

page | discussion | edit | history | delete | move | protect | watch

Decision Gate (glossary)

Glossary Term

(1) A decision gate is an approval event (often associated with a review meeting). Entry and Exit criteria are established for each decision gate; continuation beyond the decision gate is contingent on the agreement of the decision-makers. (INCOSE 2011 p 360)

(2) A preplanned management event in the project cycle to demonstrate accomplishments, approve and baseline results, and approve the approach for continuing the project. (Also known as a control gate.) (Forsberg, Mooz, Cotterman 2005, p 428)

Definition(s)

Source(s)

[edit]

Forsberg, K., H. Mooz, H. Cotterman. 2005. Visualizing Project Management, 3rd Ed., Hoboken, NJ, USA: Joh

INCOSE. 2011. Systems Engineering Handbook, version 3.2.1. INCOSE-TP-2003-002-03.2.1.

Source(s) for Definition

Discussion

[edit]

1 - The definition provided in the INCOSE Handbook is built on the language in ISO/IEC 15288:2008. Consequ

2 - The definition in "Visualizing Project Management" is tied to the project cycle and the project management i systems engineering activities into the project context.

Explanation of why the definition(s) was chosen.

Category: Glossary of Terms

Glossary Identifier

Review Comments to be added under discussion

page | discussion | edit | history | delete | move | unprotect | watch

IEEE 1471 ← Reference Title

ANSI/IEEE. 2000. *Recommended practice for architectural description for software-intensive systems*. New York, NY: Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE), ANSI/IEEE 1471-2000.

Bibliographic Entry

May also be referred to as *ANSI/IEEE 1471*.

Annotation [edit]

System Modeling Concepts

This reference is widely recognized as a foundational standard for defining modeling concepts, particularly as it rel and general architecture description.

Modeling Standards

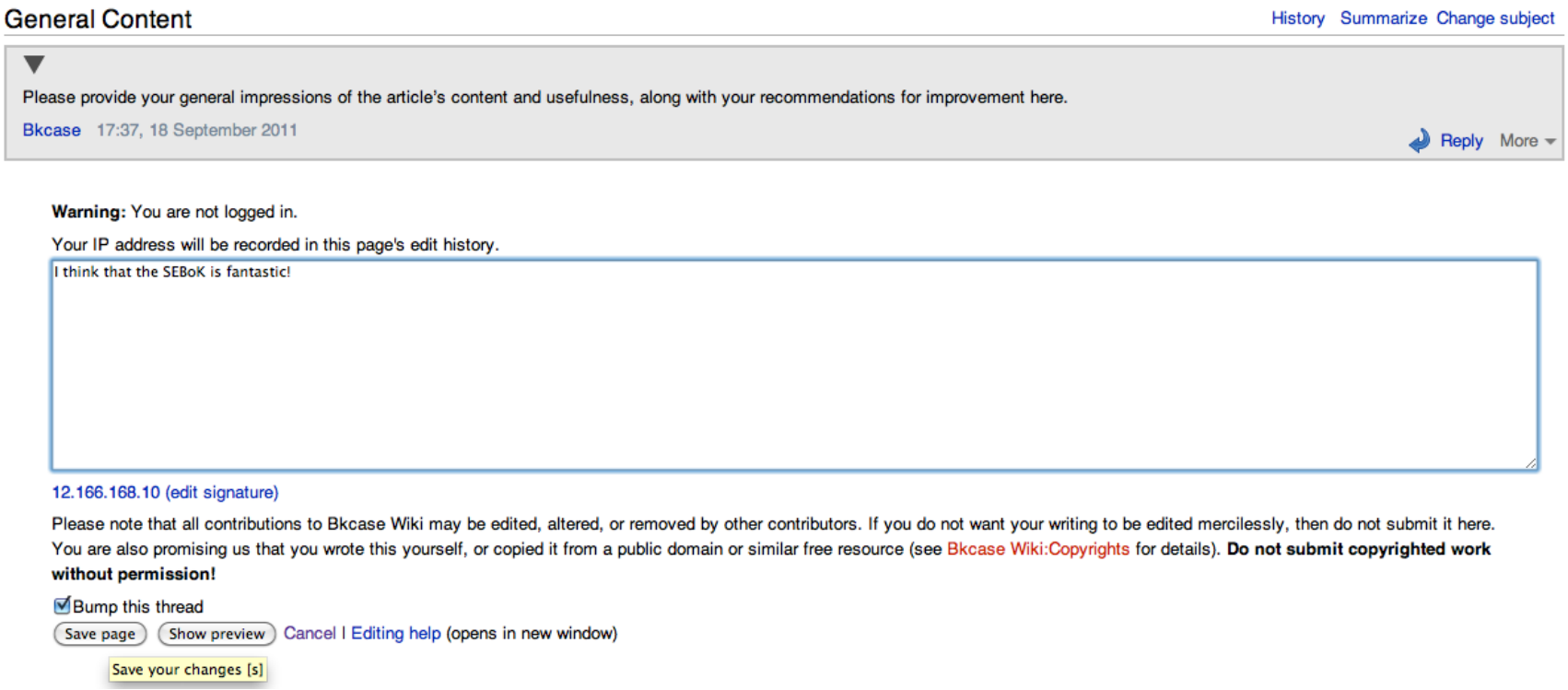
Annotation to be added for SEBoK 1.0.

