

Development of SEBoK v. 1.0

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The development of SEBoK v. 1.0 was the work of 70 authors from around the world and took three years – from 2009 to 2012. The first three years of the project were sponsored by the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)), as outlined in detail below. The author team developed 3 draft versions of the SEBoK and received over 3,000 review comments from over 300 reviewers. Complete details on the team that built SEBoK v. 1.0 can be found below.

- Version 0.25 on September 15, 2010 – A prototype that would create the first architecture and early content of the SEBoK for limited review and validation.
- Version 0.5 on September 19, 2011 – A version suitable for early adopters.
- Version 0.75 on March 15, 2012 – An interim version used to gather further community feedback and to address the most critical shortcomings identified in version 0.5.
- Version 1.0 – The first version intended for broad use, v. 1.0 was release on September 14 2012.

After the release of v. 1.0, the BKCASE Governing Board was established; the Governing Board is made of representatives from the International Council on Systems Engineering (INCOSE), the IEEE Computer Society, and the Systems Engineering Research Center (SERC).



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Original Editor-in-Chief and Co-Editor-in-Chief

The original BKCASE project was lead by Editor in Chief Art Pyster and Co-Editor in Chief Dave Olwell, who served from 2009 through early 2014. Without their leadership, vision, and drive the project would not have succeeded.

BKCASE Editors-in-Chief

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Original Sponsor

The Department of Defense (DoD) recognizes the importance of SEBoK to its own workforce development and has provided substantial financial support and partnership to the BKCASE project. The office of the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)) is the original Department of Defense sponsor for the BKCASE Project. DASD(SE) graciously provided much of the funding for SEBoK development through their Systems Engineering Research Center (SERC) (see <http://www.sercuarc.org>). Those funds have primarily paid for the time spent by the SEBoK leadership, enabled the many volunteer authors to conduct quarterly physical workshops, and provided for the technical and administrative infrastructure to conduct such a complex distributed project. DASD(SE) has not determined the content of the SEBoK, but instead has allowed the author team and the community to determine what the SEBoK should contain. Without this support over the life of the project, the creation of the SEBoK would not have been possible. Moreover, DASD(SE) has continued to provide substantial support to BKCASE in 2013 through the SERC. Special thanks go to Stephen Welby, Kristen Baldwin, Nicholas Torelli, Don Gelosh, Scott Lucero, and Darren Dusza for their support throughout the BKCASE lifetime.

“This material is based upon work supported, in whole or in part, by the U.S. Department of Defense through the Systems Engineering Research Center (SERC) under Contract H98230-08-D-0171. SERC is a federally funded University Affiliated Research Center managed by

Stevens Institute of Technology. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Department of Defense.”

Core Team

The BKCASE project was supported by a small Core Team of individuals. The Core Team provided content editing support, technical editing support, and handled planning, scheduling, and logistics for the first four years of the project.

BKCASE Core Team

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Part Team Leads

The SEBoK is divided into seven primary Parts (see SEBoK Table of Contents). Through the release of SEBoK v. 1.0, someone graciously volunteered to lead a team of authors in writing the articles and coordinating article integration for each of the Parts. This was an enormous amount of work. We would like to thank each of these individuals for their time, dedication, and leadership. In addition, a member of the editorial staff supported each of the part team leads.

- Part 1 - Barry Boehm
- Part 2 - Richard Adcock
- Part 3 - Garry Roedler
- Part 4 - Harold (Bud) Lawson
- Part 5 - Art Pyster
- Part 6 - David Olwell
- Part 7 - Heidi Davidz

Authors

As a primarily volunteer effort, the BKCASE project

depended on dozens of authors from around the world to provide their own time and expenses. Each of the individuals listed below worked many hours to develop and improve SEBoK v. 1.0 and GRCSE v. 1.0. Without each of them, it would have been impossible to succeed. Many of them were supported by their organizations during this effort, including support for travel and labor, and we also gratefully acknowledge the organizational contributions.

