



# BKCASE®

## BKCASE Newsletter March 2015

Report from the INCOSE International Workshop 2015  
and the  
Graduate Reference Curriculum for Systems Engineering.

### BKCASE at the INCOSE International Workshop 2015

In a previous newsletter we gave an update on the planned meetings and other activities of the BKCASE editorial board (EB) at the INCOSE International Workshop (IW) at the end of January. I am very pleased to report that these activities were extremely useful for the EB, and hopefully for the working groups and INCOSE members we were able to interact with.

We went to the IW with 3 aims:

1. To begin to make the review and maintenance of SEBoK articles to reflect the maturing knowledge base part of the normal business of INCOSE working groups.
2. To continue our discussion of key topics where the knowledge base needs to be better organised or matured.
3. To continue to integrate the BKCASE products into the plans of our sponsoring

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organizations.

Many thanks to all of those who helped us further our thinking on these aims, and especially to those who actively sort out members of the EB to discuss closer ties with new working groups.

Two aspects of Systems Engineering knowledge remain as key topics for the rest of the year:

1. How to better integrate and explain the relationships between the growing knowledge sources on Systems of Systems and Enterprise Systems Engineering?
2. How to reflect recent trends in Life Cycle thinking, in particular in Agile Life Cycle approaches, and to integrate this with knowledge from a wider set of application domains?



Graduate Reference  
Curriculum for Systems  
Engineering (GRCSE®)

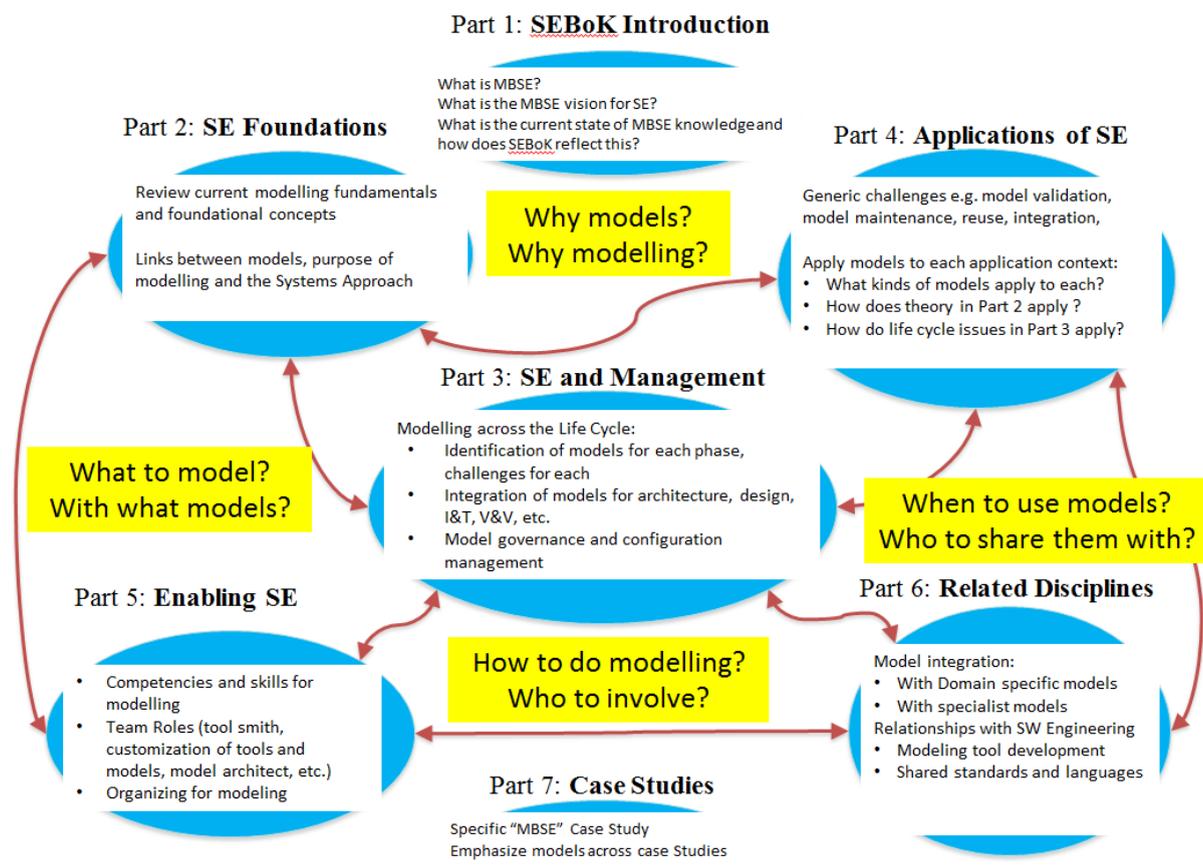
Probably the most significant piece of new work started at the IW was to look in detail at the work emerging from the Model Base Systems Engineering (MBSE) working group. MBSE has been a strong focus for INCOSE for the last few years. While aspects of models and model based can be found across the SEBoK there is not a strong central focus for these ideas. This probably reflects the maturity of these topics across Systems Engineering knowledge sources; certainly at the time that the SEBoK structure was being defined in 2009 and probably still today. As well as a very active working group, INCOSE have appointed an assistant director working under the Technical Operations team to "accelerate the integration of MBSE into all aspects of Systems Engineering practice, transforming Systems Engineering into a model based discipline". To ensure that the SEBoK can both keep track of this transformation, and play an active role in accelerating it, we have formed a joint work stream with the MBSE working group and INCOSE Tech Ops.