Listing of Articles which use as a primary reference, with annotations for each article

Category: Primary Reference

Primary Reference Identifier

Screen Shot of Review



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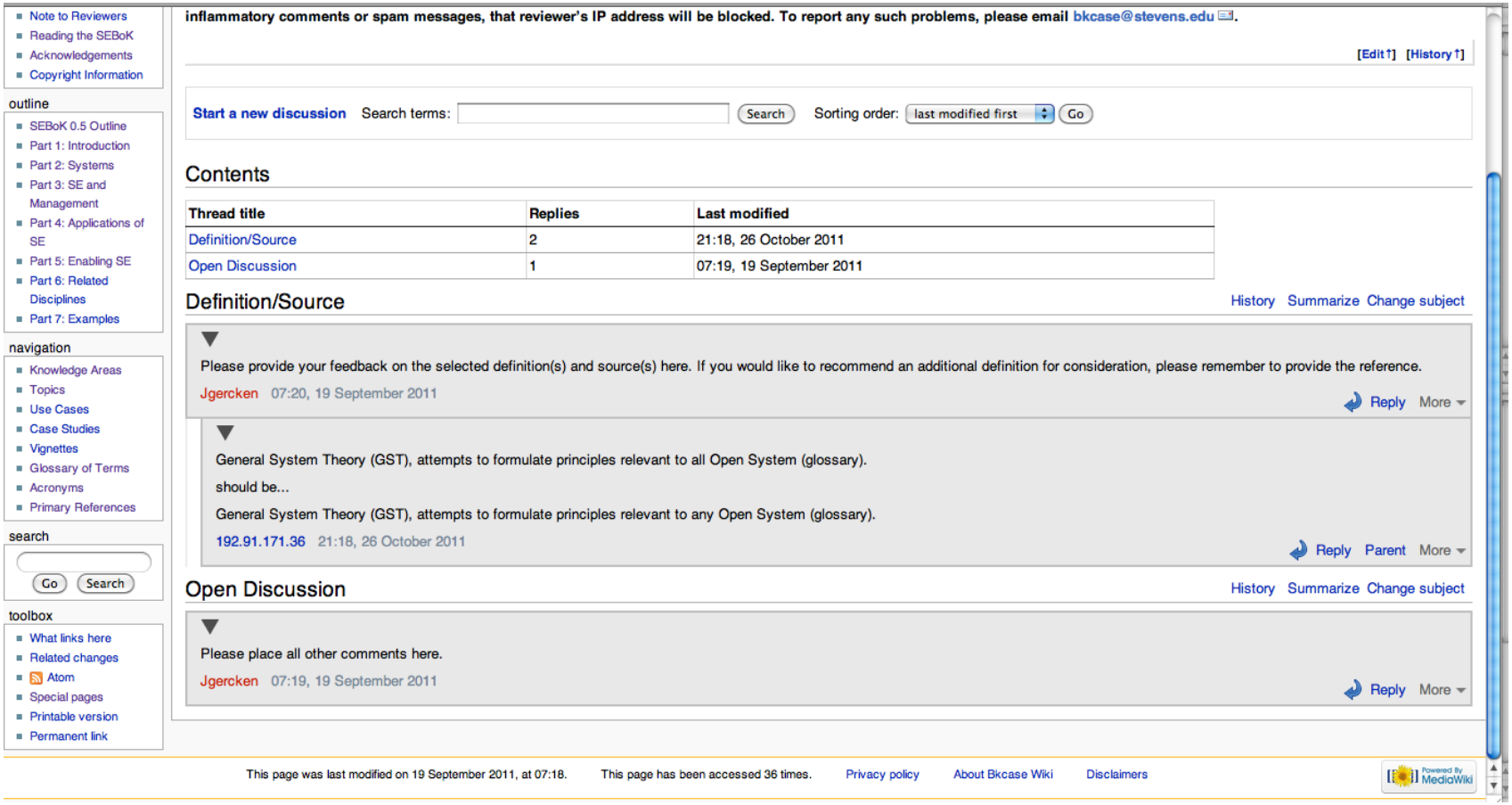