Table 1. SEBoK v.1.0 and GRCSE v. 1.0 Authors. (SEBoK Original)

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Partners

Partner organizations supported the development of the SEBoK by providing personnel and opportunities to discuss the SEBoK in open forums such as conferences and workshops, and providing valued feedback on draft SEBoK materials. Some organizations have also chosen to have an official representative(s) participate in BKCASE, as shown below. A special thanks to our partners.

- The Institute of Industrial Engineers (IIE). The official IIE representative was Johann "Hans" Demmel.
- The Association for Computing Machinery (ACM). The official ACM Representative was Andrew McGettrick.
- The National Defense Industrial Association (NDIA) Systems Engineering Division. The official NDIA Systems Engineering Division representative was Garry Roedler.

In addition, most authors came from organizations that, although not officially affiliated with BKCASE, nevertheless supported author time and expenses to participate. Collectively, those organizations provided the majority of the labor and expenses that went into creating the SEBoK.

Finally, special thanks go out to INCOSE Presidents Samantha Robitaille and John Thomas for their early and constant support to the SEBoK development.

Wiki Team

The transition from a traditional document to a wiki-based platform was a long one. We are tremendously grateful to the folks who have helped us install, manage, and update the wiki:

- Nicole Hutchison (team lead), Stevens Institute of Technology
- Stephanie Enck (co-lead), Naval Postgraduate School

- Devanandham Henry, Stevens Institute of Technology
- Hans-Peter de Koning, European Space Agency
- Paola Di Maio, University of Strathclyde
- Ray Jorgensen, Rockwell Collins
- Sanford Friedenthal, SAF Consulting
- Jude Ken-Kwofie, Stevens Institute of Technology
- Steven Mitchell, Lockheed Martin
- Robin Valeson, formerly of Stevens Institute of Technology

The wiki is currently supported and hosted by Stevens Institute of Technology. Special thanks go to the Stevens' IT organization.

Technical Editors

Every article went through rounds of technical editing to improve writing quality and consistency. Thanks go to:

- Emily Leach
- Abraham Raher
- Renee Malove
- Justin Gercken
- Dona Lee

Participants in SEBoK Development

The following individuals have provided support to the BKCASE team over the course of the project:

- Johann Amsenga
- John Baras
- Johan Bendz
- Stuart Booth
- Dan Cernoch
- Richard Frost
- Edward Ghafari
- Mike Gourley
- Richard Gryzbowski
- Peter Jackson
- Kenneth Kepchar

- Mike Kreuger
- JoAnn Lane
- Richard Rosenthal
- Sven-Olaf Schulze
- Robert (Bob) Shishko
- Mary Jane Willshire

SEBoK Reviewers

Reviewers are critical to the success and growth of the SEBoK. By providing feedback that represents the diversity of views and opinions on systems engineering, reviewers help the author team identify and describe ground truths for SE as well as areas of contention. The reviewers who provided feedback for earlier versions are listed in Table 3, below. In addition, there are a number of other reviewers who provided their comments directly on the wiki with only a user ID (and not a full name) and reviewers who were part of a group that provided a collective review; these reviewers are not listed in Table 3. Many thanks to all reviewers!

The author team would like to particularly acknowledge the efforts of several INCOSE working groups (WGs) who provided feedback:

- Systems Science WG
- Architecture WG
- Requirements WG
- Decision Analysis WG
- In Service WG
- Lean Systems Engineering WG
- System of Systems WG
- Process Improvement WG

The adjudication of all SEBoK review comments for all versions can be found at SEBoK Review and Adjudication.