At the IW we reviewed the current SEBoK structure and considered where MBSE knowledge could be better covered within it. The following diagram summarises the outputs of this review.

Note that as well as discussing details of MBSE related knowledge across the seven parts of the SEBoK, we also identified four more general groups of questions related to the SEBoK structure:

- Why do we use models in Systems Engineering and why do we employ modelling processes (in which models are used to communicate information between people)?
- What aspects of systems can we model and what models might we use?
- When in a Systems Engineering Life Cycle might we use models and modelling and who do we share them with?
- How do we create and share models and who is involved?

You can expect to see further reports on this work in future BKCASE outputs and at INCOSE events. For example, there will be a panel discussion on the best approaches to integrating MBSE into SEBoK at the INCOSE International Workshop in Seattle in July 2015.



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Rick Adcock

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The BKCASE project, in conjunction with our sponsors from INCOSE, IEEE CS and SERC, will be offering opportunities for companies to sponsor us. The details will appear in the next BKCASE newsletter and on the BKCASE website during March. We will also be producing a special edition of the newsletter on a wider distribution list to encourage more people to subscribe and follow our progress. If you are part of a company or society who might be interested in either sponsorship or sharing the newsletter, please contact us at Rick Adcock [richard.adcock@incose.org](mailto:richard.adcock@incose.org)

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### ***Graduate Reference Curriculum for Systems Engineering (GRCSE)***

Alongside the SEBoK, the Graduate Reference Curriculum for Systems Engineering master's program (pronounced "Gracie") is the other major product of the BKCASE project.

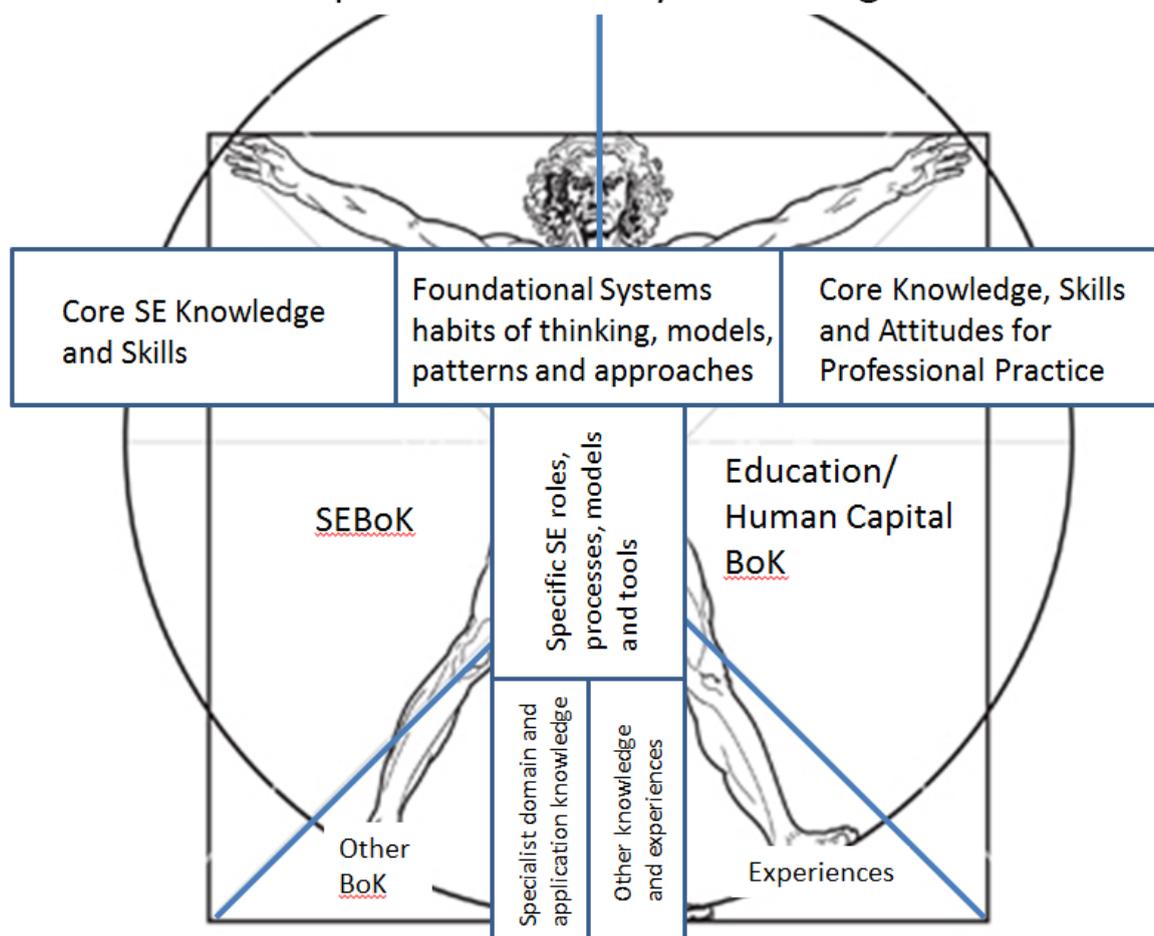
**The BKCASE editorial board is planning a number of activities to review GRCSE and consider possible material for updates planned for 2016. We have already held workshops at the INCOSE International workshop and are planning a workshop at the Conference on SE Research (CSER) on 16 or 17 March. Other workshops are planned for later in the year on the west coast of the USA, and at both INCOSE and IEEE Asia Pacific and Europe, Middle East and Africa (EMEA) sector events.**