SEBoK 0.5 Wiki Outreach Sessions

- To help orient the community to the wiki delivery of the SEBoK, the BKCASE team has planned 3

Flyers with additional information on the wiki outreach/review sessions available (just raise your hand)!

- Sessions to be held Nov 7-9
- For additional details or to register for a session, please email bkcase@stevens.edu

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Our Supporters

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Backup

Phase 1 Primary Products

- Graduate Software Engineering 2009 (GSwE2009): Curriculum Guidelines for Graduate Degree Programs in Software Engineering
- GSwE2009 Companion Document: Comparisons of GSwE2009 to Current Master's Programs in Software Engineering
- GSwE2009 Companion Document: Frequently Asked Questions on Implementing GSwE2009


iSSEc

Integrated Software & Systems Engineering Curriculum (iSSEc) Project

Graduate Software Engineering 2009(GSwE2009)

Curriculum Guidelines for
Graduate Degree Programs in Software Engineering

GSwE 2009

Version 1.0

September 30, 2009

Unlimited Global Distribution

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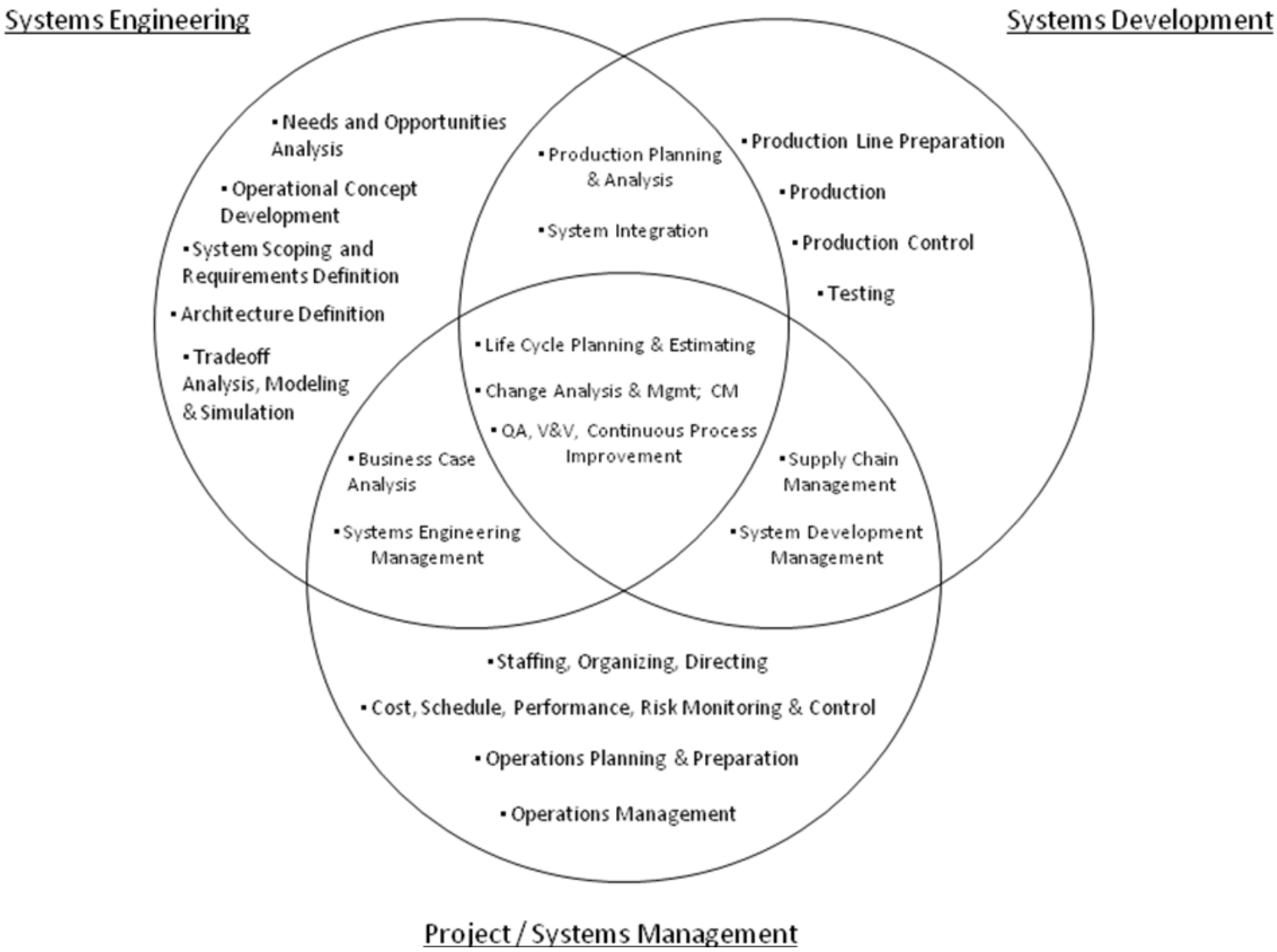
Originally sponsored by DoD. **Now sponsored by the IEEE Computer Society and ACM**

www.GSwE2009.org

SE, Development, Management



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1. Products generated by the authors, not the sponsor or supporters
2. Even though the Department of Defense is the sponsor, it does not have any authority over the content of the products, nor are the products slanted towards defense systems development and acquisition
3. Volunteer authors do the bulk of the writing
4. Core Team from Stevens and Naval Postgraduate School provides stable labor and direction
5. Core Team responsible for final integration, technical editing, and clean up of products

SEBoK 0.25 Organization

- **Part 1: SEBoK 0.5 Introduction.**
- **Part 2: Systems.**
- **Part 3: Systems Engineering and Management.**
- **Part 4: Applications of Systems Engineering.**
- **Part 5: Enabling Systems Engineering.**
- **Part 6: Related Disciplines.**
- **Part 7: Systems Engineering Implementation Examples.**

Systems Engineering Defined

- INCOSE
  - Interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, **then** proceeding with design synthesis and system validation while considering the complete problem

- Possible Alternative
  - Interdisciplinary approach and means to enable the realization of successful systems. It focuses on holistically and concurrently understanding stakeholder needs, exploring opportunities, documenting requirements, and synthesizing, verifying, and validating solutions