Table 3. Reviewers of earlier SEBoK versions. (SEBoK Original)

Reviewer	Reviewer
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Ada Hunter, <i>Lockheed Martin</i>	Kal Toth, <i>Portland State University</i>

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Alan D Harding, <i>BAE Systems</i>	Karen J Richter, <i>Institute for Defense Analyses</i>
Alan Knott, <i>Parsons Brinckerhoff</i>	Karl Best, <i>Project Management Institute</i>
Ali Bahraman, <i>Raytheon</i>	Ken Ellis, <i>Northrop Grumman Aerospace Systems</i>
Andrew Farncombe, <i>John Boardman Associates</i>	Kennedy Conway
Andrew McGettrick, <i>The Association for Computing Machinery (ACM)</i>	Kenneth Morris
Anne Sigogne, <i>THALES</i>	Kim Halladay
Annette Reilly, <i>Lockheed Martin</i>	Krister Sutinen, <i>Siemens Industry Software AB</i>
Arjan van Druten	Lajuane Brooks, <i>Aurora Sciences</i>
Arnold Neville Pears, <i>Uppsala University</i>	Larri Rosser, <i>Raytheon IIS</i>
Bart Terrery, <i>Lockheed Martin</i>	Laurie Nasta, <i>Booz Allen Hamilton</i>
Berger, <i>Northrop Grumman Corporation</i>	Loïc Fejoz, <i>RealTime-at-Work</i>
Bernadette Gasmi, <i>EADS Airbus</i>	Lori Zipes, <i>NAVSEA NSWC Panama City Division (US Dept of Navy)</i>
Beth Wilson, <i>Raytheon</i>	Lou Oddo, <i>Northrop Grumman Aerospace Systems</i>
Bob Epps and a consolidated review, <i>Lockheed Martin</i>	Louisa Guise, <i>Raytheon</i>
Bobinis, <i>Lockheed Martin</i>	M.T.F.M. van de Ven, <i>INCOSE ISSWG</i>
Bruce Elliott, <i>Arbutus Technical Consulting</i>	Marcel van de Ven, <i>Movares Nederland b.v.</i>
Bruce Munro, <i>Raytheon Space and Airborne Systems</i>	Mark Ardis, <i>Stevens Institute of Technology</i>
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Chia Eng Seng Aaron, <i>National University of Singapore</i>	Mark Maier, <i>The Aerospace Corporation</i>
Curran Hawkins	Martin Griss, <i>Carnegie Mellon University</i>
Curt Zielinski, <i>Lockheed Martin</i>	Martin Nazareth
Dahai Liu, <i>Embry-Riddle Aeronautical University</i>	Matthew Petty
Dan Dillery	Measurement While Drilling

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Dennis Moen, <i>Lockheed Martin</i>	Mike Gayle, <i>Boeing</i>
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Florian Schneider	<i>MWD Tools</i>
Francis M. Joyner, <i>Raytheon</i>	Nelson Roberts, <i>Lockheed Martin</i>
Frédéric Autran, <i>EADS - Cassidian Systems</i>	Odile Mornas, <i>Thales Université</i>
Gauthier Fanmuy, <i>AND</i>	Paola Di Maio, <i>University of Strathclyde</i>
Geoffrey A. Shuebrook, <i>Lockheed Martin</i>	Patra Stroemer, <i>Lockheed Martin</i>
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Gerlach	Peter McGee, <i>Lockheed Martin</i>
Gilles Meuriot, <i>AREVA TA</i>	Pierre Labreche, <i>CMC Electronics</i>
Gorman Findley, <i>Raytheon</i>	Pieter Botman, <i>Independent</i>
Greg Brown, <i>Lockheed Martin</i>	Ray Jorgensen, <i>Rockwell Collins</i>

Hagar, <i>Lockheed Martin</i>	Reagan Harper, <i>SEAKR Engineering Inc.</i>
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Howard Eisner, <i>George Washington University</i>	Robert Rathbone, <i>EADS - Cassidian Systems</i>
Hubert Ernest Cody, <i>Raytheon</i>	Robert Shishko, <i>NASA</i>
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Julie DeMeester, <i>Raytheon</i>	

Development of the SEBoK

Previous work to develop a guide to the systems engineering (SE) body of knowledge includes an International Council on Systems Engineering (INCOSE) sponsored online version of the Guide to the Systems Engineering Body of Knowledge (G2SEBOK) (INCOSE 2002). The G2SEBOK effort, which ended around 2004, is unrelated to BKCASE and the SEBoK despite the similarity in name. The INCOSE SE Handbook is quite popular and has continued to evolve, and has been the de facto community statement of systems engineering (SE) knowledge and structure until the SEBoK (INCOSE 2012).