**Special thanks to the INCOSE Foundation, who are funding these GRCSE workshops in 2015 as part of their ongoing commitment to promoting the professional practice of SE and to promoting its wider benefits in education, commerce and government.**

GRCSE was developed to provide a curriculum framework to support faculty members in the review or update of existing graduate programs or in the creation of new programs. It can also be useful to students, employers, accreditors and others in comparing and baselining programs. GRCSE is intended to be advisory, tailor-able and useful to university faculty; while setting some agreed minimum baseline of what good SE Masters education looks like.

The most important part of GRCSE is a mapping of SEBoK content to graduate education outcomes. This mapping offers advice on minimum levels of knowledge and skills in SEBoK topics. GRCSE advocates a “T-Shaped” people approach, with all graduate students needing a broad awareness of SE knowledge and the ability to apply core SE skills. In addition, it offers advice on how a university might use deeper knowledge in aspects of SE, coupled with domain or specialist knowledge, to satisfy the program outcomes and objectives.

### The T Shaped Graduate Systems Engineer



GRCSE does this by suggesting levels of attainment against SEBoK knowledge areas (using Blooms Taxonomy for classifying learning objectives), without placing any restrictions on course content or packaging. GRCSE encourages universities to enrich the SE curriculum content with its own areas of emphasis

or specialisation, and to link it to application areas or other topics relevant to its student or employer base.

In addition to the SEBoK mapping GRCSE offers general program guidance and advice based on the knowledge and experiences of the SE academic community. This advice includes:

- How to set program Objectives, which describe what kinds of roles the program is preparing students for?
- How to set program Outcomes, which describe what a students should be able to do as they progress through the program. These cover not only SE knowledge but also aspects of professional practice such as communication, team working and ethics?
- What is the foundational education, knowledge and experience which best support successful SE masters outcomes?

GRCSE also places a strong emphasis on the value of Capstone Experiences throughout a program to allow students to bring together and practice what they have learnt (preferably in a realistic, team based environment).

Version 1.0 of GRCSE, published in December 2012, is focused on SE centric professional masters programs. This was seen as the most relevant to our original sponsors and contributors. At the INCOSE International workshop we began to review the use of GRCSE and to plan for v2.0. This is likely to be released during 2016. Our initial discussions concluded that we should gather more information on:

- The use of GRCSE so far
- The current state of SE education
- The current and future need for SE education (by students, employers and universities)

As a minimum, we will consider updates of GRCSE to respond to this information, and to changes in the content and structure of SEBoK. We may also consider broadening the scope of GRCSE to look at:

- Other kinds of SE graduate, or under graduate, programs.
- Use of parts of GRCSE to support the creation of courses suitable for use in other engineering and none engineering programs.
- Possible uses of GRCSE to support continuing professional development, professional accreditation, in house training, etc.

Please contact us via the BKCASE website, the e-mail in the newsletter sidebar, or come along to one of our GRCSE workshops, if you are interested in contributing to or commenting on the GRCSE review and possible updates.