Systems engineering (SE) knowledge has also been documented through the standards bodies, including ISO/IEC/IEEE 15288 *Systems Engineering-System Life Cycle Processes* (2008), IEEE/EIA 12207 *Software Life Cycle Processes* (2008), and ANSI/EIA 632 *Processes for Engineering a System* (2003).

These efforts offer a foundation for the SEBoK, which goes beyond them by providing a comprehensive and regularly refreshed view of all SE knowledge.

The scale and complexity of BKCASE emerged over the first few months of the project. Systems engineering is large and relatively immature when compared to more classic engineering disciplines, such as electrical and

mechanical engineering. We are extremely pleased with how the community rose to the challenge. New authors continually stepped up when gaps in the writing team were identified and we routinely assembled 25 to 30 authors every three months in a multi-day workshop to iron out issues and make key decisions.

One of the most critical decisions occurred in January 2011, when the team confirmed a switch to a wiki-based presentation for the body of knowledge. This added much complexity to the effort, but offered great advantages in terms of the modularity for update, access to interim material by the authors, easy review and suggestions for improvements, and flexible navigation. In hindsight, the impact of choosing a wiki was much greater than we understood, but we are very happy we went down that path. We believe this format to present the body of knowledge will serve the SE community much better than if we had produced a traditional PDF or Word document.

The SEBoK is intended to evolve and morph with use and with changes in the field. The wiki structure is particularly well-suited for promoting that purpose. Users are asked to comment about what they like and dislike, what is missing and what should be removed. New articles will be added and existing articles updated regularly.

To help ensure both the quality of the SEBoK and its acceptance by the community, it was vital that the SEBoK be created with an open collaborative process. Specifically, each version had public review and each review comment was adjudicated. The adjudication results can be found at [SEBoK Review and Adjudication](#).

SEBoK Version 0.25

The first version of the SEBoK - a prototype labeled version 0.25 - was released as a document for limited review in September of 2010. A total of 3135 comments were received on this document from 114 reviewers across 17 countries. The author team reviewed these comments, paying particular attention to the reviews related to content and highlighting diversity within the community. The adjudication of version 0.25 comments may be seen [here](#).

SEBoK Version 0.75

Based on the review comments, the authors first began

by reorganizing the SEBoK to better align with the types of information included. The architecture was amended to add a handful of new articles and also about a third of the articles were revised.

SEBoK Version 0.5

In January of 2011, the authors agreed to transition from a document-based SEBoK to a wiki-based SEBoK, with the intent to make the information readily accessible worldwide, provide additional methods for searching and navigating the content, and provide a forum for the community to provide feedback while keeping the content of the SEBoK stable between versions.

This second version of the SEBoK was released for world-wide comment in September of 2011. About 500 comments from approximately 40 reviewers were received. Selected comments were addressed in version 0.75, while others were deferred until version 1.0.

SEBoK Version 1.0

Version 1.0, released in September of 2012, was the first version for broad community use. It made further revisions to the architecture, through adding, deleting, and moving articles. Most of the issues from the 0.5 and 0.75 reviews that had been deferred were addressed, though some issues were deferred to post-version 1.0 releases. All comments from all previous review cycles were entered into the final adjudication matrix and addressed. Additional wiki enhancements were added.

SEBoK Version 1.0.1

This micro update, released in November of 2012, fixed a number of spelling and grammatical errors, corrects errors in acknowledgments, and made other very modest improvements to version 1.0 of the SEBoK. There were no edits to individual articles to: improve clarity or content, add references to new publications since version 1.0 was released, improve wiki navigation and operation, or make other more substantial changes. Comments from version 1.0 were collected and archived for adjudication in version 1.1 or later.

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Additional References

None.

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This page was last edited on 21 August 2019, at 20:39.